Perry Warjiyo
Solikin M. Juhro

Editors

Central Bank Policy Mix: Issues, Challenges, and Policy Responses

Handbook of Central Banking Studies

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Perry Warjiyo   Solikin M. Juhro
Bank Indonesia   Bank Indonesia
Jakarta, Indonesia   Jakarta, Indonesia

The Governor Remarks

Talking about the Central Bank Policy Mix, my memory goes back to what happened a decade ago upon return from my terms as Executive Director at the Fund, when I first initiated the development of central policy strategy, called the Central Bank Policy Mix, for Indonesia in 2010. These periods coincide with the episode of global financial crisis of 2008/09 (GFC) and its aftermath. A new central bank paradigm emerged where mandate of central banks cannot merely be confined to achieving price stability, but augmented with promoting financial system stability. To achieve this dual mandate, there is a necessity for central bank to formulate and implement a policy mix of interest rate policy, combined with exchange rate policy, capital flow management as well as macroprudential policy.

Our experience in Indonesia since 2010 has shown that implementing a Central Bank Policy Mix is superior rather than focusing on a specific policy to drive the economy. Prior to GFC, the world economy was preceded by two decades of monetary stability attributed with declining inflation and low interest rates. However, these macroeconomic condition contributed to the financial cycle pro-cyclicality indicated by housing and asset price bubbles, extensive credit expansion domestically and externally, accompanied by risk-taking behaviors, in turn, creating financial system instability problem. Thus, the central bank should assess not only the macroeconomic and risk outlooks but also detect macro-financial imbalances in the financial system. Monetary policy responses still needs to be directed toward achieving price stability taking into account the financial instability and risk outlook looking ahead, supported with macroprudential policy and capital flow management. Beyond the central bank, policy mix is extended by strengthening coordination with the government and related agencies to ensure financial system stability and support overall macroeconomic stability and structural reforms of the nation.

These new paradigms of central banking are conceptually coherent and implementable, reflected by increasing trend of adoption by various central banks around the world. Strengthening central bank's institutional capacity on the subject of policy mix is important and becoming a necessity. With Indonesia's extensive experience during post-GFC era including the episode of taper tantrum, Bank Indonesia has been on the front line to promote and share the evolution of policy mix through

international flagship program, in terms of workshops and seminars since 2015. I am very grateful that the crystallization of my thoughts can eventually be internalized in productive activities and is contained in this book.

In closing, I would like to acknowledge and appreciate our partners in developing and executing this program over the course of five years. I hope this book is able to capture the dynamics of the program, as well as enriching for the general readers on the new dimension of central banking which will continuously evolved as we strengthen the policy mix frameworks and its supporting digital infrastructures. May our efforts leave a legacy that lasts for a brighter future.

July 2021   Perry Warjiyo
                                                      Governor of Bank Indonesia
                                                        Jakarta, Indonesia
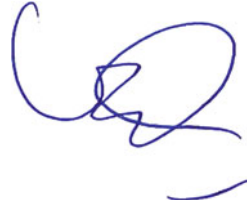
Foreword from Deputy Governor

The phrase 'policy mix' emerged in the 1960s by Nobel laureate Robert Mundell, referring to a focus on the interactions and interdependencies between different policies and instruments as they affect the extent to which intended policy outcomes are achieved. Nonetheless, the meaning of the term remains ambiguous, and the effect might be undermined up until the global financial crisis (GFC) in 2007–2008. GFC provided a lesson for monetary authority to put more emphasis on the importance of the financial sector to macroeconomic stability. GFC also raises awareness for fiscal authority to take supporting measures to restore economic stability. The rapid change of globalization factors will force economic policies to evolve continuously to address various economic challenges which cannot be addressed solely by monetary, macroprudential, or fiscal policies but requiring a mix between those policies and other supporting policies.

The emphasis of policy mix is how to have a well-measured approach to address relevant issues in timely manners. It is becoming more relevant now as global society is preparing for a new norm with the emergence of the digital economy and the advancement of technological progress, accelerated by the current ongoing pandemic. These states of the world fully embodied the terminology of TUNA (turbulence, uncertainty, novelty, and ambiguity), accentuated by hyper-connectedness, higher degree of openness, and wider and faster contagious spillover effects within country and region.

Bank Indonesia initiative to organize international workshop and seminar on these subjects since 2015 was in line with the competency development needs of fellow central bankers around the world, especially in the emerging markets. These programs are co-hosted with various leading and prominent institutions and served as a platform for discussions between policy makers, central bankers, and academia. I believe such collaboration will support the knowledge advancement on the subject of policy mix and essential for the anticipation of future challenges in our effort to safeguard and ensure long-term economic stability and prosperity.

May God Almighty bless us and enlighten our steps toward a better future.

July 2021   Dody Budi Waluyo
                                                 Deputy Governor of Bank Indonesia
                                                              Jakarta, Indonesia

Acknowledgements

As part of Bank Indonesia's transformation journey, in 2015 the BI Institute was formed as the learning and research center of Bank Indonesia. BI Institute vision is to become a prominent world-class institution of learning, study, and research that strategically contributes to fostering the quality and dignified human resources and capable of realizing a prosperous and just nation. Our international flagship workshop and seminar reflects these visions and have an important role in facilitating discussion and collaboration on various current strategic issues with participation coming from domestic and international stakeholders. The *Central Bank Policy Mix: Issues, Challenges, and Policy Responses* is our annual flagship program designed to examine the interactions among central bank policies including monetary policy, exchange rate policy, macroprudential policy, and capital flow management. It also elaborates modeling issues and quantitative analysis of the interaction among macoeconomic variables and policy instruments.

The program was first held in 2015 in collaboration with European Central Bank (ECB). Over the years, we have been working with various prominent institutions as our strategic partners, such as the International Monetary Funds—Singapore Regional Training Institute (IMF-STI), the Central Bank of the Republic of Turkey (CBRT), and other public institutions. Special mention goes to CBRT for regularly conducting a joint workshop program on these subjects in Turkey. Our target audiences for these programs are mid-to-senior-level officials working in macroeconomics sector, financial sector and fiscal sector from the central bank, and other public institutions.

This book is the integration of selected materials of keynote speeches, lectures, and related teaching materials during 6 years of the program. It is not easy, of course, to extract the relevant materials presented during 6 years of the program and delivered by several speakers. To make it more lively, discussion or dynamic interaction between speakers and participants throughout the class is also presented exclusively in the respective chapters. In addition, to make it an integrated material, we add a number of relevant bridging substances.

On this occasion, we would like to acknowledge the continued support and strong leadership from the Board of Governors of Bank Indonesia which enabled us to

implement our flagship programs on policy mix. I would also express my sincere gratitude to all strategic partners for a prolonged and wonderful collaboration, the distinguished speakers for their willingness to share expertise and knowledge, and all alumni for actively participating in the programs. Going forward, we really hope that this program will strategically contribute to knowledge-based enhancement in the functioning of our role as central bankers and the public institution policy makers. Last but not least, we wish to extend our highest appreciation to various parties who have contributed to the completion of this book. We hope this book may further enhance the reader's understanding on the subject of policy mix.

July 2021   Solikin M. Juhro
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Part I
New Paradigm of Central Bank Policy Mix

Chapter 1
Central Bank Policy Mix: Key Concepts and Indonesia's Experience

Perry Warjiyo

Abstract Central banks' mandates cannot merely be to achieve price stability; they should be enlarged to include promoting financial system stability. To achieve this dual mandate, central banks are advised to formulate and implement a policy mix of interest rate policy, combined with exchange rate policy, capital flow management as well as macro prudential policy. This policy mix should be further complemented with strong coordination and communication.

Keywords Central bank policy · Policy mix · Bank Indonesia · Global financial crisis (GFC)

Introduction

It is my pleasure to deliver the keynote address for this important workshop. After serving my term as executive director of the Funds, in 2010 I initiated the development of what is now termed the central bank policy mix in Indonesia. This period coincides with the aftermath of global financial crisis 2007–2009, which marks a fundamental change in the mandate and function of the central bank. The mandate of central banks cannot merely be confined to achieving price stability, but and should be enlarged with promoting financial system stability. To achieve this dual mandate, it is advisable for the central bank to formulate and implement a policy mix of interest rate policy, combined with exchange rate policy, capital flow management as well as macroprudential policy. Policy mix should also be complemented with strong coordination and communication. Our experience in Indonesia since 2010 has shown that implementing a central bank policy mix is superior rather than only applying a certain framework such as Inflation Targeting Framework (ITF), as we have done in the past. In addition, the central bank also needs to be ready with the challenge and opportunity from the rising of digitalization. When we are facing unbundling of financial services through fintech and e-commerce, the central banks need to understand and response properly. The fundamental idea is that monetary policy and

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financial system stability policy can still be utilized to address the digitalization in the financial services, including in the payment system. I believe, integrating economic and financial in the era of digitalisation end-to-end process is the key success of any central bank that not only want to survive in the digital era but also to reap the benefits from the rapid development of digital economy and finance. These are the new central bank paradigms.

What Has the Global Financial Crisis (GFC) Taught Us?

Let me first discuss what the global financial crisis (GFC) taught us, especially on the issue of enlarging the central bank's mandate. As we all know, prior to the GFC, the global macroeconomic condition was relatively stable. Inflation and interest rate were declining for the last two decades before the crisis. This development, among others, is due to the increasing number of central banks adopting monetary policy framework, which focus on maintaining price stability, known at that time as the inflation targeting framework. In the US, the period prior to the GFC was known as the Great Moderation. Sustained monetary stability, however, occasionally created another problem of financial system instability. This reminds us of what Hyman Minsky alluded to in 1982, namely the financial instability hypothesis (Minsky, 1982). Under an economy where capital is the backbone of the economy, low inflation and low interest rates during a period of economic boom create the booms and busts of the financial cycle. This leads to financial cycle pro-cyclicality. During an economic boom, there are housing bubbles, asset price bubbles, credit expansion, an accumulation of external and domestic debt, and risk-taking behavior. This is what we have had in the past. Where there is economic stability, an economic boom, boom and bust in the financial cycle, pro-cyclicality and systemic risk create the problem of financial system instability. A lot of research has been done on that area, including what caused the global financial crisis. Various research has documented that boom and bust cycles during an economic crisis were usually preceded by pro-cyclicality and systemic risk, along with a housing bubble, credit boom and external debt as well as the influence of capital flows (Jordà et al. 2010; Claessens et al. 2011; Claessens and Kose 2013).

Against the backdrop of GFC, let me put forward three salient lessons for central banking. First, as I indicated earlier, the mandate of the central bank cannot be confined only to achieving price stability, it should be enlarged by also promoting financial stability. How does financial stability need to be incorporated into the monetary policy setting of the central bank? This reminds us of the debate between the lean versus clean approach to monetary policy (OECD and White 2009). In the clean approach, central bank does not react to future financial system instability risk but letting the market to adjust by itself. During a crisis, the central bank will just clean up the mess. I think this approach was adopted by the US Federal Reserve under Chairman Greenspan. Bubbles may result from a declining risk premium and irrational exuberance, while rising interest rates could cause a bubble to burst more

severely. The global financial crisis taught us, however, that it is better for monetary policy to lean against future financial instability and future financial cycle risk. On the other hand, the lean school of thought implies that interest rates also need to be formulated with regard to pro-cyclicality risk in the economy. A number of countries have shown success with this approach, for example Australia when addressing the housing bubble in 2002–2003. Chairman Bernanke back in 2009, in the Washington Post, also stated that the Fed plays a major role in arresting the financial crisis and should be seeking to preserve, not degrade, the institution's ability to foster financial stability and to promote economic recovery without inflation. This is the first lesson that we must draw from the global financial crisis. In addition to price stability, central banks need to also pay due regard to financial system stability.

Second, the global financial crisis also taught us the importance of the linkages between macro economy and financial system; or the macro-financial linkages as we know it today (Morley 2016). It is important to understand the relation between financial cycle and systemic risk, the pro-cyclicality of the financial system and the systemic risk. Housing price bubbles, asset price bubbles, and excessive external debt sometimes occur when the economy is accelerating (in a boom phase). The pro-cyclicality of the financial sector also has a higher amplitude than the economic cycle. During a boom period, there is usually excessive credit growth compared to the amount required by the economy along with external debt. Whereas during a crisis period, credit growth is far more constrained than what is required in the economy. This macro-financial linkage of the financial system through pro-cyclicality and systemic risk cannot be addressed only by monetary policy but also through micro-prudential regulation and supervision. Monetary policy can lean against the wind of financial instability but interest rates alone will not be sufficient. Low interest rates environment may cause a housing bubble, coupled with risk-taking behaviors and other factors. Micro-prudential policy which focused on the healthiness of individual banks and financial institutions, can also address these issues. For example, if we want to increase the risk-weighted measure of capital requirements that would be ineffective in terms of addressing a housing bubble because a risk evaluation of capital requirements is also pro-cyclical. Usually, the risk evaluation tends to underestimate the true risk during an economic recession. This nature of macro-financial linkages, through pro-cyclicality and systemic risk in the financial system, requires a new tool, a new measure and a new policy, which is now known as macroprudential regulation and supervision. This addresses pro-cyclicality and systemic risk in the financial system. Looking at the experiences of a number of countries, it is evident that a central bank is well-qualified to assume the macroprudential function from the point of view of surveillance capacity as well as the policy tools that the central bank has. Kawai and Morgan (2012), for example, also showed this. A study of 13 developed and emerging market economies by the Bank for International Settlements (BIS) in 2011 also concluded that the central bank must be involved in the formulation and execution of financial stability policy for such policy to be effective. The performance of the monetary policy function provides the central bank with a macroeconomic focus as well as institutional capacity to enlarge their monetary policy framework with additional macroprudential measures and assessments of macro-financial linkages.

When there are costs in the economy, the central bank will be the ultimate source of liquidity for the economy, especially through the lender of last resort (LOLR) function.

The third lesson from the global financial crisis is capital flow volatility (Hannan 2017). This issue applies mostly from the perspective of emerging market economies (EME). Capital inflows were huge during the period following the GFC until the middle of 2013, namely the Fed's Taper Tantrum, due to unprecedented quantitative easing (QE) in advanced economies coupled with low interest rates. However, EME experienced sudden capital reversals following the Taper Tantrum in 2013. Currently capital flow volatility is still relatively high. EME needs to address this issue since capital flows volatility contributes to financial and macroeconomic instability in the economy (Baum et al. 2017). Central banks can respond with interest rate policy or greater exchange rate flexibility, but we need to complement it with new measures and policies, known as capital flow management.

A Post-GFC Paradigm of Central Bank Policy Mix

The three above-mentioned lessons have changed the mandate and function of the central bank. A central bank can no longer be confined to only achieving price stability, financial stability must also be incorporated. Central banks need to enlarge and complement the monetary policy framework with additional measures that lean against the wind in the form of macroprudential policy and capital flow management. This lesson leads us to the concept and key feature of the central bank policy mix and how this is being formulated and implemented through the central bank.

Let me begin the discussion of the concept and key features of the central bank policy mix. To achieve price stability and support financial stability, the central bank should assess not only the macroeconomic and risk outlooks but also enlarge the assessment to detect macro-financial imbalances in the financial system. This can be achieve by incorporating the financial sector and the external sector in the central bank's macroeconomic forecasting and analysis models. A number of models have been developed in the literature, including the model by Angelini et al. (2012). This assessment of macro-financial linkages usually emerges in the form of pro-cyclicality and a build-up of systemic risk concerning housing and other asset price bubbles, credit booms, accumulation of external debt and capital flow volatility. Based on this macroeconomic and macro-financial imbalances assessment and outlook, the following three building block forms the central bank's policy mix. As I alluded to earlier, monetary policy still needs to be directed towards achieving price stability but taking into account the financial instability and risk outlook. This is important, namely how interest rate or monetary policies need to address the emergent of pro-cyclicality and systemic risk in the financial system, such as monetary and financial stability inter-linkages. The second building block is macroprudential policy and the third is capital flow management.

From the first building block, financial system stability can be incorporated into the monetary policy framework through the lean versus clean debate that I alluded to earlier. One of the approaches is to incorporate financial stability into the inflation targeting framework of monetary policy. Agenor and da Silva (2013) discussed what they called integrated inflation targeting framework that incorporated financial stability. They argued that in addition to the inflation and output gaps, monetary policy also needs to consider and react to credit gaps, namely the credit boom aspect as well as the real exchange rate in order to address the time-series dimension of systemic risk. In a paper written in 2012, Woodford also proposed an optimal solution for monetary policy when the central bank formulates a trade-off between a greater degree of price stability and the output gap for the sake of stabilizing the financial system in terms of systemic risk (Woodford 2012). Another paper written in 2014 also shows the kind of information needs to be included by incorporating financial stability in the inflation targeting framework, in particular the transmission mechanism of financial conditions, indicators of financial stability relating to the financial cycle, financial market vulnerabilities as well as early warning signals.

The second building block of the central bank policy mix is macroprudential policy, consisting of regulations and supervision concerning financial services institutions from a macro perspective with a focus on systemic risk, as required for promoting financial system stability. The macroprudential policy has both time dimension and cross-section aspects. The time dimension of macroprudential policy aims to mitigate financial cycle pro-cyclicality as well as credit booms and busts in the economy, while the cross-section aspect of macroprudential policy focuses on addressing and mitigating the risk of interconnectedness in the financial system network. These are the two dimensions of macroprudential policy, namely the time dimension of pro-cyclicality and the cross-section dimension of interconnectedness and systemic risk. Several policy instruments have been developed and practiced by the central banks. For example, macroprudential policy instruments to address pro-cyclicality includes the loan-to-value (LTV) ratio aims to manage the credit cycle and a countercyclical capital buffer (CCB) as well as limits on foreign exchange risk exposure and offshore borrowing to address the systemic risk. These are macroprudential policy instruments available for the central bank to implement in their policy mix.

The third building block is capital flow management, which aims to mitigate pro-cyclicality and the build-up of systemic risk from the accumulation of external debt as well as capital flow volatility. As documented in the International Monetary Fund (IMF) in 2012, 2013 and 2015, the best defend to address this is through macroeconomic policy, exchange-rate flexibility, financial market deepening, strengthening financial regulations and supervision, which is now known as the Institutional Approach to Capital Flow Management. Capital flow management complements monetary policy and exchange rate flexibility. A number of countries have already implemented this, including a tax on equity portfolio and debt inflows in Brazil in 2009, for example. In Indonesia, we implemented a holding period on central bank bills and limits on short-term foreign borrowing in 2010–2011. South Korea implemented a withholding tax on interest income and non-resident purchases of

treasury and monetary stabilization bonds in 2011. Also, Thailand implemented a withholding tax on non-resident interest earnings and capital gains on new purchases of state bonds in 2010. There are a number of measures associated with capital flow management.

Conceptually, the central bank policy mix is coherent and can be implemented. Indeed, a number of central banks, including Bank Indonesia, have already implemented a central bank policy mix, which is becoming a new paradigm of central banking.

Bank Indonesia's Policy Mix

I would like to share with you some of Indonesia's experiences in terms of formulating and implementing the central bank policy mix. To support the formulation of a central bank policy mix and to enrich our better understanding of the macro-financial linkages, we have already enlarged our macroeconomic forecasting and analysis models to include macro-financial linkages. This includes external default risk as a proxy of a sudden stop capital reversal as well as credit gaps to incorporate financial system pro-cyclicality and has already been published in the papers (Harmanta et al. 2012, 2013). Even now, we have completed our DSGE model, which incorporates macro-financial linkages in the forecasting and analysis models. This is important for our policy formulation process.

The model provides policy scenarios with the basic inflation targeting framework through the interest rate response under the Taylor rule as well as a mix of reserve requirements from monetary policy and our loan-to-value (LTV) ratio as macroprudential policy instruments. The model already includes the macro-financial linkages and the instruments in the central bank policy mix include the interest rate response a la Taylor rule, exchange rate flexibility, reserve requirements and the loan-to-value (LTV) ratio to address credit cycle booms and busts. This is the model that we have already developed, which plays an important role underlying our policymaking. The central forecasting model is forward-looking, it sets important considerations on how best to lean against the possible risk from sudden stop capital flows and the build-up of pro-cyclicality and systemic risk in the financial system; whether we only need to address through interest rates alone, or complemented with exchange rate flexibility as well as other macroprudential measures, for example reserve requirements and the loan-to-value (LTV) ratio.

To strengthen our understanding of pro-cyclicality of macro-financial cycles, credit booms and housing bubbles in particular, we also run a separate model to assess the nature of their cycle and possible build-up of systemic risk both at an aggregate level and cross-section. A paper published by Alamsyah and Harun also supports our policymaking (Alamsyah et al. 2014; Harun et al. 2014). This provides a good approach and framework for our central bank policy mix, consisting of the following four main instruments. First, as with the inflation targeting framework, interest rate policy is being formulated to ensure the inflation forecast falls within

the targeted range. Second, the exchange rate policy is geared towards maintaining the stability of exchange rate movements along its fundamental trend to ensure consistency with achieving the inflation target as well as to mitigate excessive volatility that may put pressure on financial stability. Third, capital flow management is conducted to support exchange rate policy, particularly during periods of large surges of capital flows and heightened risk of capital reversal. Fourth, macroprudential policy is geared towards maintaining financial stability and supporting the effectiveness of monetary policy transmission. Policy mix effectiveness are also supported by financial market deepening, policy coordination and communication. Further, the central bank also maintain close coordination with the government through the Ministry of Finance and other agencies in the form of a Financial System Stability Committee, which consists of the Minister of Finance, Governor of the central bank, Chairman of the Indonesian Financial Services Authority and the Chairman of the Deposit Insurance Corporation (LPS). This is the framework of the central bank policy mix that Bank Indonesia has already implemented since 2010.

Let me share a brief overview of three episodes of policy mix implementation in Indonesia, considering what we have implemented, the implementation challenges as well as our central bank policymaking response since the global financial crisis. The first episode is during the period of 2010–2013. Back then, Indonesia was enjoying the benefits of conducive global economic and financial conditions. We experienced a commodity price boom and high economic growth, supported by commodity exports. This then created a housing price boom, while simultaneously accelerating credit growth. We also experienced huge capital inflows at that time, which added stimuli to the economy through liquidity injections, a credit boom and soaring house prices. This is when we introduced and started to implement a central bank policy mix because this was a challenge that we could not resolve only through interest rate policy. Low inflation environment provides the room for lowering the interest rate as we did cut our policy rate back then. However, lowering the interest rate further stimulated credit boom and housing boom. At that time, capital inflows were less sensitive to the interest rate because of abundant global liquidity. Our interest rate response through FX intervention mitigated the further misalignment of the real exchange rate that had appreciated beyond the currency's fundamental value. These policies were complemented with capital flow management. We started to issue a holding period as well as limits on short-term offshore borrowing by banks. We also introduced the loan-to-value (LTV) ratio in the automotive and property sectors because both sectors were experiencing excessive credit growth above 30% (yoy). This was more effective than only resorting to the interest rate. A policy mix of interest rates, exchange rates, capital flow management and macroprudential policies has proven to be more effective.

The second episode was much more challenging, during the period of Taper Tantrum. This was the most challenging period confronted by central banks around the world. The Fed's Taper Tantrum triggered a huge capital reversal in a very short-term period, squeezing domestic liquidity, encouraging herding behavior in the FX market as well as triggering monetary and financial instability pressures. Domestically, we still had housing and credit booms. Back then, credit growth was still

relatively high at around 27% (yoy). The situation getting more complicated, as we started to experience a current account deficit, as a result of declining international commodity prices coupled with persistently strong domestic demand. At the same time, there was uncertainty concerning government energy price policy.

The complexity of maintaining internal balance and external balance could not only be resolved through the standard inflation targeting framework and interest rate policy. Bank Indonesia was the first central bank reacting to the Fed's Taper Tantrum through an interest rate policy response. Bank Indonesia increased its policy rate aggressively, totaling 175 basis points within six months. We still based our central bank policy mix on the inflation targeting framework by responding through interest rate policy. However, we needed to complement that policy mix with other policy instruments. Thus, we also intervened in the FX market through dual intervention policy to maintain exchange rate stability. For Indonesia, most of the exchange rate pressures originated from external shocks in the form of a global reversal by investors from government bonds. Consequently, we complemented our FX intervention to stabilize the exchange rate with the purchase of government bonds from the secondary market. This dual tactic of intervention was more effective than just intervening in the FX market. We addressed the source of the risk, namely foreign investors flying from government bonds. To that end, we coordinated with the Ministry of Finance to make intervention more effective. We also relaxed our holding period from six months to one month and also expanded the scope of transactions excluded from the calculation of offshore borrowing in the banking industry with respect to capital flow management.

The complication still exist due to high bank lending growth which requires tightening the macroprudential measures. Although we relaxed the policy in terms of capital flows, we tightened our macroprudential measures in 2013, especially lending to the property sector, which was excessive at that time. Therefore, we tightened our loan-to-value (LTV) ratio for subsequent mortgage facilities. We also complemented this measure through supervisory actions for banks that were exhibiting excessive lending behavior. This was the central bank policy mix that we believed would be more effective than only relying on one instrument, namely an interest rate response. The bold monetary policy adjustment, coupled with close policy coordination with the Government and Indonesian Financial Services Authority, contributed to Indonesian resilience in the face of global financial shocks. Macroeconomic and financial system stability remained intact, as evidenced by low inflation and a narrower current account deficit from 3.3% of GDP to 2% of GDP. Consequently, economic moderation was less severe than if only one policy instrument had been used. Despite domestic economic moderation, growth remained relatively high compared with other emerging market economies. We have forecasted economic growth this year at around 5% and increasing next year. The central bank policy mix in terms of maintaining macroeconomic, monetary and financial stability, successfully navigated the second episode of the economy.

Starting in 2015, we had the liberty to adjust our policy stance. As our risk forecast for prices and financial stability starting in 2013 was low, we started to adopt accommodative monetary policy in early 2015. Last year, we started to relax reserve

requirements and macroprudential policy instruments because in 2015 we could not start with interest rates due to the uncertainty affecting the expected federal funds rate (FFR) hikes. Our policy stance came from the other instruments of the central bank policy mix. We lowered our reserve requirements by 50 basis points in November 2015 and by 100 basis points in February 2016. Lowering the reserve requirements was part of monetary easing. We also relaxed our loan-to-value (LTV) ratio by an average of 10% for lending to the property and automotive sectors in 2015. In August 2016, we relaxed our macroprudential policy on subsequent mortgage facilities.

With growing certainty concerning the future trajectory of the federal funds rate (FFR), we began to cut our policy rate this year. In 2016, we have cut our policy rate six times, totaling 150 basis points to 4.75% currently, accompanied by successful monetary operations reforms, moving our policy rate from the 12-month BI Rate to the BI 7-Day (Reverse) Repo Rate. Those were the three salient episodes when we formulated, designed and implemented the central bank policy mix. The building blocks of our central bank policy mix remained grounded in the inflation targeting framework but we enlarged our forecasting model to include macro-financial linkages, credit gaps as well as a capital reversal. We complemented this with research on the financial cycle, credit booms and busts as well as other aspects of financial imbalances. Bank Indonesia was also the first central bank amongst emerging market economies to develop a national balance sheet to address macro-financial risk. At that time, the central bank had more space and liberty to optimize its instruments, namely the interest rate, exchange rate, capital flow management and macroprudential policy.

I hope I have been successful in presenting the key concepts as well as the implementation of central bank policy mix. Hopefully our country's experience contributes to the discussions in academia and central bank policymaking. Let me add two key takeaways before closing. First, strengthening the institutional capacity of the central bank is important to support the policy mix. In Bank Indonesia's case, we enlarged our policy forecasting and analysis models to encompass macro-financial linkages, research on the financial cycle, micro-financial linkages, as well as systemic risk and interconnectedness in the financial system, in addition to the risk of capital flows, private external debt and other aspects. The internal decision-making process has also been strengthened by introducing a joint committee. Over the past two years we have held a joint monetary policy and financial system committee meeting prior to the monthly board meeting, which was previously held separately. At the meeting, we discuss the macro-financial linkages and recommend an optimal policy mix. This has been very positive and has strengthened the policy mix. Second, closer coordination with the government and other related agencies is also being strengthened. In Indonesia's case, a new law established the Financial System Stability Committee to coordinates the regulations amongst the four agencies to ensure financial system stability and support overall macroeconomic stability. Coordination is also being strengthened in terms of the structural reforms. A mix of macroeconomic policies and structural reforms is very important. We hope that this strengthens the central bank policy mix to support sustainable economic growth with sound macroeconomic and financial stability.

What's Next: Dealing with Diminishing Globalisastion and Rising Digitalization

Since the GFC until recent development, everything that we learned at the university are being challenged. We need to rethink the macroeconomic theory and practice. We need to think how the financial services operated and how to response, not just from the perspective of policy maker, but also academician and researcher. The increasing and continuing trade tension we are facing leads to an era of diminishing globalisation and rising digitalisation. I will share my thoughts from the central bank perspective on how we as academicians and policy maker need to understand what is happening in the diminishing of globalisation and the rise of global digitalisation. I invite all participants to think about the economic underlying as well as the theory that we have to teach and research we conduct in order to advance our academic thinking and the appropriate policy response. In the first part, I will talk about the characteristics of diminishing globalisation and rising digitalisation. And in the second part I will discuss the central bank's response.

Let me start with the first part. So many characteristics and stylized facts that we can learn and research since the global financial crisis. The first characteristic is the rise of inward looking policy, anti global trade. We are currently still facing the trade war between US versus China and others. Previously, trade globalisation is perceived to be the component to actually promoting our global economic growth and increasing the capacity of the country to rise as well as where actually the adjustment in the global trade can be smoothed to the equilibrium. With the ongoing trade war, is there still any room for international trade to equilibrate the disequilibrium in the global economy? Global communities are discussing whether US economy will continue to grow. Some of the financial market analysts already forecasting US will probably be in the recession in 2021 if the trade war continues. This is the issue where the trend of trade globalisation in the past is already diminishing. The next question is how the academic and policy maker may help to understand this phenomenon and how can we explain it to our students and researchers? The diminishing market mechanism in the global trade is the first characteristic.

The second characteristic is in the global financial sector. In the past, the interest rate parity and free of flow capital have become the engine to distribute saving-investment gap and promote economic growth. Interest rate parity can equilibrate the prices of capital flows. However, the volatility of capital flows has been increasing, especially since the taper tantrum. It is very difficult to understand the movement of capital flows solely from analysing the interest rate parity condition. Risk premium may help to explain the phenomenon, however we also aware that risk premium dynamics is similar to a random walk variable rather than following fundamental factors that can be explained by theory. Hence, we need to re-look the paradigm of free capital mobility as well as the interest rate parity theory, such as the Mundell-Fleming theory and the Dornbusch over-shooting model, in order to better understand the increased volatility of capital flows. Those kind of the things that we have to understand as the second characteristic.

The third characteristic is on the policy response. If we look at both in the advanced countries and the emerging countries, the policy responses are becoming less effective now. Advanced countries in the past formulate their monetary policy based on policy rules, such as the Taylor rule, Yellen rule or other rules, especially in the context of inflation targeting framework. However, when the interest rate is near or zero, the inflation targeting framework becomes less effective. Recently, we witness the implementation of unconventional monetary policy namely the quantitative easing (QE). In the past, we have learned that if we use interest rate channel then the quantity channel will adjust. But now we cannot only rely on interest rate policy for monetary policy response. We have to combine the interest rate policy with the quantitative policy, whereby in the past we learned and also taught student that this is not the proper way. This is the third characteristic.

The fourth characteristic is digitalisation. There are so many digitalisation, but I just want to talk about the digitalisation in the financial services. In the past financial services are being provided in one room by the banks and financial institutions, through deposit, lending or financing, and assets management services. Those financial services are becoming unbundled by digitalisation with the rise of fintech in the area of payment, crowd funding, peer-to-peer landing and assets management. Even in the financial market the trading is no longer conducted by people but by machine through artificial intelligent. How can the phenomenon of digital era such as of the unbundling of financial services, the use of the machine learning in trading, the transmission of monetary policy, the inter-relation function of financial services be explained from the conventional theory of financial services? Last but not least, how can we understand the central bank role on those aspects where we are facing with the emergence of digital currency such as libra and bitcoin.

In the second part, I will discuss the response from the central bank perspective. Central banks in the past are being taught to have a single objective of price stability and the use single instrument of interest rate. In Bank Indonesia's case, we had Bank Indonesia rule as opposed to the Taylor rule and Yellen rule. When I was an executive director in the IMF, representing 13 member countries in the region during 2007 and 2009, I witnessed the fall of financial services and monetary transmission mechanism globally. I also saw the fall, or at least the diminishing, of implementation of inflation targeting framework. I learned that the mandate of central bank cannot be only confined to price stability. Central bank must have a mandate of supporting financial stability because otherwise price stability cannot be achieved without financial stability thereby effective transmission as well as financial stability cannot be achieved if we cannot maintain the stability of the price and assets price.

The mandate of central bank must have promoting financial stability in addition to price stability. On the monetary policy side, even we have to complement interest rate policy with some aspects of exchange rate stability, some aspects of also managing the quantitative of money in circulation. On the financial stability area, the importance of macroprudential policy is increasing. The role of macroprudential policy, by definition, is to promote financial stability into two aspects. Managing cross-section systemic risks as well as time dimension of systemic risks, what we call financial

pro-cylicality. Those aspects of macroprudential policy must be complemented by the standard of monetary policy for achieving the price stability.

This is what I call the central bank policy mix. IMF calls it integrated policy framework, BIS is now discussing how to merge the theory and practice of central bank policy, but Solikin and I already wrote a book on that area. The Indonesia version of the book was published three years ago. More recently, Emerald published the English version titled "Central Bank Policy: The Theory and Practice" (Warjiyo and Juhro 2019). This book represents accumulation of all our knowledge, my knowledge, and Solikin's knowledge on the theory, empirics, and policies. Chapter thirteen, fourteen, and fifteen especially discuss the subject of central bank policy mix. Now is just the right time to apply the central bank policy mix, in the era of diminishing of globalisation and the rise of digitalization. This is the first aspect on the central bank policy mix.

The second aspect is the institutional setting of public policy mix in the central bank as well as on the public institutions. In the past each public institution is assigned one objective with one instrument; central bank with price stability and interest rate policy; fiscal authority with fiscal rule and fiscal sustainability; financial services authority responsible for financial stability with microprudential corporation supervision. There are ongoing debate globally whether the independence of central bank is still valid. From my point of view, I believe those institutional setting are still valid. However, I emphasise the need of simultaneously coordinate the policy within a solid synergy. The independencies of central banks must be put together in the simultaneity through coordination with public institutions as each of the equation cannot work alone. This is the policy coordination and synergy that we adopt in Indonesia.

The third aspect is the era of rising digitalisation, which is very challenging as there are still a lot of things to uncover. When we are facing unbundling of financial services through fintech and e-commerce, the central banks need to understand and response properly. The fundamental thinking is that monetary policy and financial system stability policy can still be utilized to address the digitalization in the financial services, including in the payment system. This is why in 2019 we unveiled the first ever central bank policy response in the digitalisation of economic and financial services through the Indonesia Payment System Blueprint of 2025.

In this blueprint, we need to integrate economic and financial in the era of digitalisation end-to-end process. Similar with the process in money supply where we use paper money or account based, the money issued by central bank are transmitted to the bank and circulating to the fintech and real sector and return to the central bank at the end of the day. These whole aspect of money supply process still can be used as basic reference. The second aspect of our Indonesian Payment System Vision is making the digitalization of the banking as the core of the ecosystem. We opted not to let the unbundling of financial services to grow outside the core banking. We are still promoting the growth of the fintech, the crowd funding, the peer-to-peer-lending, and the payment system, but we try to interlink those fintech with digitalization of the banking to avoid shadow banking as experienced by other countries as it possesses the risk to diminish the role of central bank and the financial services.

The fourth aspect is to find the balance between innovation versus stability and risk management, as well as know your customer and competitive policy. Last but not least, we have to deal with cross-border digitalisation of financial services to better manage capital flows and other aspect of financial services from global perspective. As an example, on August 17th 2019 we launched our Quick Response Indonesian Standard (QRIS) which aims to encourage transaction efficiency, accelerate financial inclusion, and advance Micro Small Medium Enterprises (MSMEs).

Understanding the digital economy and finance are very important and this is my new baby. The issues that I everyday try to understand with my knowledge of monetary, central bank, financial aspect in the digitalisation of economy and finance. It is a very fascinating time and hopefully I will have the luxury of time to write a book on central bank in the digital area.

Closing

With the above-mentioned exploration, I invite all professors and scholars to study, to explain the underlying theory, provide some empirical assessment, and provide some policy response so all of us, myself as governor, and other governors have a better understanding and a better response.

I do hope the next five days will be enriching and will prove to be a very fruitful and beneficial event, not only for me, but for all of us to learn new things, especially the participants, towards a new dimension of central banking. Once again, welcome to this prestigious forum. Thank you.

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Chapter 2
Central Bank Policy Mix: Issues, Challenges, and Policy Responses

Solikin M. Juhro

Abstract In the aftermath of the Global Financial Crisis, conventional economic policies have been considered insufficient in stabilizing the domestic economy. The new global economic conjuncture necessitates a modification in the existing policy framework by enhancing it with other policies; such as macro prudential policy, exchange rate policy, capital flow management, monetary and fiscal policy coordination as well as structural adjustments. This is now referred to as the policy mix.

Keywords Central bank policy · Policy mix · Global financial crisis · GFC · Policy response

Introduction[1]

I would like to welcome all the participants. Welcome to Jakarta, the capital city of the Republic of Indonesia. It is an honor for me to welcome you to the international workshop entitled "Central Bank Policy Mix: Issues, Challenges and Policy Responses". I would like to deliver three issues that will anchor the next few days. First, I would like to explain why the BI Institute organized this workshop on the theme of the central bank policy mix. Second, the essence of central bank policy mix formulation, which represents the backbone of the future central bank policy strategy in facing the global uncertainties that are expected to heighten with the emergence of the new digital era. Third, the outcomes we expect to deliver from this international flagship program.

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[1] Since 2015, BI Institute of Bank Indonesia hosts the annual international flagship workshop and seminar entitled "Central Bank Policy Mix: Issues, Challenges and Policy Responses". The workshop and seminar is intended to explore insights from prominent experts on empirical and practical experiences in conducting central bank policy mix, with participants coming from middle-to-senior level officials from overseas central banks, domestic regulatory agencies and academics.

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This event, created and hosted by the Bank Indonesia Institute of Bank Indonesia, in conjunction with the International Monetary Fund—Singapore Training Institute (IMF-STI), the Central Bank of the Republic of Turkey (CBRT), and the Reserve Bank of India (RBI), is held annually with the same theme. The first event was held in 2015 in collaboration with the ECB but in the next following years we have been working with our strategic partners, including the IMF-STI, central bank partners (CBRT and RBI), and other prominent institutions. Our target audience for this course consists of mid- to senior-level officials working in macroeconomics, the financial sector and fiscal sector from the central bank and other public institutions. For Bank Indonesia, this course has been an integral part of our international flagship program. Every year, we have around 15 international flagship programs, in terms of workshops and seminars, including a research conference because we manage two international journals, namely the Bulletin of Monetary Economics and Banking, indexed by Scopus, as well as the Journal of Islamic Economics and Banking. I invite you all to submit your research articles to our journals.

These events are co-hosted by various leading institutions as part of Bank Indonesia Institute's journey towards becoming a world-class learning and research institution. This year, we are holding 15 international workshops and seminars. This is our fifth flagship event this year with many more still to run. For sure, we can add many other strong visions to the long list of why collaboration on the knowledge advancement in this field through such workshops is essential for the preparation of anticipating future potential challenges, crises even, in order to ensure long-term economic stability and prosperity.

The key messages I will explore briefly in my remarks, with regard to the central bank policy mix, are based on important issues that need to be tackled by central banks and other public institutions in a well-measured approach. The world situation under global hyper-connectedness, a higher degree of openness and increasing speed of contagious spillover effects from country to country, and region to region, need the timely and relevant issues to be addressed. This is to become more relevant when we are dealing with the challenges ahead in managing the emergence of the digital economy and the advancement of technological progress. The global economy in the aftermath of the Global Financial Crisis in 2008/09 (GFC) was remarkable. It was the worst financial crisis since the Great Depression of the 1930s. The scope and severity of the crisis were global and exceptional and forced policymakers to take some unconventional policy measures. The financial crisis was unprecedented and the impact has been prolonged as the global economic landscape enters a new norm, with a lower growth trend and more volatile financial markets. Since then, volatility, uncertainty, complexity and ambiguity (VUCA) have re-emerged in the global economic discourse. Now, we are facing not only VUCA but also TUNA. After the situation escalated through trade tensions and retaliatory actions between the US and several other countries, the geopolitical situation in some regions, and escalation of the capital flows from emerging markets globally, we are now familiar with the economic terminology TUNA (turbulence, uncertainty, novelty and ambiguity).

Financial Crisis and Central Bank Policy Challenges

The understanding of the sources of a crisis is very important as what happened to the Asian economy 1998 that was hampered by the Asian Financial Crisis of 1997/98 and the global economy that was melted by the GFC. The crises and their aftermath have been painful reminders of the multifaceted nature of crises, either a currency crisis, debt crisis or banking crisis. We have also learned from the latest financial crisis that favorable global economic conditions, such as the Great Moderation during the period of decreasing macroeconomic volatility, as experienced in the United States and other advanced economies, could alert policymakers to misleadingly follow pro-cyclical economic and financial policies. We saw that in the early 1990s, even the Great Moderation could not guarantee that the global economy could be isolated from the crisis because in 2008 we saw that the authorities lack of identifying the sources of crisis, stemming from the vulnerability to the financial crisis, led to the global financial crisis and the prolonged impact that we are feeling to this day.

The global crisis showed that maintaining price stability without maintaining financial system stability is not enough to achieve macroeconomic stability. There is no macro stability without financial stability. The dynamics of capital flows quickly affect the effectiveness of monetary policy, therefore the monetary authority must use a variety of instruments, hence developing from a normal situation where the central bank respond to inflation and the fiscal authorities respond to finance public expenditures. In the aftermath of the GFC, the conventional economic policies were considered no longer sufficient in terms of stabilizing the domestic economy. Several central banks being aware of the condition that new global economic conjuncture necessitates a modification in the existing policy framework by enhancing other policies, such as macroprudential policy, exchange rate policy, capital flow management, fiscal policy coordination and structural adjustments. This is now referred to as the policy mix (Warjiyo and Juhro 2016, 2019). Of course, from an academic point of view, we acknowledge that there have been some thoughts about various formats of ITF implementation, from standard ITF to flexible ITF and integrated ITF, which underlie this policy mix format. This approach is basically preserving the main objective of achieving and maintaining price stability, while safeguarding financial stability as the supporting or secondary objective.

With the emergence of widespread global uncertainty, the primary goal of monetary policy is to strike the right balance between mitigating the downward pressures on domestic economic growth arising from the global economic downturn, while ensuring stability in the medium-term. As central bankers, almost all of us well understand of the nature of the Mundell-Fleming: Impossible Trinity concept based on seminal works of Mundell in 1968 (Fleming 1962; Mundell 1963). The Policy Trilemma, where over time, the three goals cannot be attained simultaneously and only two out of three conditions can be applied together, is very well-known in the literature for a small open economy. The "Impossible Trinity" actually indicates that the dream of any central bank to have free capital mobility, stable exchange rates and

independent monetary policy, which are hard to achieve in the "corner solutions". Our speakers today will provide more details on these issues.

We are living in an imperfect world, so greater domestic economic integration with the global economy, coupled with intense foreign capital flows and exchange rate dynamics, has increased the complexity of monetary management. To confront these issues, the choice of monetary policy strategy has become how to transform the impossible trinity into a possible trinity. The concept of a possible trinity can be expressed as an intermediate solution for a small open economy, including Indonesia that avoids volatile swings in the exchange rate, controls excessive short-term capital inflows and reinforces autonomous monetary policy. In this regard, for the case of Indonesia, to manage the monetary stability framework is indeed to manage the monetary policy trilemma, namely simultaneously achieving the three intermediate goals depending on the central bank's preference in terms of three conditions (Juhro 2015; Juhro and Goeltom 2015).

First, maintaining monetary policy autonomy in achieving price stability by utilizing a monetary and macroprudential policy (instrument) mix. Under standard ITF, we assume a flexible exchange rate regime but the underlying assumption does not hold mostly, for instance uncovered interest parity and the domination of imprudent foreign borrowing in domestic debt. The fact that exchange rate movements are mostly driven by market perception rather than demand and supply, we cannot rely on the free exchange rate assumption. That is why, under ITF, we cannot just rely on the interest rate as our instrument. To maintain monetary policy autonomy, we need another instrument from a macroprudential perspective.

The second condition is stabilizing exchange rate movements in line with the currency's fundamental value by employing exchange rate management. From Bank Indonesia's perspective, we have the perception that the exchange rate should be in line with its fundamental value. Therefore, if our balance of payments is performing well and our current account deficit is narrowing, we will automatically have a stronger exchange rate. In the short term, we have to smooth the volatility by engaging in a floating exchange rate regime. All central banks engage in some form of intervention.

Third, managing capital flow dynamics to support macroeconomic stability by implementing capital flow management. Our resource person in this program will hopefully explain about capital flow management, why we cannot just open our economies. We have included capital flow management in terms of financial system stability as a temporary action not a permanent action. The coordinated implementation of a policy instrument mix is ultimately part of an important strategy to manage the monetary policy trilemma in the current climate blighted by high uncertainty. Coordination is critical, not only to address sources of external and internal imbalances, but also to optimally manage the impact of monetary policy, while avoiding overkill and mutual exclusivity. Within that policy perspective, the achievement of macroeconomic stability is not only tied to monetary stability (price stability) but also to financial system stability.

From ITF to Policy Mix

Under ITF-based monetary policy, which was formally adopted by Bank Indonesia in July 2005, the main priority of Bank Indonesia is to build central bank policy credibility. Therefore, it can only be expected that consistent commitment and determined implementation will be essential to the realization of a more credible ITF. Despite progress having been made since the crisis, the economy is still burdened by various constraints and problems. In this regard, the challenge in monetary policy is to contain rising inflationary pressures without impeding economic growth. We see that Indonesia is now growing at around 5% but we have grown by as much as 6.8% in the past. In the post-GFC and Asian financial crisis period, we are facing a new norm, with growth at around 5%. Under the new norm, 5% is very impressive, however, only below China and India. The question is whether or not a monetary policy framework aimed at achieving price stability is still relevant, such as ITF. The answer is a resounding "Yes".

In his article, even Frederick Mishkin mentioned that crises do not undermine the basic principles of monetary policy, such as the importance of price stability, time consistency, independence and accountability of monetary policy and so on (Mishkin 1999). These are not disrupted by a crisis. We still need these assumptions in order to maintain ITF credibility. The fundamentals of ITF are not hampered by a crisis. We feel that ITF is still relevant. Although Bank Indonesia still sees ITF as a reliable monetary policy strategy for Indonesia, the framework needs to be enhanced by refining future ITF implementation strategy.

From a Bank Indonesia policy perspective, we see that ITF is still relevant but we need more flexibility in ITF implementation. Consequently, Bank Indonesia has enhanced ITF implementation under the unconventional wisdom of monetary policy, which later became the embrio of central bank policy mix (Juhro 2015; Juhro and Goeltom 2015; Warjiyo and Juhro 2016, 2019). There are five aspects of enhancement. First, continuing the adherence of the policy framework to an inflation target as the overriding objective of monetary policy. In this case, the main characteristics of ITF will remain, for example pre-emptive, independent, transparent and accountable policy implementation. Second, integrating monetary and macroprudential policy instruments. Appropriate monetary and macroprudential policy integration is required in order to buttress monetary and financial system stability. Third, managing the dynamics of capital flows and exchange rates. In supporting macroeconomic stability, coordinated implementation of a policy instrument mix must ultimately be part of an important strategy for optimally managing the monetary policy trilemma as I explained previously.

Two other aspects related to institutional strengtening, namely communication strategy and coordination. Communication strategy is not just for the sake of transparency and accountability. We regard good policy communication as an effective monetary policy instrument. There is a lot of evidence in Indonesia that when our central bank governor or members of the board of governors provide a strong and

clear message to the market, it helps influence how market players behave and stabilizes the market. This reduces our intervention costs. Last aspect is strengthening Bank Indonesia and government policy coordination. Policy coordination is crucial, given that inflation stemming from the supply side creates most inflation volatility. We are currently facing a flattening of the Phillips curve. This implies that the supply side is playing a more important role in terms of inflationary pressures. Therefore, we have to strengthen policy coordination in terms of monetary policy. Indeed, we have put strong synergy and coordination across a broader area through structural reforms in order to effectively balance between pro-stability and pro-growth strategies.

Therefore, under (enhanced) Flexible ITF, feasibility in policy mix implementation can be achieved through, amongst others, additional macroprudential instruments in addition to monetary instruments, which should reinforce one another. While monetary instruments will be utilized to influence monetary variables, such as interest rates, exchange rates, credit and expectations, macroprudential instruments will be utilized mainly to manage risk potential or perception in the financial markets. Fundamentally, the central bank policy mix represents the optimal integration of monetary policy, macroprudential policy and managing capital flows and exchange rates.

Now, we are moving to integrated ITF. The terminology has a broader scope than the flexible ITF proposed in several studies, such as Agenor and da Silva (2013). This represents the academic backbone of integrated ITF. Bank Indonesia has already crystalized these similar thoughts about the policy mix since 2010 but "unfortunately", we did not publish our findings. We have internal documentation concerning similar research into integrated ITF.

There are three salient characteristics of integrated ITF. First, and departing from conventional flexible ITF, the ultimate target is not only price stability but also maintaining financial system stability. Under flexible ITF, we are just integrating the function of the target, integrating the policy strategy, not only to maintain monetary policy stability but also financial system stability. Nonetheless, we do not talk about the mandate. Integrated ITF is more concrete. The ultimate target is not only price stability but also maintaining financial system stability. We have a dual mandate, which could be two primary mandates or a primary and secondary mandate. This is one of the issues we can discuss. Second, and similar to flexible ITF, the instruments used are monetary policy, macroprudential policy and foreign capital flow management in one optimal mix. If you read the e-books, they have more concrete policy rules. This basically strengthens flexible ITF. Third, which is also like flexible ITF, policy mix formulation requires an analysis framework and macroeconomic projections that take into consideration macro-financial linkages.

Therefore, integrated ITF poses the theoretical backbone for the implementation of the central bank policy mix. In central bank policy mix implementation, three salient aspects demand attention, namely: (i) how the dual targets of price stability and financial system stability can be integrated; (ii) the mix of policy instruments to use; and (iii) the effectiveness of the transmission mechanism. This is the subject of the research because these are frontier ideas that require further elaboration through future research.

The description in the upper part explains how price stability and financial system stability can be integrated into the dual mandate of the central bank. In Indonesia, for the case of Bank Indonesia, the authorities in charge of financial system stability are not just the central bank or the Indonesian Financial Services Authority (OJK) but also the Deposit Insurance Corporation (LPS) and Ministry of Finance, which all come together under the auspices of the National Financial System Stability Committee. We share the responsibility for financial system stability. That is why the main mandate of Bank Indonesia is to maintain and achieve currency stability, including inflation and exchange rate stability. To achieve financial system stability, our perspective is to support maintaining price stability because there are four authorities that have the same responsibility to guide financial system stability.

Salient Policy Responses: Pro-stability and Pro-growth

Let me share Indonesia's economic journey in 2018–2019 and describe Bank Indonesia's policy mix. We experienced a long journey last year which provides three important lessons to strengthen synergy in order to enhance resilience and encourage economic growth amidst global economic conditions that remain unfavorable. From our perspective, we have put two strategies into the central bank policy mix. We still hold our mandate to maintain stability but facing the global uncertainty that has impacted lower potential economic growth, the strategy depends on the preferences of the central bank. The central bank's main preferences are inflation deviation and output deviation; the rest is just about preference. Therefore, pro-stability and pro-growth are our strategy in 2019.

To maintain price stability, Bank Indonesia will preserve a pre-emptive and ahead-of-the-curve monetary policy stance in 2019. For this reason, several salient policy responses are to be done. First, the interest rate policy will continue to be directed to ensure that inflation is under control to achieve its target, namely $3.5\% \pm 1\%$ in 2019 and $3.0\% \pm 1\%$ in 2020. This is our disinflation path from $6.0\% \pm 1\%$ just a few years ago. This clearly demonstrates the performance of the ITF regime we adopted in 2005 in terms of bringing down stable inflation. Second, the market mechanism for maintaining rupiah exchange rate stability continues to be encouraged, without reducing the need for intervention. We have created a balance. Of course, we need market mechanisms as our basic guidance to preserve a flexible exchange rate regime but when we see potential volatility that will cheat the market expectations, we intervene as a last resort. Third, adequacy of foreign exchange reserves will continue to be maintained. Fourth, adequacy of liquidity in the money market and banking industry will also be maintained.

If we talk about traditional medicine, Jamu, we see that there is bitter medicine and sweet medicine. So, we put it in a more balanced strategy. To build economic growth momentum, Bank Indonesia applies macroprudential policies, payment system policies, financial market deepening and development of Islamic economy and finance. I do not want to elaborate in more detail because we will present the Indonesian case

on the third day as shared by our colleagues from Bank Indonesia. Basically, this is a representation of how Bank Indonesia articulates its way to implement the policy mix strategy. Behind the strategy, there will of course be rigorous work done by our departments in terms of monetary policy and macroprudential policy. They have a modelling structure, policy rules and other discussions and policymaking decisions. Frontier research is used to back up sound policy.

Challenges Ahead

In the last part, I would like to share my view about the challenges ahead in terms of managing the emergence of the digital economy and technological advancement. Amidst all the global and domestic challenges due to the widespread impact of the AFC and the GFC, it is also important to understand potential new crises if the digital economy uprising is not managed properly. Even the cause of GCF, 10 years ago, was based on the real sector, especially property, but the exposure to unanticipated financial derivatives, such as risky subprime mortgage securities and a lack of prudential financial sector regulation, were the contributory factors of the crisis. We have to be aware of progress of new technology. Hence, we have to anticipate the next future challenges, such as the massive emergence of new forms of financial intermediation and the risk exposures following the exponential growth of shadow banking and financial technology (FinTech) development. The massive advance of technological aspects in delivering financial transactions and other digital economic challenges need a 3-A approach according to Mersch (2017), from the European commission. First, adapt policies to take into account technology-driven socio-economic changes. Second, adopt appropriate technology that supports the various functions and tasks of central banks. Third, Anticipate technological risks to operations. Of course, uncontrolled situations will continue to persist and technological advancement will continue to impact monetary policy. There has not been an impact on monetary policy yet but perhaps in the future. Money is growing along with technology, so it will have an impact on how we operate monetary policy. This is important to understand.

In applying the 3-A concept as mentioned earlier, central banks and financial institutions require transformative shifts, including a change of mindset, a measure of interconnected behaviour and integrated policy formulation beyond standard central bank policy wisdom. In that sense, coordination becomes more critical, especially coordination across ministries and agencies to build a digital economic and financial ecosystem. Synergy between central banks and the financial services authorities on digital financial policies is needed when implementing a payment system based on digital financial policies that could encourage better financial intermediation. Besides, establishment of a national committee for the development of digital finance becomes more crucial. Amongst the government ministries and agencies, we are already discussing the need for us to have a formal, integrated national committee for the development of the digital economy and finance. In Indonesia, we are finalizing

the blueprint for the digital economy and finance. It has not been finalized yet so unfortunately, I am unable to share.

Closing

This course has succeeded in gathering the brightest minds with experience in both academia and financial practices in the area of the Central Bank Policy Mix. We are lucky that all the issue discussed above will be delivered by a great team, consisting of various experienced senior economists from our strategic partners, including the IMF-STI, RBI, CBRT, Bank Indonesia, and related prominent institutions.

I am convinced we will agree that the challenges faced by the authorities in the macroeconomics area have become more complex over time. Going forward, we really hope that this course will strategically contribute to knowledge-based enhancement in functioning our role as central bankers and the public institution policymakers.

Before I end my remarks, on behalf of Bank Indonesia, I would like to express my sincere gratitude to all strategic partners for a prolonged and wonderful collaboration, distinguished speakers for their willingness to share expertise and knowledge, and the participant for taking time to concentrate and contribute to this enlightening course.

May God Almighty bless and enlighten our steps towards a better future. Please enjoy a fruitful and lively discussion and have a pleasant stay in Indonesia.

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Part II
Monetary Theory and Policy

Chapter 3
Monetary Policy Framework

Solikin M. Juhro and Ole Rummel

Abstract This section discusses monetary policy, covering the basic theories and concepts of monetary policy, monetary policy frameworks, and the evolution of monetary policy from the period before the 1997/98 Asian financial crisis to the period after the 2008/09 global financial crisis (GFC). The ITF can, on the whole, still be relied on as a monetary policy strategy. However, due to a background of problems, especially those that emerged after the 2008/09 global financial crisis, various central banks need to strengthen their monetary policy framework through the application of a non-strict framework, or flexible ITF, with efforts to jointly stabilize inflation and the real economy in the short term.

Keywords Monetary policy · Monetary policy transmission · Inflation targeting framework

Introduction

How monetary policy plays a role in the economy has always been the subject of public debate. Some support monetary policy focus on price stability. Others believe that monetary policy should play a role in stimulating output growth. Some hold this view due to political interests, while many others consider that demand for monetary stimuli during an economic downswing or even recession should support the fiscal stimuli of the Government. However, many country experiences showed that using monetary policy to finance massive projects could lead to hyperinflation, which culminated in an economic crisis and the failure of the economic development program. On a practical level at central banks, the core of the debate has become the essence of how monetary policy should offset the trade-off between price stability, in the form of low and stable inflation, and fostering economic growth.

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To what extent there is a trade-off between inflation and economic growth in the near term depends on the assumptions underlying monetary economics in a country's economy. In an economy with perfect markets (high economic flexibility) and rational economic agents (with complete information), using the assumptions of classical theory, the short-term trade-off between inflation and economic growth tends to be small. Nonetheless, those assumptions are not always present in an economy, as observed by Keynesian economists. Price and wage rigidity, incomplete information and irrational economic behaviour are all present, which means a market is not always in equilibrium and, therefore, has implications on quantity and prices. Total money supply also has distributive and allocative effects through the impact of real interest rates on output, amongst others, due to holdings of government bonds and central bank monetary operations. The various factors explain why monetary policy not only affects prices but also output and other real economic variables.

How money plays a role in the economy is an empirical question. In this case, based on the empirical literature, consensus is generally reached amongst economists that money neutrality only occurs in the long term, while in the near term, monetary disturbances can have a significant impact on real variables, such as output. Ultimately, although consensus was reached amongst economists concerning the role of money and monetary policy shocks in an economy, at least in the near term, no consensus has been reached regarding the transmission mechanism and role of a systematic monetary policy response. Several empirical questions arise, including whether money supply or the interest rate would more relevantly represent monetary policy? How long is the lag? And, how does the monetary policy transmission mechanism affect inflation, output and other real economic variables? This is primarily because of differing views concerning two aspects, namely what is the actual structure? And, to what extent is there interconnectedness between the variables in a policy regime?

The discussion on theory and empirical findings also showed that the real interest rate is a more appropriate monetary policy instrument than money supply in terms of its effect on the economy. The relationship between money supply and output is not stable and difficult to predict due to the innovation of products similar to money that may only be traded in the financial sector and do not relate directly to economic transactions. In fact, reverse causality has been found, meaning that economic growth has more of an impact on demand for money supply. Consequently, central bank monetary operations should be directed more towards influencing interest rates on the money market, which would be expected to affect interest rates in the financial sector and, thus, aggregate demand, inflation and economic growth. Therefore, how effectively the policy rate is transmitted to various interest rates in the financial sector and economic variables becomes significant. In this case, the assumptions debated between Classical and Keynesian economists, including the flexibility of economic sectors, the completeness of information, and the rationality of economic agents, also influence the effectiveness of the interest rate in the economy.

This chapter consists of five parts that provide a general description of monetary policy, and the direction for applying monetary policy with the goal of price stability in mind. After this introduction, the second part looks at some of the general

substance surrounding the implementation of monetary policy, especially as it relates to the business cycle, the existence of other macroeconomic policies, and economic openness. The third part then describes the strategic framework, transmission mechanism, and operational framework of monetary policy. The next part focuses on monetary policy framework oriented towards price stability (inflation targeting) as well as the development of thinking and policy perspectives after the 2008/09 Global Financial Crisis. The chapter concludes by drawing together common threads from the discussions on monetary policy framework that have evolved among various structural developments and financial crises.

Concept of Monetary Policy

Monetary policy is a policy pursued by the monetary authorities, or the central bank, aimed at controlling monetary aggregates in order to achieve the desired development of economic activity.[1] In practice, the desired development of economic activity refers to macroeconomic stability, as reflected, among other things, by price stability (low inflation rate), improvement in real output (economic growth), as well as the ample availability of employment opportunities.

Monetary policy, as outlined above, forms an integral part of macroeconomic policy, which is generally carried out by taking into account the business cycle, the closed or open nature of a country's economy, as well as other fundamental economic factors. Monetary policy strategy is implemented differently from one country to another, in accordance with the objectives to be achieved and the transmission mechanism deemed most suited to the economy concerned. Based on the chosen strategy and transmission, a monetary policy operational framework is then formulated.

Monetary Policy and the Business Cycle

The economic development of a country inevitably experiences ups and downs (cycles). In certain periods the economy grows rapidly and in other periods growth slows down. In order to manage and influence economic development so that it can take place properly and stably, the government or monetary authority usually takes steps known as macroeconomic policies. The essence of these policies is to manage the demand and supply sides of an economy in order to steer it towards a state of balance with a sustainable level of economic growth.

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[1] In this case, monetary aggregates can be in the form of the money supply, reserve money, or bank credit.

Monetary policy, as one of these macroeconomic policies, is generally applied in line with the business cycle.[2] In this case, the monetary policy applied to conditions where the economy is enjoying a boom is of course different from that applied to conditions where the economy is enduring a depression or slump. In the literature review, there are two types of monetary policy, namely expansionary monetary policy and contractionary monetary policy. Expansionary monetary policy refers to monetary policy aimed at encouraging economic activity, which includes increasing the money supply. In contrast, contractionary monetary policy refers to monetary policy aimed at slowing down economic activity, which includes reducing the money supply.

In practice, the effectiveness of monetary policy depends on the relationship between the money supply and key economic variables such as output and inflation. From the literature, the main interesting finding regarding the relationship between money supply, inflation, and output is that in the long run, the relationship between money supply growth and inflation is perfect, while the relationship between money supply growth or inflation and real output growth may be close to zero. This finding indicates that there is a consensus that in the long run, monetary policy will only have an impact on inflation, and will not have much effect on real economic activity.[3]

Despite the differences in viewpoints above, generally practitioners and academics believe that in the short term, an expansionary monetary policy can encourage economic activity in an economy that is experiencing a prolonged recession. On the other hand, a contractionary monetary policy can bring down high rates of inflation which generally occur when an economy is in a boom. The pattern of implementing a monetary policy which actively "smooths" the development of economic activity that is tending towards an extreme turning point is known as counter-cyclical monetary policy.

At first glance, it seems appropriate enough to apply a counter-cyclical monetary policy pattern so that an economy can avoid structural shocks or fluctuations in the business cycle. However, the basic problem that arises is related to the difficulty of predicting the business cycle, especially regarding the extent to which the development of an economy has reached a certain position in the current cycle. Mistakes that occur in predicting economic cycles can lead to errors in determining monetary policy responses.

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[2] According to the definition put forward by Burns and Mitchell, in Measuring Business Cycles, NBER (1946), the business cycle is a type of fluctuation that occurs regularly in the development of a country's economic activities. The cycle generally consists of an expansion that occurs when the business world increases its activities, which is then followed by a slowdown in economic activity or a recession, until the recovery of economic development in the expansion phase of the next cycle. The sequence of these changes occurs repeatedly, but not periodically. In this case, the duration of one cycle varies from more than one year to ten or twelve years. Further reviews of Business Cycles can be found in Parkin and Bade, Modern Macroeconomics, Philip Alan Publishers Ltd., 1988, pp. 113–138.

[3] The consensus from the empirical literature regarding the short-term effect of money is that a monetary policy shock causes a hump-shaped movement of real economic activity (slightly upward and then down). This means that the easing/tightening of monetary policy can slightly boost/suppress real economic activity in the very short term and then its effect will disappear. For a more comprehensive follow-up analysis, see Walsh (2001, Chap. 1 : Empirical Evidence on Money and Output).

Monetary Policy and Other Macroeconomic Policies

The implementation of monetary policy cannot be carried out separately from the implementation of other macroeconomic policies, such as fiscal policy and real sector policy, among others.[4] This is especially true given the very close relationship between monetary policy and other parts of macroeconomic policy. In addition, the effects of policies that are implemented simultaneously may have opposite directions so that they weaken each other. For example, in an economy experiencing inflationary pressures, the central bank may tighten monetary policy. At the same time, the government is expanding in the fiscal sector in order to prompt economic growth. The disharmony of the two policies can result in the goal of suppressing inflation not being achieved. Meanwhile, a combination of monetary and fiscal policies that are too expansive due to a lack of coordination could lead to a warming of the economy. As such, to meet macroeconomic policy objectives as optimally as possible, a coordinated policy mix is usually applied between one policy and another.

Optimal here means the coordinated achievement of inter-policy objectives so as not to cause an unfavorable impact on the achievement of overall macroeconomic policy objectives. One well-known example of an application of a policy mix is the monetary-fiscal policy mix. Conceptually, the coordination of a monetary-fiscal policy mix can be carried out by means of several scenarios, as follows[5]: (1) expansionary monetary policy/expansionary fiscal policy, (2) contractionary monetary policy/expansionary fiscal policy, (3) expansionary monetary policy/contractionary fiscal policy, and (4) contractionary monetary policy/contractionary fiscal policy.

For example, if the monetary-fiscal policy mix can be carried out in a coordinated manner, then policy scenarios 1 and 4 are the most effective policy scenarios to be applied for the counter-cyclical policy objectives as described previously. Empirical observations show that if an economy experiences a prolonged recession, monetary and fiscal policies that are similarly expansionary and coordinated are very appropriate to stimulate economic activity with a moderate influence on interest rate developments. In line with this, monetary and fiscal policies that are similarly contractionary and coordinated are very beneficial as part of efforts to reduce the pace of expansion of economic activity.

Meanwhile, policy scenarios 2 and 3 will produce mutually exclusive effects, and the final outcome is highly dependent on the relative strength of influence between the monetary and fiscal policies involved. Empirically, the combination of expansionary monetary policy and contractionary fiscal policy has not been widely observed. As for the combination of contractionary monetary policy and expansionary fiscal policy however, empirical evidence indicates that this policy scenario tends to prompt a rise

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[4] Fiscal policy is a policy related to aspects of government budget management. Fiscal policy is considered to be one of the most important policies that can be implemented directly by the government in maintaining economic stability.

[5] Assuming that the fiscal authority's source of funds comes from sources outside the money supply.

in market equilibrium interest rates, thereby hampering investment activities by the public.[6]

Monetary Policy in an Open Economy

Before discussing the topic of monetary policy in an open economy, we will briefly mention monetary policy in a closed economy. In a simple and closed economy—when the economy of a country does not interact with the economy of other countries—monetary policy can be formulated and implemented more simply. This is due to various international economic variables such as trade, capital flows, exchange rates, and interest rates which have no effect on such an economy. However, in this era of globalization, no country can be said to have a closed economic system, so the next discussion will focus on monetary policy in an open economy.

In the era of the global economy that has come into being over the past several decades, economic interactions between countries are an inseparable aspect of the economic development of a country that is increasingly open. Moreover, the swift development of information technology, communication and transportation, as well as trade policies in the last decade, has prompted rapid economic openness and interdependence between countries. For example, trade relations between Indonesia and Japan today are much closer than those in place during the early days of independence.

The greater the interconnectedness between countries, the more open the economies of the countries concerned will be. This economic openness leads to a rise in trade transactions between countries. A country that is unable to meet the need for certain goods and services can buy (import) these goods and services from other countries. On the other hand, a country can trade (export) the goods and services it produces to other countries that need them. Developments in international trade are generally followed by developments in the international financial sector.

The economic openness of a country will have consequences on the planning and implementation of macroeconomic policies, including monetary policy. This is because the greater the volume of international trade and financial transactions carried out by a country, the greater the foreign capital flows. These foreign capital flows will in turn affect the amount of money circulating in the economy. In the event of capital inflows, there will be an increase in the money supply. On the other hand, in the event of capital outflows, there will be a reduction in the money supply. As such, monetary policy needs to be directed so that the money supply is in accordance with the needs of the economy.[7]

In the event of large capital inflows, the central bank can implement contractionary monetary policy in order to reduce the money supply. In contrast, if there are large capital outflows, the central bank can implement expansionary monetary policy in order to increase the money supply. Monetary contraction or expansion will increase

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[6] In economics literature, the phenomenon of when public investment activity decreases as a result of the expansion of government activities is known as the crowding-out phenomenon.

[7] For more details, read *Buku Seri Kebanksentralan No. 2, Penyusunan Statistik Uang Beredar*/Book Series on Central Banking No. 2, Compilation of Money Supply Statistics, by Juhro and Suseno, PPSK Bank Indonesia (2002a).

or decrease domestic interest rates. Furthermore, these changes will either increase or decrease the interest rate differential, which in turn will encourage both inflows and outflows of foreign capital. This condition can reduce the effectiveness of monetary policy. The high mobility of capital inflows and outflows will render the central bank unable to independently implement monetary policy.[8] Meanwhile, the mobility of capital inflows and outflows is influenced by the exchange rate regime and the foreign exchange regime adhered to by a country. Thus, the extent to which the implementation of monetary policy can be carried out independently depends on the exchange rate regime and the foreign exchange regime chosen.

As such, the selection of the exchange rate regime and the foreign exchange regime, as well as the independence of monetary policy implementation, are the three strategic issues focused on by studies in the monetary sector. Generally, it is agreed that if a country applies a fixed exchange rate system and there is an inflow/outflow of foreign capital, then monetary policy must still be directed at maintaining the exchange rate at a predetermined level. Given this, it is difficult to implement monetary policy independently because monetary policy will be directed to absorb or increase the money supply originating from capital inflows and outflows. On the other hand, if a country applies a floating exchange rate system, its monetary policy is not aimed at maintaining the exchange rate, such that monetary policy can be implemented more independently.

In the event that a controlled foreign exchange regime is applied, the mobility of capital inflows and outflows tends to decrease, thereby boosting the independent implementation of monetary policy. This is because the central bank does not need to expand or contract the amount of money supply stemming from capital inflows and outflows. Meanwhile, if a free foreign exchange system is applied, the mobility of capital inflows and outflows will be enhanced. As a result, the central bank has to expand or contract the amount of money supply originating from capital inflows and outflows. This, thus, can compromise the independence of monetary policy implementation.

As described above, the independent implementation of monetary policy, a fixed exchange rate system, and a free foreign exchange system cannot be achieved simultaneously. This condition is known as the policy trilemma or impossible trinity.[9] In fact, several empirical studies conclude that only two of the above three conditions

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[8] Independence here refers to the independence of a central bank in implementing monetary policy without interferences arising from developments in external factors. This independence differs from the independence of a central bank in terms of its institutional framework, as discussed in other chapters of this book.

[9] According to the theoretical assumptions put forward by Robert Mundell in his book International Economics (1968), a mismatch arises in trying to achieve the three trinities simultaneously (the impossible trinity). This refers to exchange rate stability, mobility of foreign capital flows, and independence of monetary policy. "Overtime, the three goals cannot be attained simultaneously" (p. 147). Empirical observations generally also prove that only two of these three factors can be attained simultaneously. This indicates that, with an international trend/consensus that encourages the mobility of foreign capital flows, there is a trade-off between realizing exchange rate stability and monetary policy independence.

can be applied together..[10] A description of the implementation of monetary policy in an open economy, particularly in relation to the policy trilemma, will be presented in Chapter 4 of this book, focusing on exchange rate policy and the management of foreign capital flows.

Monetary Policy Framework

The monetary authority develops a monetary policy framework that can be divided into two parts, namely a strategic framework and an operational framework. The monetary authority is duly guided by this framework to ensure effectiveness in the implementation of monetary policy.

Monetary Policy Strategic Framework

As previously explained, the policy objective to be achieved, both by monetary policy and macro policy, is generally macroeconomic stability, including price stability (low inflation rate), economic growth, and the availability of employment opportunities. It is difficult to attain all of the above targets simultaneously because efforts to achieve these ultimate goals often conflict with each other. For example, efforts to boost the rate of economic growth and expand employment opportunities may, to some extent, drive price increases, thus undermining the optimal achievement of macroeconomic stability.

Recognizing the contradictions involved in achieving these targets, central banks are faced with two alternatives. The first option is to choose one target to be achieved optimally by ignoring the other targets—for example, opting for a high economic growth rate by ignoring the inflation rate. The second option is to attempt to achieve all the targets, but to accept that none of them will be achieved optimally—for example, aiming for economic growth that is not overly high in order to maintain a predetermined inflation rate. Acknowledging these weaknesses, several countries have gradually shifted the implementation of monetary policy to focus more on the single goal of price stability.

In principle, several strategies exist for achieving monetary policy objectives. Each strategy has characteristics in line with the nominal anchor that is used as the basis of reference, or a kind of "intermediate target" on the path to achieving the ultimate goals. Strategies for implementing monetary policy include: (i) exchange

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[10] Theoretically, if a fixed exchange rate system is applied when the economy of a country is very open and the mobility of foreign capital is very high, monetary policy cannot be carried out independently, as previously explained. In other words, to be able to implement monetary policy independently in conditions of a very high degree of economic openness, exchange rate developments must be fairly flexible. If a fixed exchange rate system is preferred, monetary policy can be implemented independently; however, this must be supported by efforts to control the flow of foreign capital that are tight enough to restrict the mobility of this foreign capital so as not to interfere with the implementation of monetary policy.

rate targeting, (ii) monetary targeting, (iii) inflation targeting, (iv) monetary policy with an implicit but not an explicit nominal anchor.[11]

Monetary Policy Transmission Mechanism

The explanation of the strategic framework of monetary policy in the previous section does not include a discussion of how monetary policy can affect nominal income and real economic activity as a whole. In light of this, it is necessary to first understand the process or mechanism for transmitting the influence of monetary policy on real economic activity, known in short as the monetary transmission mechanism. Specifically, Taylor (1995) states that the monetary transmission mechanism is "the process through which monetary policy decisions are transmitted into changes in real GDP and inflation".

In the monetary economics literature, the study of the monetary policy transmission mechanism generally refers to the role of money in the economy, as first outlined in the Quantity Theory of Money. This theory basically describes a clear framework for analyzing the systematic direct relationship between money supply growth and inflation, expressed as a mathematical identity known as "The Equation of Exchange":

$$MV \equiv PT$$

in which the money supply (M) multiplied by income velocity (V) is equal to the amount of real output or economic transactions (T) multiplied by the price level (P). In other words, in balance, the money supply used in all economic transaction activities (MV) is equal to the amount of output transacted, as calculated at prevailing prices (PT).[12]

Based on this transmission mechanism, in the short term the growth in the money supply only affects the development of real output. Furthermore, in the medium term growth in the money supply will push prices up (inflation), which in turn will lead to a decline in the development of real output to its original position. Meanwhile, in the long-term balance, the growth in the money supply has no effect on the development of real output, but encourages a proportional increase in the inflation rate. This direct monetary channel is considered unable to explain the influence of factors other than money on inflation, such as interest rates, exchange rates, asset prices, credit, and expectations. As a subsequent development, in addition to the direct monetary channel, the transmission mechanism can also generally occur through

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[11] A full description of the results of empirical observations of the application of several strategies for implementing monetary policy in various countries can be found in Mishkin (1999).

[12] To see the relationship between the growth of the money supply and inflation, two assumptions are used. First, the velocity of money/income velocity (V) remains quite stable, or at least predictable. The veracity of this assumption is an empirical question. Second, in the long run, real output or economic transactions (T) can generally be considered constant and not influenced by developments in the money supply (long-run money neutrality); however, it is influenced by supply-side developments in the economy, such as the amount and productivity of labor, availability of capital, and technological advances.

five other channels, namely the interest rate channel, exchange rate channel, asset price channel, credit channel and expectations channel.[13] The period before and after the 2008/09 global financial crisis demonstrated that risk-taking behavior (risk-taking channel) is included as a separate monetary policy transmission channel—a point that is important to understand for managing financial system stability. In practice, monetary policy transmission varies from one country to another, depending on differences in economic structure, developments in financial markets, and the exchange rate regime adopted.

Risk Taking Channel

The period prior to and following the 2008/09 global financial crisis showed that the risk-taking channel in the financial system contributed to vulnerability, contagion as well as asset price bubbles. Increased risk in the financial system can arise for various reasons, including financial product innovation, valuation methods in capital and accounting, ease of funding, risk tolerance, or the ever closer integration of global finance. The financial turmoil leading up to and after the global financial crisis demonstrates that the financial system tends not to act as a shock absorber but instead becomes a source and driver of turmoil, or a shock amplifier (Allen and Carletti 2008).

In many aspects, increased risk in the financial system is inseparable from monetary policy. Monetary stability and ease of liquidity in boom periods can encourage widespread financial product innovation, risky behavior and elevated financial vulnerability. On the other hand, in downward economic cycles, or bursts, such a rise in financial vulnerability from risky behavior accelerates the worsening and contagion of a financial crisis, thereby complicating the required monetary policy response. As such, in contrast to the standard monetary transmission analysis, Borio and Zhu (2008) express the view that risky behavior is a separate monetary transmission channel. Specifically, the risk-taking channel is defined as "the impact of changes in policy rates on either risk perceptions or risk-tolerance and hence on the degree of risk in the portfolio, on the pricing of assets, and on the price and non-price terms of the extension of funding".

The transmission process in the risk taking channel is asymmetric. When economic activity is in an upward cycle (upward phase/bubble/falling interest rates), the transmission process through the risk-taking channel operates slowly and persistently, and financial system risks are usually not apparent. When economic activity is in a downward cycle (burst bubble), the transmission process will change rapidly and suddenly. Maturity mismatches will exacerbate shortages of liquidity funds. Sharp declines in asset prices will cause losses, capital shortfall, and market liquidity drought. This will further exacerbate liquidity shortage conditions as a result of declining collateral values and margin calls, or situations in which investors must add funds to their accounts to meet the minimum margin.

According to Borio and Zhu (2008), there are three ways the risk taking channel works in the financial system, as follows:

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[13] For more details, see Mihaljek and Klau (2008) and Kakes (2000).

(1)   Effect of interest rates on valuations, incomes and cash flows from investments

When interest rates decrease, valuations of asset prices and collateral, cash flows and profits will increase. This prompts the emergence of risky behavior and boosts the acceleration of finance in banking credit and other financial transactions. Likewise, risk perceptions of non-performing loans will decline during an economic boom such that external finance premiums also decline and tolerance of credit standards becomes looser.

(2)   Relationship between interest rates and target rates of return commonly used as benchmarks for financial investment performance appraisals

The higher the rate of return compared to the benchmark, the bigger the bonus for the investment manager. As such, a decrease in monetary policy interest rates will cause a large difference to the investment rate-of-return target, thus encouraging investors to look for investment alternatives with higher rates of return (search for yield). Investors' perceptions tend to value asset prices far above their fundamental values during an economic boom, a phenomenon known as irrational exuberance.

(3)   Positive impact of central bank monetary policy transparency

Many central banks are becoming increasingly transparent in communicating interest rate policy decisions and inflation forecasts. This has a positive impact by increasing investment and various economic activities, as well as compressing risk premia in financial markets. Nevertheless, monetary stability also drives risky behavior from speculative investors, such as seeking higher returns from financial product innovations and speculative investment activities.

Monetary Policy Operational Framework

The previous section discussed the strategic framework and transmission mechanism of monetary policy with respect to the achievement of the ultimate goals which include price stability, economic growth, and the expansion of employment opportunities. To gain more clarity about monetary policy, an understanding of the operational framework of monetary policy is needed. In general, the monetary policy framework consists of instruments, operational targets, intermediate targets, and ultimate goals.

To achieve the established ultimate goals, intermediate targets are required as there is a time lag between the implementation of monetary policy and the realization of these goals.[14] Therefore, it is necessary to have indicators that are more immediately apparent—commonly known as intermediate targets—in order to discern the policy indications. The selected intermediate targets must have a stable relationship with the ultimate goals. Intermediate target options that can be used include monetary aggregates (such as M1 and M2) or credit and interest rates.

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[14] In monetary economics literature, a time lag consists of several parts, including an inside lag and outside lag. An inside lag consists of a recognition lag, decision lag, and action lag.

Furthermore, to achieve the intermediate targets, the central bank requires operational targets so that the transmission process can run according to plan. The selected operational targets must have a stable relationship with the intermediate targets and can be controlled by the monetary authority. In addition, information on the operational targets becomes available earlier than that on the intermediate targets. Operational target options that can be used include reserve money (M0) and short-term interest rates.

Meanwhile, monetary instruments are instruments belonging to the central bank that can be used either directly or indirectly to influence the established operational targets. Among the instruments used are open market operations, reserve requirements, discount facilities, and moral suasion.[15]

The series of central bank steps, from determining and forecasting the ultimate goals, to monitoring the economic-financial variables to be used as the basis for formulating monetary policy, and implementing monetary control in the money market to achieve the ultimate goals, is referred to as the monetary policy operational framework. It should be pointed out that in practice, the use of intermediate targets depends on what operational approach is used by the central bank, that is whether the approach is based on the quantity of monetary aggregates (quantity-based approach) or based on the price of monetary aggregates/interest rates (price-based approach). Generally, the quantity-based approach uses explicit intermediate targets, while the price-based approach does not use explicit intermediate targets. However, the effects of changes in operational targets are transmitted to changes in the ultimate goals through the development of various information variables that serve as leading indicators of developments in economic activity and inflationary pressures, such as inflation expectations and long-term interest rates.

Determination of Monetary Policy Response: Rules versus Discretion

In essence, monetary policy response can be determined using either rules or discretion. Analytically, Barro and Gordon (1983) describe how the determination of monetary policy instruments based on a pattern of rules (rule-based policy) is carried out by responding to the prevailing conditions, while taking into account previous formulations of policy instrument determination. In contrast, the determination of monetary policy instruments based on a pattern of discretion (discretion-based policy) is based more on evaluations over time that take into account prevailing conditions, while regarding past developments and policies as irrelevant. Meanwhile, Taylor (1993) explains that, in contrast to discretion-based policy, the behavior involved in determining rule-based policy is systematic, in the sense of being "methodical and according to a plan", and not casual or random. One example of a commonly-known rule, as proposed by Friedman (1960), is constant money growth. By definition, any deviation from this pattern is classified as discretionary.

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[15] A more comprehensive description of available monetary control instruments can be found in *Buku Seri Kebanksentralan No. 3: Instrumen-instrumen Pengendalian Moneter*/Central Banking Book Series Volume No. 3: Instruments of Monetary Control, by Ascarya (2002).

The consensus arrived at after a long debate among economists regarding the choice between the two determination patterns is that the central bank cannot implement monetary policy entirely based on a discretionary pattern. On the other hand, some patterns of rules are considered to be a prerequisite for the implementation of good monetary policy, such that the implementation of policy without using certain rules may have the opposite consequence.

In a traditional sense, economists are currently more focused on observing the following two types of rules.

(1) Money growth rules, as pioneered by McCallum (1988). These rules expand on the rule proposed by Friedman by including a feedback mechanism in making gradual corrections to errors that have occurred in the past.
(2) Interest rate rules, as pioneered by Taylor (1993). These rules also include a feedback mechanism, namely that the central bank changes interest rates based on deviations of inflation and output from the target level.

Which type of rules should be selected is still an unanswered problem.[16] However, it is generally agreed that rule-based policy can be applied with certain discretions in mind. On the other hand, even in ideal circumstances, it is still recommended that the application of discretion-based policy take into account the rules component.[17]

Inflation Targeting as a Framework for Monetary Policy

Inflation Targeting is a monetary policy framework whose main characteristics include an official statement from the central bank that the ultimate goal of its monetary policy is to bring about and maintain a low inflation rate, as well as a public announcement of the inflation target. Such an announcement implies that the central bank is providing a commitment and guarantee to the public that each of its policies will be consistently oriented towards achieving the target in question, and that the central bank can be held accountable for its policies if this target is not met.

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[16] A comprehensive study on the existence of policy rules in the implementation of monetary policy is presented in Monetary Policy Rules, NBER Conference Report, J.B. Taylor (Ed.) The University of Chicago Press, 1998.

[17] As it has developed since the early 1980s, the "rules versus discretion" debate has focused on a new argument that raises the issue of inconsistency ("time inconsistency" problem) in the implementation of policy strategies. The time-inconsistency problem refers to the differences between the (optimal) policy steps announced by the central bank to the public—if the central bank has good credibility— and the policy steps actually undertaken by the central bank after people have made a decision based on their expectations. For example, the central bank announces a promise to achieve a certain inflation target, and people enter into a work contract or agreement based on that announcement. Under these conditions, the central bank has an incentive to not fulfill its promise by looking for the possibility to achieve greater output growth, with the consequence of higher inflationary pressure. However, in the end, people will find out about this and duly adjust or set their expectations to a higher inflation rate, thereby obstructing the development of real output. If this series of events is repeated, an inflationary bias will arise whereby increases in real output do not occur while inflationary pressures are mounting.

Table 3.1 Characteristics of Inflation Targeting

No.	Criteria	Bernanke et al. (1999)	Svensson (2000)	King (1994)
1	Price stability as the main objective of monetary policy	Yes	Yes	Yes
2	Announcement of inflation target	Yes	Yes	Yes
3	Medium-term inflation target	Unclear	Yes	Yes
4	Intensive communication with the public	Yes	Yes	Yes
5	Use of specific monetary policy rules	Unclear	Inflation forecast targeting	Inflation targeting + supply-side response
6	Publication of inflation and output forecasts	Unnecessary	Yes	Unclear
7	Target set by the government (goal dependence)	Yes	Unnecessary	Unnecessary
8	Independent use of instruments (instrument independence)	Yes	Yes, but not explicitly stated	Yes

Source Bofinger (2001)

The characteristics of Inflation Targeting, as put forward by Bernanke et al. (1999), Svensson (2000) and King (1994), are summarized in greater detail in Table 3.1.

The underlying principles of the Inflation Targeting framework espouse that the ultimate goal of monetary policy is simply to achieve and maintain a low and stable inflation rate. In this context, it is assumed that: (i) a high inflation rate is a type of cost incurred by the economy in the form of low economic growth and a decrease in the real value of national income, (ii) monetary policy, through controlling the money supply, cannot affect real output growth in the long term, but can in the short term, while (iii) inflation control through monetary policy is aimed at stabilizing and reducing inflation in the long term and not in the short term. In addition, the success of the inflation achievement policy as a single objective within the Inflation Targeting framework requires the following, among others: (a) independence of the central bank, particularly in implementing monetary policy, (b) application of a floating exchange rate policy, (c) the existence of a price indicator that is relevant to the policy target, (d) good inflation projection methodology, and (e) absence of dominance of the fiscal sector. Meanwhile, the following are among the basic concepts of monetary policy in the Inflation Targeting framework.

(1)   Inflation target

As already stated, the Inflation Targeting Framework begins with the determination and announcement of the inflation target to be achieved by the central bank. The inflation target is of course determined by taking into account various factors and macroeconomic developments, especially social loss as a result of the trade-off between inflation and economic growth.[18] Among the other important factors also considered is that the inflation target must be able to be used as an anchor for the implementation of the central bank's monetary policy, and that inflation targeting is not only determined in the short term (annually), but also in the medium and long term.

(2)   Forward-looking monetary policy

With the inflation target as the anchor, the formulation of monetary policy is directed at achieving the established inflation target. Bearing in mind the time lag for monetary policy to have an effect on inflation, the monetary policy undertaken constitutes an anticipatory measure, not a reactive one, against the occurrence of inflationary pressures in the future compared to the inflation target set. Thus, the time horizon for how long the inflation target is to be set will depend on this time lag. Finally, the determination of a forward-looking mechanism is the most important aspect in establishing the direction of monetary policy at the central bank.

(3)   Transparency

The implementation of Inflation Targeting demands a high level of transparency, or openness, from the central bank, as one of the keys to the successful implementation of Inflation Targeting lies in the transparency of the central bank in making monetary policy. Such transparency is needed so that the public's inflation expectations that are formed match the wishes of the central bank. Transparency can be achieved by means of periodic explanations by the central bank to the public regarding the latest economic developments, inflation projections, and policies taken to keep the inflation rate on track. Such transparency is a way of demonstrating the central bank's commitment to fighting inflation.

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[18] The Phillips Curve first emerged on the back of the results of a study by the British economist A.W. Phillips, who in 1958 concluded that there is an inverse relationship, or trade-off, between rates of unemployment and rates of changes in wages. Initially, economists considered the above finding as one of the missing parts in the structure of the income-expenditure model. After applying a slight modification (changing wage level to price level), this curve became one of the most widely known curves in economics, thereafter known as the Phillips Curve.

   Subsequently, by considering the general characteristics of the business cycle, a close inverse relationship was identified between patterns of unemployment and real output growth (negative comovement). This is known as Okun's Law. The Phillips Curve can generally be derived from the pattern of the "trade-off" relationship between the inflation rate and real output growth. In this version, the trend of the relationship is upward sloping, such that rises in inflation occur in line with increases in real economic activity.

(4)   Accountability and Credibility

The central bank makes itself inherently accountable by announcing the inflation target explicitly to the public. Meanwhile, the credibility of the central bank will largely depend on its commitment to achieving the established inflation target. As such, the implementation of Inflation Targeting requires the establishment of a decision-making mechanism in the central bank concerned which is more reliant on the results of evaluations and the preparation of future projection scenarios based on the development of research-based economic models.

Conceptually, the use of Inflation Targeting requires fundamental changes in monetary policy in response to economic conditions. For example, Inflation Targeting requires a completely forward-looking monetary policy. However, central banks that do not explicitly implement inflation targeting may also be forward-looking and simultaneously focused on the ultimate goal of achieving price stability. Therefore, in practice, Inflation Targeting is more of a formal strategy of an existing policy, such that it is expected to improve the accountability, transparency, and credibility associated with monetary policy.

Monetary Policy in the Post 2008/09 Global Financial Crisis Period

In an economic environment that has yet to fully recover from the problems that emerged as a result of the 2008/09 global financial crisis, the challenges related to institutional aspects for the application of a monetary policy paradigm based on the ITF also tend to be increasingly complex. This mainly concerns behavioral changes in the financial sector on the one hand, as well as demands for the ITF to play a role in supporting the process of domestic economic recovery in the wake of the 2008/09 global financial crisis. This situation requires Bank Indonesia to be more flexible in responding to uncertainties which arise in the economy and are beyond conventional wisdom.

With reference to the results of evaluations that have been conducted, it can be concluded that, essentially, the ITF can still be relied upon as a monetary policy strategy in Indonesia. Nevertheless, Bank Indonesia needs to reinforce the monetary policy framework by improving the ITF implementation strategy going forward. In this regard, the results of evaluations of the implementation of the ITF in Indonesia also justify the need for a non-strict ITF implementation, or flexible ITF (FITF), as the format most suited to the Indonesian economy (Juhro et al. 2009).[19]

An ITF and FITF have the same main objective of controlling inflation. However, the difference between the two lies in the meaning of "flexibility", which refers to flexibility in placing the role of the exchange rate management strategy framework

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[19] The term flexible ITF was first popularized by Svensson (1999) who contrasted flexible IT with strict IT. With flexible IT, the central bank not only pays attention to the inflation gap, but also focuses on the output gap and/or interest rate smoothing. In contrast, with strict IT, as practiced by inflation nutters, the central bank focuses solely on the inflation gap (the deviation between the inflation rate and its target) (King 1997). However, not a single country adheres to strict IT (see Walsh 2008; Svensson 2000).

and the financial system stability framework with the application of a mix of monetary and macroprudential policy instruments. Monetary policy is used to maintain monetary stability as reflected in price stability using interest rate instruments, statutory reserves, and others. On the other hand, macroprudential policy is a policy that focuses on interactions between financial institutions, markets, infrastructures and the wider economy, including measuring potential future risks. This policy aims to prevent systemic risks that have the potential to cause a financial system crisis as a result of macroeconomic conditions.

The flexible ITF in Indonesia is built on the following 5 basic elements (Juhro 2015; Juhro and Goeltom 2015; Warjiyo and Juhro 2019):

1. Inflation to remain the main target of monetary policy
    In the formulation of monetary policy, trade-offs emerge between economic growth, exchange rate stability, and financial system stability. However, in the event of a conflict, achieving the inflation target takes priority. In addition, ITF institutional elements will be strengthened, such as independence, accountability, and transparency of monetary policy.
2. Integration of monetary policy and macroprudential policy to strengthen policy transmission and support macroeconomic stability
    Linkages between the monetary stability and financial system stability frameworks are bolstered through the integration of monetary policy with macroprudential policy. The global financial crisis provided some important lessons about the role of financial accelerators.[20] Financial system stability determines the effectiveness of monetary policy transmission. Likewise, the monetary policy response has an effect on financial system stability. As such, it is essential to implement a mix of policy instruments. In this regard, the interest rate policy response, as the main policy stance, needs to be supported by exchange rate policy and macroprudential policy for managing foreign capital flows and domestic liquidity.
3. Management of exchange rates and capital flows to support macroeconomic stability.
    In this context, the exchange rate needs to be managed consistently with the achievement of inflation targets and macroeconomic stability. The optimal solution to the problem of the impossible trinity is to look at the link between exchange rate stability policies and the management of foreign capital flows, and its implications for macroeconomic stability.
4. Strengthening policy coordination between Bank Indonesia and the government for both inflation control and financial system stability

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[20] The term first appeared in an article by Bernanke et al. (1996). It is the idea that large fluctuations in aggregate economic activity sometimes stem from seemingly minor shocks. This is what underlies the existence of an accelerator mechanism, or a factor that expedites the occurrence of a crisis. The authors argue that financial accelerators arise from changes in the credit market, which affect intrinsic borrowing and lending costs due to information asymmetry. Turbulence that harms the economy can be exacerbated by deteriorating financial market conditions. Worse still, adverse conditions in the real economy and in financial markets reinforce one another, leading to a vicious circle that tends to depress macroeconomic and financial conditions.

Strengthening the policy coordination framework is vital considering that apart from the demand side, sources of inflationary pressure also come from the supply side and strategic commodities. In addition, obstacles in implementing infrastructure programs and increasingly limited economic capacity have prompted the implementation of an integrated policy strategy among policy authorities. Moreover, policy coordination can be carried out in managing foreign capital flows because the characteristics of foreign capital inflows are sensitive to turmoil or short-term issues that can trigger a reversal.

5. Boosting policy communication as part of policy instrument use

The role of communication in monetary policy is not only designed to achieve transparency and accountability, but also as a medium to reduce uncertainty. In addition, communication also plays a role in mobilizing public expectations and market participants, as well as in enhancing predictability, thereby reducing volatility in financial markets. Finally, communication plays an important role in providing the public with an understanding of the objectives, framework, and transmission of monetary policy.

A flexible ITF uses monetary and macroprudential policy instruments together and in a complementary manner, such that it is useful in managing the influence of policy. Policy communication is used to convey to the public the policies pursued by Bank Indonesia. Policy operational targets are the links between policy instruments and policy indicators. Operational targets indirectly represent the existence of monetary policy transmission mechanism channels, such as interest rates, exchange rates, credit/liquidity, expectations, and risk perceptions.

Closing Notes

This chapter discussed monetary policy, including theories related to an overview of monetary policy and the monetary policy framework, as well as the evolution of monetary policy from the period before the 1997/98 Asian financial crisis to the aftermath of the 2008/09 global financial crisis. In theory, there are several important lessons to be learned here. First, the policy goal to be achieved by monetary policy and macro policy is macroeconomic stability, as reflected by price stability (inflation) and output (economic growth), among other things. To realize the ultimate goal of a policy, there are several strategies carried out by the central bank, targeting the exchange rate, monetary aggregates, and inflation, as well as targeting without a firm anchor.

Second, in the era of the global economy, the greater the linkages between countries, the more open the economy of the countries concerned. The economic openness of a country will have consequences on the planning and implementation of its monetary policy. High mobility of foreign capital inflows and outflows can affect the effectiveness of an independent monetary policy. Meanwhile, the mobility of capital inflows and outflows is influenced by the exchange rate regime and the foreign

exchange regime. However, it is impossible to apply an independent monetary policy, a fixed exchange rate system, and a free foreign exchange system simultaneously, a quandary known as the impossible trinity.

Third, the increasingly integrated global financial system affects the effectiveness of monetary policy transmission in almost all channels, including from a money view perspective (interest rates, exchange rates, asset prices, expectations) and credit view perspective (credit channel and balance sheet). Moreover, the spillover impact of global crises affects policy transmission through the risk-taking channel.

The 2008/09 global financial crisis exacerbated the process of economic recovery from the Asian financial crisis, clearly demonstrating that low inflation from the credibility of monetary policy is unable to guarantee macroeconomic and financial stability. The global financial crisis of 2008/09 gave rise to a number of problems, both globally and nationally. At the global level, problems have arisen related to the high mobility of short-term fund flows which greatly affect exchange rate developments. Coupled with behavioral changes in the financial system related to the strengthening of the roles of risk perception and procyclicality, this also potentially makes monetary control more complex and decision making more difficult. At the national level, challenges have arisen mainly related to structural rigidity on the supply side, which fundamentally disrupts the operation of policy transmission mechanisms and puts pressure on monetary stability.

The ITF can, on the whole, still be relied on as a monetary policy strategy. However, due to a background of problems, especially those that emerged after the 2008/09 global financial crisis, Bank Indonesia needs to strengthen its monetary policy framework through the application of a non-strict framework, or flexible ITF, with efforts to jointly stabilize inflation and the real economy in the short term. In line with the post-crisis economic dynamics, Bank Indonesia needs to further reinforce price stability and financial system stability by implementing a policy mix, utilizing interest rate, exchange rate, macroprudential, and foreign capital flow management policies that focus on systemic risk.

Going forward, a new paradigm is needed for the central bank in which it takes into account indicators of financial system stability in the formulation of monetary and macroprudential policies through an integrated inflation targeting framework regime. This is driven by the effect of monetary policy on risky behavior in the financial sector, and the impact of vulnerabilities in the financial sector on the effectiveness of the transmission process and the attainment of price stability, such that financial system stability has to be the second target of central bank policy.

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Chapter 4
Exchange Rate Policy and Capital Flow Management

Solikin M. Juhro, Reza Y. Siregar, and Budi Trisnanto

Abstract This chapter discusses the relationship between exchange rate and foreign capital flow management, as influenced by the increasingly integrated nature of the global economy and finance. From the central bank's perspective, a strategy mix composed of interest rate and exchange rate stabilization policy alongside capital flow management has the potential to provide better results for monetary and financial system stability. Interest rate policy still needs to be directed towards achieving price stability, while exchange rate stabilization policy and capital flow management are aimed at maintaining external and internal stability. This chapter also sheds light on the closeness of the relationship between monetary stability and financial system stability. The magnitude of changes in foreign capital flows not only threatens macroeconomic stability, but also creates pressures on financial system stability, such as liquidity and bank credit growth. In light of this, the integration of monetary policy and macroprudential policy is increasingly important.

Keywords Exchange rate policy · Capital flow management · Monetary policy trilemma

Introduction

In the era of globalization, the increasingly integrated global economy has led to a rapid rise in the turnover of foreign currency exchanges between countries in the context of international transaction payments. Such foreign currency exchanges, which are increasingly non-physical in nature, continue to dominate almost all international trade and finance transactions. In line with these developments, exchange rates are greatly influenced by movements in non-physical currency flows, both for payments for international trade transactions and foreign investments in domestic financial market instruments, better known as foreign capital flows. Given the ever

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more rapid movement and changes in exchange rates, countries that adhere to a fixed exchange rate system, or a variation thereof, leave themselves very vulnerable to sudden reversals of capital flows and speculative activities. This is exactly what has happened during times of exchange rate crisis, such as in Latin America in the early 1990s and Southeast Asia in 1997/98.

Globalization has also resulted in unrestricted flows of capital among countries. This became increasingly apparent after the global financial crisis, with large amounts of liquidity and low global interest rates caused by the monetary easing implemented by developed countries to stimulate their economic recovery. On the one hand, the flow of foreign capital is beneficial for financing to encourage economic growth in Emerging Market Economies (EMEs). The amount of foreign capital flows is greatly influenced by individual economic factors in each EME, in particular the state of its economic fundamentals, its degree of economic openness, the exchange rate regime and foreign exchange regime it adheres to, as well as the macroeconomic policies it pursues. The better the economic condition of the EME and the higher the yields offered, the greater the inflow of foreign capital it will receive. On the other hand, foreign capital flows can also make a country's economy more vulnerable to external shocks that take place in the global economy, a phenomenon known as global spillover. In this case, monetary stability and financial system stability may be disrupted. Therefore, an understanding of foreign capital flows is very important for policy formulation, including monetary policy, in order to be able to maximize the benefits these foreign capital flows offer and minimize the risks that they pose to the national economy.

The flow of foreign capital has made monetary policy in an open economy more complex. The ability of monetary policy to achieve domestic economic objectives, such as those related to inflation and economic growth, will be strongly affected by exchange rate volatility and foreign capital flows from the influence of external factors, as described in the 'policy trilemma' or the 'impossible trinity'.[1] According to this theory, if the desire is for monetary policy to be truly effective in achieving domestic economic objectives, then a fixed exchange rate regime and controlled foreign exchange regime is one of the options. However, this option is not in line with the flow of globalization which offers many benefits to the domestic economy from international trade and investment. As such, it is necessary to formulate an optimal alternative involving monetary policy, exchange rate policy, and capital flow management in order to obtain the benefits of economic openness while also achieving domestic economic objectives. In other words, it is necessary to find an optimal solution to address the policy trilemma in an open economy.

Capital flow and exchange rate management are strengthened according to the following basic principles. First, the coordination or application of a mix of policy instruments is an important part of the strategy to achieve optimal policy objectives.

[1] This term was coined by Mundell (1968: 147) in his book International Economics to explain the impossibility of achieving the goals of exchange rate stability, freedom of mobility of foreign capital, and independence of monetary policy at the same time. "Over time, the three goals cannot be attained simultaneously".

Second, while still adhering to a free foreign exchange regime, macroprudential measures in the area of capital flows are a policy option aimed at reducing excessive short-term capital flows, provide room or the possibility for the exchange rate to strengthen, the accumulation of foreign exchange reserves, as well as the use of monetary and fiscal policies, while consistently considering prudential and structural policies to manage capital inflows.

Third, the exchange rate is managed so as to remain flexible and provide room for appreciation, but is maintained so that it does not deviate too far from its fundamental value (become overvalued). Exchange rate management in line with the fundamental conditions is carried out through symmetrical intervention in the forex market, which provides room for appreciation when there is a high flow of foreign capital. The complexity of monetary policy through interest rates on the monetary policy side can be partially overcome by implementing macroprudential policies. Fourth, monetary policy is supported by macroprudential policies aimed at minimizing the impact of capital inflows on asset price bubbles as well as excessive credit growth which can pose risks to monetary stability and financial system stability, including Capital Flow Management (CFM).

This chapter will discuss in-depth issues related to exchange rate and foreign capital flow management in several sections. The next section presents several conceptual dimensions, including basic theories regarding the determination of exchange rates and the concept of the policy trilemma/impossible trinity, as well as exchange rate and foreign exchange regimes. The subsequent two sections look at the practice of foreign capital flow management along with several empirical issues related to the management of the policy trilemma. The last section contains some closing notes.

Conceptual and Empirical Dimensions

Theories of Exchange Rate Determination

Many theories have been developed in the international financial economics literature to explain exchange rates and the relationships between variables in an open economy. Initially, theories of exchange rate determination were more focused on the view of the international trade side of the balance of payments. However, with the development of global financial markets and increasing financial liberalization in many countries, the theories that later emerged placed greater emphasis on the capital account side of the balance of payments. The modern approach views the exchange rate as one of the assets in the international financial market by emphasizing monetary aspects, currency substitution, and the balance of investment portfolios between countries (Warjiyo and Juhro 2019). The analyses presented in these various theories are not only limited to theories of determining the exchange rate, but also focus on the effect of the exchange rate on various economic variables and its implications for the macroeconomic policies adopted. While not all theories are able to explain

the complex phenomenon of exchange rate puzzles and the relationship between variables in an open economy, the various theories described below provide a framework for analyzing the linkages between three important aspects in the international financial economy—exchange rate stability, capital mobility among countries, and macroeconomic policy responses, especially monetary policy in an open economy.

The earliest developed theory of exchange rate determination was the Purchasing Power Parity (PPP) theory, sometimes also called the inflationary theory of exchange rates. Basically, the PPP theory states that the law of one price applies to various products traded internationally.[2] This theory is based on a concept of flows from international trade activities in determining the exchange rate, when the flow of demand for foreign currency to pay for imports will be equal to the flow of supply of foreign currency generated from exports.[3] If there are no barriers to international trade and no arbitrage to gain profit from the trade of foreign currency, then in absolute terms the price of goods for each country will be the same after taking into account the prevailing exchange rate, namely P = P* + S, where S is the nominal exchange rate, while P and P* are the price levels of domestic and foreign goods. Meanwhile, in relative terms, if the method and scope of goods in the calculation of inflation are not much different, then according to PPP, the change in exchange rates will be the same as the difference in inflation between countries, that is $\Delta S = \pi - \pi^*$, where π and π^* are the rates of domestic and foreign inflation, as laid out by Cassel (1918).[4]

With trade expanding to a number of countries, the PPP theory became the basis for measuring the weighted exchange rate in real terms, known as the Real Effective Exchange Rate (REER), that is: $REER = \sum \omega_j \pi_j^* / \pi$, in which ω is the portion of trade value with each trading partner country. REER calculations are generally expressed in an index with a base year that reflects the normal conditions of the countries concerned. The REER index can be used as a measure of how far the exchange rate has moved out of alignment with fundamental conditions (misalignment). In addition, the REER index is also used to measure levels of competitiveness in terms of the real exchange rate so that its influence on export and import performance can be analyzed.

In contrast to PPP, which is based on the balance of trade transactions, the Interest Rate Parity (IRP) theory emphasizes the concept of flows in the movement of capital flows among countries in the capital account transactions. With the existence of an international asset market, IRP conditions can act as a manifestation of the law of one price for interest rates among countries. This condition can occur with the

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[2] The law of one price states that if calculated in the same currency, freely-traded commodities will cost the same everywhere, assuming perfect market mechanisms (i.e. low transaction costs, no taxes, homogeneous products, and no uncertainties). If the prices for homogeneous products differ from each other, commodity arbitrage will take place to seek profit from these price differences until the prices become the same.

[3] PPP is called a flow concept because it is based on the flow of goods and services in the balance of trade for determining exchange rates.

[4] If speculative behavior is considered, Roll (1979) suggests an alternative PPP formulation in the form of expectations, that is in absolute terms: E(P) = E(P*) + E(e), or in relative terms: $\pi - \pi^*$ = E (et + 1 − et), where E(.) is the expectation operator.

assumption that the foreign exchange market is efficient enough in transforming information into exchange rate movements and does not face significant transaction barriers for perfect market competition to work. Capital mobility among countries is also very easy (perfect capital mobility) as the types of assets traded in the financial market are relatively homogeneous and can be exchanged perfectly (perfect capital substitutability).[5] In such a condition, the level of investment returns or interest rates among countries will be the same after taking into account the exchange rate.

The Interest Rate Parity theory can be demonstrated in the form of Covered Interest Rate Parity (CIRP) and Uncovered Interest Rate Parity (UIRP). With UIRP, investment returns or domestic interest rates will be the same as foreign interest rates after taking into account expectations of changes in exchange rates in the market, that is $r = r* + [E(S) - S]/S$, in which $\{r, r*\}$ = domestic and foreign interest rates and $\{E(S), S\}$ = expectations and the spot exchange rate. Meanwhile, CIRP shows interest rate parity for investments between countries that have been hedged against exchange rate risk with forward transactions, so that $r = r* + (F - S)/S$, in which F = the forward exchange rate. Such interest rate parity can occur because the arbitrage process in international financial transactions will prevent any abnormal profits from investment and borrowing transactions in the domestic asset market compared to foreign asset markets. Any differences in interest rates among countries will be eliminated by the freedom of mobility of funds among countries as well as the arbitrage mechanism.

Policy Trilemma: Exchange Rate and Capital Flow Management

The increasing integration of the domestic economy with the global economy, as well as the rapid inflow of foreign capital, is making macroeconomic management ever more complex, particularly when it comes to monetary policy and exchange rates. Obstfeld et al. 2005 examined the monetary policy trilemma for 103 countries over more than 130 years. The autonomy of monetary policy is measured by the relationship between domestic interest rates and the interest rates of countries of comparison. Under various approaches, there exists either a pegged or non-pegged exchange rate system, and a free or controlled foreign exchange regime. The study looks at the following three periods: Gold Standard (1870–1914), Bretton-Woods (1959–1970), and Post Bretton-Woods (1973–2000). Based on the theory of international interest rate parity or Uncovered Interest Rate Parity (UIP), the policy trilemma in this study is proven by estimating the following equation:

$$\Delta R_{it} = \alpha + \beta \Delta R_{it}^* + \varepsilon_{it} \tag{4.1}$$

in which: R = domestic interest rate, R* = comparative interest rate. The countries of comparison are those in which a peg is applied: The UK for the Gold Standard period,

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[5] Examples of barriers in the capital market include restrictions on the mobility of funds among countries (such as in a controlled foreign exchange regime), transaction costs, taxes, and risk differences in investing in securities.

the USA for the Bretton Woods period, and various countries for the post-Bretton Woods era.

Overall, the study confirmed that the trilemma remains valid as a guide for a monetary policy framework in an open economy. First, it turned out that pegged exchange rate systems created a closer relationship between domestic interest rates and the interest rates of the countries of comparison than did the non-pegged exchange rate systems. Interest rates of pegged exchange rate countries reacted more strongly and had a stronger long-term relationship with the interest rates of the countries of comparison. Second, with the loosening of controls on foreign capital flows, pegged countries saw a decline in their monetary policy autonomy. At the same time, non-pegged countries had a stronger degree of autonomy, especially in the post-Bretton Woods period, even in conditions of free foreign exchange. Third, pegged countries did not in fact always keep their exchange rates absolutely fixed at a certain level, due to devaluations or maintaining their exchange rate within a range. Conversely, non-pegged countries also did not always allow their exchange rates to float freely, and often followed countries of comparison in determining domestic interest rates.

A number of other studies show how central banks deal with this policy trilemma. Calvo and Reinhart (2002), for example, point out that there is a tendency for the phenomenon of 'fear of floating' in the exchange rate policies of many countries. The classifications of exchange rate regimes adhered to by many countries reveal that more and more countries are adopting an intermediate system rather than a hard peg or a pure floating exchange rate system. The 'fear of floating' phenomenon is one way to get around the policy trilemma, namely by stabilizing the exchange rate. Even in countries that adhere to a flexible exchange rate system, the central bank also intervenes in foreign exchange to stabilize the exchange rate.

Aizenman et al. (2011), for example, examined a modification of the Taylor rule in determining monetary policy interest rates with panel data for 16 EME countries during the period 1989:Q1-2006:Q4. The results demonstrated that EME countries that adhere to ITF implement strategies in which the central bank responds both to inflation and the real exchange rate in determining policy interest rates. A study by Mohanty and Klau (2004) also showed similar results from an estimation of the Taylor modification for 13 EME countries where the central bank reacted to actual inflation, output gaps and exchange rate changes. Overall, the results illustrated that the central banks reacted to real exchange rate volatility. In all the countries, except Chile, it was evident that the central bank "leans against the wind" by raising interest rates when the exchange rate depreciates. Moreover, there was high persistence in monetary policy responses to exchange rates in South Korea, India, Mexico, Peru, Thailand, and South Africa. The response of monetary policy to the exchange rate was even greater than the corresponding response to inflation and output gaps, a testament to the 'fear of floating' phenomenon. Intervention in the foreign exchange market was an instrument generally adopted.

Exchange Rate and Foreign Exchange Regimes

Essentially, the selection of the exchange rate regime and the foreign exchange regime, as well as the independence of monetary policy from the influence of foreign

developments, are the 3 (three) strategic issues when it comes to the formulation and implementation of monetary policy in an open economy.[6] Generally, when applying a controlled foreign exchange system, the mobility of capital inflows and outflows tends to be controlled, rendering the impact on the money supply in the country concerned relatively minor. Conversely, when applying a free foreign exchange system, the mobility of capital inflows and outflows will increase, both in terms of amount and fluctuations. As a result, developments in the country's money supply will be greatly affected by the flow of foreign funds.

The extent to which monetary policy is able to overcome the influence of foreign fund flows is influenced by the exchange rate regime adopted. If a country applies a fixed exchange rate system, monetary policy is directed to maintain the exchange rate at a predetermined level. As such, it is difficult to implement monetary policy independently because the foreign fund flows will directly affect developments in the money supply, economic growth, and inflation in the country. On the other hand, if a country applies a floating exchange rate system, the flow of foreign funds will directly affect developments in the exchange rate in the market. Therefore, monetary policy can be more independent in focusing on controlling the money supply and its impact on economic growth and inflation in the country.

As outlined above, the policy trilemma refers to the fact that in an open economy, exchange rate stability, freedom of mobility of foreign funds, and independence in the implementation of monetary policy cannot be achieved simultaneously. In the economics literature, this condition is known as the impossible trinity. The central bank can only achieve two of the three conditions above. Thus, if exchange rate stability is desired through the application of a fixed exchange rate system, the independence of monetary policy requires limiting the mobility of foreign funds through the implementation of a controlled foreign exchange regime. Conversely, if freedom of mobility of foreign funds is desired through the application of a free foreign exchange regime, the independence of monetary policy requires the adoption of a floating exchange rate system so that, as described above, the influence of the mobility of foreign funds can be absorbed by changes in the exchange rate (with the consequence that the exchange rate is not always stable) and the money supply in the country remains under control. However, there is an argument that states that the monetary authority should be able to pursue the possible trinity to the maximum extent possible, by using various policy instruments. This involves the central bank maintaining exchange rate stability as well as free capital flow while also remaining an independent institution. This is indeed quite difficult and challenging, especially in the era of an increasingly integrated global financial system. It requires policies other than monetary policy, such as macroprudential policies and government policies, to play a supportive role.

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[6] The term independence here refers to the ability of the central bank to implement monetary policy without disruptions stemming from developments in external factors, such as the mobility of foreign funds and developments in the global economy. The definition of independence here differs from the independence of the central bank as relates to its institutional arrangements and absolute authority to carry out the tasks stipulated in the law, regardless of efforts by the government or other parties to interfere, as discussed in other parts of this chapter as well as in other chapters in this book.

Exchange Rate Regimes

The exchange rate of a currency is defined as the relative price of one currency against another. Meanwhile, the exchange rate regime is a system adopted by the monetary authority of a country in regulating the exchange rate of that country's currency against currencies of other countries. There are various types of exchange rate regimes in the world, especially after the collapse of the Bretton Woods exchange rate system in 1976. In general, however, exchange rate regimes can be classified into the following three groups; (1) absolute fixed exchange rate system, (2) pure floating exchange rate system, and (3) fixed but adjustable rate (FBAR) system which is a combination of a fixed and floating exchange rate system (Corden 2002).

The exchange rate or the value of one currency against another currency is set at a certain value in a fixed exchange rate system. For example, if the exchange rate of the Rupiah against the United States Dollar is set at Rp. 8,000 per Dollar. The central bank, at this exchange rate, will be ready to sell or buy foreign exchange needs in order to maintain the fixed exchange rate. If the exchange rate can no longer be maintained, the central bank can carry out a devaluation or revaluation of the specified exchange rate.[7]

In a floating exchange rate system, the exchange rate is allowed to move according to the forces of supply and demand that occur in the market. Thus, the exchange rate will strengthen if there is an excess supply of foreign currency and, conversely, the domestic currency will weaken if there is an excess demand for foreign currency.[8] The central bank may intervene in the foreign exchange market, either by selling foreign exchange when there is a shortage of supply or buying foreign exchange if there is an excess supply, to avoid excessive exchange rate fluctuations in the market. However, these interventions are not directed at achieving a specific exchange rate target or target range. A managed float regime is a system that lies in between the two exchange rate systems outlined above. The central bank sets a limit on the range within which the exchange rate may move, called the intervention band, in the exchange rate system. The exchange rate will be determined according to market mechanisms as long as it remains within the range of the intervention band. If the exchange rate penetrates the upper or lower limit of the range, the central bank will

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[7] Devaluation is a policy taken by the government of a country to unilaterally determine the exchange rate of that country's currency against other currencies. For example, the Rupiah exchange rate which was originally set at Rp 800 per US Dollar gets lowered to Rp 9000 per US Dollar. On the other hand, revaluation is a policy of increasing the exchange rate of the country's currency against other currencies. Devaluation or revaluation policies are usually carried out in order to maintain a country's foreign trade performance. For example, a policy of devaluation in the short term can increase competitiveness so as to stimulate export activities, assuming other countries do not retaliate by taking devaluation measures and exporters can enhance production efficiency to meet export demand.

[8] The exchange rate is said to have weakened if a greater value of money is needed to buy the same amount of foreign currency; for example, the Rupiah exchange rate weakened from originally being able to purchase a Dollar with Rp 8000 to being able to with Rp 9000.

automatically intervene in the foreign exchange market so that the exchange rate moves back into the intervention band.[9]

Each exchange rate regime has its own advantages and disadvantages. The choice of the system to be applied will depend on the economic situation and conditions of the country concerned, in particular the amount of foreign exchange reserves it has, the openness of its economy, the foreign exchange regime it adheres to (free, semi-controlled, or controlled), and the volume of its domestic foreign exchange market. One of the advantages of a fixed exchange rate system is the certainty it offers to the market in terms of the exchange rate. However, this type of system requires large foreign exchange reserves due to the necessity for the central bank to maintain the exchange rate at a specified level. In addition, this type of system may persuade the business community not to hedge its foreign currencies against the risk of changes in exchange rates. Such a system is generally applied in countries that have large foreign exchange reserves, with a somewhat controlled foreign exchange system in place. In contrast, one of the advantages of a floating exchange rate system is that large foreign exchange reserves are not required because the central bank does not have to maintain the exchange rate at a specific level. However, excessively fluctuating exchange rates can exacerbate uncertainties for the business world. Such a system is generally applied in countries that have relatively small foreign exchange reserves while the foreign exchange system adopted tends to be free.[10]

Exchange rate movements in the market are influenced by both fundamental and non-fundamental factors. Fundamental factors are reflected in macroeconomic variables, such as economic growth, inflation rates, and export and import developments.[11] Meanwhile, non-fundamental factors include market sentiments concerning socio-political developments, the psychology of market participants in digesting information, rumors that are circulating, or other developments in determining daily exchange rates.

Foreign Exchange Regimes

Foreign exchange is a financial asset used in international transactions. The establishment of a foreign exchange regime in a country is intended to regulate the movement

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[9] If the exchange rate penetrates the upper or lower limits of the intervention band, the central bank will automatically sell or buy the exchange required by the market for the exchange rate to move back within the range of the intervention band. Determining the width of the intervention band depends on the size of the foreign exchange reserves held by the central bank along with possible needs that arise in the market. Generally, the range will be adjusted from time to time in accordance with developments in foreign exchange reserves and the volume of transactions in the foreign exchange market.

[10] For a managed float exchange rate system, the advantages and disadvantages lie between those associated with a fixed and floating exchange rate system.

[11] There are various approaches in international financial theory to determine exchange rates in a fundamental manner; for more details, read Darsono, R. Eki Rahman (2018), *Teori Nilai Tukar, Buku Pasar Valuta Asing: Teori dan Praktik, Rajawali Pers, Depok*/Exchange Rate Theory, Foreign Exchange Market Book: Theory and Practice, Rajawali Press, Depok.

of foreign exchange traffic between residents and non-residents from one country to another. Basically, there are three types of foreign exchange regimes, as follows: (i) controlled foreign exchange system, (ii) semi-controlled foreign exchange system, and (iii) free foreign exchange system. The choice of which foreign exchange regime to adopt will depend on the conditions of the country concerned, particularly its economic openness—or more specifically how far the country in question wants to integrate its economy with the global economy.

In a controlled foreign exchange system, foreign exchange is basically owned by the state. Therefore, any foreign exchange acquired by the public must be turned over to the state and any use of foreign exchange requires permission from the state. In a semi-controlled foreign exchange system, the obligations mentioned above only apply to the acquisition and use of certain foreign exchanges, while other types of foreign exchange can be freely acquired and used. In a free foreign exchange system, people are allowed to freely acquire and use foreign exchange.[12]

As of now, all these systems are still used in numerous countries with various other policy combinations. Essentialy, every country shares the goals of not allowing either the inflow or outflow of foreign exchange to interfere with domestic economic performance, and ensuring that the impact of foreign exchange flows on the exchange rate is directed at making at the economy internationally competitive. The application of a particular foreign exchange regime has implications for other economic/monetary policies. The choice of foreign exchange regime must take into account the characteristics of the domestic economy while seeking to achieve price stability and sustain domestic economic growth.

Practice of Capital Flow Management

The theoretical and empirical reviews of various countries, as outlined above, prove that foreign capital flows, notwithstanding their ability to stimulate economic growth, can also pose risks to macroeconomic stability and the financial system. Therefore, a mix of macroeconomic (fiscal and monetary), financial system stability, and structural reform policies is urgently needed at the national level. The policy mix combination will depend on the conditions of the country concerned. Structural reform policies are very important in enabling the benefits of foreign capital flows to boost productivity and economic growth. Macroeconomic policy adjustments are also necessary, particularly in the event of macroeconomic stability pressures such as inflation and a large current account deficit. As such, prudent and consistent monetary and fiscal policies play a vital role as the first line of defence against foreign capital inflows. In the event of excessively high volatility, macroeconomic policies also need to be supported by

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[12] Actually, in practice, most countries that apply a free foreign exchange system retain an obligation for the public to report the acquisition and use of foreign exchange.

exchange rate stabilization policies. Adequate foreign exchange reserves and bilateral and multilateral swap arrangements also play an important role as the second line of defence. Strengthening and deepening the financial sector, as well as enhancing institutional capacity, have proved effective at increasing the ability to deal with foreign capital flows.

Principles, Goals and Instruments

In the context of the central bank, a combination of monetary policy mix, exchange rate stabilization, and capital flow management is needed to achieve an optimal balance in responding to the policy trilemma as described above. Experience since the 2007/2008 Global Financial Crisis has shown that volatility and the volume of capital flows into EMEs cannot always be responded to with interest rates as the main instrument, or even with foreign exchange interventions as a secondary instrument. In the face of very large capital flows, for example, foreign exchange interventions will increase the accumulation of large foreign exchange reserves as well. Although it can strengthen the external resilience of EMEs, the costs of the accumulation of foreign exchange reserves are also large due to the central bank's need to sterilize liquidity for the foreign exchange interventions. In such conditions, foreign capital flow management (CFM) is an instrument that can be considered by the central bank. CFM is also needed in the event of a very large capital outflow, because the interest rate response is not always effective while foreign exchange interventions can be limited by the adequacy of the foreign exchange reserves held by the central bank.

Principles of Formulation and Application

In general, the following conditions can serve as a reference for when CFM can be put into practice (IMF 2013). First, CFM is needed when the room for further macroeconomic policy adjustments is increasingly limited. For example, despite having undergone monetary or fiscal tightening, there remains an inability to control foreign capital inflows. This condition is generally encountered when the economy is overheating or showing signs of asset price bubbles, there is an accumulation of external debt, the exchange rate is overvalued, and the accumulation of foreign exchange reserves is too large and ever more expensive.

Second, CFM is needed if the implementation of macroeconomic adjustment policies is taking time, both in the formulation process and in their impact on the economy. For example, budget changes as part of fiscal policy generally take a while to be approved by parliament. The effectiveness of monetary policy may also be delayed due to the transmission mechanism in influencing inflation expectations and domestic demand.

Third, CFM is necessary in the event that a surge in foreign capital inflows adds to the risks posed to financial system stability. Systemic risks that do not come from foreign capital flows are better addressed with macroprudential policies. However, a surge in capital flows could lead to an excessive rise in credit disbursement, due to both liquidity expansion and increased risky behavior. Under these conditions, restrictions on capital inflows by means of CFM can support the effectiveness of

macroeconomic policy, monetary policy, and macroprudential policy in maintaining macroeconomic stability, monetary stability, and financial system stability.

When applying CFM, there is a need to consider its effectiveness and efficiency (International Monetary Fund 2013). Likewise, the design and implementation of CFM have to be transparent, targeted, temporary, and non-discriminatory towards residents and non-residents alike.

- **Transparent and targeted**: Clear communication of the CFM's goals and instruments is essential for avoiding market distortions and incorrect public expectations. CFM targeted at certain aspects that pose risks, such as short-term and speculative foreign portfolio investment flows and debt, will be more effective. The balance between the scope, effectiveness and side-effects of CFM needs to be evaluated according to country-specific conditions. Targeted CFM will be easy to monitor and not cause unwanted side-effects.
- **Temporary**: Once implemented, CFM can be tightened if capital inflows are large or, conversely, relaxed in the event that capital inflows have decreased or capital reversal occurs. CFM can be continued if it is still needed to support financial system stability, rather than for balance of payments purposes.
- **Non-discriminatory**: In general, CFM that does not differentiate between residents and non-residents is preferred. However, if this causes the CFM to be less effective, instruments that discriminate against non-residents (otherwise known as capital controls) can be applied. The preference for non-discriminatory CFM is based more on considerations of fairness and equality of treatment, as expected of each member of the IMF.

Goals: Macroeconomic Stability and/or Financial System Stability

In implementing CFM, it is necessary to have a clear goal in mind to be achieved, be it macroeconomic stability, financial system stability, or both. The answer will depend on the type and level of volatility of the capital flows, as well as the fundamental conditions of the economy and the financial sector of the country concerned. As already explained, the volatility of portfolio investment flows has an impact on the volatility of the exchange rate, stock prices, and bond yields. If there are no problems with inflation and the current account in the country, monetary policy can be pursued either through interest rates or interventions in the foreign exchange market to mitigate asset price volatility, as mentioned above. In this regard, CFM for the purpose of macroeconomic stability can be applied to support monetary policy, especially when inflation is relatively low and foreign exchange reserves are insufficient to stabilize the exchange rate. However, if inflation and the current account are high, CFM needs to be used as a complement to the required macroeconomic policies, either through monetary or fiscal policy, or policies in the real sector.

Under other conditions, the volatility of capital flows not only threatens macroeconomic stability but also puts pressure on financial system stability. Excessive asset price volatility increases market risks. Similarly, pressures on financial system stability may arise from the expansion of bank liquidity and credit due to excessive inflows of foreign capital. The external debt of the banking system also has

an impact not only on macroeconomic stability but likewise on the stability of the financial system. The extent of this impact will depend on the resilience of the financial sector as well as the effectiveness of the macroprudential and microprudential policies implemented. In this regard, CFM to control capital flows with the aim of macroeconomic stability can support the effectiveness of macroprudential policies in maintaining financial system stability.

There is occasionally a perception that CFM is a type of macroprudential policy, even though the two have different goals. CFM is a regulation aimed at restricting capital flows, while macroprudential policies are intended to limit systemic risks and maintain financial system stability. CFM is directed at controlling the amount and composition of capital flows, while macroprudential policies are aimed at mitigating the accumulation of systemic risks regardless of whether they arise externally or domestically. For example, taxes applied to certain types of foreign capital flows constitute CFM and only indirectly affect financial system stability. On the other hand, capital surcharge provisions and counter-cyclical buffers against systemic financial institutions are macroprudential policies and only indirectly affect capital flows.

However, there are a number of situations in which CFM and macroprudential policy can complement each other (IMF 2015a). When capital flows pose systemic risks in the financial sector, instruments in the form of CFM and macroprudential policies can be used. For example, capital flows to the banking sector from both external debt and portfolio investments can lead to a boom in credit and domestic asset prices. Provisions that limit external debt in the banking system, such as through Statutory Reserves (SR), maximum loans to capital, the Net Open Position (NOP), or even different risk weights in the calculation of capital requirements, can limit capital flows and exchange rate volatility, while simultaneously controlling excess banking liquidity, credit growth, and rising domestic asset prices. Given this, it can be concluded that both CFM and macroprudential policies can be directed towards limiting capital flows while, at the same time, reducing systemic risks in the financial sector.

Another important consideration is how and when these two instruments (CFM and macroprudential policy) need to be reduced or exited. When capital flows are no longer large and highly volatile, CFM can create an unwanted burden on the economy or become so ineffective as to warrant discontinuation. However, a number of macroprudential policies can still continue to be applied to manage systemic risks in the financial sector which may remain prevalent after a period of large capital flows and high volatility. Formulating macroprudential policies that are indeed aimed at financial system stability, not to control capital flows, is very important and will be discussed separately in Chap. 5. Moreover, while capital flows are still ongoing and permanent, further policy reforms need to be carried out for deepening the financial sector, boosting investment and productivity in the real sector, as well as strengthening institutions.

Choice of Instruments: Prudential Provisions or Capital Controls?

What instruments can be used to mitigate the risks posed by foreign capital flows? In general, the policy options will depend on the specific conditions of the country in question. A number of tools are available to control the flow of capital in the form of administrative instruments, including capital controls, as well as prudential provisions. Administrative instruments are aimed directly at certain types of capital flows, while prudential provisions are aimed at increasing the ability of the financial sector or corporations to mitigate risks that may arise from capital flows.

CFM administrative instruments take the form of certain obligations placed on residents or non-residents with regard to the capital transactions they perform. These may include the taxation of capital flows from non-residents, adding to the statutory reserve without interest remuneration, special licensing obligations, and even absolute restrictions or prohibitions. These provisions can be applied to all types of capital flows, or can be applied selectively according to the type or time period concerned (debt, stocks, Foreign-Owned Company/PMA; short-term vs. long-term). They can apply to the entire economy, to a specific sector (usually the financial sector) or to a specific industry (e.g., strategic industries). The term CFM generally applies to non-discriminatory instruments, in the sense that the arrangements concerned are mandatory for both residents and non-residents. When the arrangements differentiate between residents and non-residents, they are called capital controls. For example, if the minimum statutory reserve for non-residents is higher than that for residents, this is a form of capital control. In contrast, a regulation that distinguishes statutory reserves on the basis of currency and applies to residents and non-residents alike is still considered a CFM instrument.

Meanwhile, the prudential provisions of CFM are generally directed at foreign exchange transactions based on the currencies involved, instead of the residency of the parties conducting the transactions. Regulations apply to domestic financial institutions, particularly banks. The instruments can be in the form of a limit on the NOP in accordance with capital capacity, or a limit on banking investments in foreign currency assets. Other provisions can be in the form of limits on bank credit in foreign currencies, especially for customers who do not carry out hedging, or differences in the statutory reserve for obligations in domestic currency and foreign currencies. In addition to financial institutions, CFM prudential provisions can be applied to the corporate sector, in particular to mitigate the risks resulting from the external debt it receives. Other instruments can be in the form of hedging obligations to mitigate exchange rate risks, liquidity obligations to mitigate the ability to pay principal and interest, as well as provisions on the maximum or minimum debt-equity ratio to mitigate corporate default risks.

The various CFM instruments described above are generally applied to control foreign capital inflows. However, some of them can be used to mitigate the negative impact of capital outflows on macroeconomic stability (IMF 2015b). For example, taxes or statutory reserves can be relaxed or revoked altogether in order to address the risk of capital reversal, depending on the intensity of the problems encountered. A number of other CFM instruments, particularly prudential provisions such as the

NOP and foreign borrowing limits, may still be maintained as they can strengthen risk management against volatility in capital flows. There are also other CFM instruments available to deal with capital outflows, such as the following: (1) limiting residents' investments in financial instruments abroad (Iceland); (2) establishing a minimum holding period for non-residents to sell their investments (Chile in the 1990s), establishing a waiting period to transfer the proceeds from sales of investments (Ukraine); imposing taxes on the transfer of investment returns (Malaysia); (3) prohibiting the conversion and transfer of domestic currency assets (Iceland) and restricting withdrawals of deposits (Argentina, Greece). Restrictions on non-residents' access to local currency may also make speculation more difficult.

As in the case of capital inflows, CFM instruments for controlling capital outflows will be more effective if they are part of a comprehensive policy package and are supported by sound institutions and a strong legal system. In other words, the management of capital outflows should not be a substitute for sound macroeconomic policies, especially if the outflows of capital are also caused by the vulnerability of the domestic economy. More specifically, management of outward flows is more effective if it is formulated properly and can be implemented consistently. To avoid being futile and to remain effective, CFM also needs to be comprehensive and able to adapt to problems as they develop.

Possible Trinity: Managing the Policy Trilemma in Indonesia

In the case of Indonesia, the application of CFM is an integral part of the strategy for managing the monetary policy trilemma (Warjiyo and Juhro 2019). This policy trilemma is managed through a monetary policy mix consisting of an interest rate response complemented by exchange rate flexibility, capital flow management, and macroprudential policy support. Interest rate policy, in line with the inflation targeting framework implemented by Indonesia since 2005, serves as the main instrument for anchoring inflation expectations and forecasts within the targeted range. Exchange rate policy is directed at maintaining exchange rate stability in accordance with its fundamental path. Capital flow management is also implemented with the aim of reducing short-term excess volatility and stabilizing the exchange rate. At the same time, macroprudential policies are intended to manage procyclicality and excessive borrowing in certain sectors. Overall, the objective of this policy mix is to boost the effectiveness of all monetary transmission channels. This policy mix strategy tactically shifts the paradigm of "impossible trinity" to "possible trinity".

The steps involved in managing the policy trilemma for the Indonesian economy are illustrated in Fig. 4.1.

From the perspective of a small open economy like Indonesia, fluctuating capital flows, especially short-term and speculative ones, drive up the risk of monetary and financial system stability (Prabheesh et al. 2021; Juhro and Anglingkusumo 2020). Carry-trade flows often cause excessive volatility in exchange rate movements beyond fundamental values. There will also be market liquidity risks. In certain periods, large capital inflows often lead to excessive domestic borrowing and asset bubbles, while at other times large capital reversals pose serious risks to illiquid markets and also risk the overcorrection of asset prices. Dual intervention in the
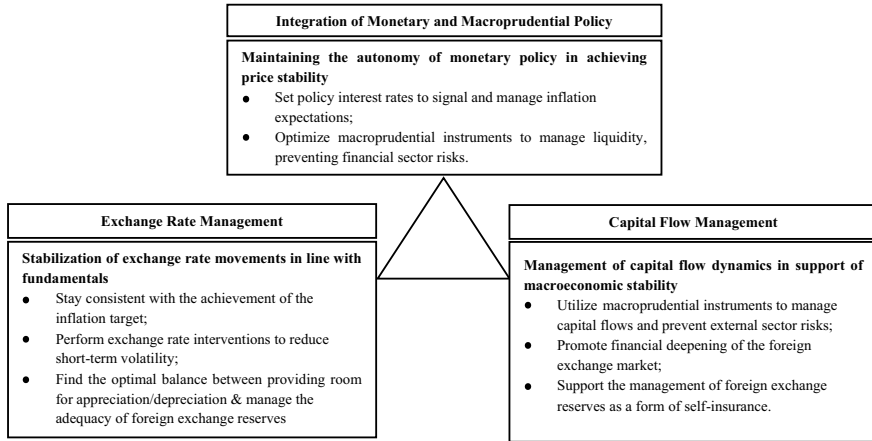
Fig. 4.1 Policy trilemma. *Source* Juhro and Goeltom (2015), Warjiyo and Juhro (2019)

forex and rupiah markets is one strategy to smooth out the impact of erratic capital flows on asset prices and market liquidity. In many cases, however, direct capital flow management measures are still required.

In Indonesia, capital flow management policies are guided by 3 (three) principles. First, their objective is to help reduce the negative impact of short-term volatility in capital flows on exchange rate stability and the overall monetary and financial system. Second, specific measures targeting short-term and speculative capital flows are welcomed, both for the medium and long term, as they benefit the economy. Third, these measures are consistent with the broad principle of maintaining a free foreign exchange regime. The measures are also temporary—meaning that they can be tightened in the case of excessive capital inflows and relaxed in the event of excessive capital outflows—and do not discriminate between domestic and international actors or investors.

Several Empirical Issues on Monetary Policy Trilemma

The decade after the Global Financial Crisis (GFC), a period roughly from 2009 until 2019, highlights a global economy that is marked by elevated risk and uncertainties in the global financial markets. Post GFC uneven recovery in AEs, prolonged consolidation in the Euro area, growth rebalancing in China, the United Kingdom (UK) exit from the European Union (EU), and rising trade tensions between the United States (US) and China, are among the notable features of the period.[13] However, for central banks, particularly in emerging market economies (EMEs), including in

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[13] See various issues of the International Monetary Fund (IMF) World Economic Outlook since the GFC.

Asia, an essential facet of this period has been the resumption of large and very often volatile capital flows, which can be attributed to the implementation of UMP, i.e. QE policy by AEs, particularly the US.

Azis and Shin (2015) discuss three phases of global liquidity expansion (and retrenchment) and its spill-over effects to emerging Asian economies. The first phase (the period leading up to the GFC in 2008/2009), was marked by banking led capital flows, intermediated by the global banking system. The second phase (began in 2010, after the QE in AEs), was precipitated by the global search for yield on the back of ample USD liquidity, and rapid growth of local currency (LCY) bond markets in Asia. The third phase started after the Fed announcement of US monetary policy normalization, which propelled capital flow reversals. This last phase accentuated the interconnectedness and high international integration of financial sector in Asia.

Recently, Rey (2016, 2018) argues that global financial cycles, i.e. the recurring episodes of increasing/declining risk tolerance and appetite for leverage, which is born by the rising financial globalization, has transformed the challenges about trilemma management in EMEs. Specifically, financial shocks originating from the core AEs, i.e. the US, may spill across borders, making it harder for EMEs' central banks to maintain monetary policy sovereignty (MPS). As also shown in Azis and Shin (2015) the episodes of large and volatile capital flows before, during and after the GFC demonstrate potent adverse implications of the global financial cycles on EMEs through the financial and welfare (real) channels.

A corollary to the above, in growingly interconnected and integrated financial markets, lax (tight) financial condition in the core AEs, may prompt lax (tight) global financial condition. It may further trigger an increase (a decrease) in risk tolerance in the global financial markets and induce large capital inflows (outflows) into (out of) EMEs and relax (tighten) borrowing constraints in the capital flow recipient countries. Hence, global financial cycles will determine domestic financial conditions regardless the degree of exchange rate stability (ERS), and may reduce monetary policy effectiveness in economies with a high degree of financial openness (FO), leading into "*an irreconcilable duo*" where the trilemma morphs into a dilemma, such that MPS is possible if and only if capital mobility is restricted or a low degree of FO is preferred (Rey 2016, 2018). Yet, Nelson (2020) shows that in a financially open economy with the floating exchange rate, MPS can still be achieved because authorities will have stronger control over domestic policy objectives. On this, a recent study by Eichengreen et al. (2020) concludes that, contrary to Obstfeld et al. (2005), a flexible exchange rate has insulating properties against external shocks in EMEs. Additionally, if large exchange rate fluctuations remain of a concern for financial stability, maintaining a large international reserves buffers ("a war chest" in the sense of Calvo and Reinhart (2002)) may not always be sufficient, and additional tools, such as macroprudential policies, are needed, provided the country has initially low financial fragility (Aizenman 2019).

This is more evident in emerging economies, where domestic financial conditions react faster and stronger to global financial shocks than to the changes in domestic monetary policy rates. Therefore, conducting a timely and quick monetary policy becomes a serious challenge (Bruno and Shin 2015; Georgiadis and Mehl 2016). It

is argued that the monetary policy has a limited impact during the period of global financial shocks. While introducing capital flow management may also support stabilizing the economy in the presence of global financial shock in a flexible exchange rate regime, the increased importance of macroprudential policies in recent years helps to mitigate the risks associated with global financial shocks and thus continue to adhere to an open capital account regime (Warjiyo and Juhro 2019; Korinek and Sandri (2016); Juhro and Goeltom 2015; Farhi and Werning 2014).[14] In other words, managing financial stability using macroprudential policies may help the central bank to optimize its benefits from choosing policy options from the trilemma combinations. Thus, macroeconomic stability can be maintained by achieving monetary stability along with financial system stability (Smets 2018). Therefore, the present study tries to examine the effectiveness of the trilemma policies in the presence of macroprudential policies[15] in emerging market economies.

The emerging economies' policymakers face many challenges to maintain the macroeconomic stability as the asset price movements in the countries are sensitive to international capital flows, especially to portfolio flows; these economies' financial cycle often deviates from the economic cycle due to excessive credit boom/bust, subsequently affect financial stability. This was more prevalent during the global financial crisis and its aftermath, these economies experienced an unprecedented change in the magnitude of capital flows. Subsequently, the many emerging economies adopted macroprudential policies to curb the pro-cyclicality of credit growth, to minimize the systemic risk and thereby increase the financial sector's resilience (Jung and Lee 2017; Lubis et al. 2019; Warjiyo and Juhro 2019; Galati and Moessner 2018). Since many of the emerging economies follow inflation targeting (IT) framework, the global financial crisis reignited the view that central banks' focus on inflation targeting may be insufficient to bring about macroeconomic stability and may need to be complemented with targets for financial measures such as credit, leverage, or various asset prices (Leduc and Natal 2018). Thus understanding the effectiveness of macroprudential policies in the case of IT economies is also crucial for choosing the optimum mix of the policies to maintain macroeconomic stability.

The available literature in this context may be classified into three strands. The first strand of studies assesses categorical trilemma configurations and found the countries that follow fixed exchange rate attain higher monetary policy as compared to floating exchange rate countries (Frenkel 2004; Herwartz and Roestel 2017; Miniane

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[14] In order to provide a clear definition, Korinek and Sandri (2016) present the difference between capital control and macroprudential measures. Capital control applies exclusively to financial transactions between residents and non-residents whereas macroprudential regulation limits the domestic agents to borrow either from domestic or foreign lenders.

[15] The macroprudential policy has been defined as "the use of primarily prudential tools to limit the systemic risk-the risk of disruptions to the provision of financial services that is caused by an impairment of all or parts of the financial system and can cause serious negative consequences for the real economy" (IMF 2013). It includes a range of instruments, such as measures to address sector-specific risks (e.g., loan-to-value (LTV) and debt-to-income (DTI) ratios), counter-cyclical capital requirements, dynamic provisions, reserve requirements, liquidity tools, and measures to affect foreign-currency based or residency-based financial transactions.

and Rogers 2007; Rodriguez 2017) and capital control fosters the independence (Obstfeld et al. 2005; Shambaugh 2004). The second strand of literature analyses the evaluation of country-specific trilemma configurations over time and testing their binding nature (Aizenman et al. 2008, 2010, 2011a, b; Aizenman and Ito 2012; Hsing 2012). Similarly, some studies looked into the role of international reserves on trilemma configuration and found that high reserve holding economies are able relax to the trilemma constraint as compared to the low level of reserve holding economies (Akcelik et al. 2014; Juhro and Goeltom 2015; Steiner 2017) and helps to improve the monetary policy independence (Taguchi 2011).

The recent strand of studies emphasized the role of global financial cycles on trilemma constraints. They argued that a flexible exchange rate might not absorb external shocks during the global financial cycle. Thus, independent monetary policy is possible only if the capital account is managed directly or indirectly through macroprudential policies. If the global financial cycle causes financial instability, macroprudential instruments can be used to stabilize the financial sector by limiting its exposure to foreign currency (Cho and Hahm 2014). Hence countries face a dilemma instead of the trilemma, between independent monetary policy and free capital mobility (Caputo and Herrera 2017; Edwards 2015; Rey 2015; Taylor 2016).

Closing Notes

This chapter focused on the relationship between exchange rate and foreign capital flow management, as influenced by the increasingly integrated nature of the global economy and finance. Depending on the country, foreign capital flows have varying risks and affect changes in economic growth differently. The magnitude of these risks or benefits depends on several factors, such as the country's degree of openness and the foreign exchange system it applies, as well as its macroeconomic policies.

From the central bank's perspective, a strategy mix composed of interest rate and exchange rate stabilization policy alongside capital flow management has the potential to provide better results for monetary and financial system stability. Interest rate policy still needs to be directed towards achieving price stability, while exchange rate stabilization policy and capital flow management are aimed at maintaining external and internal stability. In the midst of high foreign capital inflows and appreciation pressures, the objective of exchange rate stabilization policy is to minimize exchange rate volatility to stay consistent with macroeconomic growth and developments, particularly as part of efforts to control and stabilize prices.

This chapter also revealed the closeness of the relationship between monetary stability and financial system stability. The magnitude of changes in foreign capital flows not only threatens macroeconomic stability, but also creates pressures on financial system stability, such as liquidity and bank credit growth. In light of this, the integration of monetary policy and macroprudential policy is increasingly important for strengthening monetary and financial system resilience. Macroprudential measures

are seen as regulations that play an essential role in managing both external flows and risks.

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Chapter 5
Financial Stability and Systemic Risk

Cicilia A. Harun and Iman Gunadi

Abstract Recent episodes of financial crises have provided empirical evidence that financial stability is a necessary condition to support sustainable macroeconomic growth. Likewise, systemic risk has become an important measure in macroeconomic risks, especially in light of the increased concern about its ability to distress the economy. The economic authorities thus need to have an understanding of systemic risk given that it may become elevated through the exacerbation of vulnerabilities triggered by shocks arising from different elements of the financial system, including the macroeconomic environment.

Introduction

Financial stability has become an integral part of the macroeconomic stability framework. Recent episodes of financial crises have provided empirical evidence that financial stability is a necessary condition to support sustainable macroeconomic growth. Financial system distress will disrupt the flow of funds to the economy in the form of lower economic liquidity, the deterioration of intermediation, payment system disturbances, and diminished market confidence (Warjiyo and Juhro 2019).

The Global Financial Crisis (GFC) in 2008 was caused by the materialization of systemic risk triggered by a subprime mortgage problem in the financial sector. Not only did it have a negative impact on the performance of the financial sector, but it also significantly derailed global economic growth. Interconnectedness and feedback loops between the financial sector and the real sector inflicted a high cost of crisis, scarred the economy and induced an economic recovery that lasted for many years. This event increased the importance of taking into account macro-financial linkages in the macroeconomic policy formulation.

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These conditions prompted the leaders of the G20 during their meeting in Seoul in 2010 to ask the Financial Stability Board (FSB), International Monetary Fund (IMF), and Bank for International Settlements (BIS) to develop a macroprudential policy framework in order to mitigate systemic risks in the financial sector (FSB et al. 2011). As the next step, the central banks and financial authorities of many countries participated in developing a macroprudential approach in order to limit systemic risk and sustain financial system stability.

Systemic risk is at the core of financial stability and macroprudential policy. This policy is defined as a policy that limits risk and the cost of systemic crises (Galati and Richhild 2011). Meanwhile, the European Systemic Risk Board (ESRB), an institution whose missions include supervising the European financial system and avoiding as well as limiting the occurrence of systemic risk in the Euro Zone, define macroprudential policy as a policy to maintain financial system stability as a whole, including strengthening financial system resilience and reducing the accumulation of systemic risk, resulting in guaranteed continuity of economic growth in the financial sector (ESRB 2013). A similar definition comes from the IMF, stating that macroprudential policy is a policy aimed at sustaining financial stability as a whole through the limitation of systemic risk (IMF 2011).

Systemic risk has become an important measure in macroeconomic risks, especially in light of the increased concern about its ability to distress the economy. The economic authorities thus need to have an understanding of systemic risk given that it may become elevated through the exacerbation of vulnerabilities triggered by shocks arising from different elements of the financial system, including the macroeconomic environment. As such, an understanding of the financial system and its elements is as important as understanding the anatomy of systemic risk. Bearing this in mind, the following section will describe the scope of the financial system.

Understanding the Financial System

The financial system consists of various institutions/entities and markets that interact for the objective of mobilizing funds from surplus units (Lenders-Savers) to deficit units (Borrowers-Spenders) using financial instruments. In this case, surplus and deficit units could be households, business firms or corporations, or governments and foreign entities. Figure 5.1 shows how they can interact (Mishkin 2016). In direct finance, lenders channel investment by buying financial instruments or securities issued in the financial markets by borrowers. The role of the financial markets in this case is to match the need for investment and borrowing by allowing the issuance of a variety of financial instruments. The market eliminates the need to have an intermediary institution to mobilize funds. However, not all financing needs can be fulfilled by market-based transactions.

In indirect financing, there is an intermediary institution between lenders and borrowers. One of the functions of banks, as intermediary institutions, is to channel funds from lenders (depositors) to borrowers. The intermediation function of banks includes maturity transformation from short-term deposits to longer term lending.
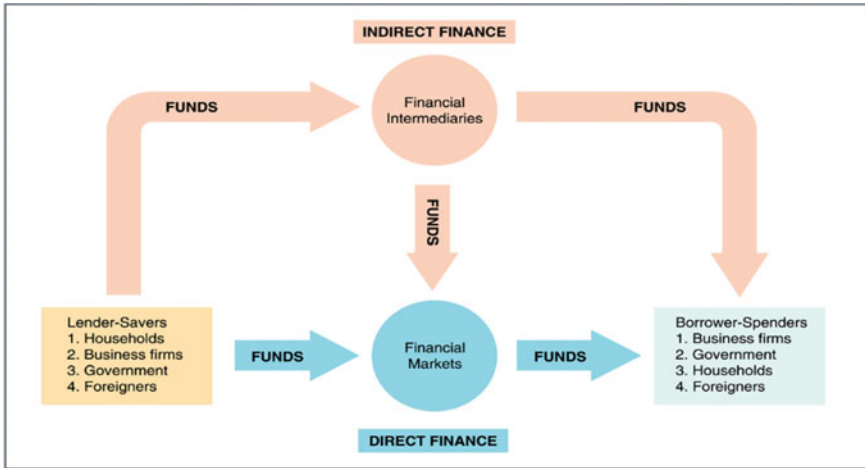
Fig. 5.1 Inter-element interaction in the financial system. *Source* Mishkin (2016)

Therefore, banks need to ensure the creditworthiness of borrowers to ensure they are able to honor their agreement to provide liquidity management for depositors. Nowadays, depositors should be able to withdraw funds from their balance from the bank whenever they need to. The function of banks is thus unique given they require the expertise to match maturities and assess loan projects. Because of this, banks are very highly regulated and required to maintain a capital buffer (capital adequacy ratio) to absorb liquidity and credit risks.

In general, the financial system consists of the following four main components; financial services providers, financial services users, markets and infrastructure. Financial services providers are financial institutions in the form of banks and non-banks. These include pension funds, insurance companies, finance companies, securities firms and others. Meanwhile, financial services users include the corporate sector and household sector, collectively known as the real sector. Figure 5.2 illustrates these elements of the financial system.

Some countries have a financial system dominated by the banking sector, a characteristic known as a bank-based economy, while some more advanced economies tend to have a financial system more dominated by the capital market and larger non-bank financial institutions. The share of non-bank financial institutions in the financial system tends to increase in line with: (i) domestic economic conditions that are conducive to financial services and product development; (ii) a population better educated about the variety of financial sector products and services available; (iii) broader public access to financial services; and (iv) robust domestic economic growth that ameliorates the level of public prosperity and welfare. Nevertheless, market structure and regulatory regimes also shape the financial system, so we can still find bank-dominated financial systems in advanced economies.
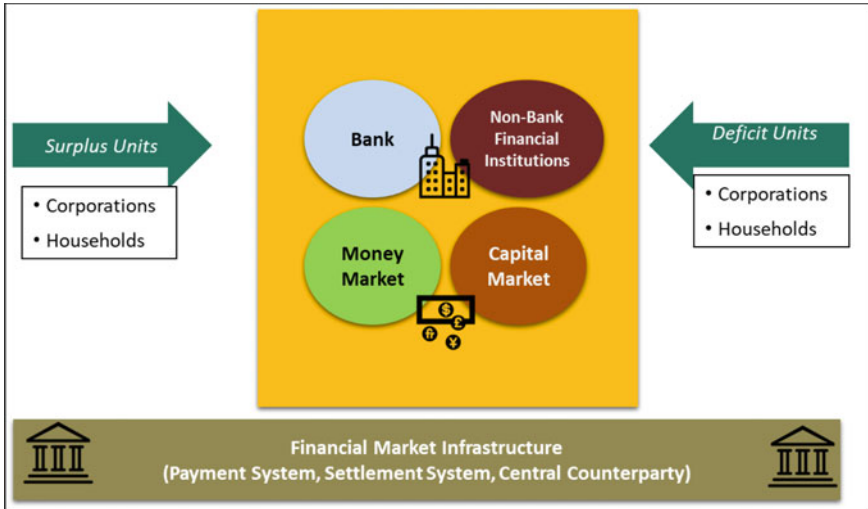
Fig. 5.2 The financial system

The financial system consists of financial institutions, financial markets, financial infrastructure, and non-financial corporations and households which interact in funding and/or financing the supply of the economy. The financial system is also characterized by inter-element interactions—among financial institutions, and between financial institutions and the real sector—otherwise known as interconnectedness. A fraction of the total deposits of the banking industry is owned by non-bank financial institutions, like insurance companies, pension funds and mutual funds. Another fraction is owned by the corporate sector and households/individuals. Banks extend credit to corporations, households and non-bank financial institutions. Therefore, problems among corporations, households and non-bank financial institutions have the potential to affect the banking sector specifically, and the financial system in general, and vice versa. Another example of interconnectedness is how activities on the interbank money market affect banks. A bank defaulting on an interbank market transaction has the potential to trigger a default at another bank, or even disrupt the interbank money market as a whole.

Moreover, in addition to the inter-element interactions of the financial system, interactions between the financial system and macroeconomic variables are of equal importance. As the effects of the global financial crisis spread in 2008, the presence of a feedback loop was evidenced between financial markets and the macro-economy. Meanwhile, exchange rate pressures that flared up during the East Asian financial crisis in 1997/98 had a far-reaching impact on the financial system in Indonesia. Losses were not only incurred by the banking sector, but also by the corporate sector and household sector—due to disruptions of liquidity and credit flow. Given the aforementioned characteristics and structures, monitoring the financial system to maintain stability is a challenge on its own. The dynamics that need to be captured

are not only about the performance of each element of the system, but also the inter-element interconnectedness, along with the impact of the macroeconomic conditions on each of the elements as well as on the financial system as a whole.

Given the scope of the financial system and its dynamics, maintaining financial system stability requires the concerted efforts of a number of authorities. Put differently, there is more than 1 (one) authority accountable for achieving financial system stability. What distinguishes the different authorities is the method used by each institution to attain its main objective; such as the Central Bank—through monetary, macroprudential, and payment system policy; the Government—through fiscal policy; the Financial Services Authority—through microprudential policy; and the Deposit Insurance Corporation—through resolution policy.[1] The implementation of all these policies requires consideration as to how they interact, especially those that have an impact on the financial system. Generally, the interactions are complementary, thereby making the elements of the financial system more prudent. Through the interactions of each policy, problems occurring in the financial system should be managed and limited to maintain sound macroeconomic and real sector conditions.

A Bank Indonesia regulation[2] stipulates that financial system stability is a condition that enables the national financial system to work effectively and efficiently, while also being able to withstand internal and external vulnerabilities, thus resulting in funding allocations or financing that can contribute to national economic growth and stability. Meanwhile, the financial system is defined as a system consisting of financial institutions, financial markets, financial infrastructure, and non-financial corporations and households which interact in funding and/or financing the economy.

Having established this, we can now move on to discuss systemic risk.

The Anatomy of Systemic Risk

Some research defines systemic risk as risk that can cause loss of public trust and greater uncertainty within a financial system, thereby causing the financial system concerned to function improperly and disrupting the flow of the economy. Systemic risk can arise suddenly and unexpectedly or, conversely, build up slowly without some of the relevant parties realizing or detecting it—which may result in late implementation of the appropriate mitigation policy. The negative effects of systemic risk in the economy can be detected by increases in disruptions to the payment system and credit flows, as well as the depreciation of asset values (Group of Ten 2001). Systemic risk is otherwise defined as any set of circumstances that threatens the stability of, or public confidence in, the financial system (Billio et al. 2010). The ECB defines

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[1] Resolution policy refers to the policy decided in the practice of the resolution of banks (or financial institutions in general). Resolution, in this case, is the restructuring of a bank by a resolution authority through the use of resolution tools in order to safeguard public interests, including the continuity of the bank's critical functions and financial stability, as well as ensuring minimal costs to taxpayers.

[2] Bank Indonesia Regulation (PBI) Number 16/11/PBI/2014 of 1st of July 2014, regarding Macroprudential Regulation and Supervision.

systemic risk as a risk of financial instability, so widespread that it impairs the functioning of a financial system to the point where economic growth and welfare suffer materially (ECB 2010). Bank Indonesia defines systemic risk as the potential instability caused by contagion to some part, or the whole, of the financial system due to interactions from the factors of size, complexity, and interconnectedness between institutions and/or financial markets, as well as the behavioral tendency of financial players or institutions to excessively follow the economic cycle (procyclicality).

Building upon the definitions of systemic risk mentioned above, as well as the previous description of the financial system, the following 3 (three) observations can be made. First, systemic risk does not have to stem from a financial institution, but can also come from the other elements of the financial system, such as corporate failure or problems within the payment system. It may also arise from shocks outside the financial system. Second, interconnectedness among the elements of the financial system means there is the potential for risk contagion, with the risk spreading from a certain element to the rest of the financial system (contagion effect). Third, the potential impact from systemic risk is broad; it is not confined to the financial sector, but can also disrupt the economy as a whole. Therefore, efforts to minimize systemic risk in order to maintain the stability of the financial system involve monitoring all elements of the financial system, while also keeping track of the macroeconomic conditions.

The three aforementioned observations demonstrate that the performance and soundness of financial institutions are not sufficient to indicate systemic risk and enhance financial system stability. Systemic risk can occur if financial institutions are exposed to the same risks (common risk factor), one of which is the impact of a concentration of risk within a particular portfolio (concentration risk). Meanwhile, the soundness of a financial institution is no longer important if there is a potential failure of, or risk to, one, or some, other financial institutions that could create significant (systemic) impact in the financial system.

Building upon this concept, in order to analyze systemic risk further, there are 2 (two) dimensions identified as a guide for systemic risk analysis and the formulation of policies. These are the cross-sectional dimension—which focuses on behavioral differences across elements and financial agents, and the time series dimension—which focuses on the behavior of the dynamics of financial elements/agents over time. These dimensions also become the focus of macroprudential policy, contrasting with the focus of microprudential policy which tends to lean on assessments of individual institutions at one point in time or cross-sectional dimension only. It is interesting to observe that monetary policy also tends to focus only on the time dimension aspect of macroeconomic indicators. In detail, in the context of systemic risk, the cross-sectional dimension places an emphasis on how risk is distributed within a financial system during a certain period, which is caused by the concentration within a portfolio of a certain risk (concentration risk), or if exposure to risk is the same (common risk factor), resulting in greater potential for spillover risk between individuals/sectors (contagion risk). As a result, problems in an institution may negatively impact other institutions, either directly or indirectly. Meanwhile, the time series dimension places an emphasis on how risk within a financial system evolves over time, including the

behavior of financial agents that follow the economic cycle (procyclicality). A focus on the time series dimension causes macroprudential policy to become time-varying (varied according to time), implying that the calibration of policy is dynamic in accordance with the evolution of the economic cycle. Problems or risk that contain dimensions of time series will be responded to with policies that go against the economic cycle (countercyclical).

Although more and more financial authorities are implementing macroprudential policy, there is no economic theory that serves as a guide in mitigating systemic risk. Unlike monetary policy which targets inflation using clear policy instruments, such as the interest rate, exchange rate and liquidity, systemic risk cannot be measured with one indicator. To date, no quantitative methodology/model has emerged that is able to comprehensively measure systemic risk within a financial system, except for models and methodologies which rate one or more aspects of systemic risk separately (BCBS 2012). There is plenty of literature describing systemic risk as a certain mechanism, such as imbalances (Caballero 2009), correlated exposures (Acharya et al. 2010), spillover to the real economy (Group of Ten 2001), feedback behavior (Kapadia et al. 2012), asset bubbles (Rosengren 2010) and contagion (Moussa 2011). However, the lack of a common theoretical background has become the foundation on which central banks and financial authorities establish a macroprudential policy framework to mitigate systemic risk, or at least for formulating a framework with the right procedures, based upon accurate data and information, and targeted for implementation at the right moment. Efforts to formulate a policy framework are carried out continuously along with efforts to mitigate systemic risk through the development of risk identification and monitoring, as well as comprehensive risk assessment.

Interconnectedness, **Too Big to Fail** *and Common Risk Factor*

As explained in the previous section, efforts to maintain financial system stability are insufficient if only focused on individual soundness and the performance of individual banks or other financial institutions. This is because, within a financial system, institutions are tied to one and another in the form of financial transactions. The assets of one bank are the liabilities of another. For example, an interbank market transaction may involve two banks, one of which is lending and the other borrowing funds. A default by one bank can have a profound impact on another bank, or maybe even on numerous banks that have placement in the defaulting bank. Due to the nature of interconnectedness within a financial system, problems of one institution can quickly spread to another, thereby becoming an aggregated problem of the financial system which may potentially affect the real sector.

As explained above, the spillover potential from one institution to another increases if the problem lies with a dominant or substantially large institution. For example, the failure of a big bank with a fairly substantial market share within a financial system will create a more significant impact in comparison to the failure of

a smaller bank. This concept is known as *too big to fail*. Apart from their scale of business, big banks tend to have more interconnectivity with other banks or institutions which have a high business complexity. This means that trouble in a large bank can disrupt the wider coverage of the financial system, ultimately causing systemic risk. The concept of *too big to fail* is unacceptable for the current regime of financial regulation. Therefore, there is a supervisory process that has determines lists of Systemically Important Financial Institutions (SIFI) in general, or Systemically Important Banks (SIB) in particular. These lists can be in the context of the global financial system—G-SIFI and G-SIB—or in the context of a jurisdiction—Domestic SIFIs and SIBs (D-SIFI/D-SIB). The determination of the lists depends on the indicators of size, interconnectedness, complexity and substitutability (BCBS 2012). The financial institutions that fall into these lists have to maintain a higher capital buffer, and sometimes a higher liquidity buffer as well.

Moreover, risk can potentially materialize if a number of healthy financial institutions coincidentally have the same risk exposure (common risk factor). Risk can occur even when each financial institution manages an equally healthy risk profile. As an example, when the property sector grows rapidly, the majority of banks will focus their credit disbursement on the property and construction sectors. As a result, bank concentration on the property sector becomes high. If a slowdown or shock subsequently occurs in the property sector, many banks will face the same risk and will experience asset value deterioration. Such a situation may create instability within the financial system.

Given the aforementioned characteristics of the financial system (interconnectedness, *too big to fail*, and common risk factor), a conclusion can be drawn that in order to maintain financial system stability, a regulation and supervision approach with aggregated characteristics, which is system oriented and takes into account all the elements within the financial system as a unit intertwined with each other, while also understanding and being cautious about the potential transmission of systemic risk, is needed. Such an approach can be accommodated with macroprudential policy. Macroprudential policy is necessary to handle a number of problems arising from the characteristics of the financial system. Macroprudential policy which focuses on the system as a whole will be better able to capture sources of risk in aggregate. In other words, financial system stability can be achieved through supervision—as long as it is not limited merely to the soundness of individual financial institutions.

Procyclicality and Countercyclical Policy

The tendency of financial agents to follow the economic dynamics defines the time dimension of systemic risk. With the profit maximizing objective, financial agents always assess economic upturn as an opportunity to push their business. Banks will extend credit with lower lending standards, because they believe that real sector risk is low during good times. This is true across financial institutions as they also see that liquidity in the economy is quite ample and therefore they can afford to maintain

less of a liquidity buffer (and concentrate more on riskier portfolios) since they think liquidity will be available to borrow quite cheaply as interest rates are also low. However, when the economy faces takes a downturn, financial agents immediately switch to risk aversion mode. Liquidity in the market becomes thinner since the economy is slower. Combined with the uncertainties in their counterparty risks, they prefer to hoard liquidity and reduce their lending appetite significantly, thereby exacerbating the liquidity squeeze.

Basically, financial agents will exaggerate upturns in the economy because of their excessive risk taking during such periods, and then exacerbate downturns by becoming risk averse during such economic slowdowns. The risk of a switch at the peak of the cycle is that the real sector is suddenly left without the flexibility of credit line and liquidity access, thereby causing disruptions to the supply of production and a reduction of the repayment capacity of corporations and households. This, in turn, will provide a negative feedback to the financial system that will push the cycle further down. Because of this, the authorities will devise a countercyclical policy to encourage financial agents to maintain higher capital and/or liquidity buffers during an upturn when funding is relatively cheap. The requirement to maintain such a buffer will also suppress risk appetite that could otherwise potentially push the upward cycle too high, risking an even worse fall after the turning point is reached. This buffer can also then be used to absorb the risks that the financial agents will have to face during the downturn. The policy to require such a buffer is called countercyclical policy.

Materialization and Analysis of Systemic Risk

Materialization of Systemic Risk

The identification of systemic risk refers to the identification of events and potential which may have systemic impact. According to Bernanke (2013), risk will materialize when shock events (*shocks*) interact with vulnerability in a financial system. An analogy for this interaction is that of a homeowner who usually locks his doors at night for security. One night he forgets to do so, thereby leaving himself vulnerable. If there are no shocks, such as the appearance of a thief who comes with the intention of robbing the house, there will be no risk of burglary or theft. The risk of theft arises if a thief arrives at the house to find its doors unlocked, so enters and robs the home. Subsequently, risk will become systemic if it is not balanced with adequate resilience. To extend the analogy, resilience could be likened to taking the preventative action of placing valuable goods inside a secure box. As such, even in the event of theft, no valuable goods will be stolen and any losses will be insignificant. Therefore, the identification of systemic risk is divided into 2 (two) main activities; identification of shocks and identification of vulnerability. A shock is an event which triggers a crisis (proximate cause), while vulnerability is associated with the pre-existing features of a financial system that can amplify and accelerate shock contagion (Bernanke

2013). Systemic risk materializes as a result of an interaction between shock and vulnerabilities embedded in the financial system. The vulnerabilities in the system can be discerned by looking at the systemic risk's cross-sectional and time series dimensions. These are concentration risk, contagion risk and procyclicality. They can also be discerned by looking at the market risk, credit risk, liquidity risk, and operational risk of financial institutions and markets. The resilience of financial institutions involves their ability to absorb risks, such as their capital (solvency) and liquidity buffer. If systemic risk materializes and financial agents actually have the resilience to absorb the risk, then the financial system will only experience temporary turbulence to none at all. However, if systemic risk materialize and financial agents do not have enough buffer to absorb the risk, then the financial system will experience instability that could have a temporary or structural (longer term) impact. Figure 5.3 illustrates the concept of the materialization of systemic risk.

Shocks to the financial system can come from both endogenous and exogenous sources. They are endogenous when they come from the structure and behavior within the financial system, e.g. fraud committed by a financial institution within the system, depreciation of the local currency, a breach of cyber security, failure of a systemically important bank. They are exogenous when they come from outside the financial system, e.g. a shock from the global market (GFC), increase of the policy rate in an advanced country (taper tantrum), currency depreciation in a peer country
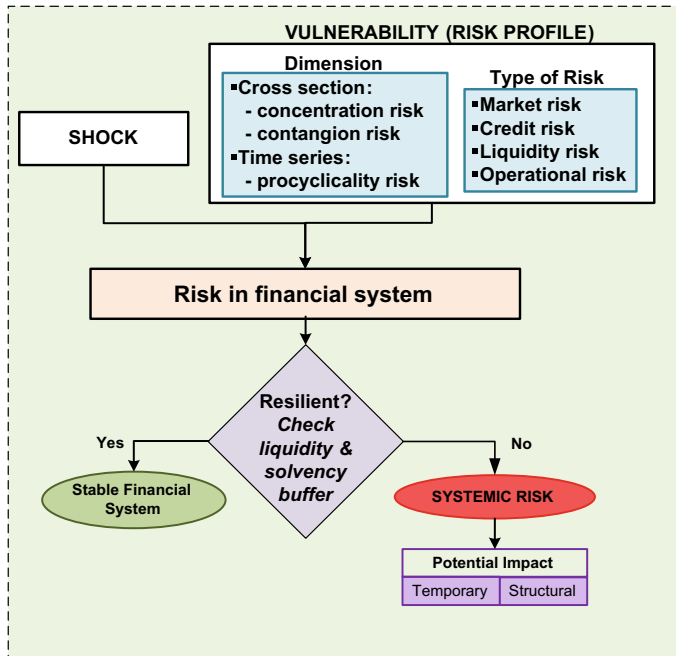

Fig. 5.3 Systemic risk materialization

(Asian Financial Crisis). Shocks can also be idiosyncratic, meaning they stem from a failure of a financial institution, or systematic, meaning they stem from a common exposure, e.g. exchange rate or interest rate shocks.

The transmission of shocks can follow different mechanisms. They can be transmitted through direct financial transactions. For example, a default by a primary client could incur a large loss for the bank that provided the loans to the company concerned. Shocks can also be transmitted through a systematic process in which financial agents are exposed to the same financial risks. For example, a decrease in commodity prices may trigger an increase in non-performing loans within the commodity sector. The other channel of transmission is through the effects of information. In this case, asymmetric information in the financial system could lead to a lot of assumptions of risks and herding behavior, especially when the financial system is in distress. Uncertainties related to information spread within the financial market and may induce irrational behavior on the part of financial agents to the point that they suspend lines of credit altogether. Another example are bank runs, where trouble in a bank may diminish trust in the banking system as a whole, thereby leading not only to massive withdrawals from the bank in distress, but also from other banks deemed to have similar problems based, for example, on similarities in their size and business exposures (domino effect).

Systemic risk also materializes in phases, namely build-up, shock materialization, and amplification and propagation. The build-up phase refers to a slow increase of systemic risk that may possibly go undetected without active risk monitoring, identification and assessment. It is a result of the heating-up of the financial system during an upturn cycle. This is indicated by a boom in financial asset prices, high credit growth, and accelerated financial innovation. The next phase is shock materialization. This begins with the emergence of a shock to the financial system. This can be in the form of a GDP or fiscal shock, an exchange rate depreciation due to external imbalances, or the failure of a systemically important financial institution. The last phase is amplification and propagation, in which systemic risk is further transmitted across financial institutions, markets, sectors and sometimes economies/jurisdictions. It is crucial to manage this phase properly in order to ensure that the systemic risk does not create a structural impact and turn into a prolonged crisis.

Monitoring and Analysis of Systemic Risk

The monitoring and analysis of systemic risk refer to the following 3 (three) off-site macroprudential supervision activities—monitoring, stress identification, and risk assessment.

(i) **Monitoring**

Monitoring of the financial system is conducted by monitoring the indicators which represent the performance of the elements of the financial system, as well as macroeconomic indicators that can affect financial system performance. Ideally, monitoring

should cover all the elements of the financial system, namely financial institutions (banks and non-banks), especially those that are potentially systemic, including parent companies, affiliates, and subsidiary units of banks that may potentially induce systemic risk. Moreover, monitoring should also cover financial markets and infrastructure, as well as the household and corporation sectors. Monitoring of households and corporations is required considering the direct interconnectedness of both these sectors with financial institutions, such that a problem in either of these sectors could have an impact on financial institutions. The broad scope of monitoring is meant to capture previously unidentified *unknown risk*.

(ii)   **Stress Identification**

Stress Identification is conducted in order to see when performance indicators show negative signals which represent increasing risks to the financial system. The issue can be examined by comparing the indicators and the corresponding thresholds which have been pre-determined through empirical research results with observations in past crises. It can also be examined by following the indicator's financial cycle. Financial cycle refers to the self-reinforcing interactions between perceptions of value and risk, risk-taking, and financing constraints, which are translated as booms and busts (Borio 2012). Stress in the financial system can also be represented by a composite index which reflects the combined performances of financial institutions and financial markets, as well as by other indicators that can represent the vulnerabilities of the financial system that may turn into systemic risk when triggered by shocks.

(iii)   **Risk Assessment**

Risk assessment is conducted with the objective of measuring the extent of the potential impact of previously-identified risk on the financial system or real sector. One methodology used by many financial authorities in measuring risk is a stress test (see Box 1). A stress test is a methodology used to measure the resilience level in regard to certain shock scenarios. Currently, the implementation of stress tests is still focused on banks, considering that banks dominate a lot of financial systems in different jurisdictions. Stress test methodology is also used to test the resilience of other elements of the financial system, such as NBFIs and corporations.

> **Box 1. Stress Test**
> In the financial sector, the realization of the importance of understanding and diving further into the vulnerability measurement methodology of the financial sector grew during the 1990s. In the context of the financial sector, stress testing is defined as a methodology to test financial system stability for adverse conditions (Borio et al. 2012). In other literature, a stress test is defined as a methodology created by researchers or decision-makers to calculate risk during abnormal conditions (Kalirai and Scheicher 2002). It is important to remember that stress scenarios do not reflect projections of the economy in the future.

For a financial system which is dominated by banks, the financial system resilience measurement calculated by means of a bank stress test is decisive. In this context, capital adequacy serves as the main indicator of banking resilience. Capital becomes a bearing for financial institutions to absorb loss that may occur because of risks taken, such as credit, liquidity, market, or operational risk. In credit risk for example, loss materializes because of a degraded repayment capacity of debtors due to various reasons, such as reduced income due to economic shocks, which in turn can push up the non-performing loan (NPL) ratio. When facing worsening NPLs, banks must set aside a loan loss reserve (LLR). The building-up of the LLR erodes bank profits and therefore the capability of banks to put aside profit for capital decreases. This issue will degrade the bank's resilience level, as reflected by a reduced Capital Adequacy Ratio (CAR) of banks.

Generally, there are 2 (two) approaches in conducting stress testing; top-down stress tests (industry-wide) conducted by the central bank/bank supervisory institution, and bottom-up stress tests conducted by individual banks with models adjusted to risk management by banks. Both approaches are implemented using a common set of macroeconomic scenarios for all banks. In general, top-down stress testing is developed to measure banking industry resilience against potential risk that may arise. The methodology consists of 7 (seven) main elements needed for calculating a banking stress test, as follows:

1. Stress Scenario: including macroeconomic scenarios and other scenarios. In the practice of stress testing in many countries, there are at least 2 (two) macroeconomic scenarios, namely the baseline scenario and stress scenario. Usually, the baseline scenario is a projection of variables within the macroeconomy, while the stress scenario can consist of many levels, ranging from mild to moderate, adverse and severe. A bespoke scenario can also be developed specifically for each bank according to its specific business process. This bespoke scenario can be developed by the authorities for special concerns, or by the bank itself for the comprehensiveness of the assessment. The most severe stress test scenario should follow a case of extreme but plausible events. The idea is that the authorities should know the level of resilience of the financial system when it faces a worst-case scenario.

2. Macro Stress Testing: broadly used to examine the impact of various macroeconomic factors with regard to bank credit risk. Changes in macroeconomic factors, such as GDP, currency depreciations, inflation or policy rate increases, will have an impact on bank credit quality, as reflected by NPLs.

3. Credit Risk Stress Testing: used to measure the impact of deteriorating credit quality in regard to bank capital, as reflected by the Capital Adequacy Ratio (CAR).

4. Market Risk Stress Testing: used to measure bank losses due to changes in interest, changes in Government bond prices, and depreciating currency, which have to be covered by bank capital and therefore reduce the CAR.
5. Liquidity Stress Testing: used to measure the capability of bank liquidity tools in fulfilling the short-term (daily) liabilities of banks.
6. Integrated Stress Testing (a mixture of credit risk and market risk): used to measure the simultaneous impact of credit risk and market risk on bank capital.
7. Interbank Stress Testing: used to measure the impact of bank failure on fulfilling interbank liabilities in regard to other banks (contagion effect). Interbank stress testing is used to recognize if a bank is systemic to others.

The above setup stops after the calculation of the CAR after incurring all the losses caused by the macroeconomic scenario. The previous modeling—the microprudential stress test—usually only relied on transmitting the macroeconomic scenario on the balance sheets of banks. Nowadays, macroprudential stress tests are developed to further enhance the results of stress tests. In this setup, the amplification and propagation mechanism due to interconnectedness and common risk factors is incorporated. The second round impact in the form of feedback from the real sector to the financial system is also applied. The final measurement is also in the form of systemic risk measurement (instead of distressed CAR in the microprudential stress test). The results of a macroprudential stress test should be more appropriate in determining the resilience of the overall financial system in facing stress, and therefore such a stress test is suitable for macroprudential authorities.

(iv) **Risk Signaling**

Monitoring, stress identification, and risk assessment will be less than optimum if the results are not delivered to related parties within a short span of time and in a proper manner. Proper signaling will determine the success of the policy response that is taken. Other than related parties and time span, another factor that determines the effectiveness of risk signaling is the signal communication strategy. Generally, risk signaling as the result of macroprudential supervision is given to:

(a) Internal Parties

Internal parties include all financial authorities that participate in maintaining financial system stability. Signaling to internal parties is conducted to deliver the current financial system conditions and as an alert for financial authorities regarding a financial system condition that requires more intensive attention. Signaling is in the form of a monitoring report, the identification and assessment of systemic risk delivered at the Board of Governors Meeting, and in coordination meetings with other financial authorities, namely the Ministry of Finance, Financial Services Authority, and

Deposit Insurance Corporation. In order to ensure signaling can be communicated effectively, the thresholds "normal" and "crisis" should be established according to past experiences, and this should be understood and agreed to by all parties. This is to ensure decision-making can be done faster to solve problems if necessary. In normal conditions, the reporting frequency of systemic risk assessments can adhere to the regular procedures of all the financial authorities as well as the schedule of the financial stability committee. However, in a "crisis" condition, the frequency and scope of the reports have to increase as needed, and this will require a set of crisis management protocols (CMP).

(b)   Market Participants, Financial Institutions, and the Public (*Stakeholders*)

Signaling to market participants and the public refers to communication from the authorities to provide the latest condition of the financial system. Meanwhile, signaling to stakeholders is about providing guidance for prudent financial portfolio management, as well as increasing awareness to reduce exposure towards portfolios which contain growing risk. The term *stakeholders* here refers to all parties that benefit from the financial system. To provide greater detail, signaling to external parties is conducted with the following objectives:

 (i)   Providing explanations regarding policies in the financial sector to ensure business certainty in the financial system;
(ii)   Providing financial education to the public to minimize asymmetric information, as commonly occurs in financial businesses;
(iii)   Ensuring market participants and the public follow the development of the financial system and contribute to implementing market discipline[3] to minimize excessive risk taking; and
(iv)   In a crisis condition, providing guidance for market participants and the public to contribute to minimizing the propagation and/or contagion of risk, as well as to prevent the crisis from getting worse.

   In particular to improve the effectiveness of communication for external parties, the signaling process needs a proper communication strategy to manage the reactions of market participants as well as changes in their behavior, while also enhancing public confidence in the information they receive. Financial system stability can be managed better when the market and public feel confident about the integrity and performance of the financial system.

Closing

It can be concluded that financial stability policy and efforts to limit systemic risk should be integrated into an overall macroeconomic stabilization policy. Past

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[3] Market Discipline is the contribution and active participation of users/participants in the financial market to avoid or punish participants who do not abide by prudential principles.

evidence has shown that the materialization of systemic risk—such as the subprime mortgage crisis—can trigger turbulence that is transmitted to the global financial market (Global Financial Crisis). Financial stability has become a prerequisite for the effective transmission of monetary policy and sustainable economic growth. A financial crisis also has the potential to cause large fiscal costs from crisis resolution and financial system recovery. Therefore, preventing the materialization of systemic risk by minimizing vulnerabilities, detecting shocks as early as possible, safeguarding resilience through adequate financial buffers, and ensuring prudential behavior among market players through sound policy dissemination, is a vital part of the macroeconomic stabilization policy.

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Part III
Financial Stability and Macroprudential Policy

Chapter 6
Macroprudential Policy and Institutional Arrangement

Arlyana Abubakar and Yanti Setiawan

Abstract Experience shows that various economic and financial crises, including the COVID-19 pandemic, pose complex challenges for the central bank when it comes to implementing macroprudential policy. From a broader perspective, macroprudential policy consists of three pillars—balanced intermediation, system resilience and inclusion—which correspond to the problems that need to be addressed by central bank policy. In the future, macroprudential policy will encounter challenges associated with digitalization and the surge of fintech and bigtech, increasing social inequality, and climate-change risks, all of which will embolden policy transformation and the innovation of its instruments.

Keywords Macroprudential · Systemic risk · Intermediation

Introduction

After the Global Financial Crisis (GFC) in 2008, there was a significant change in financial sector policies previously known as microprudential policies and prudential regulation. Macroprudential policies became increasingly necessary after the GFC, a crisis that spread from the financial sector to the global economy.

The GFC crisis occurred because of subprime mortgages that encouraged people to purchase homes by obtaining funds not only from banks but also from other financial institutions. Debts in these financial institutions were securitized, or backed up by a bonafide financial institution, with their securitization traded on financial markets not only in the US but also in global markets. When there was a downturn in the economic cycle, housing prices tumbled, non-performing loans and unemployment rose, and defaults by insurance companies began spreading. These conditions forced the government to adopt a quantitative easing policy. At the same time, these issues also made the authorities more aware that the use of monetary or microprudential

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policies was not adequate to solve problems in the economy and financial sector. Another policy with the ability to connect monetary and microprudential policies was required, in the form of macroprudential policy.

The prolonged trade war between the US and China after the GFC which affected many other countries, particularly developing economies such as Indonesia, also emphasized the importance of macroprudential policies in complementing existing policies. Macroprudential policies even also intersect with macroeconomic policies, such as fiscal and other external policies related to capital flows. The objectives of macroprudential policy are predominantly related to financial stability and economic activity, although there are several countries which include the employment aspect as one of the policy's goals.

The GFC also provided valuable lessons about the mandates and practices of central banks in carrying out monetary policy complemented by macroprudential and other policies, and their ability to maintain financial system stability while simultaneously boosting growth. Changes in central bank policy objectives have evolved a lot since the GFC. Before the GFC, the banking policy function of observing idiosyncratic risk or individual bank soundness still lay with the central bank in almost all countries. However, after the GFC, some of the functions of central banks shifted to financial services supervisory authorities that focus on bank soundness or microprudential policies. With this, the functions of the central bank became more concerned with monetary policy, payment system policy, and macroprudential policy—three policies that inevitably interact with each other. An example of this is the transmission of interest rate policy that still requires micro-orders, such as the bank's process of setting loan interest rates. The transmission of interest rate policy needs to be seen from the monetary, macroprudential and microprudential side. This can serve as the basis for determining the formulation of a more effective monetary policy transmission. On the macroprudential side, it is necessary to build a more efficient system that is capable of encouraging credit growth, while on the microprudential side, policies aimed at encouraging efficiency are needed.

Bank Indonesia itself defines macroprudential policy as a policy that is established and implemented to prevent and reduce systemic risk, promote a balanced and quality intermediation function, and improve financial system efficiency and financial access in maintaining financial system stability, as well as to support both monetary and payment system stability (Warjiyo & Juhro 2019).

In general, the perspectives of economic agents around the world vary on economic issues. Similarly, the perspectives of financial authorities from the period before the GFC differ from those after it. In the 2000s, all authorities believed that issues could be solved by using just one policy; for example, problems with financial stability could be overcome by monetary policy related to interest rates, or by using microprudential policies oriented towards the health of individual banks, with idiosyncratic risk in them, such as the policy of easing Risk Weighted Assets (RWA).

On the other hand, the problems that occurred in the macroeconomy were not able to fully describe what happened to the condition of financial system stability. On the contrary, problems with financial system stability can also have an impact on the macroeconomy. Macroeconomic stability cannot be achieved if financial

system stability is not maintained, meaning that macroeconomic and financial system stability are two components inextricably interrelated one to another.

Macroprudential policy aims to maintain financial system stability by limiting the increase in systemic risk (IMF 2011). This definition shows that systemic risk must be managed so that it does not have a bigger impact beyond the control of the authorities. Macroprudential policy is also aimed at limiting the risks and costs of a systemic crisis (BIS 2011). Risk restrictions can also affect the cost of a crisis, whereby the greater the risk, the higher the costs incurred. Macroprudential policies are also intended to maintain overall financial system stability, including strengthening financial system resilience and reducing the buildup of systemic risk so as to ensure the sustainability of the financial sector's contribution to economic growth (European Systemic Risk Board 2013).

Systemic risk appears as a common thread in these various definitions. Systemic risk refers to the potential instability caused by contagion to some part, or the whole, of the financial system due to interactions from the factors of size, complexity, and interconnectedness between institutions and/or financial markets, as well as the behavioral tendency of financial players or institutions to excessively follow the economic cycle, or procyclicality.

The characteristics of macroprudential policy can be seen from two dimensions, namely the cross-sectional and time series dimensions. The dimension between subjects, or cross-section, is how risk is distributed across the financial system in a certain period, thereby necessitating more aggregate regulation and supervision. There are several characteristics of a financial system that can trigger systemic risk in the cross-sectional dimension, including:

(a) Interconnectedness among actors in the financial system where assets in one institution are liabilities for other institutions, and problems in one institution can affect the performance of other institutions.
(b) The existence of institutions that have a systemic impact or are *too big to fail*, where the impact of risk spillover in the financial system will be even worse if the source of failure is a bank with a systemic impact.
(c) The existence of common risk factors between elements of the financial system. If the elements of the financial system share similar risk factors, then a shock to the sector can have an impact on financial system stability.

As for the time series dimension, risk in the financial system evolves over time. This encourages the need for system-oriented regulation and supervision, including cross-sectional and time series dimensions. Financial institutions tend to move in a procyclical fashion, meaning that their risk taking behavior is in line with the ups and downs of the economic cycle. Figure 6.1 illustrates that when economic conditions are good, financial institutions will expand and increase their risk taking behavior, while when economic conditions take a downturn, financial institutions tend to hold back on expansion and reduce risks—including withholding lending. The health of financial institutions that are assessed at a certain time is not able to describe the evolution of risks that exist in these institutions.
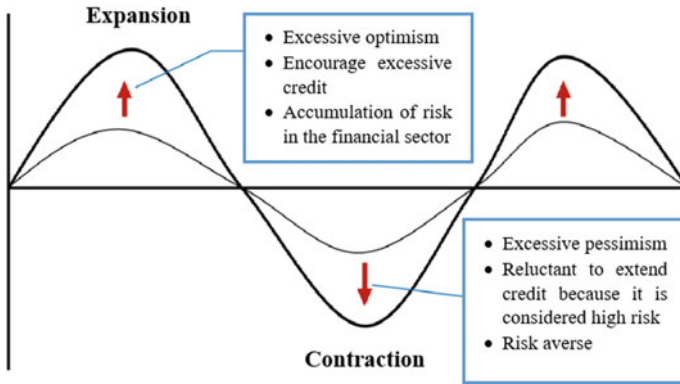
Fig. 6.1 Behavior of financial institutions dependent on economic condition

The Role of Macroprudential Policy in Maintaining Financial System Stability

Macroprudential policy aims to limit the increase in systemic risk by reducing vulnerability and increasing resilience in the financial system. Macroprudential policies are implemented as a part of a policy mix accompanied by other policies that have an impact on financial system stability.

Bank Indonesia implements macroprudential policies with a mandate to maintain a balanced and quality intermediation function related to procyclicality. In most countries, the main mandate of macroprudential policy is to monitor and address systemic risk, while in Indonesia there is also an additional mandate of promoting the financial system.

In the current condition, where we are in the midst of the Covid-19 pandemic, capital flows are more limited, impacting not only financial institutions but also corporations and households—such that macroprudential relations with the non-financial sector are closer than what happened in the 1997 crisis. The performances of financial institutions and corporations are interlinked and influence each other. In macroprudential policy, the shock induced by the ongoing pandemic must be analyzed, as too must the vulnerability of the financial system, in order to be able to assess the resilience of financial institutions and the financial system as a whole (Fig. 6.2).

The growing trend of digitalization as well as other developments in the economy and financial system are driving the authorities to gradually develop macroprudential policy. Macroprudential policies are currently directed towards Macroprudential 4.0—that is macroprudential policies that lead to financial innovation by paying more attention to digital developments, economic inclusion, and green finance to support sustainable and resilient economic growth.

Taking into account the increasing growth of digitalization, as well as recently-emerged issues in the economy and financial system—including lessons learned
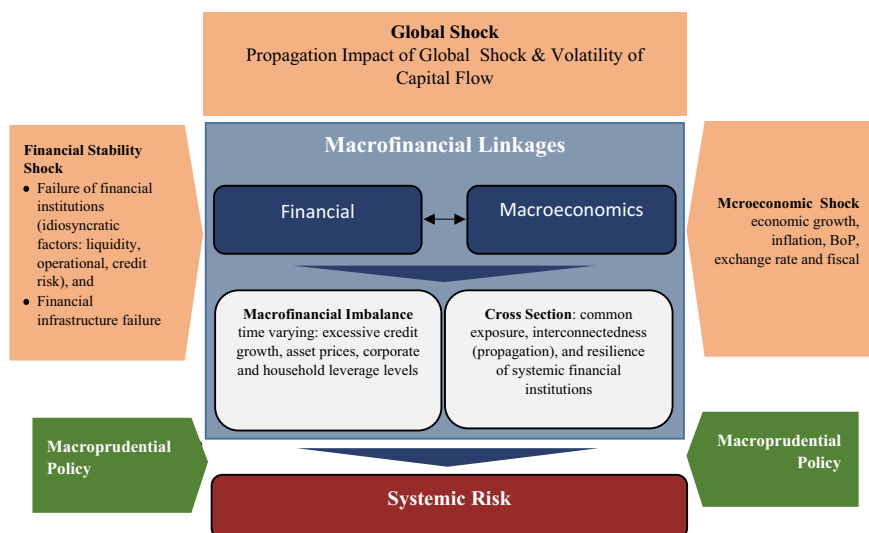
Fig. 6.2 Role of macroprudential policy in maintaining financial system stability

during the Covid-19 pandemic—the role of macroprudential policy in maintaining financial system stability is enhanced by:

(a) Strengthening policy formulations and innovative macroprudential surveillance supported by quality assessments and research, to maintain financial system resilience and balanced and quality financing growth. In a situation where the monetary policy space to continue lowering interest rates is more limited, macroprudential policy plays an important role in promoting economic recovery.

(b) Increasing policy effectiveness by strengthening the policy mix with monetary policy and the payment system, and by forging synergies with other authorities, so that the macroprudential policies issued have a greater positive impact in achieving their objectives. For example, the Loan to Value (LTV)/Funding to Value (FTV) policy is in synergy with the taxation policy for property and motor vehicles issued by the Government.

(c) Extending financial inclusion programs in order to support economic financing. Financial inclusion can help to expand financing and is one of the keys to the current economic recovery.

(d) Utilizing digital technology, including the use of big data and Machine Learning in the macroprudential assessment and surveillance process. An example of this is the mapping of inter-corporate financial transactions and the projected probability of default.

(e) Strengthening policy coordination with the Financial System Stability Committee and relevant Ministries/Institutions, as well as intensifying communication with stakeholders in an effort to increase the understanding of the substance of Bank Indonesia's policies to maintain financial stability.

(f) Strengthening the role of Bank Indonesia at the international level as a reference for the central banks, or other relevant authorities, of other countries in implementing macroprudential policies.

Box 1: Bank Indonesia's Integrated Macroprudential Policy Framework

Dynamic Integrated Macroprudential Policy and Surveillance Framework

Bank Indonesia established the Dynamic Integrated Macroprudential Policy and Surveillance Framework (DIMPS) to improve macroprudential policy in response to the increasing complexity in the financial system. In this integrated framework, all elements of the financial system, such as Banking, Non-Bank Financial Institutions and Financial Markets, and Corporations and Households, become objects of the assessment to ensure that all sources of risk can be covered and transmission due to linkages between financial elements can be captured, so that systemic risk measurements can be performed comprehensively. This integrated framework also allows interactions between policies to be carried out, especially with monetary policy and the payment system as part of the Bank Indonesia policy mix, green finance policy, financial inclusion, and market deepening - including aspects of Islamic finance policy.

This framework includes the following aspects:

- Dynamic to the movement of the financial cycle, limiting increases in risk due to procyclical behaviour; and policies are implemented in a manner that is forward-looking, ahead of the curve and pre-emptive.
- Integrates all elements of the financial system, both for financial and non-financial institutions; policy formulation is integrated with other policies; comprehensive assessments cover all risks that affect the financial system; and integrate surveillance results with policy formulation.
- Macroprudential Policy that aims to limit increases of systemic risk in the financial system, maintaining balanced, quality, productive and sustainable financing growth, including by encouraging the deepening of financial markets as well as improving economic and financial inclusion.
- Macroprudential Surveillance and Supervision in the context of identifying, monitoring and conducting assessments of increased systemic risk, either due to procyclicality or contagion, as well as monitoring financing developments, including those related to economic and financial inclusion.

The analysis of macrofinancial linkages within the framework of an integrated macroprudential policy is operated by using a forward-looking approach

and is oriented towards the use of frontier financial enhancement, both in the implementation of assessments and in the development of the financial system. Meanwhile, macroprudential policy formulation is carried out dynamically to reduce both over-optimism and over-pessimism as well as to suppress the materialization of risk due to the contagion effect in the financial system.

An example of this is the implementation of integrated macroprudential policy, including monetary policy through a reduction in the Minimum Reserve Requirement followed by an increase in the Macroprudential Liquidity Buffer to increase the Bank's liquidity resilience, and at the same time, the elimination of the Macroprudential Intermediation Ratio's current account disincentives.

The dynamics of the interaction of business cycles, financial cycles and capital flow cycles require policy responses that are similarly dynamic and integrated. In a contraction phase, such as the current Covid-19 situation during which economic activity has declined, the macroprudential policy stance is of course directed to be accommodative in order to encourage the acceleration of economic recovery.

Accommodative macroprudential policy has succeeded in accelerating several sectors, such as the property and automotive sectors, through the policy of easing the LTV/FTV ratio to 100% and Motor Vehicle Loan Advances of at least 0%. This policy is increasing in effectiveness, driven by synergies with fiscal policy and microprudential policy.

Pillars of Macroprudential Policy Implementation.

In general, the macroprudential policy framework consists of the following three pillars—balanced and quality intermediation, including sustainable finance; financial system resilience; and economic and financial inclusion, including Islamic banking, economics and finance. Various instruments used by Bank Indonesia are directed at those three dimensions and apply both for conventional and sharia banks.

The first pillar focuses on efforts to promote balanced and quality intermediation of potential sectors. For the intermediation pillar, there are credit-related instruments such as the CCB which is currently still being applied at 0%, LTV/FTV for property loans/financing, down payments for motor vehicles, and the Macropudential Intermediation Ratio (MIR). The MIR is used to promote balanced intermediation. It is designed to be within a range between a lower and upper limit, currently set at 84–94%. The Macroprudential Intermediation Ratio can exceed the upper limit as long as the bank concerned has a high capital ratio and a low level of Non-Performing Loans (NPL). This pillar also contains green macroprudential initiatives which are the policies that encourage green finance.

The second pillar is a strategy to encourage financial system resilience, which will be formulated and implemented through the Dynamic Systemic Risk Surveillance (DSRS) framework. In DSRS, surveillance is carried out

on individual banks and on transmissions through non-bank institutions, such as Payment Service Providers, Payment Infrastructure Providers and Rupiah Money Management Service Providers, as well as on the industry as a whole, given its potential to affect financial system stability. The instruments used include the Macroprudential Liquidity Buffer and Liquid Assets to Third-Party Fund ratio as monitoring tools.

The third pillar is related to the framework of the National Economic and Financial Inclusion Strategy. Further enhancements in economic and financial inclusion, to provide new sources of growth, are needed. Financial inclusion must be encouraged, including from the supply side by using the policy of the Macroprudential Inclusive Financing Ratio. This ratio is intended as a reinforcement and innovation of the Small and Medium Enterprises (SME) credit ratio, as it was previously known. Meanwhile, from the demand side, the policy is to strengthen SMEs, enhancing their capacities and competitiveness by using multiple strategies, including by introducing digitalization and connecting SMEs to e-commerce platforms, export aggregators and other projects.

The implementation of the main pillars in this policy framework is supported by research-based policy and surveillance, the digitalization of work processes, data and information, enhanced coordination and communication, the strengthening of the legality of macroprudential mandates, and the continuous improvement of Human Resource (HR) competencies.

Institutional Arrangements

As previously mentioned, the GFC imparted valuable lessons about the mandates and practices of central banks in carrying out monetary policy complemented by macroprudential and other policies, and their ability to maintain financial system stability while at the same time boosting growth. After the GFC, a number of countries improved the institutional arrangements of financial authorities, including their mandates and authority, as well as the coordination mechanisms between authorities.

Observations of a number of practices, as well as lessons learned from the global crisis, demonstrate that the central bank, which is also the authority for the monetary and payment system, is the appropriate authority for macroprudential mandates. The basis for this consideration is that the central bank has the capability and resources to monitor macrofinancial linkages, identify systemic risks, and formulate a policy mix to address these potential risks. Added to this is the function of the central bank as the lender of last resort.

It is very interesting to study the case of Indonesia. This is not only related to the intensive handling of financial crises in the last two decades (Asian financial crisis of

1997/98 and global financial crisis of 2008/09), but also to the establishment of the Financial Services Authority and strengthening of institutions to oversee financial system stability at the national level.

From the legal perspective, since the establishment of the Indonesian Financial Services Authority (IFSA) through Law No. 21/2011, the function of microprudential regulation and supervision of banks has shifted to IFSA. Article 7 of the aforementioned law explains that IFSA has the authority to regulate and supervise institutions, soundness, prudential aspects, and the examination of banks. Furthermore, Article 7 articulates that anything beyond the scope of the regulation and supervision assigned to IFSA falls within the role and authority of Bank Indonesia.

To implement effective macroprudential policy, both in conducting assessments and formulating policies to mitigate systemic risk, the macroprudential authority requires the following powers (i) the authority to formulate regulations; (ii) the authority to conduct supervision (off-site); (iii) the authority to conduct examinations (on-site) to detect behavioral patterns of financial agents, including to ensure compliance with the specified provisions; (iv) the authority to request information on a regular and *any time* basis; and (v) licensing for certain activities which are in the scope of that authority. These five powers are essential for the relevant authority to carry out its roles effectively. These powers are properly regulated in Bank Indonesia Regulation Number 16/11/PBI/2014 concerning Macroprudential Regulation and Supervision, which is complemented by several derivative regulations which act as guidelines in implementing the policy framework.

Since the maintenance of financial system stability is a shared responsibility among financial authorities, the Financial System Crisis Prevention and Management Act in 2016 strengthened the legal basis for cooperation and coordination among authorities, according to their respective roles and authorities, through the Financial System Stability Committee (FSSC).

The FSSC is a structured coordination mechanism for the authorities in the financial sector, namely the Ministry of Finance, Bank Indonesia, IFSA and the Indonesia Deposit Insurance Corporation (IDIC), without voting rights, with the tasks of: (i) coordinating in the context of monitoring and maintaining financial system stability; (ii) handling financial system crises; and (iii) handling systemic bank problems, both in normal and crisis conditions as pertains to financial system stability. The Committee holds meetings once every 3 months, or at any other time based on a request of its members. The abovementioned Act also regulates coordination between the IFSA and Bank Indonesia in determining systemic banks and providing short-term liquidity loans for illiquid but solvent banks.

The synergy and coordination among the Committee's members have been tested since the onset of the COVID-19 pandemic in March 2020. Law of No. 2/2020 concerning State Financial Policy and Financial System Stability for Handling the Covid-19 Pandemic strengthened the authority of each of the Committee's members in being able to take extraordinary actions to mitigate the impact of the pandemic. For Bank Indonesia, the authority includes handling certain bank problems through the provision of Short-Term Liquidity Loans for systemic and non-systemic banks, and Special Liquidity Loans for systemic banks (under certain terms and conditions);

the purchase of Government Bonds and/or Government Securities. For the IDIC, the purchase/repo of Government Bonds and/or Government Securities; the regulation of foreign exchange flows and provision of access to corporate funding with Government Securities repos through banks; and the strengthening of its authority related to the handling of bank solvency problems. For the IFSA, the strengthening of its authority related to the regulation of financial services institutions, including the authority to carry out bank consolidations. And for the Ministry of Finance, the reinforcement of its authority to provide loans to the IDIC.

These financial sector policies were subsequently included in the Integrated Policy Package issued in February 2021, the implementation of which is still being monitored and evaluated. The pandemic, from which we have yet to fully recover, requires that all authorities in the financial sector take increasingly intensive and innovative actions to promote economic recovery and maintain financial system stability.

In addition to coordination through the Financial System Stability Committee, Bank Indonesia has also strengthened policy synergies with the IFSA and IDIC, both bilaterally and trilaterally, under a memorandum of understanding or cooperation agreement, covering areas such as the exchange of data and information, including the results of surveillance, capacity building, research and others. Similarly, BI also maintains synergy and coordination with several relevant ministries/agencies, including in the context of strengthening SMEs.

Navigating the Financial System's New Landscape

The global financial system's landscape in 2021 and beyond will face three main challenges, namely the expansion of digitalization, the need for improved financial inclusion, and climate change-related risk. Without ignoring the numerous other issues in the financial sector, future macroprudential policy needs to pay more attention to these three issues, which are popularly known by the acronym DIG—Digital, Inclusion, and Green Finance.

Digitalization

The trend of digitalization has rapidly gathered speed since the 2008 GFC, changing the structure of the financial sector which was previously dominated by the banking industry in terms of credit intermediation services as well as payment services. The swift development of technology and its ease of use have stimulated the emergence of ever more technology-based financial services, either from technology companies with an established presence in the market for digital services (bigtech) or financial innovations based on the use of digital technologies and big data (fintech).

More recently, there have been many collaborations between banks and fintech companies, alongside the phenomena of bigtech acquiring small banks and large-scale and medium-scale banks launching digital platforms to broaden their services and meet customer preferences which have hitherto been difficult to satisfy.

In the near future, the financial industry landscape will become dominated by digital developments, resulting in the banking industry being faced with several scenarios if it does not respond with the right strategies. The most extreme scenario is one in which banks lose their relevance as customers begin to benefit from the comprehensive services offered by more agile, technology-based digital platforms, be it in lending, payment, investment or other activities.

The digitalization of banking has also brought forth the following challenges: consolidation in the banking sector as more mergers or acquisitions take place; reduced financing capacity due to the shifting of intermediation activities into fee-based income transaction services; and increased policy mix transmission complexity due to the emergence of new economic agents in the form of fintech/bigtech that will affect variable calculations in interest rates, credit rates, and expenditure (Singh et al. 2008). As to data, can the data related to fintech/bigtech activities be controlled and processed? In the years ahead, digitalization is expected to become a new source of vulnerability in the financial sector, most notably with the emergence of cyber risk, an increasingly high level of interconnections which will be more difficult to measure, as well as other risks yet to be identified.

Corresponding to the development of the macroprudential policy framework and the development of a strategic environment that continues to change dynamically, Bank Indonesia has formulated a strategic business plan in relation to digitalization, as detailed below:

(a) Digitalizing policy formulation—that is the use of digital information for policy formulation and calibration through the development of a forward-looking Financial System Stability Index, Stress Test 4.0 for a Macroprudential Stress Test, namely an Integrated Stress Test using big data and forward-looking expected loss, Policy Mix, MacFin Model for a Macrofinancial Granular Model for systemic banks and corporations.

(b) Regulatory and supervisory technology such as suptech, real time liquidity indicator, Crisis Management Protocol Dashboard, and studies on cyber risk.

(c) Business process digitalization such as (i) Digital Macroprudential Policy, Utilization of integrated data repository, and Digital Repository for task execution; and (ii) digitizing Macroprudential communication for Gen Z and millennials.

(d) Digital financial deepening and inclusion such as (i) digitalization of financial market licensing and Development of Market Intelligence and Market Monitoring; and (ii) end-to-end integrated digitalization of SMEs.

(e) Massive development of HR competencies in the fields of cyber risk and data analytics, such as Machine Learning, Artificial Intelligence, Deep Learning, Text Mining, etc. as well as the enhancement of relevant employee expertise.

The system applications which are utilized to monitor movements in banking include the Statutory Reserve Requirement application and the LTV application. These applications will be brought into the existing digitalization programs in an effort to create an integrated digitalization program for financial stability information systems.

The development of digital technology should be used to boost financial system stability and increase intermediation by giving customers more alternatives for conducting their financial transactions through fintech, peer-to-peer lending, or digital banking. The objective is to establish a more efficient ecosystem by using, for example, open data with a high governance level, while at the same time managing risks, including cyber risks, so as to keep them under control.

SMEs can also be benefited by the use of digitalization to develop their business and assist them in becoming more export-oriented through e-commerce platforms and aggregators, both directly (SMEs are given online stalls to promote their products) and indirectly (SMEs place their products in aggregators). Currently, there is trend of mergers between e-commerce and fintech in order to expand financing. Going forward, digitalization and financial innovation are expected to change business models and the overall structure of the financial industry.

Inclusion

SMEs have become the spearhead of the Indonesian economy. Currently, SMEs account for around 99.99% (65.5 million units) of the total number of business actors in Indonesia and they also absorb around 97.8% of the national workforce. Nevertheless, there is still a disparity in the fact that SMEs only contribute around 57% to GDP. SMEs access to financing in the banking sector and non-banking sector is still limited, receiving only around 20% of the credit disbursed by banks, with the other 80% going to larger businesses. As such, greater efforts should be made to promote SMEs so that they can level up by increasing their incomes and contribution to GDP.

The empowerment of SMEs is key to creating sustainable economic growth and a stable financial system. The Asian crisis of 1997/1998 provided empirical evidence that the SME segment is more resilient than big corporations. With global economic conditions still shrouded in uncertainty, global shocks are likely to be more frequent, thereby adding to the importance of such empowerment efforts.

Encouraging SMEs to level up is no easy task. Suci (2017) states that there remain challenges in developing SMEs, such as a lack of capital in terms of amount and sources, a lack of managerial skills and operational skills for organizing, as well as marketing limitations. There are also other obstacles such as unhealthy competition and economic pressures, resulting in their scope of business being narrow and limited.

One of the keys to encouraging SMEs to level up is SME empowerment (Priminingtyas 2013), such as through funding for SMEs which is managed by a credit assistant, as well as entrepreneurial and management training to encourage the development of SMEs managed by women. Efforts to provide women with access to funding take place in various countries through priority sector credit policy (Jain et al. 2015; Rani and Garg 2015). Another way of encouraging financing for SMEs is to require a certain credit allocation to the SME sector, as is done in some South Asian countries (Ahmed 2010; Dasgupta 2002).

Efforts to encourage SMEs to level up begin with lower-income groups of people who find it difficult to meet their own basic needs in terms of clothing, food, and a home. These groups therefore require government support, especially in obtaining

otherwise unaffordable homes. This is in line with Act No 1/2011 concerning Housing and Resettlement Areas that defines lower-income people as people with limited purchasing power, such that they need government support to own a home.

By increasing the capacity of the poorer segments of society and encouraging them to start doing business, these people would be expected to level up by becoming new entrepreneurs in micro business groups. Furthermore, existing micro business groups need to be encouraged to expand their production and market capacity. This, along with increases in their financing capacity, would eventually lead to greater sales turnover and the chance to level up to become a small business group. Similarly, small business groups need to be encouraged to overcome intense competition so that they can continue to grow and become mid-level business groups.

The Macroprudential Inclusive Financing Ratio is an innovative policy that complements the previous Small and Medium Enterprises (SME) credit ratio obligation. The Macroprudential Inclusive Financing Ratio has the following three main objectives: (i) to make it easier for banks to fulfill the SME credit ratio obligation that has been effective since 2012 through the expansion of the modalities for fulfilling obligations; (ii) to ensure that the liquidity for institutions that are actively financing SMEs continues to go through the partnership and refinancing mechanism; and (iii) to encourage the creation of competitive credit interest by providing better bargaining power for supply chain corporations and SMEs.

By 2024, the banking sector is expected to be able to meet the minimum ratio target of 30%. A similar policy has also been adopted in other countries such as India, Thailand, Sri Lanka which have set even higher targets for their SME credit portion.

Green Finance
Nowadays, almost all scientists in the world agree that increases in the earth's temperature are causing very extreme weather changes. The UN intergovernmental body known as IPCC states that an increase in the earth's temperature of more than 2 degrees Celsius from pre-industrial levels will cause tremendous environmental and economic disruption.

Losses due to extreme global weather in the last 2 decades from 2000 up to 2020 have reached US$5.1 Trillion. Meanwhile, the National Development Planning Agency projects that national losses due to extreme weather conditions in Indonesia will amount to Rp 112 trillion by 2023.

Although the losses due to extreme weather are becoming increasingly evident and are growing, some countries still seem reluctant to make progress towards a transition to a low-carbon economy because of the high transition costs involved. However, as global policies on climate change become tighter, countries that do not convert as soon as possible will be exposed to greater costs. This is because these climate change policies are in the form of cross-country regulations. For example, import barriers put in place by some countries on high-carbon content products could disturb Indonesia's export market, affecting things such as plantation products, cars, coal, and other products from leading Indonesian sectors. In addition, the carbon tax policies of other countries may also cause investment disruptions in Indonesia. This is because the concept of carbon emissions measurements is global, such that carbon

emissions produced by branch offices and projects financed in other countries are taxed in the investor's country of domicile. As such, foreign investment in Indonesia, including via securities, could become more limited or expensive.

The costs incurred due to climate change will depend on the policy responses pursued. In the absence of a transitional policy, global temperatures will continue to rise and extreme weather changes will inevitably come to pass. The Network for Greening the Financial System (NGFS), a group consisting of 91 central banks and supervisors, projects that global GDP could fall below 25% of the expected level by the end of this century if the world does not act to reduce global greenhouse gas emissions. However, this potential shortfall could be reduced to 9% if governments across the globe are willing to make the transition to a low-carbon economy, in the case of a disorderly transition. Moreover, in the case of an orderly transition, the losses could be confined to just 4%.

Considering the impact of global climate change, various international forums are currently discussing climate change issues intensively, including the green transformation of central banks, data and disclosure, as well as taxonomy and the scaling up of green financing. The most active one is NGFS which incorporates all the aspects of central banking.

Bank Indonesia is also very concerned about climate change and green finance issues. This is evidenced, among other things, by its very active involvement in various international forums such as the G20 Sustainable Finance Working Group (SFWG), NGFS, FSB Working Group on Climate Risk (WGCR), ASEAN Task Force on Sustainable Finance (TFSF), and EMEAP Interest Group on Sustainable Finance (IGSF), along with the several bilateral collaborations it has entered into with other national authorities, international institutions, and national taskforces.

Furthermore, green macroprudential policy can be an option for closing the gap between macroeconomic and microprudential policy in mitigating climate risk (Dikau and Volz 2018). The following are among the green macroprudential policy options that may be implemented by Bank Indonesia:

(a) Climate-related Stress testing, to assess the potential impact of climate risk on the economy, the resilience of individual financial institutions, and the financial system as a whole.
(b) Countercyclical capital buffer (CCB), an instrument used to mitigate the financial cycle and also used to address climate risk. For example, a higher CCB is applied to "carbon-intensive" credit growth (Schoenmaker and Tilburg 2016).
(c) Green Credit Allocation, a policy which is quite popular in several developing countries and aims to boost green investment and sustainable development.
(d) Green Reserve Requirement, a policy by which banks that have a green asset portfolio within a certain threshold are permitted a lower Minimum Reserve Requirement.

Bank Indonesia has already implemented green macroprudential policies such as Green LTV and green down payment for Car Ownership Loans, which have been applied since 2019. Through these policies, the ratios of LTV/down payment were relaxed to boost both green property and green motor vehicle loans. By implementing

these policies, Bank Indonesia has given a strong signal that in the future, macroprudential policy will continue to be directed in a manner that contributes to sustainable finance. To this end, multiple future research projects and studies will be conducted, both internally and in collaboration with other institutions.

Closing

There are indeed many more challenges for the Central Bank when it comes to maintaining financial system stability. As discussed above, the application of macroprudential policy alone will not solve all the problems in the financial sector. Instead, the key is a policy mix—with the big challenge for the Central Bank being to determine the 'dose' of each policy in the mix. As such, assessments have to be sharpened, policy formulations need to be strengthened, and synergies with other authorities have to be made more effective.

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Chapter 7
The Linkage Between Monetary and Financial Stability: Some Policy Perspectives

Solikin M. Juhro

Abstract Since the onset of the GFC, issues concerning financial stability have become as important as those on monetary stability. A key question regarding their nexus: are the two mutually supportive or do they work against each other in the sense of a trade-off? This chapter explores background issues on the linkages between monetary and financial stability from central bank policy perspectives. It explores some technical aspects of implementation and implications, especially concerning the central bank's mandate.

Preview of Monetary Stability and the Financial Stability Nexus

Discussion of issues concerning financial stability becomes as important as monetary the issues of monetary stability since the onset of the global financial crisis of 2008/09 (GFC). There is a variety of definitions related to monetary and financial stability. The broadly accepted definition of monetary stability in academic circles and for the central bank is a condition that guarantees the attainment of price stability as defined by low, stable prices (subdued inflation). The factual basis for this lies in the important role that price changes play in the process of adjustments and decision-making by economic agents. However, a clear understanding of financial stability is missing due to the absence of agreement on a definition. In this respect, Mishkin (1990) defines financial stability as a condition in which the financial sector guarantees efficient allocation of savings and investment in a sustainable manner and without significant disruption, but this definition is considered too broad. A more easily discernible definition is used in analysis, in which financial stability is a situation marked by stable asset prices and the absence of banking crises, with market interest forces

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transmitted readily into interest rates (Issing 2003). In this paper, financial stability is understood more in line with the latter definition.

Given the definitions of monetary stability and financial stability, there is a question regarding their nexus: are the two mutually supportive (complementary) or do they work against each other (substitute) in the sense of a trade-off? The conventional view is that monetary stability supports financial stability. Nevertheless, the main proponents of this view regard monetary or price stability as more of a 'sufficient condition' for financial stability (Schwartz 1995). This view assumes that inflation is one of the main factors behind financial market instability. A related opinion is that inflation increases the likelihood of misperceptions concerning future income achievement and exacerbates the problem of asymmetric information between lenders and borrowers. In another view, high inflation also encourages high price fluctuations, which create business uncertainty and even banking crises.

This argument is consistent with the reverse relationship, in which a banking crisis will trigger monetary instability. In this respect, a twin crisis involving the banking system and the exchange rate will cause an unexpected or even reversed monetary policy impact (Goldfajn and Gupta 2002). In a crisis involving only the exchange rate, tight monetary policy has the potential to stabilise the exchange rate, prompt a reversal through changes in the nominal exchange rate and stabilise the financial sector. However, in a banking crisis, the opposite will occur, whereby a tight monetary policy stance will reduce the probability of a reversal. In this situation, several factors will influence the monetary policy response, such as the extent of the currency mismatch at domestic banks and the discretionary powers of the central bank in supplying liquidity in a crisis situation.[1] The difference in the nature of the relationship during different crises is in accordance with the conventional view that there is generally no trade-off between monetary stability and financial stability.

The 'new environment' hypothesis, however, suggests such a trade-off based on the proposition that successful inflation control by the central bank could foster overly optimistic market perceptions and forecasts for the future of the economy. Incorrect perceptions create a false sense of security and lead to miscalculations of asset values with possible future negative impact. Borio et al. (2001) indicates that the combination of increased asset prices, high economic growth and low inflation within the context of a stabilisation programme could foster exaggerated expectations of future economic performance. Overoptimistic expectations could lead to drastically escalating activity on the asset and credit markets that surpasses the level of potential productivity improvement. This in turn drives up asset prices and fuels a booming trend along with inflationary pressures. At this stage, there is little empirical evidence to support such a proposition.

Issing (2003) analyses the trade-off by taking into account the time horizon to ascertain whether the trade-off is short term or long term. In this respect, the trade-off possibly arises in the short term, during a period of sudden disinflation (inflation

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[1] As transpired in Indonesia, the complexity of problems during the twin crises in 1997/98 undermined the effectiveness of monetary policy responses. This was reflected not only in high interest rates, but also massive liquidity flows.

below the predicted rate). In the 'new environment', this could precipitate fragility because of its effect on driving down nominal interest rates, which further exacerbates moral hazard in the form of increased high-risk lending in a low interest, low inflation environment. In some cases, in a very low inflationary environment, this opens the possibility to an asset price bubble. However, the fragility in the disinflation period will tend to be short-lived. Not only will the economy adjust itself to the low inflationary environment, but the central bank is also likely to raise nominal interest rates to curb inflation of asset prices caused by excessive investment and in so doing prevent long-term inflationary pressure and any resultant economic crisis. Thus, within the context of the forward-looking central bank mandate of building price stability with a view to the horizon (medium and long term), this conflict will disappear of its own accord.[2]

In subsequent discussions, especially at the onset of the global financial crisis of 2008/09, Borio and Zhu (2008) put forward the existence of the 'risk-taking channel' and suggest three mechanisms to explain this new channel. *The first* relates to valuation factors, income and cash flows. Under this mechanism a decline in interest rates would increase the evaluation perception on asset prices and profit potential. In this context, a decline in interest rates is parallel to the perception of a rise in profit potential and cash flow. What emerges from this behaviour is a rise in risk-taking behaviour by economic players when the monetary policy stance is loose. *The second* mechanism corresponds to the correlation between interest rates and the target (nominal) rates of return. This mechanism is in line with the assumption that a decline in interest rates would increase the money illusion towards asset ownership attributable to a sticky rate of return. Similar to the first mechanism, this will subsequently encourage risk-taking behaviour. *The last* mechanism relates to the positive effect of transparency from central banks. In this respect, greater transparency or central bank commitment would reduce future uncertainty and lower the risk premium, consequently improving risk-taking behaviour.

Some empirical studies support the argument of a risk-taking channel in the monetary policy transmission mechanism. Altunbas et al. (2009), for instance, find evidence that unusually low interest rates over an extended period of time cause an increase in banks' risk taking, although further analysis is required concerning to what extent monetary policy or the general level of interest rates is significant for the banks' risk-taking. De Nicolo et al. (2010) also suggest that monetary policy easing will increase risk taking but this relationship depends on the health of the banking system, i.e. less so for poorly capitalized banks. These findings bear on the policy debate on how to integrate the monetary and macroprudential policy framework to meet the dual objectives of monetary stability (price) and financial stability. This issue becomes particularly relevant in the future, given the fact that the nexus

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[2] From another standpoint, because of the threat posed by financial instability to inflation stability in the medium and long term, the price stability focus of central bank actions must consider financial stability. The implication of possible short-term conflict certainly does not overrule the conventional wisdom that price stability promotes financial stability.

between monetary and financial stability, whether they are substitutes or complements, will depend on the types of shocks to the economy as well as the role of portfolio effects and risk shifting that force the banks' condition.

This paper explores background issues on the linkages between monetary and financial stability from central banking policy perspectives. The following section presents financial sector behaviour and monetary policy effectiveness, touching mainly upon financial sector characteristics that could potentially exacerbate macroeconomic instability by developing output fluctuations (procyclicality) and their implication on the workings of monetary policy. The third section elaborates the need to integrate the monetary and financial system stability framework, including the implementation of macroprudential policy in several countries. The fourth section provides the policy instrument mix as a key strategy to implement the monetary and financial system stability framework. It elaborates objectives and policy mix variations, as well as explores some technical aspects of implementation. The last section derives conclusions and implications, especially concerning the adjustment of the central bank's mandate and its consequences on policy governance.

Financial Sector Behaviour and Monetary Policy Effectiveness

The previous section posed the importance of the financial system for the monetary policy transmission mechanism, implying the need for the central bank to better understand the linkages between the financial sector and monetary policy. This issue has become increasingly pronounced, especially since the Global Financial Crisis of 2008/09. The crisis provided a key lesson that the financial sector plays a crucial role in macroeconomic stability because of its behaviour that triggers excessive procyclicality.[3] Due to its procyclical nature, the financial sector could potentially compound macroeconomic instability by amplifying output fluctuations. The procyclical characteristic of the financial sector is inherently attributable to a number of factors. *Firstly*, asymmetric information in the financial market that triggers the financial accelerator. With this kind of market characteristic, when the economy is in a contractionary period and collateral values are low, even a sound corporation with a profitable project would find it difficult to access credit. Conversely, when economic conditions improve and collateral values increase, the same corporation would regain access to banks, thereby adding to economic stimuli. Although the financial accelerator is the main mechanism behind the occurrence of procyclicality, disproportional responses of market players in perceiving risks also contribute to the worsening of procyclicality (Borio et al. 2001).

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[3] Procyclicality is defined as a character of the financial sector that follows economic activity. Through the work of the financial accelerator, it further pushes an economy to grow faster when in a cycle of expansion and weaken during a period of contraction.

Table 7.1 Interaction between the business cycle, risk behaviour and the financial cycle

	Business cycle	Risk-taking cycle	Financial cycle
Expansionary phase	Macroeconomic stability Increased economic growth	Confidence and Optimism up Risk-taking up Credit demand up	Risk value down, interest rate spread narrower Asset prices up, pushing up collateral value Leverage up Foreign capital inflows up Credit extension up
Contractionary phase	Heightened macro volatility Decreased economic activity	Market confidence down Risk averse Credit demand down	Bank deleveraging Loan loss provisions up Interest rate spread wider Credit extension down Capital inflows down

Source Nijathaworn (2009), edited

Procyclicality is not just the result of interactions between the business cycle and financial cycle; it is also affected by the risk-taking cycle, which is a characteristic marked by over-optimism during economic booms and over-pessimism in times of economic bust (Nijathaworn 2009). The interaction of the three can typically be described in the context of a boom-bust cycle. Initially, when the economy moves during an expansionary phase, characterised by macroeconomic stability and escalating growth, investor confidence raises optimism when assessing the economy. This will lead to the risk-taking behaviour, which will eventually push up credit demand and asset prices (Table 7.1).

During this optimistic period, risk in the financial sector eases, lending rate spread narrows and risky asset allocation is reduced as banks prefer to apply a short-term perspective to a longer-term one. Surging asset prices push collateral values up thereby boosting credit expansion. This further improves market confidence and encourages risk-taking behaviour, reflected by soaring leverage. Greater credit expansion compels corporations to boost investment and households to raise consumption, further lifting economic growth. Conversely, when confidence in the economy dwindles, investors become risk averse. As a result, asset prices drop, causing collateral values to fall. Banks respond by deleveraging, shifting their portfolio from high-risk credit to low-risk assets, such as central bank certificates and government bonds, in a bid to maintain capital adequacy. Reserve allocation is also expanded to anticipate deteriorating credit quality. Such conditions undermine credit expansion, which, in turn, harms the economy.

Secondly, procyclicality may also emerge in line with the characteristics of financial sector regulations, which are inherently procyclical. For instance, the rules on capital and provisioning determine a softer requirement on banks during a period of economic boom or expansionary phase. One of the rules governing the banking

sector that is deemed procyclical is Basel II. Basel II specifically aims to strengthen risk management at banks. However, it also poses a procyclical impact as the Basel II Framework indirectly encourages banks not to accumulate additional capital while banking and economic conditions are prospective, and to raise capital when such conditions deteriorate. Consequently, in the event of a crisis, banks are required to increase their capital ratio, but they are forced to seek funding in a limited capacity, which may further worsen the banks' condition. In addition, the Internal Rating Based approach under Basel II demands that capital requirements be based on a bank's estimation on the possibility of default of its loans and related losses, as both tend to increase during a crisis period. This may exacerbate the impact of a crisis on credit supply and the economy overall.

Furthermore, accounting standards are suspected of contributing to procyclicality. According to accounting standards that assess a bank's balance sheet components on the basis of the market value approach, if the economic situation is improving, the value of the assets or the performance of banks will also be considered improving so that banks are not required to have a high capital requirement and provision. In such a situation, banks are inclined to make expansive moves. However, in the event of a crisis or during a contractionary period, asset value would fall but the bank would not be able to use its capital or risk provisions immediately to maintain balance sheet conditions. This would subsequently lead to worsening conditions and potentially pose systemic risk in the banking sector.

Empirically, procyclicality can be observed through the development of bank credit during both expansionary and contractionary periods. Observable correlations between average credit growth and economic growth indicate that the higher the economic growth is, the higher the average credit growth would be. Moreover, credit growth was observed to outpace GDP growth during an expansionary period and grow slower during an economic downturn. Table 7.2 presents procyclicality in several Asian countries measured by the correlation coefficient of GDP and real credit.

The complexity of problems accompanying procyclical behaviour in the financial sector ultimately takes its toll on the efficacy of the monetary policy transmission mechanism. Mishkin (2009) stated that monetary policies potentially tend to be more

Table 7.2 Procyclicality of real credit and GDP in several Asian countries

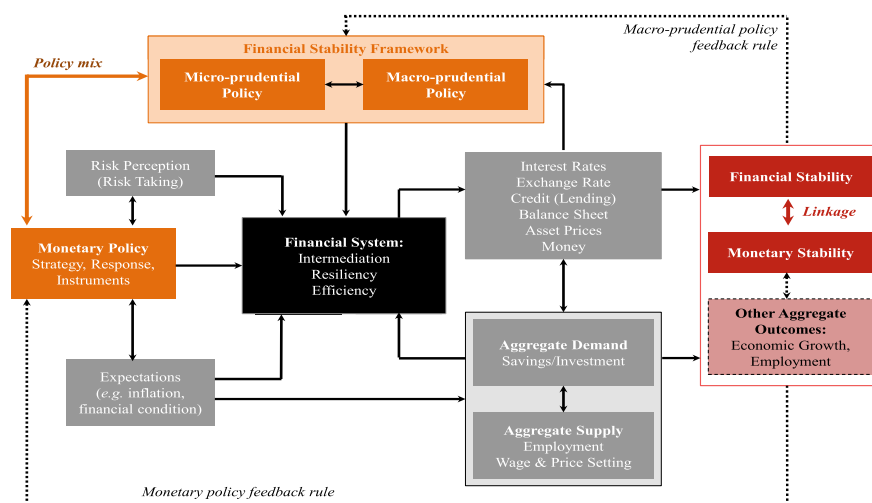| Countries	Correlation coefficients
Indonesia	0.82
Malaysia	0.51
Philippines	0.33
Thailand	0.32
Australia	0.26
Japan	0.48
China	0.31
Hong Kong SAR	0.30

Source Craig et al. (2006)

Fig. 7.1 Monetary-financial stability linkages and the monetary policy transmission mechanism. *Source* Bank Indonesia

efficient during economic crises rather than during normal times, thereby providing a basis to carry out macroeconomic risk management to deal with the problems related to economic contraction during times of crisis. This statement shows a link between monetary stability and financial sector stability.[4] Some empirical observations support the close correlation between financial sector behaviour and the monetary policy transmission mechanism. Nier and Zicchino (2008) discovered that bank credit supply is affected by monetary policy stance that interacts with balance sheet stress and is then transmitted through bank losses. They concluded that the repercussions of interaction between the monetary policy stance and bank losses grow stronger during a crisis period, assuming that the magnitude of financial sector risk will escalate in the case of an economic crisis.

Figure 7.1 describes the workings of the transmission mechanism in the presence of risk perception (risk taking). When the economy experiences an expansionary phase, characterized by macroeconomic stability and escalating growth, investor confidence raises optimism when assessing the economy. Such risk-taking behaviour, which is initially triggered by monetary policy, will eventually drive up credit demand and asset prices. Changes in the financial sector, as reflected in adjustments of financial variables (financial stability), influence aggregate outcomes such as economic growth and employment, which are directly linked to monetary

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[4] As mentioned in the early part of this section, Borio and Zhu (2008) explain the importance of the risk-taking channel within the monetary policy transmission mechanism. The risk-taking channel, in contrast to the financial accelerator concept discussed by Bernanke and Gertler (1999), affects bank credit supply through the banks' decision to extend credit in accordance with the banks' behavioural changes to credit risk. In connection with this, empirical studies have provided sufficient evidence of the existence of the risk-taking channel within the monetary policy transmission mechanism.

stability. This is where the linkage between financial stability and monetary stability occurs. A healthy macroeconomic environment and monetary stability has bidirectional feedback with financial system stability. Any developments between monetary and financial stability will be considered by monetary policymakers through the macro-prudential policy feedback rule, which is scrutinised under the financial stability framework.

Within this policy perspective, in order to strengthen the framework of monetary and financial system stability, the central bank must be more flexible and creative when responding to emerging uncertainties within the economy and to think beyond public perception. Such flexibility is not only linked to the adjustment preference to control inflation and manage the macroeconomy on the one hand, and the role of financial system stability on the other, but it is also crucial to overcome the conflict potential or "trade-off" between targeting monetary stability and financial system stability itself.

Integration of the Monetary and Financial System Stability Framework

Empirical facts show that the macroeconomic stability achievements attained during the period of great moderation between 1987 and 2007 would not automatically isolate the global economy from the impact of crisis, which was generated by financial sector susceptibility. Therefore, central bank policy formulation should simultaneously evaluate the strategic role of monetary policy and the financial system. Dynamics during financial crises have shown that monetary policy needs to be further directed towards anticipating macroeconomic instability risk stemming from the financial system. This implies that healthy macroeconomic management should also consider financial system stability as the foundation to realise a sustainable macroeconomic environment. "*There is no macroeconomic stability without financial stability*".

Within this policy perspective, in order to strengthen the framework of monetary and financial system stability, the central bank must be more flexible and creative in responding to emerging uncertainties within the economy and to think beyond public perception. Such flexibility is not merely linked to the adjustment preference to control inflation and manage the macroeconomy on the one hand, and the role of financial system stability on the other, but it is also crucial to overcome the conflict potential or "*trade-off*" between targeting monetary stability and financial system stability itself.[5] In this connection, policy implementation flexibility can be achieved

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[5] The occurrence of a trade-off between reaching monetary and financial system stability depends on the type of shock (Geraats 2010). If the shock originates from the demand side, efforts to stabilise prices and the financial system will generally move simultaneously. Central banks may adjust the interest rate to cope with shocks in aggregate demand in a bid to stabilize not only the output gap, but also prices of goods and assets. Meanwhile, shocks stemming from the supply side tend to have

through additional instruments (in this case macroprudential instruments) in addition to establishing a longer time horizon to reach the inflation target in order to accommodate output stabilization in the near term. In connection with the measures to overcome potential policy conflict, it is no less important to prioritize the policy goal, for example by setting price stability as the overarching policy goal.

Urgency to strengthen the monetary and financial system stability framework requires strong financial infrastructure along with an adequate examination and supervision function to support domestic market integration into an increasingly complex financial system. To that end, Borio (2003) emphasizes the need to strengthen the regulatory framework or macroprudential policy, thereby limiting the risks when the financial market confronts intense pressures for a protracted period of time, which may force real output within the economy to tumble.

Conceptually, macroprudential policy is a prudential regulation instrument aimed at enforcing financial system stability as a whole, instead of the individual well-being of financial institutions. Analogically, microprudential policy is a prudential regulation instrument intended to maintain the health of individual financial institutions.

> Macroprudential policy seeks to develop, oversee and deliver appropriate policy responses to the financial system as a whole. It aims to enhance the resilience of the financial system and dampen systemic risks that spread through the financial system. (Group of Thirty 2010)

Therefore, macroprudential policy is used to prevent *boom-bust cycles* of credit supply and liquidity, which may lead to economic instability. With its role in terms of maintaining stable financial intermediation supply, macroprudential policy backs the monetary policy goal of maintaining price and output stability.[6]

In a later development and in line with the changing financial sector arrangement, especially in the post-2008/09 crisis period, many central banks have applied macroprudential policy instruments covering a broader scope. In this connection, several instruments previously better known as microprudential instruments (such as *loan-loss provisioning requirements*, or *loan-to-value*) or monetary instruments

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a reverse effect on price and financial system stability. This happens, for instance, when shocks on the supply side move positively by suppressing inflation but lifting output. Under such conditions, expansive monetary policy will likely propagate asset prices bubbles.

[6] There are two important dimensions of macroprudential policy. *First*, the cr*oss-section* dimension, which shifts the focus of prudential regulation applied on financial institutions individually to the regulation system as a whole. The history of financial crises shows that most of such crises occurring around the world were not caused by problems at an individual bank, which subsequently infected the system as a whole. On the contrary, major crises in the past were caused by exposure to macro-financial instability conducted simultaneously by most actors within the financial system. Therefore, a more holistic view on the financial system and its correlation with the macroeconomy through various sides is urgently required. The second dimension is the *time-series* one, namely macroprudential policy that aims to restrain the risk of excessive procyclicality within the financial system. In this context, macroprudential policy should be specifically designed to eliminate, or at least mitigate, procyclicality. Principally, it is about how to encourage the financial system to prepare an adequate buffer when economic conditions improve, or when financial system instability generally occurs, and how to use that buffer during an economic slump.

(such as *reserve requirements*) were also used to prevent systemic risk and to maintain financial system stability in the economic activity cycle. Such policy instruments are not focused on efforts to deal with risk at an individual bank. Therefore, these policy instruments could be categorized as policy instruments in a wider macroprudential perspective. Several macroprudential policy instruments used in a number of countries are presented in Table 7.3.

Strengthening the monetary and financial system stability framework requires appropriate monetary and macroprudential policy integration. As is known, the main goal of monetary policy is to maintain price stability. To attain this goal, central banks traditionally use the interest rate as their primary instrument. However, maintaining price stability is still not sufficient to guarantee macroeconomy stability, as a financial system with its procyclical behaviour triggers excessive economic fluctuations. Meanwhile, the goal of macroprudential policy is to guarantee financial system resilience as a whole in a bid to support financial intermediation for the economy as a whole. With its countercyclical role, macroprudential policy supports the goal of monetary policy in terms of preserving price and output stability.

The objectives achieved through monetary and macroprudential policies are mutually reinforcing. Steps to empower financial system resilience will also improve

Table 7.3 Macroprudential policy implementation in several countries

Problem	Instrument	Countries
Leverage (procyclicality potential)	Risk-weighted adjustment of capital regulations	India, Indonesia, Malaysia, Estonia, Ireland, Portugal, Norway
	Application of capital to risk-weighted asset ratio	India, Bulgaria, Croatia, Estonia, Australia
Credit (Correlation and characteristics of borrowers, pressure over macro stability)	Application of *countercyclical provisioning* (provisions for certain credit)	China, India
	Limitations of *loan-to-value ratio* on certain sectors (with potential bubbles)	China, Hong Kong, Korea, Singapore, Malaysia, Thailand, Bulgaria, Norway, Portugal, Rumania
	Credit limitations to certain sectors (such as property, credit cards)	Korea, Malaysia, the Philippines, Singapore, Thailand, Rumania
	Changes in r*eserve requirements across the board* or specific targets	China, India, Indonesia, Korea, Malaysia, Finland, Estonia
Liquidity (risk potential on certain aspects)	Buffer application to minimize reliance on risky funding sources	India, Korea, the Philippines, Singapore
	Application of *loan-to-deposit ratio*	China, Korea, Indonesia

Source Borio and Shim (2007), Hannoun (2010), Group of Thirty (2010)

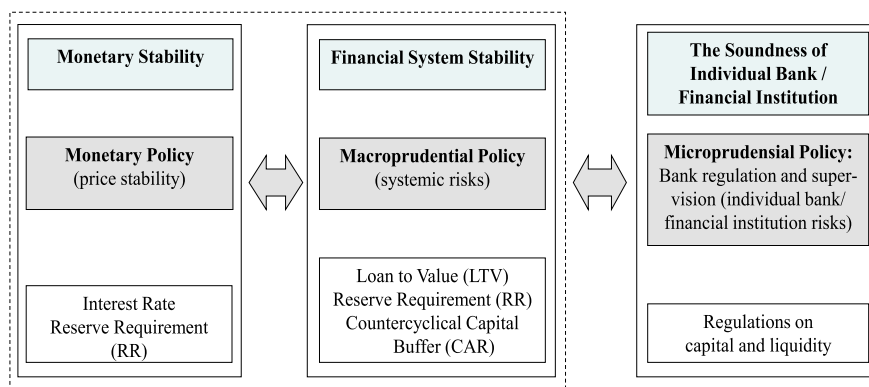| Monetary Stability	Financial System Stability	The Soundness of Individual Bank / Financial Institution
Monetary Policy (price stability)	Macroprudential Policy (systemic risks)	Microprudensial Policy: Bank regulation and super-vision (individual bank/ financial institution risks)
Interest Rate Reserve Requirement (RR)	Loan to Value (LTV) Reserve Requirement (RR) Countercyclical Capital Buffer (CAR)	Regulations on capital and liquidity

Fig. 7.2 Integration of monetary-macroprudential policy. *Source* Bank Indonesia

monetary policy, including protecting the economy from sharp fluctuations within the financial system. On the other hand, macroeconomy stability will reduce financial system vulnerability due to procyclicality. In general, therefore, the interest rate may not need to move at a magnitude usually required in times of no policy integration or coordination. Meanwhile, macroprudential policy affects credit supply and, consequently, monetary policy transmission. The effectiveness of policy coordination definitely relies on the macroeconomic environment, financial conditions, the intermediation process as well as the level of capital and assets in the banking system. Hence, it is not realistic to expect the combination of monetary and macroprudential policy to be fully capable of eliminating economic cycles. The main goal of such policy integration is to moderate cycles and bolster financial system resilience at a macro scale.

Improvement of the monetary and financial system stability framework, through monetary and macroprudential policy integration, is illustrated in Fig. 7.2.

Such monetary and macroprudential policy can be described as follows. Macroprudential policy aims to tighten capital and the liquidity requirement during an economic upswing, thus compelling banks to rein in credit growth in an effort to build up resilience and anticipate a future economic slump. In this condition, efforts to maintain banking sector resilience will simultaneously underpin the monetary policy goal of stabilising credit supply. Therefore, the objective of such macroprudential policy, with its countercyclicality, will synergize with the goal of monetary policy, namely to reduce excessive economic fluctuations (Fig. 7.3).

Several conditions are required to make the integration of monetary and macroprudential policy run well. Firstly, there is a need to understand the framework of the linkages among monetary policy, macroprudential and microprudential policies. This is to take into account the conflict potential to reach the objective of the policy. That is why the use of an instrument mix or adding new instruments could be considered as the right alternative move. Secondly, there is a need to understand the workings of monetary and macroprudential policy transmission in terms of affecting economic
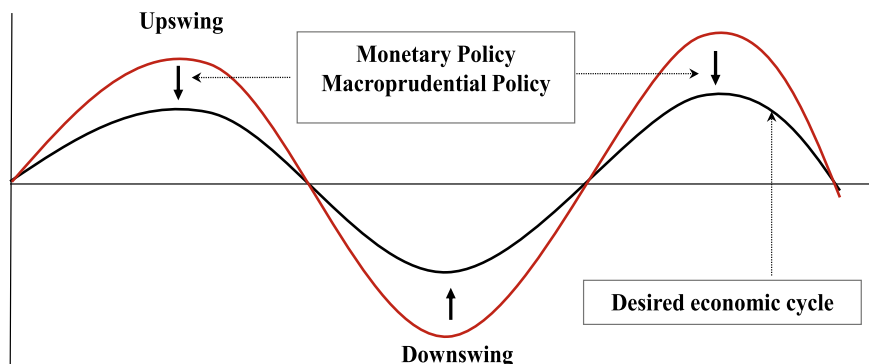
Fig. 7.3 Monetary and macroprudential policy to dampen procyclicality. *Source* Bank Indonesia

activity. This requires a more integrated analytical framework, especially when evaluating the important role of the financial sector. Thirdly, there is a need to measure the right risk behaviour indicators to support risk system monitoring. Measuring the risk indicators in addition to supporting the right monitoring system will also strengthen the analysis of the transmission mechanism through the risk-taking channel.

Policy Instrument Mix as a Key Strategy

The Objectives

On an ideal financial market, the central bank typically relies on a single instrument to reach the monetary policy goal. In reality, however, market imperfections are always present, such as those relating to banking structure and soundness, the distribution gap in market liquidity and excessive market fluctuations. Imperfections force the employment of an instrument mix and wider operational procedures to support the effectiveness and efficiency of monetary policy implementation.

Empirically, the variations when employing an instrument mix are based on several considerations (Balino and Zamalloa 1997). *First*, to secure the achievement of monetary management in terms of weathering the turbulence that distorts the supply and demand of banking reserves. *Second*, to adapt to instrument and operational procedures in line with institutional constraints affecting the work of an instrument. *Third*, to gain the objectives of other policies deemed crucial and supportive to the work of the monetary policy transmission mechanism. *Fourth*, to adjust to the macroeconomic policy environment, especially to the type of monetary and exchange rate regime. Referring to the *Tinbergen rule*, it is said that for each and every policy target there must be at least one policy tool, therefore the application

of instrument mix is deemed necessary in case of a change in economic conditions along with the corresponding challenges, which also support the policy objective enlargement targeted by policymakers.

In this connection, besides the availability of several policy instruments, of most significance is how to mix or coordinate the application of the instruments to raise policy effectiveness in terms of supporting general economic development. This is to consider that each instrument has its own unique timing and magnitude characteristics. In a later development, the application of an instrument mix has become a trending practice at many central banks. In this regard, the type of mix is not merely limited to monetary policy instruments, but also tends to include a mix of monetary policy instruments and other policy instruments, such as those of macroprudential policy. With a different policy umbrella, it is not a simple task to formulate the correct kind of mix.

Policy Mix Variations

As previously mentioned, the complexity of problems generated by the 2008/09 global financial crisis has raised awareness that the role of the financial system should be taken into account in monetary policy formulation. For instance, the decision has to be made as to whether or not monetary policy is required in response to asset price developments that potentially lead to financial market imbalances. Apart from the growing debate over such an issue and despite that monetary policy is crucial in terms of controlling financial sector imbalances, this does not mean that asset price stability, for instance, should be an explicit target of monetary policy. This is to consider that monetary policy itself is not capable of controlling asset prices, especially when asset price speculation contributes to surging prices, thereby precipitating an extremely high return on assets. Under such conditions, any changes in the interest rate would fail to affect investors' portfolios, especially against those investments within the financial market. An across-the-board interest rate hike would 'overkill' the economy as a whole.

Therefore, monetary policy requires additional supporting instruments to control the surge in asset prices on the financial market. In this case, countercyclical macroprudential policy instruments could be utilised to overcome procyclicality and backup monetary policy to achieve macroeconomic stability. One example of a macroprudential instrument that would complement the interest rate in terms of managing asset prices is the Loan-to-Value (LTV) ratio, namely the ratio of money borrowed on a property to the property's fair market value, which aims primarily to fend off asset bubbles in the housing sector. To that end, LTV is set at a certain limit (for instance at a maximum of 80%), which is generally considered as a norm or a reference in credit expansion for real estate development and is safe enough from a macroprudential point of view.

An instrument mix is also applicable to quell the complexity of problems accompanying the prolonged economic recovery in advanced countries, which propels an

influx of foreign capital into emerging countries. In certain countries, such as China, India and Indonesia, the foreign capital inflow phenomenon complicates efforts to oversee soaring liquidity on domestic financial markets. Greater excess liquidity could potentially accelerate credit growth and compound inflationary pressures on the monetary side. Due to such complexity in the form of distortions in both external and internal imbalances, the role of the interest rate instrument turns out to be extremely limited.

An interest rate hike as a measure to control economic liquidity by a central bank would eventually be offset by the significant force of foreign capital inflows, which leaves efforts to oversee macroeconomic stability ineffective. This offsetting phenomenon repeats itself as a vicious circle of capital inflows. Under such conditions, monetary policy transmission taken through the interest rate channel would face constraints, especially over the workings of the term structure interest rate hypotheses. In this case, the development of monetary aggregates, including credit, tends to be inelastic to interest rate performance. For that reason, if the interest rate is used as a monetary instrument, the complexity of the problems requires the use of other instruments (non-interest rate) as a backup to optimally reach the goal of monetary policy.

There are several examples of an instrument mix that support the role of the interest rate, for instance the reserve requirement (RR). The modification of RR in domestic exchange is often seen as a part of those instruments to implement monetary and exchange rate policy. Evaluating the phenomenon of how developing countries responded to rapid inflows of foreign capital, the attention has been focused more on the use of RR to moderate the financial cycle. Adjustments to RR could be used to supplement or replace the use of an interest rate instrument to control the impact of credit on the economy. In a later development, a number of countries also applied RR to their foreign exchange based financing provided by financial institutions. In this case, macroprudential issues are closely related with currency mismatch and vulnerability of foreign exchange liquidity within the banking system, which may also be caused by the financing scheme itself. Additionally, RR variation has been applied based on a specific consideration. In general, the application of RR variation is for macroprudential purposes under a condition where the credit market is segmented and dominated by intermediation institutions, which is tightly regulated. Although the same impact may be generated from the application of the interest rate instrument, the use of RR can be classified as a more direct way to influence banks' funding costs and capacity in triggering financial market imbalances.

The forms of instrument policy mix applied by many central banks are also varied. One form is through reliance on foreign exchange market intervention, which is generally related to accumulating foreign exchange reserves in a bid to manage the external balance. Under a flexible exchange rate regime, central banks intervene on the foreign exchange market to dampen exchange rate volatility and/or to accumulate foreign exchange reserves. This has been evidenced by foreign exchange reserve assets growing with rapidity over the past decade. Yet, foreign exchange reserve accumulation bears its own costs. On one hand, foreign exchange reserves can be seen as a macroprudential instrument to enhance resilience during an episode of

financial market distress. On the other hand, however, persistently large foreign capital inflows along with a surge in central bank foreign assets almost always enlarge the banking system balance, which would eventually lead to a credit and asset price boom, culminating in a crisis.

The use of macroprudential instruments thus raises a question over how such instruments connect with interest rate policy; whether as a complement or a substitute. It is understood that the use of both instruments is a tactical way to influence financial sector conditions. Macroprudential instruments work by influencing financial sector incentives and resilience and directly impact the monetary policy transmission mechanism. Such instruments work by either strengthening or weakening policy repercussions, which are ultimately reflected in the accessibility and the cost of borrowing faced by debtors (private and public). From this point of view, such macroprudential instruments fall into the complementary category. For instance, in terms of weathering intense inflationary pressures, rapidly growing credit and soaring asset prices, central banks have a proclivity to tighten monetary policy and employ additional countercyclical instruments. In this case, both interest rate policy and macroprudential policy will mutually strengthen one another to tighten financial sector conditions.

As both will eventually affect the accessibility and cost of borrowing, however, such instruments could also be classified as substitutes. Specifically, interest rate and macroprudential instruments may be adjusted to simultaneously tackle shocks in the macroeconomy and financial sector. For instance, central banks could either raise the interest rate or RR. The interest rate magnitude and RR ratio would be determined depending on the proximity of the macroeconomy with financial stability, and the relative effectiveness of such instruments. For example, a dilemma emerges when inflationary pressures are weak, while credit and asset prices accelerate. One of the possible scenarios of using an instrument mix is the use of interest rate policy to fight inflation, while RR policy is instituted to confront financial system stability risks. Based on such an interpretation, the interest rate may not be changed due to weak inflationary pressures, while the RR could be raised to smother excessive credit growth and a potential asset price hike. The advantage is that an increase in RR may not attract significant capital inflows, unlike an interest rate hike. However, whether the application of this scenario is sufficiently optimal requires further analysis.

Technical Aspects of Implementation

When implementing the policy instrument mix, several aspects require consideration in order for optimal performance, including: (i) the signals necessary to elicit a response; (ii) response characteristics; (iii) timing of implementation and

procyclicality; (iv) effectiveness and calibration of policy measures; and (v) policy communication.[7]

Signals Necessary to Elicit a Response

Within a forward-looking policy perspective, the policy response should be directed towards anticipating signals related to distortions of future macroeconomic balance. In this case, a policy response may not be necessary in the case of temporary shocks.[8] The lessons gleaned from past crises revealed that a number of indicators and analyses can be used as policy response guidance through their advantage to detect resilience, imbalances and systemic risks. Examples of such indicators include financial system resilience, macroeconomic resilience and systemic risk. Generally, such indicators are predominantly set within an early warning system framework.

Therefore, the accuracy of the policy response will depend highly on the performance of those indicators in predicting possible imbalances. Although theoretically such indicators may be easily constructed, the performance of empirical models and analyses in terms of predicting imbalances, or through an early warning system framework, remains unconvincing. For instance, it is difficult to observe the exact timing and magnitude of credit growth that can be sensitive to economic vulnerability, bearing in mind that rapid credit growth is also required within a fast changing economy due to the profit-taking opportunities which lead to financial deepening, as experienced in various Latin American countries. Thereby, there is an urgency to have more systematic research and better understanding of systemic risk characteristics and their correlation to the benefits from a macroeconomic perspective.

Response Characteristics

When formulating a macroprudential policy response, one of the crucial issues is whether the response will apply a *rule versus discretion.* Similar to monetary policy, the trade-off between a rule versus discretion is a constant. A rule provides certainty for market players and credibility to central banks. However, a rule that is too rigid undermines the flexibility to respond to both structural changes and uncertainties frequently occurring in the financial market.

On the other hand, discretion provides room for central banks to assess the macroprudential impact against the financial system and the economy and then to apply some adjustments towards the use of such approaches in addition to setting a judgment

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[7] For further discussion on such issues, see Moreno (2011), Committee on the Global Financial System (2010), Barell et al. (2010) and Born et al. (2010).

[8] Based on several empirical studies, it is generally acknowledged that financial cycles have a lower frequency compared to business cycles (Borio 2012). However, under certain conditions, they might be relatively synchronous (Oman 2019).

over the possibility of future policies to be taken. Discretion definitely triggers uncertainties over possible future policies, which would unquestionably compel prudence amongst market players by maintaining liquidity and a capital ratio at a higher level than required. Consequently, banks would become less efficient and charge the cost of capital to borrowers, creating a high cost of credit in the economy. Discretion may also lead to forbearance, especially when confronted with a difficult or unpopular decision to be taken. Nonetheless, such discretion policy bears a legal consequence on the central bank. Considering the strengths and weaknesses of both rules and discretion, the decision model could incorporate rule-constrained discretion.

Timing of Implementation and Procyclicality

It is important to take into account the timing of policy application during an economic cycle, partly because a macroprudential regulation is often procyclical.[9] A number of other issues pertaining to the application of a macroprudential framework are countercyclical as follows.

1. Relates to how much weight is given to measures to stabilize an economic cycle (e.g. GDP) compared to measures to manage the financial sector cycle (e.g. credit and asset prices). One fundamental issue is whether with the rapid innovation found in the financial sector, the policymaking authorities are able, in a timely fashion, to extract the financial sector cycles (e.g. "excessive" credit growth, "inflated" asset prices, "abundant" liquidity) from the variations in the normal cycle and long-term trends.
2. Relates to who should assess the cycle (the public sector or the private sector)? As is known, economic cycles are unobservable and methods to estimate them are fraught with numerous uncertainties. Therefore, a diversity of opinions is likely to occur. One of the solutions for policymaking authorities is to rely on a group of independent experts like the approach taken in Chile (to determine the long-term trend of the country's GDP and copper prices) when implementing the fiscal rule.
3. Relates to the timeliness of action taken. Lateness in taking action may have implications on actions that are more procyclical than countercyclical.

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[9] For example, the provision on the removal of allocation for productive assets (the loan-loss provision) tends to decrease while the NPL ratio also tends to fall during the expansionary period. The financial market itself is procyclical as risk distribution tends to narrow during the expansionary phase and dilate, sometimes drastically, during the contractionary phase. From a risk-management perspective, policy instruments should ideally be applied as early as possible by considering the risks that may appear in the event of deteriorating economic conditions (based on observations of economic cycles). Some opinions suggest that measures should be countercyclical, i.e., tightening during periods of expansion and loosening during periods of contraction. In response to the crisis, the Basel Committee on Banking Supervision took a number of measures (in the context of Basel III) to reduce procyclicality. These measures include (i) assessing and mitigating the effect of cyclicality of minimum capital requirements; (ii) encouraging forward-looking provisioning; (iii) adopting a regulatory framework for capital conservation and countercyclical buffer; and (iv) introducing a minimum leverage ratio.

4.   Relates to whether the prudential ratio should remain constant or move with the cycle. A solution would be to set a wide enough range of stability for, say, the targeted GDP. Thus, the change in provisioning to manage the cycle is adjusted only when the target is outside the corridor. In this regard, judicious decisions are critical to complement the existing formal rule or to calibrate policy measures.

Effectiveness and Calibration of Policy Measures

The effectiveness a policy instrument will affect the calibration of the selection of policy measures that are deemed appropriate. In contrast to the analysis of monetary policy transmission, there has been no theoretical macroprudential policy framework developed or robust empirical results to guide the calibration. With the uncertain impact of a macroprudential policy instrument, the policymaking authorities need to be pragmatic in the use of the instrument. This is certainly not easy in the absence of a theoretical foundation and empirical research that describes how policy measures might be adjusted when calculating potential risks that could arise.

A study on the results of the calibration of macroprudential policies in OECD countries (Barrell et al. 2010) indicates that, in general, macroprudential policies can be used to address the macroeconomic risks confronting banks and simultaneously reduce the probability of a crisis happening. Antipa et al. (2011), using the UK and U.S. as case studies, also concluded that macroprudential policies would have been particularly effective for smoothing the credit cycle and preventing the global financial crisis from bringing about deeper ramifications. Beyond these findings, one particular thing that is important to note is the need for a compromise to enable a country to make adjustments to the application of macroprudential instruments considering that adjustments to instruments or regulations may also lead to the incurrence of costs, including an increase in funding costs and margins, thus adversely impacting an increase in economic activity. Thus, policy application needs to be performed at a proper dosage in order to align the costs and benefits thereof with the risk control expected.

Policy Communication

Communication in the context of monetary policy and macroprudential integration is crucial and by no means a simple challenge. *Firstly*, conveying a message to the market about the dangers of the growing imbalance in the financial sector during an economic boom is difficult because such a message would be very unpopular in the midst of market optimism. A monetary policy response in the form of higher interest rates when there are no immediate inflationary pressures is politically and economically hard to accept because the central bank could be perceived as jeopardizing growth and the interests of the people. Therefore, persuasive communication to the public concerning the importance of long-term stability is very much required. The communication strategy for normal conditions would be unusable under conditions

of excessive optimism. The communication of monetary policy needs to adjust to the ongoing dynamics of the financial system. Here, the role of macroprudential policy that is rule-based in supporting monetary policy makes the central bank's task easier. With such support, monetary policy only plays the role of transmitting signals rather than directly controlling the growing risks in the financial sector. *Secondly*, future economic uncertainties, which are very high, especially during the turning points of economic cycles, pose a unique challenge for policy communication.

Conclusion and Implications

In this paper we have discussed various underlying aspects of the linkage between monetary and financial stability and a number of central issues that still need to be analysed further, particularly in relation to the practical significance of risk-taking behaviour in reshaping the workings of the monetary policy transmission mechanism. The discussion leads us to the understanding that there are several strategic and tactical challenges facing central banks in terms of designing policy strategy to integrate the monetary and macroprudential policy framework, especially to meet the dual objectives of monetary stability (price) and financial stability. Given the fact that the nexus between monetary and financial stability, whether they are substitutes or complements, is still an open debate, it is important to draw implications, especially related to the central bank's policy mandate.

Adjustment of Mandate and Its Consequences on Policy Governance

Learning from the crisis, when formulating a post-crisis monetary policy strategy the central bank should increasingly strengthen its function in terms of stabilizing the financial system to ensure macroeconomic stability. The shifting or emphasizing of the central bank's mandate to maintain financial system stability has consequences on policy governance. Moving away from the generally understood format of monetary policy governance, as in the application of ITF, the format of policy governance for financial system stability is not yet fully understood. Adoption of financial system stability as a major or additional aspect of the responsibilities of the central bank could give rise to complications in the format of central bank policy governance. Hence, it is by no means an easy feat to design a central bank's mandate to simultaneously maintain the stability of prices and the financial system.

There are several underlying reasons for complications in central bank policy governance (Crockett 2010). *Firstly*, there is no firm and quantified understanding of the objectives of financial stability as understood in the objectives of price stability. Thus, there has been no benchmark on how to assess the central bank's success

in fulfilling its responsibility to maintain financial stability. *Secondly*, the responsibility for maintaining financial system stability is essentially multidimensional. The scope of such responsibility starts from prudential supervision, the establishment of policies to prevent systemic risks to liquidity support in the financial market and individual financial institutions. In this regard, there is no clear governance model that accommodates differences in the characteristics of each of these steps. *Thirdly*, decisions related to financial system stability tend to be politically sensitive, as compared to monetary stability. This makes it difficult to align the interest to maintain independence with the response to the existing political environment. In that case, the toughest challenge faced by central bank in an effort to maintain independence is how action taken by the central bank, especially in areas outside the central bank's mandate, could finally be officially accepted and legitimized by the government or parliament.

In relation to this way of thinking, one of the issues raised is how to place a mandate to maintain financial system stability in the monetary policy framework. One of the alternative monetary policy formats that can be drawn up is to continue using price stability as the main element that determines the monetary policy response. The substance of price stability has expanded, however, to accommodate financial stability indicators and has a broader forward-looking horizon.

Another alternative policy format is to establish strengthening financial system stability as one of the mandates of monetary policy, in addition to maintaining price stability. In respect to this, Svensson (2010) asserts that there is a close linkage between the achievement of monetary stability and financial system stability. Financial system stability directly affects the financial market and financial market conditions will affect the effectiveness of the monetary policy transmission mechanism. Therefore, a financial market in trouble may affect real economic activities drastically, as indicated by the occurrence of financial crises. Meanwhile, monetary policy affects bank balance sheets and asset prices, which in turn affect financial system stability. Despite being interrelated, however, both have conceptual differences in terms of the objectives, instruments used and authorities responsible. Thus, it is unreasonable to refer to the achievement of financial stability as part of the monetary policy mandate.[10]

Hence, some views suggest that price stability should be the overarching objective of monetary policy[11]. Meanwhile, the substance of financial system stability, particularly in its relation to macroprudential policies, should be calculated carefully and efforts should be made to prevent the achievement of policy goals that are too ambitious, for example through overregulating the development of asset prices and credit growth. One initial step to address this situation is through the use of macroprudential instruments to address the apparent imbalance in credit and asset markets.

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[10] Beyond that, as argued by Blinder (2010) and Nyberg (2010), such conceptual differences do not negate the possible gains of accountability, which are vast, for maintaining financial system stability by the central bank.

[11] See Svensson (2010), Hannoun (2010), and Jordan (2010).

In the future, in line with the policy practice of using various macroprudential instruments along with monetary instruments, a more appropriate policy mandate could be formulated on the basis of past experiences.

Mandate for the Implementation of Macroprudential and Microprudential Policies

In carrying out its function to achieve and maintain financial system stability, a central bank requires supporting instruments in the form of macroprudential and microprudential supervision. Macroprudential supervision refers to the process of managing the overall soundness of the financial system, which is achieved through a series of behavioural analyses of the financial sector and financial market conditions. This management process is implemented by designing policy architecture and responses to ongoing financial system conditions. Meanwhile, microprudential supervision is the process of individually managing the soundness of financial institutions, which is carried out through supervision and regulation that is expected, in aggregate, to create continuity and stability in the financial system and provide consumer protection.

The crisis also showed that close coordination between microprudential supervision and macroprudential supervision in formulating appropriate and expeditious policies at crucial times is required. Macroprudential supervision is directed at the activities of financial institutions, both banks and nonbanks, which have a significant influence on both the financial market and the financial system. According to macroprudential supervision, macro indicators are monitored as a means to anticipate and mitigate various anticipated risks that may threaten the stability of the financial system and real economy as a whole. In addition, monitoring macroprudential conditions may also provide information on systemic risks and mitigate the propagating effects of disturbances occurring at financial institutions that may interfere with the business cycle. Information acquired from macroprudential supervision will assist policymakers as to whether it is necessary or not to rescue a financial institution that is experiencing a lack of liquidity. In practice, the authority carrying out the monitoring of macroprudential conditions requires immediate and forthcoming access to information, micro data and unimpeded official authority to acquire any additional data as required.

Given the linkages between microprudential policy and macroprudential policy, does this also mean that the central bank also needs to be given the responsibility to implement microprudential policies? Those arguing for or against the need for central banks to implement microprudential policies are still continuing their debates to this day. Substantively, it can be understood that the most important element for the effectiveness of central banks in maintaining financial system stability is the continuity of the flow of exchange and the quality of information between microprudential and macroprudential supervisory agencies, given that the functions of both agencies are

complementary. In light of this, the feasibility of information exchanged depends on the institutional framework of the agencies, their habits and human factors.

Thus, if the central bank is not mandated to implement microprudential policies, then close coordination between the central bank and the competent authorities in the microprudential supervision sector is absolutely necessary. In other words, coordination is as necessary as maintaining consistency and harmony amongst the achievement of the goals of monetary, macroprudential and microprudential policies. In this case, macroprudential policy has an extremely vital role both in supporting monetary policy in maintaining macroeconomic stability and microprudential policy. Macroprudential policy in a narrower dimension requires the consistent use of microprudential instruments while macroprudential policy in a broader sense requires consistent monetary policy.

The aforementioned view has very significant ramifications on the institutional mandate of Bank Indonesia, whereby the banking supervision function was separated from Bank Indonesia and turned over to a new institution, namely the Financial Services Authority (FSA). The paradigm that monetary policy requires the support of macroprudential policy implies that the two cannot be separated in order for both to operate effectively.

After the establishment of FSA, the macroprudential policy framework shall inevitably involve two institutions, that is, Bank Indonesia and the FSA, which is authorized to regulate and supervise microfinance institutions. Bank Indonesia has the ability to assess macroeconomic risks and global financial market developments. Meanwhile, the FSA has information about individual financial institutions. Therefore, in order for the system to function properly, there must be a mutual exchange of information between Bank Indonesia and the FSA.[12] The FSA must provide all information relating to the monitoring of individual risks whereas Bank Indonesia has access to macroprudential assessments that must be submitted to the FSA to be implemented at an individual level.

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[12] Arguments for and against the need for central banks to implement microprudential policies are still continuing to develop to this day. Substantively, it can be understood that the most important element for the effectiveness of central banks in maintaining financial system stability is the continuity of the flow of exchange and the quality of information between microprudential and macroprudential supervision, given that the two have complementary functions. Pertaining to this, feasible information depends on institutional form, habits and the human factor. Thus, if a central bank is not mandated to implement microprudential policies, close coordination between the central bank and the competent authorities in the microprudential supervision sector is absolutely necessary.

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Part IV
Country Experience and Empirical Study

Chapter 8
Bank Indonesia Policy Mix

**Juda Agung, Solikin M. Juhro, Yati Kurniati, Reza Anglingkusumo,
and Sahminan**

Abstract This chapter focus on the experience of the Bank Indonesia (BI) in implementing policy mix after the GFC between 2008 and 2015. It elaborates the policy challenges and policy responses that BI undertook given complex challenges in the aftermath of the GFC. Under BI's policy mix response, the integration of monetary and macroprudential policy provides better results in terms of mitigating excessive macroeconomic and financial sector fluctuations compared to any single policy instrument.

Keywords Policy mix · Bank Indonesia · Global financial crisis/GFC

Introduction

This chapter is designed to give a prelude to tomorrow's policy simulation exercise. This relates to our experience after the global financial crisis between 2008 and 2015. The data that we will be using in this presentation is up to 2015. The presentation will be divided into four main areas. We will begin by providing the policy context before discussing the policy challenges and policy discussions in the aftermath of the global financial crisis that we at bank Indonesia undertook, given the policy challenges at that time. We will then discuss the policy responses and close by offering some conclusions.

As will be discussed, against the backdrop of a dynamic global environment, the multitude of challenges confronting the Indonesian economy demanded a policy mix response utilizing multiple instruments. Consequently, we allowed our inflation targeting framework to become more flexible than standard ITF in terms of managing monetary and financial stability in Indonesia. Under Bank Indonesia's policy mix response, the integration of monetary and macroprudential policy provides better

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[1] See Agung, et al. (2016), Warjiyo and Juhro (2016), and Juhro (2014, 2015).

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results in terms of mitigating excessive macroeconomic and financial sector fluc-
tuations compared to any single policy instrument. A lot of the material in this
presentation has been borrowed heavily from the main references listed here.[1]

Policy Context

Global

In 2008, the sub-prime mortgage default sent shockwaves of heightened counterparty
risk in the global financial markets. Starting in the US financial markets, the counter-
party risk increased, which drained liquidity, especially in the money markets. The
resulting impact was that firms had limited access to credit and as a result, economic
growth and economic transactions slowed down significantly, not only in the US
but also in the European Union and other advanced economies, with spillover to
emerging market economies, including Indonesia. There was a synchronized slow-
down/recession in the global economy. In the aftermath of the global financial crisis,
we observed boom-bust cycles in the global economy. Many explanations have been
put forward why such boom-bust cycles could take place. One plausible explana-
tion is that the structural policy measures, which are very important to address the
underlying fundamental problems related to crises, were lagging behind the cyclical
measures and, hence, the boom- bust cycles of economic activity appeared along
the long-run trajectory. Relating to the boom-bust economic cycles were the global
commodity price cycles (Figs. 8.1 and 8.2). I have put global commodity price
cycles here because this relates very strongly with the Indonesian case because we
are a commodity producing exporter. Some of you may remember, this was called
the commodity super cycle. The cycle started early in the year 2000, in the after-
math of China's admission to the World Trade Organization. The Chinese economy
subsequently expanded and with the expansion, demand for commodities increased,
triggering a commodity super cycle. Fuelling this commodity super cycle as well
was the Great Moderation in advanced economies as well as the US, where inflation
was quite low, which prompted the Federal Reserve to loosen its monetary policy for
a prolonged period of time. That also fueled the commodity price boom. This ended
during the global financial crisis.

Conditions recovered but given the sluggishness in the global economic recovery,
and a permanent slowdown in the Chinese economy, we saw that commodity prices
slowly went down afterwards. This is important because our current account, which
also records our trade balance, depends heavily on the commodity cycle. In response
to this fear of a growth slowdown and the threat of deflation as well as to avoid a repeat
of the Great Depression, the Federal Reserve, the US monetary authority, embarked
on an unprecedented policy, namely quantitative easing (QE). More recently, this has
become quantitative tightening but in the aftermath of the global financial crisis in
2009–2010, the Federal Reserve implemented quantitative easing. This amounted to

Fig. 8.1 World economic
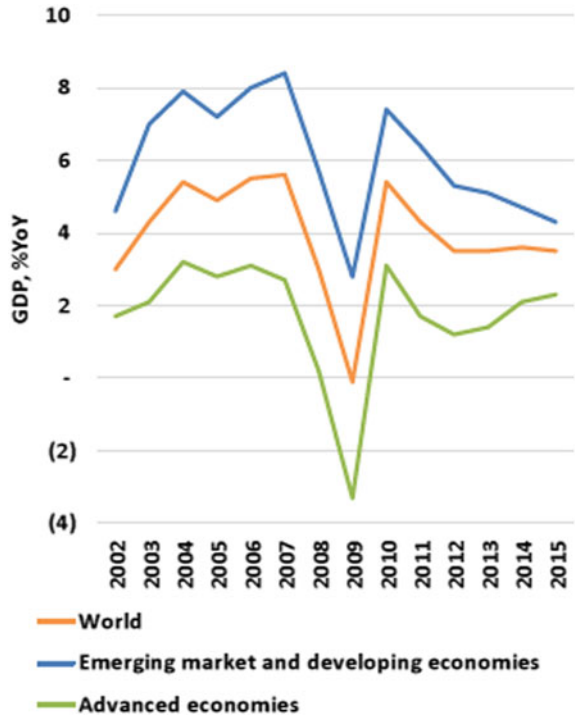growth. *Source* IMF-WEO
database and World Bank

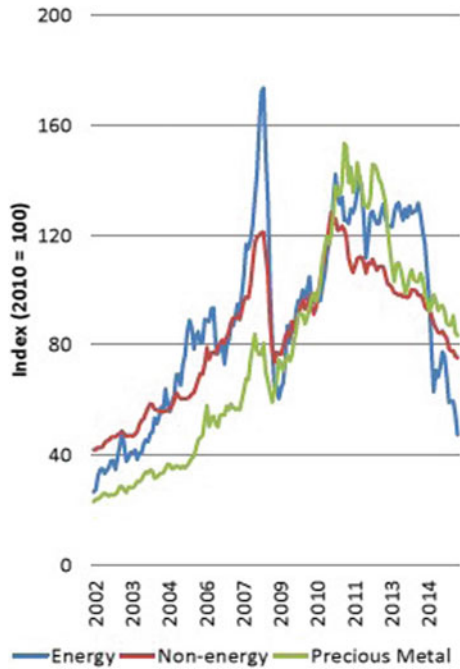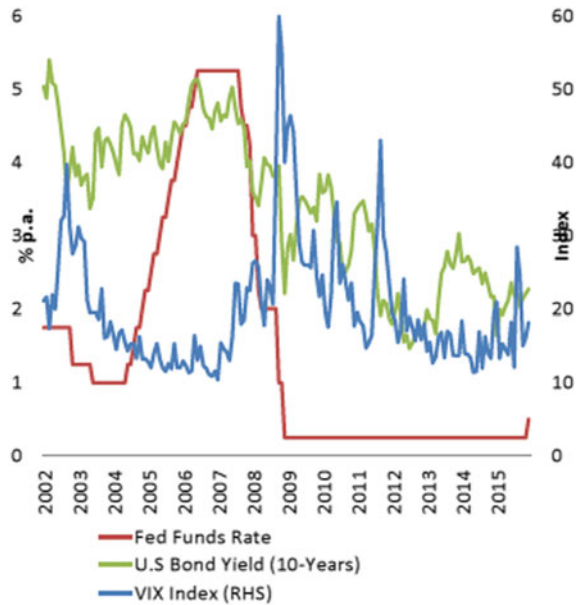**Fig. 8.2** Global commodity
prices index

Fig. 8.3 US monetary
policy and global risk.
Source US Federal Reserve;
FRED database

Fed Funds Rate
U.S Bond Yield (10-Years)
VIX Index (RHS)

the printing of US dollars. The Fed was printing money by purchasing assets, not only
from financial corporations but also non-financial corporations. That created excess
liquidity, as intended, which lowered yields and the Fed Funds Rate but increased the
asset side of the Federal Reserve's balance sheet (Figs. 8.3 and 8.4). When the asset
side of the Federal Reserve's balance sheet increases, it means the bank is printing
money. The Fed added extra US dollar liquidity into the US economy. The idea was
that the excess liquidity would, in turn, reflate the US economy and avoid a prolonged
recession along with the threat of deflation. Nevertheless, the quantitative easing had
a spillover effect on the global economy in the form of large and volatile capital flows.
The money permeated into many corners of the global financial markets, including
emerging market economies and Indonesia. That is the global context of where we
found ourselves in the aftermath of the global financial crisis from 2008–2010.

Domestic

With the dynamics of the global financial markets and global economy together with
the heightened uncertainty that went with it, as a small and very open economy with
strong integration in the global financial market, how did Indonesia fair? What were
the key risk factors the policy authorities had to cope with in the aftermath of the
global financial crisis? Those were the questions in the back of our minds as poli-
cymakers in Indonesia at that time. Actually, we found that inflation in Indonesia,
at that time, was quite manageable. The disinflation path continued. An excepting

Fig. 8.4 Unconventional monetary policy (balance sheet of fed)
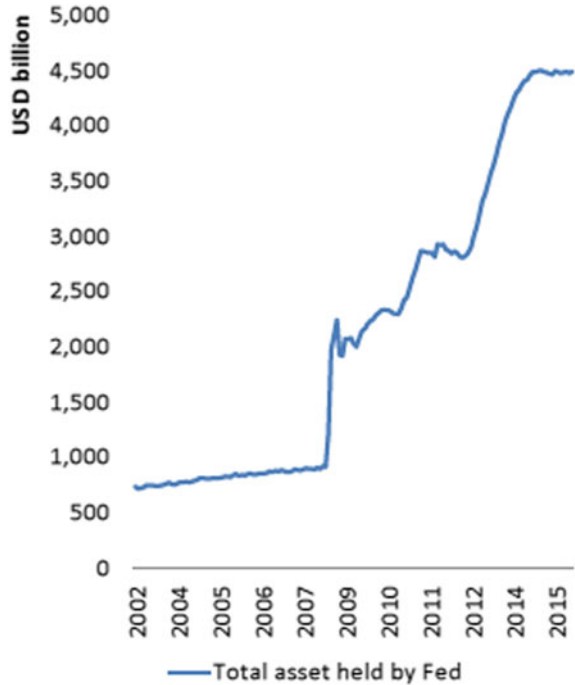
a few episodes where administered prices went up, inflation in Indonesia remained around the target corridor. The higher administered prices typically related to government fiscal reform in the area of subsidies. For example, the government lifted the product-based subsidies on energy and used the money for people-based subsidies, such as education. This was part of the fiscal consolidation policy of the government and fiscal reform. The shaded area on the graph (Fig. 8.5) represents the target range of headline inflation set jointly by the government and central bank. Looking at the components of CPI inflation, core inflation (blue line) remained within the target range, even during periods of rising administered prices (Fig. 8.6). The fact that core inflation was maintained within the target corridor set by the government and Bank Indonesia suggests that monetary policy was able to limit the second-round effect of price shocks to inflation. This demonstrates the credibility gains of monetary policy in terms of information management. Bank Indonesia was happy with this outcome. It suggested that monetary policy had gained credibility. The question then becomes how to secure the credibility gains given the risk factors affecting the Indonesian economy in the aftermath of the global financial crisis? Most of the risks related to increasing macro vulnerability in the aftermath of the global financial crisis. In 2009–2010, Indonesia's balance of payments enjoyed a current account surplus most of the time before starting to decline into a deficit in 2011–2012. This relates to the commodity price bust because a significant portion of our exports are commodity based, such as crude palm oil (CPO), coal, nickel and so on. That was
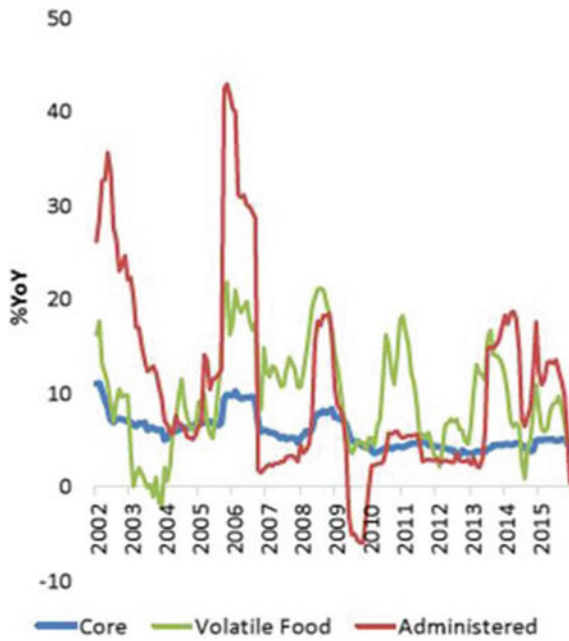
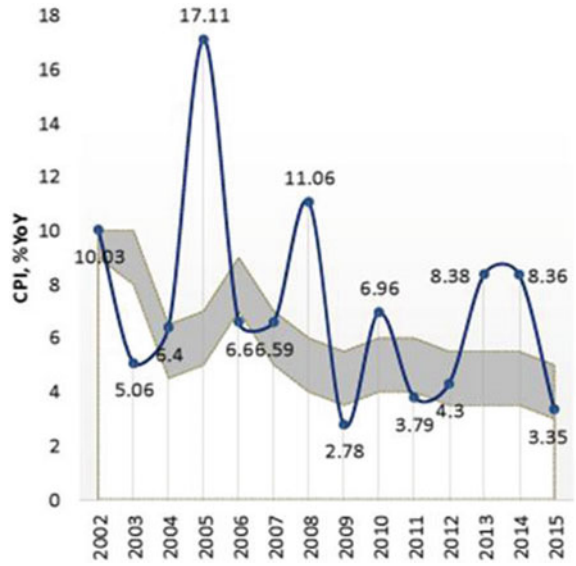**Fig. 8.5** Indonesia inflation: headline CPI

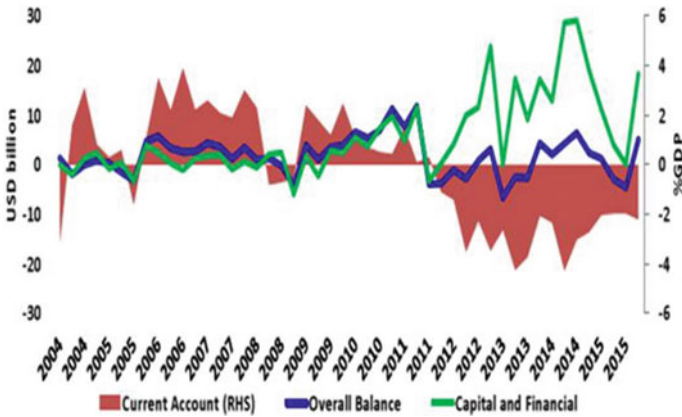**Fig. 8.6** Indonesia inflation by component CPI

Fig. 8.7 Indonesia GDP growth

the first macro vulnerability we observed. In 2012–2013, the current account deficit widened and started to constrain economic growth in Indonesia, thereby increasing economic vulnerability in the country. GDP growth remained solid at around 5%, however, which sustained the confidence of investors in the global financial markets (Fig. 8.7). Therefore, investors kept buying Indonesian securities, which financed our current account deficit through the capital and financial account. At that time, the capital and financial account recorded large surpluses. The balance thus reflected an external posture. We saw increasing vulnerability in terms of our current account, but we were able to finance the current account through the capital and financial account, especially portfolio flows, thanks to quantitative easing. A lot of the money flowed from the US through the global financial markets, such as wholesale funding and local currency bonds in emerging markets, due to the spillover impact of quantitative easing. Consequently, we were able to finance our current account deficit (Fig. 8.8).

Notwithstanding, such conditions brought other risks because capital flows are prone to volatility and shifts in investor sentiment or expectations about the stance of global monetary policy and the relative parity of interest rates between the home country and the host country, for instance. Figure 8.9 shows the composition of instruments in the capital and financial account flows. The flows were dominated by the bond market and equity market, mostly investors buying Indonesian local currency government bonds. The chart shows that shifts in investor confidence, for example during the euro crisis in 2011, precipitated a drop in the capital and financial account, meaning that capital flowed out of Indonesia. The flows would subsequently resume before another shock, this time the Taper Tantrum, would trigger more capital outflows. The Taper Tantrum was prompted by a statement issued by Ben Bernanke concerning the Fed's upcoming plan to normalize monetary policy. This spurred a portfolio adjustment by global investors, which affected our financial markets as capital flowed out of the country. This happened again in 2015 when the Fed actually began normalizing its monetary policy and reducing its balance sheet.
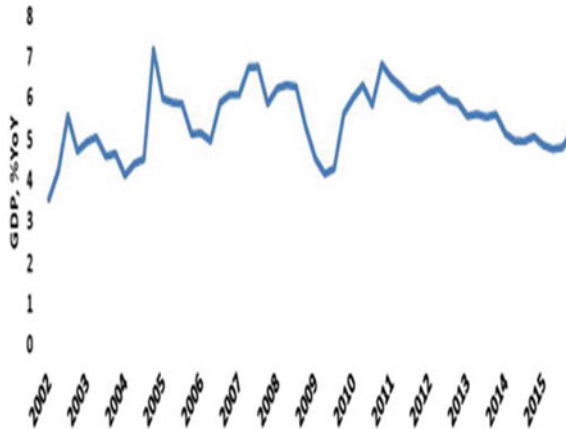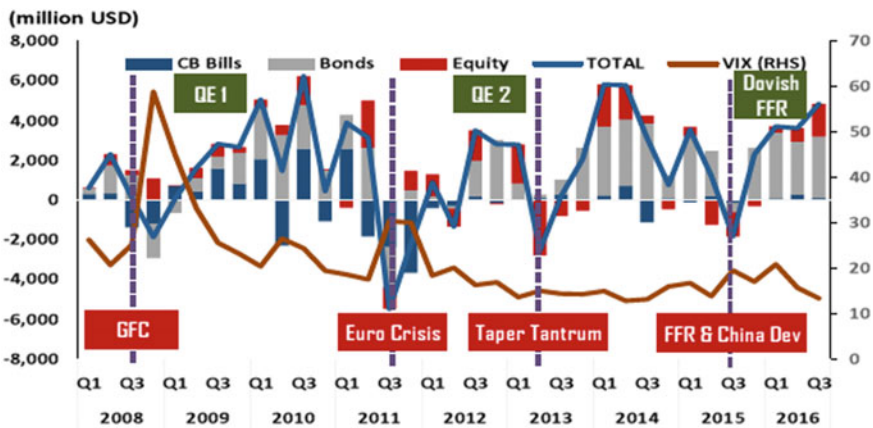
Fig. 8.8 Indonesia inflation by component CPI

Fig. 8.9 Indonesia: capital and financial flow. *Source* BI; ADB

As of 2015, around 40% of Indonesia's local currency government bonds were held by global investors and, hence, prone to shifts in market expectations (Fig. 8.10). It helped us finance our current account deficit but there were risks associated with it. There is always a trade-off in terms of policy; a policy dilemma that is encountered. Another policy issue/dilemma was to avoid boom-bust cycles, where the real sector and financial sector tend to move in a pro-cyclical way. When an economy is booming, credit is also booming (Fig. 8.11).

When the business cycle begins to decline, the financial cycle is still increasing and that is something to be avoided because rapid credit growth (boom) will eventually bust because, as with the experience of advanced economies before the global
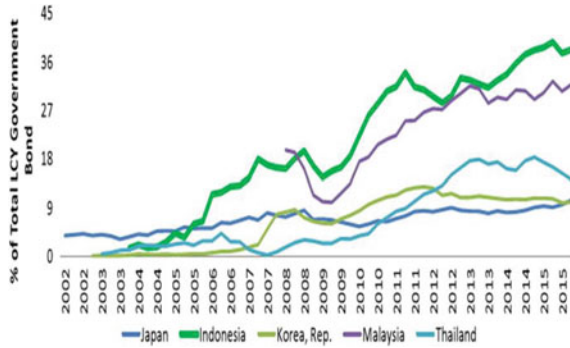
Fig. 8.10 Foreign holding of local currency government bond

Fig. 8.11 Indonesia: domestic credit. *Source* BI

financial crisis, a rapid credit boom masks the concentration of risk, making it unob-servable. This can catch policymakers off-guard. There is uncertainty with regards to where the concentration of risk is.

Policy Challenges and Discussion

Policy Challenges

That was the global and domestic policy context but what are the policy challenges? I have distilled all the dynamics of the domestic and global economies into this one matrix (Fig. 8.12). There are four episodes, namely 2008–2009, 2010–2011, 2012–2013 and 2014–2015. Monetary stability is on the y-axis and financial stability on the x-axis. With monetary stability, you have high inflation, implying a period of growing risk to price stability, and low inflation where the risks to price stability are actually subdued. In terms of financial stability, there is high credit growth that usually increases the concentration of risk due to lower lending standards, and also low credit growth. This matrix is important as later on we will see what kind of policies should be used in each of these episodes.

This chart presents another way of looking at the policy challenges, which was our way of thinking at that time. We are an inflation targeting country, and our target is inflation, but we have dual objectives. However, there would be no price stability without financial system stability. To maintain macroeconomic stability, financial system stability is also required. Macroeconomic stability is our mandate, but we also have to consider financial stability as well because the real sector and the financial sector tend to behave in tandem in a pro-cyclical way. Pro-cyclicality usually embodies risk-taking behavior. This is usually a source of risk concentration and functions as a financial accelerator. Risk-taking behavior is also influenced by the dynamics of the global environment, particularly the world interest rate or global

Fig. 8.12 Policy challenges in four different time

capital flows. When interest rates in advanced economies are low, namely an accommodative monetary policy stance, it means they are printing money. Risk-taking behavior will consequently affect us in the domestic economy because Indonesia is a small open economy and well-integrated into the global capital markets because we issue bonds that can be purchased by foreigners, which we need in order to finance our current account deficit. Basically, we need to finance our development.

In 2011, when we published the Indonesia Economic Report for 2010, the terms 'policy trilemma' and 'policy mix' were used in our press release because they featured very much in our thinking in 2010. We have the classic Mundell Trilemma, which says that as a country, you want access to the global capital and credit markets but if you want access, you have to allow the exchange rate to float, namely you cannot control your exchange rate, and you have to somehow let your monetary policy adjust to shifts in global sentiment. This means that the reaction function of monetary policy must be allowed to be a function of other central banks' reaction function. This means that if the Federal Reserve is thinking of raising its interest rate, other central banks may have to follow suit in response. Parity must be maintained along with the competitiveness of your financial instruments. Nevertheless, that would make us prone to exchange rate and financial market volatility. There is another trilemma, known as the Financial Trilemma, and the concept was first introduced in 2011 by Schoenmaker (2011) (Fig. 8.13). It has also appeared in the International Journal of Central Banking. According to the Financial Trilemma, if a central bank desires financial integration (access to global capital and credit markets), it must follow the rules or regulatory regimes that have international standards. The authorities must be disciplined not to follow discretionary local rules. For example, Basel III implementation safeguards the financial system from potential risks to financial stability, but some policy autonomy is lost in terms of setting your own national policy. There is another trilemma, known as the Governance Trilemma. If you want your rule to be universal and democratic, you cannot have effective rules.
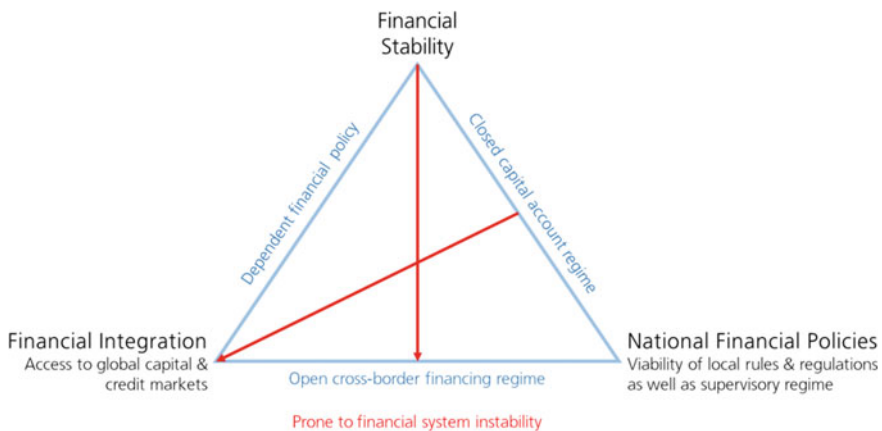

Fig. 8.13   Financial Trilemma. *Source* Schoenmaker (2011)

A good example of this is the United Nations, a democratic institution with universal coverage but somewhat ineffective.

Policy Discussion: Managing Capital Flows

Another theme in our discussion was how to manage capital flows. In 2011–2012, the main message coming out of the IMF and World Bank was about capital flows. It is a question of how to handle capital surges and capital inflows. During 2011–2013, a lot of capital was flowing to emerging markets. We were the recipients of large capital inflows. This triggered macroeconomic concerns. First, the national economy may overheat due to excess liquidity. Second, we might lose competitiveness because our exchange rate is appreciating. Most central banks manage this by accumulating foreign reserves but this incurs a sterilization cost.

Those are the macroeconomic concerns but there are also financial stability risks because a credit boom usually carries with it concentration risk and the potential for asset price bubbles. Hence, to manage capital surges, the idea was first to implement consistent macroeconomic policies and prudential policies. This should be the central bank's primary response. Then, you mitigate the risk through capital flow management, which is a sort of capital control. There is a question about whether you are willing to implement capital controls and how stringent they should be. That forms part of the discussion too and, ultimately, we decided against it because we did not know what the investor reaction would be. That would represent a significant change in regime. Instead, what we decided was to implement the primary response, namely macro policies and prudential policies, because during periods of capital inflow, higher interest rates would actually increase the inflows even more. Macroprudential policies helped us because it placed less burden on our primary instrument, the policy rate.

Monetary Policy Versus Macroprudential Policy

Macroprudential policy can be used to support monetary policy in order to curb credit in certain sectors without raising the interest rate. Macroprudential policy addresses risks to the financial system caused by a weakening of financial conditions, financial and sectoral imbalances as well as imprudent behavior and so on. On the other hand, monetary policy addresses the risks associated with economic growth, inflation, current account deficits and exchange rates. Both sets of risks are interrelated (interconnected) but require different policies to address the risks. Furthermore, monetary and macroprudential policies may conflict from time to time, implying a trade-off. For example, during asset price bubbles, credit must be squeezed through higher interest rates. If such a situation is accompanied by low inflation, however, it could contract the economy even more and inflation would be too low, even below the

target, but higher interest rates would attract more capital flows. These are the trade-offs that must be considered, such as tighter monetary policy through higher reserve requirements to reduce exchange rate pressures could create liquidity problems for banks or macroprudential policy which requires high capital to maintain the stability of the financial system could hamper economic growth (aggregate demand) or a loose monetary policy that encourages growth may lead to excessive credit expansion and financial instability.

Policy Discussion

In a nutshell, increasing global financial market integration and large capital flows prompted the monetary authority to shift away from corner solutions towards a middle solution with regards to the trilemma, making the impossible trinity possible. That was the joke at the time, how to make the impossible trilemma possible? Hence, the need emerged for a more flexible and refined inflation targeting framework (ITF). Pure ITF only cares about inflation but that would have been too simplistic for us as a small open economy.

Policy Response

Our policy response was to integrate monetary and macroprudential policy, with a view that there is no macroeconomic stability without financial system stability. That was our main justification. Economic dynamics during financial crises have shown that monetary policy needs to be further directed to anticipate macroeconomic instability risk stemming from the financial system. The central bank needs to strengthen the framework of monetary and financial system stability, which requires monetary and macroprudential policy integration. The goal of macroprudential policy is to guarantee financial system resilience as a whole in a bid to support financial intermediation.

Bank Indonesia Policy Mix

In 2008–2009, Bank Indonesia maintained accommodative monetary and macroprudential policy. In fact, macroprudential policies were around before the term 'macroprudential policy' was invented. Some of the prudential regulations were macroprudential in nature. In 2008–2009, some of the elements of macroprudential policy were already there. The overall stance of monetary and macroprudential policy was loosening/accommodative. During the period of capital inflows from 2010–2011, we could not raise the interest rate even though, at that time, we saw rising credit

growth, which could feed into inflation down the road. Therefore, we implemented macroprudential policy. Simultaneously, we loosened monetary policy and tightened macroprudential policy. In 2012–2013, we experienced inflation shocks. There was a shortage of basic food necessities at that time along with productivity shocks. Consequently, inflation began to rise. As the monetary authority, we could not let that hike in inflation feed through into the inflation expectations and cause second-round effects on the overall price level. In response, we tightened our monetary policy stance, while the macroprudential policy stance remained tight. In 2014–2015, when we saw that credit growth had already begun to decline and we were happy there was no boom or sudden bust in the credit growth, namely there was a smooth transition from rapid credit growth to slower credit growth, we relaxed our macroprudential policy stance.

Optimal Policy Response

In 2010–2011, rapid capital inflows led to excess liquidity and the commodity super-cycle prompted a capital account surplus. Therefore, we implemented a mixed policy response by letting exchange rates appreciate, accumulating reserve assets, increasing the reserve requirement to mitigate the impact of US dollars flowing into the domestic economy, including the foreign exchange reserve requirement, implementing a 6-month holding period for investors buying central bank bills and a net open position to limit banks from having wholesale funding from the markets to only 30% of capital. Foreign exchange exposure up to 30% of capital was permitted. Now we are experiencing capital outflows, we have relaxed the holding period but at that time we required investors to hold their position for at least six months.

In 2012–2013, we allowed our exchange rate to be more flexible as capital outflows prompted rupiah depreciation. We also conducted dual intervention. To ensure the financial system was not deprived of liquidity, however, we purchased government bonds in the secondary market. We also tightened the LTV rules because there were concerns about banks allocating too much credit to the property sector and also to households to purchase property and motorcycles. In Indonesia, motorcycles are everywhere, which is partly a legacy of this era of easy access to finance. Some of these loans to purchase motorcycles were sub-prime. We also introduced a loan-to-deposit ratio linked to the reserve requirements. We had a range for our LDR of 80-92% at that time. Below 80%, we would punish the banks for not lending to people and so the excess would be put towards the reserve requirement. Above 92%, we would punish the banks for being a risk taker. This was an LDR-linked RR, which can be tightened or loosened as required.

In 2014, we introduced another regulation relating to rising private external debt. A lot of Indonesian non-bank corporations were financing their activities through private debt. We did not like this trend due to the risks that would emerge from global shocks, leading to volatility in the financial markets. Therefore, we required non-financial corporations to hedge their foreign exchange exposures. In general,

our policy response was a mixture of allowing the exchange rate to be more flexible at times through dual intervention and accumulating reserve assets, and the Bank Indonesia policy rate. We tried to balance the three indicators of international reserves, exchange rates and BI rate.

Structural Reform: Promoting FDI

The issue is foreign capital. Portfolio flows carry a lot of volatility but there is a part of the inflows that we would love to have, namely FDI or foreign direct investment. In addition to the policy mix, the government implemented many structural reforms that allowed Indonesia to be a desirable place for investment (FDI). Consequently, a lot of FDI regulations have been relaxed, including foreign ownership regulations. Before, we requested FDI firms coming to Indonesia to have a 50% share with local partners. Therefore, if it was a USD10 billion investment for example, where would we find a local investor able to invest USD5 billion? Not too many Indonesian people have USD5 billion to throw around. Consequently, we relaxed the regulations. From the fiscal policy side, the need to finance our economy through foreign savings meant it was important to maintain long- term fiscal sustainability. From 2012 onwards, therefore, the path of our fiscal policy has been one of consolidation. We are trying to reach a surplus in our primary balance. Perhaps later, one of our colleagues from the Ministry of Finance could explain fiscal consolidation in Indonesia.

Conclusion

Against the backdrop of a dynamic global environment, the multitude of challenges confronting the Indonesian economy demanded a policy mix response utilizing multiple instruments. Consequently, we allowed our inflation targeting framework to become more flexible than standard ITF in terms of managing monetary and financial stability in Indonesia. Under BI's policy mix response, the integration of monetary and macroprudential policy provides better results in terms of mitigating excessive macroeconomic and financial sector fluctuations compared to any single policy instrument.

Interaction

Speaker: Please elaborate on foreign ownership of banks.
Participant: Regarding foreign ownership of banks, we regulate everyone equally, foreign and domestic. An individual can buy a bank up

	to 20% of bank equity or 30–40% for a financial institution. This applies to foreign and domestic investors.
Speaker:	All of the data and your experiences in the presentation are up to 2015, especially in terms of how the central bank formulated its policy response from the challenges that were encountered. From 2016–2018, however, 16 economic policy packages were introduced by the government, some of which would have influenced the central bank policy mix. How can we manage these 16 economic policy packages to ensure that our macroprudential policy, in the years ahead, remains effective?
Participant:	This question concerns structural reforms conducted by the government. There have already been 16 economic packages since 2016 that were directed towards many things, including social protection, promoting foreign investment and so on. Some of those policies have been quite effective in terms of social protection. Furthermore, some of the FDI measures have also been effective but more recently, when our current account deficit tended to persist, the government started to strengthen the FDI policies with many more relaxations, including tax holidays and R&D incentives, for example, to allow FDI to enter Indonesia. These are not short-term solutions. We will only see the benefits of these reforms later in the long run. We have just planted the seeds, but it will take time for the trees to produce fruit. The reforms conducted by the government contained massive infrastructure projects, which required imports. Nevertheless, we were able to control a manageable current account deficit through import control policy. In 2018, the current account deficit was even narrower, showing how effective the policies had been.

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Chapter 9
Central Bank of the Republic of Turkey Policy Mix

Mustafa Faruk Aydin and Devrim Yavuz

Abstract This chapter will focus on the experience of the Central Bank of the Republic of Turkey (CBRT) concerning the policy mix. The chapter discusses the impact of the global financial crisis on the international financial markets, the challenges faced and the need for a policy mix, including how the authorities in Turkey handled the trade-offs, the measures taken and the results.

Keywords Policy mix · CBRT · Global financial crisis (GFC)

Introduction

This chapter will focus on the policy experience of the Central Bank of the Republic of Turkey (CBRT) concerning the policy mix. I work as an economist at the central bank in the Research and Monetary Policy Department. My first lecture is about the central bank policy mix experience in Turkey and then I would like to share some research we have done at the central bank on the policy mix.

The first session will be in three parts. In the first part, I will explain the impact of the global financial crisis on the international financial markets, including the lessons learned, the challenges faced and the need for a policy mix. In the second part, I will explain Turkey's experience concerning the policy mix, how the authorities in Turkey handled the trade-offs, the measures taken and the results. In the last part, I will talk briefly about the recent developments in Turkey, how the policies have affected the reversal of the global financial cycle and gradual normalization of monetary policy.

Some Lessons Learned Since the GFC

After the 2007–2009 global financial crisis, the advanced economies implemented unorthodox monetary policy, which triggered vast global liquidity and capital flows

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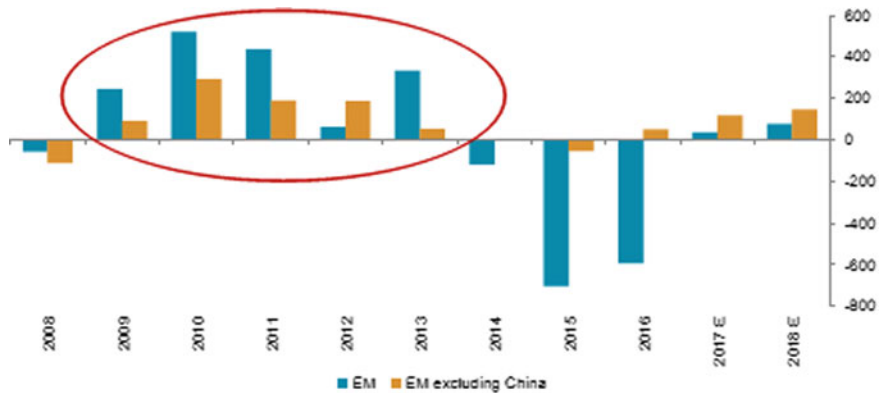Central Bank of The Republic of Turkey, Ankara, Turkey

Fig. 9.1 Portfolio flows to emerging markets (net, billion USD). *Source* IIF

to emerging markets. After the global financial crisis, the unorthodox policies of the advanced economies triggered huge volatility and capital flows to emerging markets. This graph is from the Institute of International Finance (IIF) and shows the portfolio flows to emerging markets. The blue column represents all emerging markets and the orange column represents all emerging markets excluding China. After 2008, we see a huge amount of capital inflows with high volatility. If you want to look at this graph in more detail, we see these volatile capital inflows in bonds and equities. This graph is from the EPFR and it shows that bond and equity flows nearly quadrupled after the QE policies of the advanced economies (Fig. 9.1).

Post-crisis Dynamics and Spillovers to the EMES

In advanced economies, there were historically low policy rates and quantitative easing policies, which had important implications for emerging markets, such as a surge in capital inflows to emerging markets, rapid credit expansion and real exchange rate appreciation. Consequently, with rapid credit expansion and real exchange rate appreciation, we saw a deteriorating current account balance in the emerging markets. Current account deficits increased vulnerability to sudden stops in global risk appetite and capital flow reversals. Such global financial conditions also amplified macro-financial linkages in the economy.

A Self-feeding Cycle Amplifies the Effects of Capital Inflows

Figure 9.2 explains the macro-financial linkages through global liquidity conditions. When global liquidity conditions become easier, it reflects itself as capital inflows to
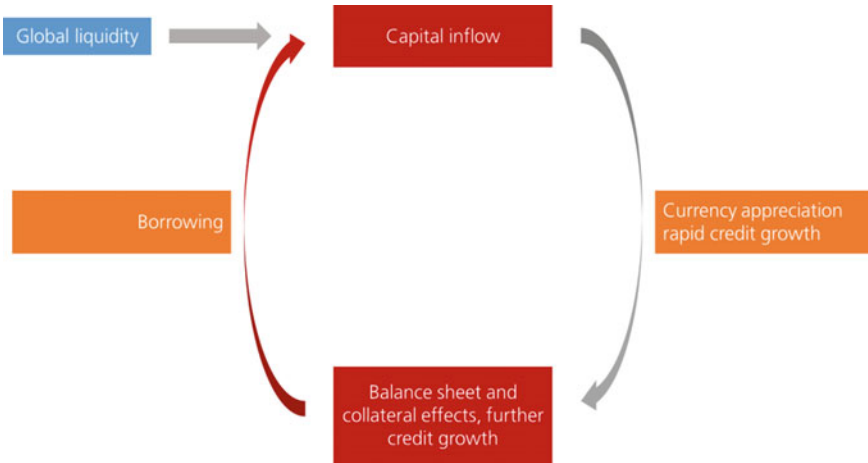
Fig. 9.2   Macro-financial linkages: global liquidity

emerging markets. When the capital inflows come to the emerging countries, we see real currency appreciation and rapid credit growth. Currency appreciation has balance sheet and collateral effects because firms that have foreign currency liabilities on their balance sheet will be in a better position due to currency appreciation. Therefore, the collateral constraints will be relaxed due to real currency appreciation and the firms will demand more credit because they are in a better position. This will lead to further credit growth. To meet the firms' credit demand, banks need to take some external borrowing, which also increases capital inflows. This is a self-feeding cycle and the capital flows amplify the effects of the cycle.

Challenge 1: Financial Channel. There is a challenge under these conditions for the policymakers because the exchange rate should act as a shock absorber under free capital mobility and a flexible exchange rate regime. What I mean by shock absorber is that when capital flows increase, this leads to real currency appreciation and this should be reflected in net exports. When the currency appreciates, we see a decrease in net exports but the self-feeding cycle creates some challenges for the economy because it has a financial channel as well. When capital inflows increase and the real exchange rate appreciates, it has a balance sheet effect through the risk-taking channel, which leads to an increase in credit growth. This is the opposite of the trade channel. Through the financial channel, the firms want to have fewer credit constraints and through the risk-taking channel, what I mean is that, since the currency is appreciating, banks think that foreign funding is not as risky as previously because global liquidity conditions are easier. Therefore, the banks take more risk when deciding on the loan portfolio, namely to which firms they want to extend loans. Consequently, banks take more risk. These two channels work in opposite directions, which is a challenge for monetary policy because we do not know how output will be affected through these capital inflows.

Challenge 2: Exchange Rate Pass-Through. The second challenge concerns exchange rate pass-through. As you would expect, capital inflows are primarily associated with economic booms. Under strong aggregate demand conditions, exchange rate pass-through is stronger. With capital inflows, the domestic currency appreciates and the exchange rate pass-through effect will be rapid because this occurs during a boom period. Domestic currency appreciation lowers imported inflation and provides more room for expansionary policy. Inflation and output move in opposite directions if the pass-through effect is strong. What would the central bank do under such conditions? This creates another challenge for the central bank.

Policy Trade-Off Under Standard Inflation Targeting

When global liquidity shocks dominate, using a single instrument under ITF may exacerbate the trade-offs. For example, during capital inflows there are two options. The central bank can use the short-term interest rate. If the central bank increases the interest rate, it would lead to further appreciation of the domestic currency and a wider current account deficit, which would make the economy more vulnerable to a sudden stop. Oppositely, if the central bank decreases the interest rate, it would not help to reduce the risk because the move would ease financial conditions thus feeding higher credit growth and over-borrowing in the domestic economy. Therefore, multiple objectives require multiple instruments. The crisis has taught us that to achieve multiple objectives, we need multiple objectives. A single instrument is not enough to achieve our objectives under these global financial conditions.

Benefits and Costs. The use of macroprudential tools entails a trade-off between the benefits and costs. One of the benefits from using macroprudential tools is lower systemic risk, greater resilience as well as lower frequency and severity of crises. Nevertheless, there is an adjustment cost to the financial sector and balance sheet constraints may take time to phase-in. There are also efficiency costs for borrowers from a reduction in the provision of financial services. The final cost is that output growth will vary across tools. For instance, the aggressive tightening of any one single tool can lead to output costs, which implies any tightening should be done gradually. Macroprudential tools should be used gradually to avoid output costs. At the beginning of the crisis, nobody knew how the macroprudential tools would transmit into the economy, which was another cost and challenge for the implementation of macroprudential tools.

Turkey's Policy Mix Experience

Under such global economic conditions, Turkey's monetary policy has evolved in the past two decades through four distinct periods. In the period from 2001–2005,

Turkey experienced a domestic crisis. It was a mixture of a balance of payments, banking and fiscal crisis. We saw the adverse consequences of this crisis in the form of declining GDP growth. After the domestic crisis, however, broad-based structural reforms were implemented. We changed the central bank law because in 2001, the central bank was not independent. According to the new central bank law, the central bank gained independence. Before 2001, Turkey implemented a fixed exchange rate regime but after the domestic crisis, we started to implement a flexible exchange rate and changed our monetary policy framework to inflation targeting, beginning with implicit inflation targeting. We did not officially implement the inflation targeting framework because the Turkish economy was not in a strong position after the 2001 crisis. During implicit inflation targeting, we took some actions in terms of the fiscal balance and the banking sector. We established some regulatory and supervisory institutions for the financial markets. This was our preparation period for the official inflation targeting framework.

After 2006, we officially started to implement the full-fledged inflation targeting framework. From 2006 to 2010, we implemented full-fledged inflation targeting in a conventional way, using the short-term interest rates and our objective was price stability. After the global financial crisis and the impact on the financial markets, however, we incorporated financial stability into our inflation targeting framework. From 2011 to April 2016, was our policy mix period because we incorporated financial stability into our policy objectives. Since April 2016 until the present day, we have implemented a monetary policy simplification process.

Inflation in Turkey: 2001–2018

If you look at the inflation path during these four periods of different monetary policy frameworks, at the beginning, there was a huge crisis in 2001. As a result of structural reforms, there was a long disinflation process during the implicit IT period. After 2006, we implemented full-fledged IT and nearly every year, inflation was above the target. Between the full-fledged IT and policy mix periods, inflation remained above the target but this was acceptable because we did not experience any huge inflation shocks. During the monetary policy simplification process, however, especially during the most recent period, we experienced a huge exchange rate shock that was reflected by an increase in inflation (Fig. 9.3).

Interaction

Participant: What was your inflation target during this time?
Speaker: Now, it is 5%. At the beginning, it was around 7%.
Participant: What is the base year? I know that during the crisis last year, there was growth since 2003 but that growth is combined with
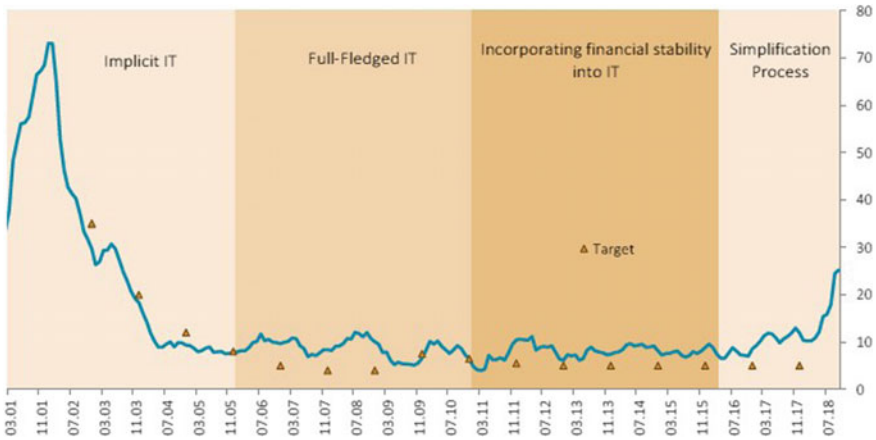
Fig. 9.3 Turkey: inflation. *Source* TURKSTAT

inflation. There was high growth with high inflation so on the ground we can say there is inflation growth similar to the Asian crisis. I have looked at the Article IV for Turkey and the IMF announced there were high vulnerabilities in 2014 and that growth in Turkey came with high inflation as well, along with a lot of external borrowing. The Central Bank of Turkey would have access to these figures so why was nothing seen before the crisis? There was also something about after the crisis. If there is a crisis in the local currency, I think the first thing you should do is raise the interest rate but this took a long time in Turkey. Another thing is that you said the Central Bank of Turkey is independent but is it not the case that the Minister of Finance still has influence in the central bank? Can the president interfere?

Speaker: No, the central bank is independent. In his speeches, the president is always talking about interest rates but we are trying to distance our policies from his influence. Furthermore, exchange rates pass-through is also high in Turkey.

Participant: I think the central bank did a lot to take into account the vulnerabilities through macroprudential policy but after the Tweet by US President Trump, Turkey experienced a crash.

Speaker: At the beginning, it was also due to political reasons. Therefore, it was rapid to increase but it also decreased rapidly as well. This was an exchange rate shock.

Participant: Since you know that there were vulnerabilities, we should take care about these vulnerabilities and make some macroprudential

policies to avoid any upcoming crisis but just one Tweet by the President of the United States triggered a downturn. Why did CBRT not take this into account? Why was there no action before the crisis? From Article IV, you can see a large wave coming, almost like a snowball, getting bigger and bigger, but there was no action. The actions came a long time after the crisis.

Speaker: Actually, they did take it into account. The implemented huge monetary policy tightening and increased the interest rate. After the monetary policy tightening, the exchange rate started to appreciate as well but in the beginning, they did not take any actions because nobody knew what was going on. Some people were speaking on Twitter and we saw the effect of the Trump speech on exchange rates. While he was speaking, we saw large depreciation. Before the crisis, the central bank was trying policies to contain the adverse effects but you are right, it was not enough. Some pre-emptive actions could have been taken before the crisis. It was very hard with the pressure from the president. We are trying to distance ourselves because we are independent but it is very difficult to implement policies with such pressures. The president believes the high interest rate is the reason for high inflation not that high inflation is the reason for the high interest rates. He thinks that if the interest rates are high, it will have some financing costs for the firms and other economic agents, which leads to an increase in prices. Therefore, there was a lot of support to decrease interest rates but it is not possible all the time to do what he suggests.

Participant: Based on the graph, your inflation target was consistently below actual inflation. Why did you not just increase the target in order to gain credibility? After you have gained credibility, the central bank could lower the target again.

Speaker: Actually, we did adjust our target at the beginning of full-fledged inflation targeting in 2007–08. During this period, there was a huge increase in the oil price so our inflation was also very high. At the beginning, our medium-term inflation target was 4% but after the external shocks, we increased the inflation target to 5%. It is not easy to change the inflation target due to the negative effects. If you regularly change your inflation target, the central bank will lose credibility

Participant: What would you do if you do not hit the target at the end of the year?

Speaker: If we do not hit the target at the end of the year, we have to write an accountability letter to parliament and the president. There

was always a reason why we could not hit the target, primarily due to external shocks but food inflation was also very volatile in Turkey, which was another reason we could not hit the target. We did change the target once but to do it too regularly would have negative effects on credibility. Since 2006, our inflation target has remained at 5%. We do have an uncertainty band around the inflation target of $\pm\,2\%$. If inflation remains within the target corridor, we do not have to write an accountability letter to the president and parliament. The change in the target is really hard to explain as we saw in our previous experiences. Also, it is the mid-long- term target for the economy, so if you increase it, there could be negative effects on how the economy will evolve in subsequent periods. The central bank does not want to change the inflation target; they just want to fall within the upper bound. After changing the inflation target once, they did not want to do it again.

Sharp Capital Flow Reversals in Turkey are Associated with Large Output Losses. This graph shows the net capital flows and the GDP growth rate. In Turkey, sharp capital flow reversals are mostly associated with large declines in output growth, or deep recessions. For instance, during the 2001 crisis, the cumulative output loss was around 12.3% and around 15.1% during the global financial crisis in 2008–09. This graph clearly illustrates the structural vulnerabilities in the Turkish economy. The savings are insufficient to handle the investment expenditures, so Turkey needs external finance. Therefore, if there is a sudden stop in the capital inflows, we see a sharp recession in the domestic economy (Fig. 9.4).

Rapid Credit Growth and Currency Appreciation after Quantitative Easing. After the global financial crisis, there were huge capital flows to emerging markets, including Turkey. This was reflected in credit growth and also in the exchange rate. Figure 9.5 shows total loan growth in Turkey since the GFC. From the beginning of QE by the Federal Reserve, credit growth started to increase, reaching around 45% (yoy) by 2010. Figure 9.6 shows the real exchange rate, with 20% appreciation in one year after QE policy.

Sharp Widening in the Current Account Deficit, Financed with Short-Term Inflows. This surge in capital inflow also showed itself in the current account deficit. The current account deficit in Turkey increased to around 7% of GDP in that period. The current account deficit was mostly financed by short-term capital inflows. On the right graph, the red bars show portfolio and short-term flows. Most of the current account deficit was financed by unstable portfolio and short-term flows. In our history, we know that if there is a sudden reversal of capital flows, we will see a rapid contraction in the economy. This is not the case only in Turkey but for all emerging markets. Somebody needed to do something under these conditions. At that point, the central
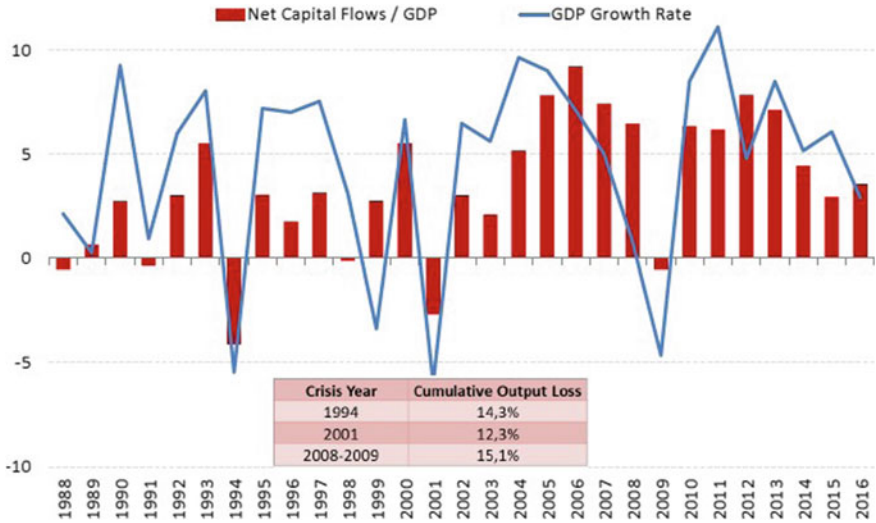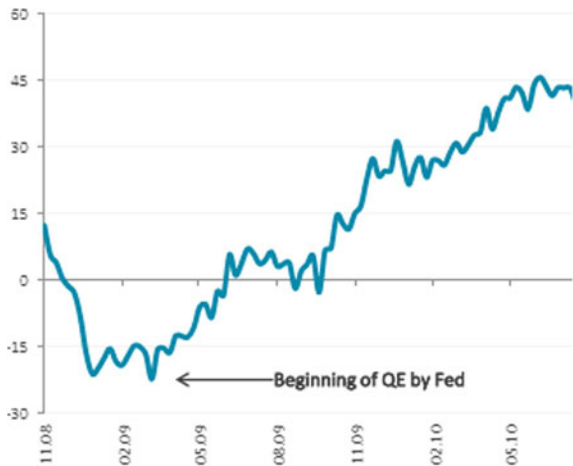
Crisis Year	Cumulative Output Loss
1994	14,3%
2001	12,3%
2008-2009	15,1%

Fig. 9.4 Turkey: capital flows. *Source* CBRT, TURKSTAT

Fig. 9.5 Turkey: total loans growth (13 weeks moving average, annualized, FX adjusted, percent). *Source* CBRT

bank was implementing full-fledged inflation targeting with the interest rate as the policy tool. There are also some other institutions in the economy, such as banking supervisory and regulatory institutions. They do not have a macro perspective. They were doing microprudential activities at the individual bank level. They were looking at the individual bank's health without a macro perspective. If you look at bank-level credit growth or other variables, it seemed like there was no problem but from a macro perspective, it revealed a large current account deficit, a huge increase in credit growth and real currency appreciation, so there were some risks at the macro level.

Fig. 9.6 Turkey: real
exchange rate (2003 = 100)
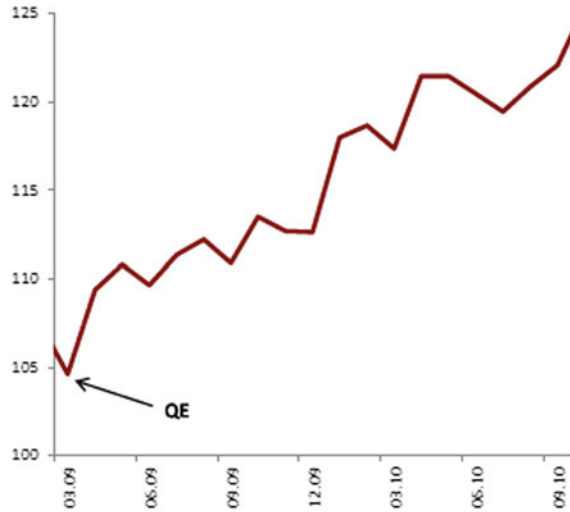
Consequently, some institutions needed to take some steps to contain the macro-financial risks. Therefore, the Central Bank of Turkey took the first step to contain the macro-financial risks.

Monetary Policy Framework

Inflation Targeting (IT). First, the central bank had a conventional inflation targeting framework. In that framework the objective was price stability and the policy tool was the policy rate.

Monetary Policy Framework: Financial Stability Augmented IT. To contain the macro-financial risks, the central bank of Turkey changed its monetary policy framework by incorporating financial stability into the inflation targeting framework. Financial stability became one of the concerns of the central bank, while price stability remained the main objective. Since the central bank now had multiple objectives, it expanded its policy toolkit to include reserve requirement ratios and an interest rate corridor as additional policy tools.

Amplifying Effect of Capital Flows were Contained. The aim of these additional policy tools was to contain the adverse impact of capital inflows to the economy. The aim of the flexible interest rate corridor was like a capital control to decrease the capital inflows in the economy. The aim of the reserve requirements was to contain high credit growth in the economy. By changing the reserve requirements, the central bank tried to control the impact of capital inflows on credit growth rates.

Using Monetary Policy Tools as Macroprudential Instruments. What did we do with the interest rate corridor? On the graph, there is a corridor around the one-week repo rate, which is the policy rate, represented by the black line. The aim of the corridor was to increase the volatility of short-term interest rates. During the easing of global conditions, the central bank widened the interest rate corridor downwards, which increased the short-term interest rate volatility in order to decrease capital inflows. This could be considered a capital control but the main objective of this policy was to decrease the capital inflows during that period (Fig. 9.7).

In terms of the reserve requirement ratios, before the end of 2010, there was a remuneration on the reserve requirements if the banks were paying interest on the excess reserves. After financial stability was incorporated into the monetary policy framework, the central bank stopped remuneration of the reserve requirements and increased the reserve requirement ratio by almost 10% within one year. The aim of the reserve requirement policy was to contain the increasing credit growth (Fig. 9.8).

Interaction

Participant: How was the transmission to reduce the capital flow by increasing the corridor? Usually, central banks want to make the overnight rate consistent with the policy rate. Can you explain more about how the volatility reduced capital flows? Was it through the risk channel?

Speaker: The central bank widened the interest rate corridor download, which increased the volatility in the interest rate. You are right, the interest rate was not close to the policy rate but for the central bank, the important thing was to stop the capital inflows.
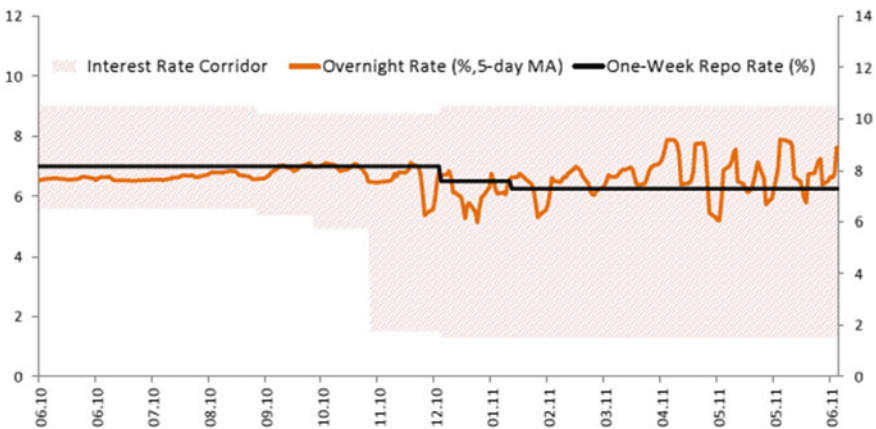

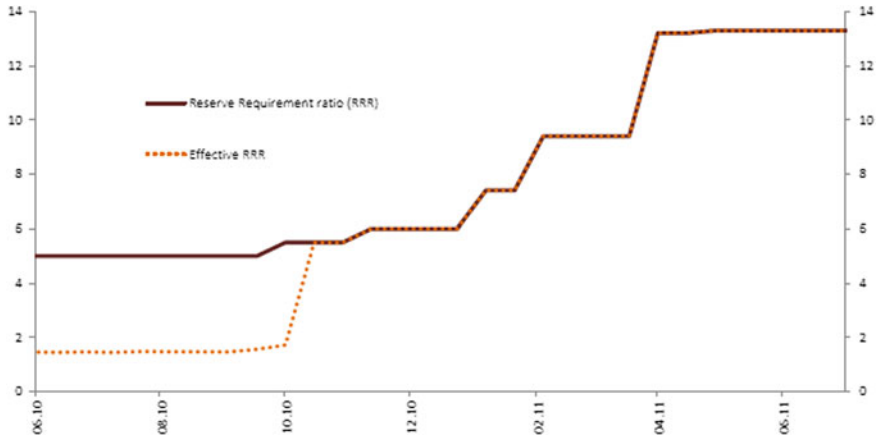**Fig. 9.7** Turkey: interest rate corridor. *Source* CBRT

Fig. 9.8 Turkey: reserve requirement ratios. *Source* CBRT

	You should not think about policy transmission, the aim of this interest rate corridor was to stop the capital inflows. The policy instrument increased the uncertainty in the financial markets.
Participant:	What is the roof of the corridor? When we have a corridor, we have a ceiling and a lower bound so the volatility is restricted within that corridor. That is how the volatility is minimized.
Speaker:	The roof of the corridor is flexible not fixed. Sometimes the corridor is wide and other times it is narrow. The width of the corridor was changed as a policy tool.
Participant:	I understand that if you increase the band, the volatility will increase. I do not understand how the transmission of volatility in the one-week repo rate can hold the capital inflows.
Participant:	I do not think the band is increased or decreased frequently as a matter of policy change. When you have a corridor, it means you are restricting the volatility to ensure smooth policy transmission.
Speaker:	You are right, the volatility of the interest rate is within the corridor but when you widen the band through the lower bound, new capital flows will have low interest rates and therefore be less attractive.
Participant:	Why do not you just decrease the policy rate?
Speaker:	If you decrease the policy rate, credit growth will accelerate further. Our aim at the time was also to control credit growth. For that reason, we used the reserve requirement ratios.

Communication Challenges. We implemented new policy tools, such as the reserve requirement ratios and interest rate corridor, but there were some initial communication challenges. During the conventional inflation targeting period before the global financial crisis, monetary policy decisions were communicated mainly through stable overnight interest rates and inflation. Expectations management was more straightforward as well. When we started to implement the new policy tools, we faced some communication challenges, especially within this framework. We had multiple objectives that required multiple instruments. It was hard to attach one objective to one instrument, which was a communication challenge. In addition, there was no clear definition of financial stability. For price stability, there is an inflation rate but for financial stability, there is no clear definition. This was a communication challenge for the macroprudential policies. Another challenge was the transmission channel of the new policy tools. They were new for the economy, so it was very difficult to convince the economic agents about the use of these macroprudential tools. This was another challenge for policy implementation.

Interaction

Participant: How is the independence of the CBRT set up? To whom does the CBRT report and what happens if the targets are not hit?

Speaker: To parliament. If we do not hit our targets, we must draft an accountability letter explaining why the targets were not hit. This is our accountability mechanism. We also regularly present to parliament concerning current economic conditions and developments.

Participant: I just have a quick question about the interest rate corridor. By widening the interest rate corridor, I guess you contain the capital flows, but I was wondering whether or not if there were any other unintentional effects, perhaps on bank funding strategies, for example, or loan pricing.

Speaker: There are some studies showing the banks taking the upper bound of the corridor when pricing their loans. They no longer took the policy rate as the benchmark, they were using the upper bound of the interest rate corridor. Therefore, the interest rate corridor does have an effect on loan pricing.

CBRT took some steps to manage these macro-financial linkages. At the beginning, it was very hard due to the communication challenges and uncertainty about these new policy tools, but it also created some awareness in the other financial institutions about these micro-financial risks. After CBRT took some steps to manage the macro-financial linkages, the other institution started to think the risks in a more macro-financial framework.

Financial Stability Committee (FSC): A Significant Step for a Formal Institutional Framework for MaP

The Financial Stability Committee (FSC) was founded in 2011, consisting of five institutions, namely the CBRT, under secretariat of the Treasury, Banking Regulation and Supervision Agency, Savings Deposit Insurance Fund, and the Capital Markets Board. The aim of the FSC is to enhance information sharing, coordination and cooperation between the institutions. The main duties are to assess the systemic risks, identify necessary measures and make relevant policy recommendations to different institutions in order to increase coordination. The main aim of this committee is to increase coordination between the different financial institutions. The FSC has no decision power or tools, the power rests with the authorities represented in the Committee. Each institution still has its own mandate and responsibility but the Committee has increased coordination between the institutions. After establishment of the Financial Stability Committee, we saw a decline in long-term growth because the Banking Regulation and Supervision Agency took some LTV cap measures. It is very important to have coordination between the institutions to see the impact of macroprudential policy tools.

Broad Objectives of Macroprudential Policy

The broad objectives of macroprudential policies were to increase sustained growth prospects, contain credit growth in household over borrowing, improve the quality of external financing and bolster safety nets against external financial shocks. As I showed you previously, the current account deficit was mainly financed by short-term financial sources so one of the aims of macroprudential policy was to improve the quality of external financing, making it longer term and more stable. Another objective was to dampen the financial amplification channels. The aim of these policies was to decrease the interaction between capital flows, credit and exchange rates.

Why Focus on Credit Growth and Household Borrowing? From the literature and previous crises, credit booms are the most robust and significant predictors of financial crises. Furthermore, periods of strong credit growth are typically followed by periods of sluggish economic activity. This is true not only in Turkey, yet also in many other countries. There are many studies in the literature to support these findings. Specifically, a rise in the household debt to GDP ratio predicts lower output growth over the medium run. The main reason for using these macroprudential tools was to focus on high credit growth and household borrowing in order to contain the adverse impacts of over borrowing and excessive credit growth in the real economy.

Macroprudential Measures to Smooth the Credit Cycle and Contain Household Debt were Implemented Two Major Steps. The first round occurred in 2011, when the Financial Stability Committee was founded. Higher risk weights and provisions were

put on consumer loans along with limits on credit card payments. Most credit card expenditure was for imported goods, so the authorities wanted to put some limits on credit card payments, especially for imported goods. In addition, the authorities also placed an LTV cap for housing loans. In the second round from 2013–2014, the caps and limits were increased, and higher risk weights were puts on credit cards. Maturity restrictions (36 months) were also introduced for uncollateralized consumer loans and an LTV cap was introduced for vehicle loans. Most recently, with the reversal of the global financial cycle, the authorities have reversed the macroprudential measures by eliminating some of the constraints on consumer loans to stimulate the real economy.

What Was Achieved?

The monetary and macroprudential policy mix in Turkey managed to engineer a soft landing and a gradual rebalancing in the economy. Furthermore, the strong link between economic activity and capital flow volatility has declined to some extent. In other words, the amplification mechanism has been contained to some extent with the help of these tools. Moreover, establishment of the Financial Stability Committee showed the importance of institutional policy coordination, which has become well understood. Well-targeted countercyclical macroprudential policies have improved the policy trade-offs faced by monetary policy. An efficient macroprudential framework requires policy coordination between different policy institutions. It was also well understood that neither monetary policy nor macroprudential policy can substitute deeper structural reforms. Turkey's vulnerabilities stemmed from structural issues, for instance savings were lower than investment thus necessitating external finance, which exacerbated the amplification mechanism between capital flows and domestic macroeconomic variables. If Turkey could reduce its demand for external financing, the country would become less vulnerable to changes in the global financial cycles. The main objective should be to unwind the vulnerabilities, which cannot be achieved long term through monetary or macroprudential policies. Structural reforms are also required. In addition, one challenge associated with the policy mix is that expectations management is much harder within a multiple-objective and multiple-instrument monetary policy framework. This is complicated further because sometimes the instruments are used in opposing directions.

Interaction

Participant: I am curious about the legal framework in Turkey. Since you added financial stability to your objective, it means you have a dual objective. Was that contained in a central bank law? Does CBRT have a dual mandate?

Speaker:	Legally, our main objective is price stability, but we also take into consideration financial stability. In the central bank law, there is no special role stipulated for financial stability. The Financial Stability Committee mostly decides the macroprudential tools. We only have the reserve requirement ratios and interest rate corridor as tools and, through the FSC, we advise the other financial institutions to apply other macroprudential measures.
	We call it a macroprudential tool. The target is not the price stability objective; the target is the financial stability objective. The banks can also borrow from each other and they also come to the central bank for liquidity because interbank borrowing is insufficient. The financial markets department are using these interest rates while they are providing liquidity to the banking sector. The interbank rate is also within this corridor, which serves as a benchmark for interbank rates. This influences the banks but the aim is primarily to increase short-term interest rate volatility in order to decrease the attractiveness of capital flows. Through auctions, they change short-term interest rates within the corridor in order to decrease the attractiveness of capital flows.
Participant:	What is the current loan-to-value ratio? Has it had an effect on house prices?
Speaker:	I am not sure the current LTV ratio. It has not had an impact on house prices. The impact was on housing loans.
Participant:	How frequently do you change your band? Are the loan rates pegged to the band?
Speaker:	Not immediately. They are changing the amount of the liquidity they provide to the banking system. The banks need central bank funding because interbank funding is insufficient to meet their financial needs. They can change the band at the monthly meetings as well as the width of the corridor. They can change the funding amount to the banking system. They are just changing the amount of liquidity they provide to the banking system. Our policy rate is currently 24% because of a recent shock that triggered a huge increase in inflation. Consequently, we tightened monetary policy. We now operate a fixed corridor without changing the width of the band.

Credit Growth. In terms of what was achieved by the monetary and macroprudential policy mix, this graph shows the change in credit growth. The blue I and II indicate two rounds of macroprudential policy tightening to smooth credit growth. After implementation of two rounds of macroprudential tightening, credit growth

was observed to decline. The aim of the macroprudential tools was to contain the consumer loans. The red line shows the change in consumer loans and the blue line shows the change in commercial loans. The impact was most significant on consumer loans. The aim was to contain the over borrowing of households and we see the impact of these macroprudential tools on consumer loans. On the other hand, commercial loans were largely unaffected (Fig. 9.9).

Current Account. In terms of the current account deficit, after implementation of two rounds of macroprudential tightening, we saw a positive impact on the current account. The graph shows a narrower current account deficit after both rounds of macroprudential tightening because we implemented some constraints on the expenditures to imported goods, similar to the consumer loans, as most of the consumer loans are going to imported goods. We saw these implications on the current account deficit as well. I do not have a graph to show how the current account deficit is financed by short-term or long-term sources, but after macroprudential tightening, most of the current account deficit was financed through long- term sources. This was another positive development for the impact of macroprudential tools (Fig. 9.10).

Reserve Requirements were used in Several Dimensions to Improve the Quality of External Finance and Bank Liabilities. To contain credit growth, we also used reserve requirements to increase the quality of external finance. Figure 9.11 shows the change in the reserve requirements for different dimensions. The top-left graph shows Turkish lira and foreign currency reserve requirement measures. We increased both the Turkish lira and foreign currency reserve requirement ratios, but the change in the foreign currency reserve requirement ratio was significantly higher than the Turkish lira reserve requirements. We also differentiated the reserve requirements for core versus non-core foreign currency liabilities of the banks. The top-right
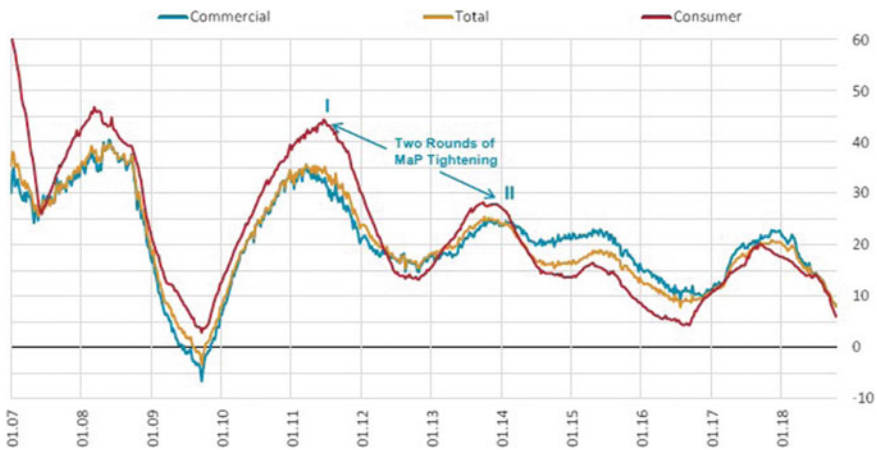

Fig. 9.9 Turkey: consumer and commercial loans (adjusted and exchange rate effect, annual percentage change)
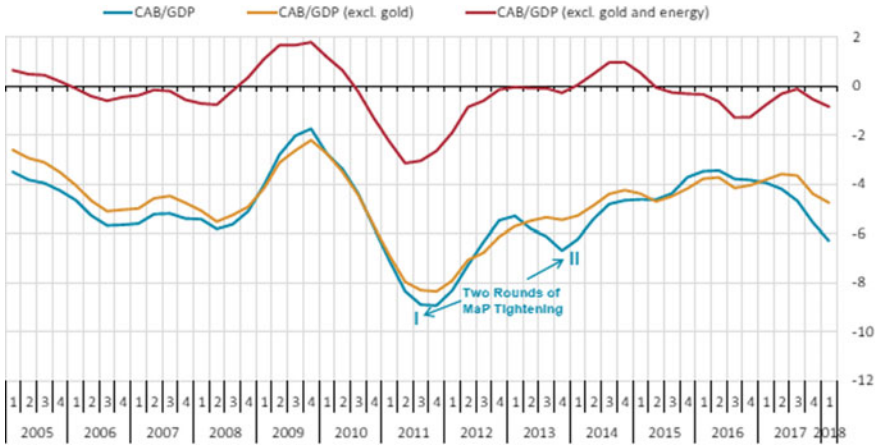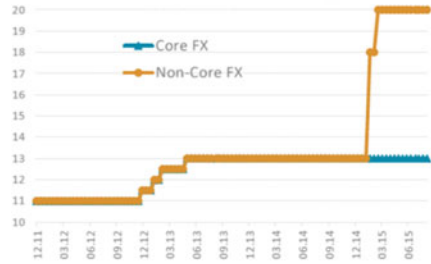
Fig. 9.10 Turkey: current account (12-month cumulative, %GDP). *Source* CBRT
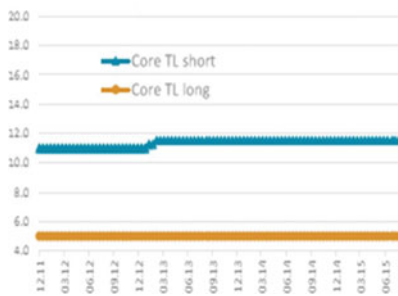
TL vs FX (short term)   Core vs Non-core (FX)
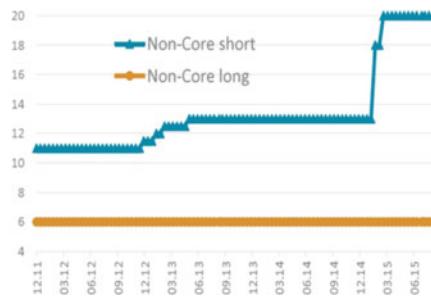

Short vs Long (core)   Short vs Long (non-core)

TL: Turkish Lira; FX: Foreign exchange

Fig. 9.11 Turkey: reserve requirement (based on currency). *Source* CBRT

graph shows the difference between the core and non-core foreign currency liability reserve requirements. For non-core foreign currency liabilities, we implemented higher reserve requirements because we wanted to increase the quality of external finance. CBRT wanted the banks to have more stable funding, so CBRT increased non-core foreign currency liability reserve requirements more substantially than the core foreign currency liabilities. The bottom two graphs show the differentiation between the maturity-based reserve requirement measures. The left panel shows short versus long term core liability reserve requirements. We see no change in the core long-term Turkish lira liabilities. Core means deposits. CBRT wanted the banks to have stable long-term core liabilities so CBRT increased the short-term reserve requirements for core Turkish lira liabilities. The right panel shows the short versus long-term non-core liabilities. We see a similar approach here as well. CBRT wanted the banks to have long-term non-core liabilities to increase the quality of external finance so we see a huge increase in the non-core short- term liabilities of the bank. We see the impact of these different reserve requirements on the banks' foreign currency liabilities.

Maturity of Non-Core Liabilities has Improved. Figure 9.12 shows the maturity composition of foreign currency non-core liabilities. The orange dotted line shows the short-term foreign currency liabilities of the banks. The blue line shows the long-term foreign current liabilities of the banks (more than 3 years) and the red line shows the medium (1–3-year) foreign current liabilities. The measures were taken at the end of 2014 and we subsequently saw a rapid decrease in the share of short-term foreign currency liabilities, while the long and medium-term foreign current liabilities increased after these measures were introduced at the end of 2014.

Average Maturity of Banks' External Liabilities has increased Considerably. The average maturity of the bank's external liabilities increased considerably after the measures were introduced at the end of 2014. We saw some implications on the
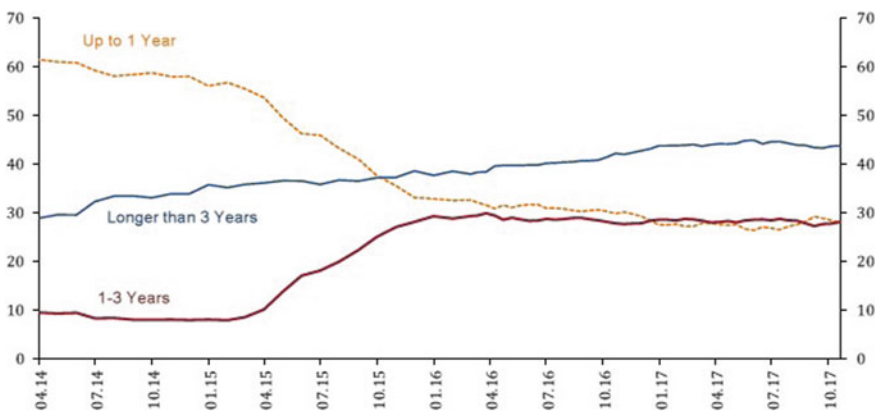

Fig. 9.12 Turkey: maturity composition of FX non-core liabilities (percentage share). *Source* CBRT
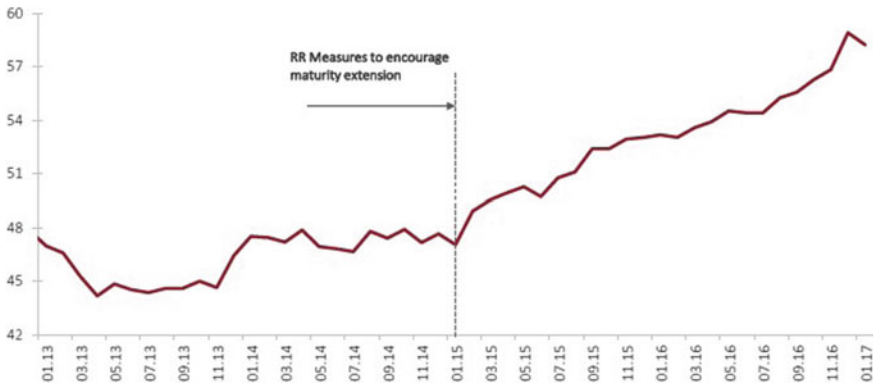
Fig. 9.13 Turkey: average maturity of non-core FX liabilities (months). *Source* CBRT; CMB; PDP

quality of the external finance through such differentiation in the reserve requirement measures (Fig. 9.13).

Recent Developments in Turkey[1]

Reversal of the Global Financial Cycle

The Turkish economy has been hit by a series of adverse events in recent years, including escalating geopolitical uncertainties, tighter global financial conditions, rising protectionism, higher oil prices and a deterioration in bilateral relationships with some of Turkey's traditional partners. The Federal Reserve has stopped quantitative easing policy and started to normalize monetary policy, which has led to a reversal of the global financial cycle. The series of adverse events have led to a further deterioration in risk sentiment, weaker external flows and exchange rate depreciation pressures. There has also been a huge sell-off of Turkish assets.

Relative Value of Turkish Lira. The blue line shows the value of the Turkish lira, the orange line is the average value of emerging economies' currencies and the red line shows the relative value of the Turkish lira. In 2017, there has been a huge depreciation of the Turkish lira due to a series of adverse events. During the few months from May to August 2018, the Turkish lira depreciated by almost 50% before subsequently rebounding. There was huge uncertainty during that period and we see the implications of that in the exchange rate, while other emerging markets enjoyed more stable exchange rates (Fig. 9.14).
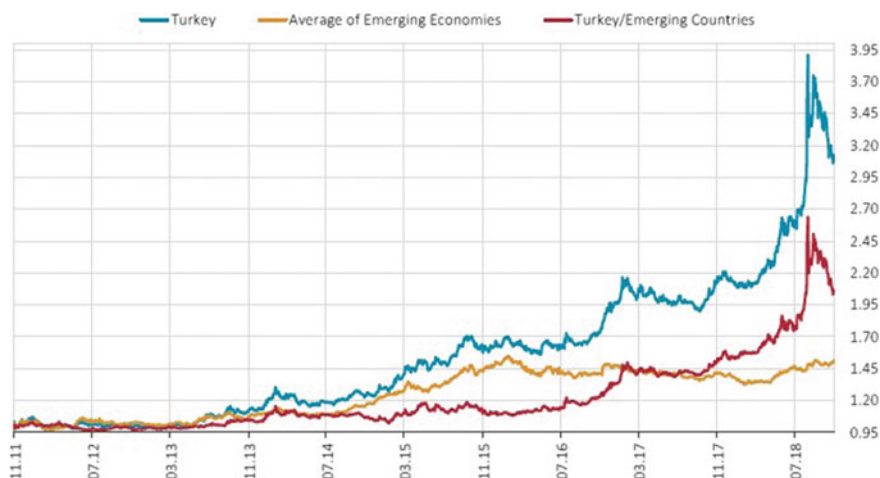
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[1] Up Until 2018.

Fig. 9.14   Turkey: relative performance of Turkish Lira against USD (01.11.2011 = 1). *Source* CBRT

Aggregate Demand. Since financial market uncertainty increased during that period, we also see implications in terms of aggregate demand. Financial market uncertainty and exchange rate uncertainty negatively affected aggregate demand. Banks were also less eager to lend in the uncertain environment, which also undermined aggregate demand.

CPI and Core Inflation. The decrease of aggregate demand also had an impact on inflation. Exchange rate pass-through is very high in Turkey, however, so the exchange rate shock fed through to a huge and rapid increase in inflation. Furthermore, the uncertainty also led to an increase in terms of exchange rate pass-through. The pricing behavior of economic agents was also negatively affected because they did not know what would happen to the domestic currency in the subsequent periods. Therefore, expectation formation and expectation management were also adversely affected during this period of turmoil and we see it reflected in inflation (Fig. 9.15).

Reversal of the Global Financial Cycle and Gradual Normalization of Monetary Policy

CBRT has formulated an integrated approach since 2016 to achieve and maintain low and stable inflation. CBRT has pursued price stability-oriented monetary policy, complemented by simplifying the monetary policy framework. Volatility in the central bank funding rate has been gradually reduced and, as of June 2018, the one-week repo rate was restored as the policy rate of CBRT (a single policy rate) instead of the interest rate corridor. There is still an interest rate corridor but its
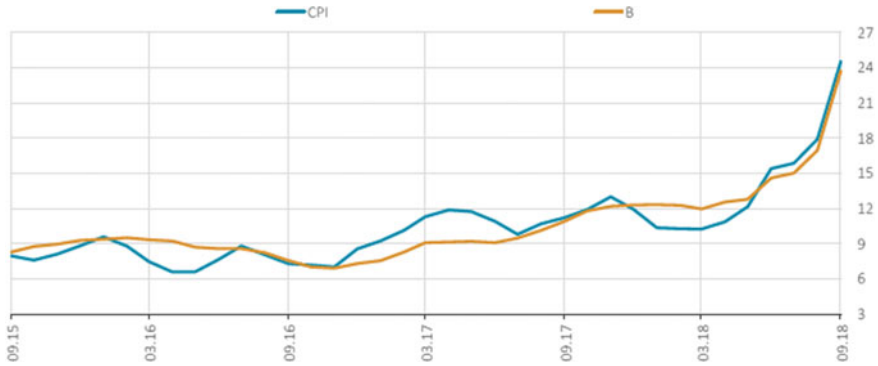
Fig. 9.15 Turkey: CPI and core price index (B) (annual, % change). *Source* CBRT; TURKSTAT

width is fixed. CBRT also identifies structural impediments to disinflation, while promoting a coordinated effort among all relevant institutions to address further challenges, particularly related to changes in global risk sentiment. To minimize the adverse impact of huge uncertainty and exchange rate shocks, CBRT first implemented frontloaded and pre-emptive monetary tightening, which prompted exchange rate appreciation. CBRT also implemented some Turkish lira and foreign currency liquidity measures by easing reserve requirement policies due to huge uncertainty when the banks required liquidity. Therefore, the central bank provided liquidity by easing the reserve requirements for the banks. CBRT also made rediscount credit and swap arrangements due to the uncertainty surrounding foreign currency.

Macroprudential Measures

The Financial Stability Committee has also taken some measures in response to less accommodative global liquidity conditions by reversing macroprudential tightening in terms of consumer loans. The maturity of consumer loans was also increased, while decreasing the limits on consumer loans. The FSC also implemented a two-pillar approach to contain risks emanating from FX borrowing by non-financial corporations. A decree was issued, effective from May 2018, that requires firms with less than a USD15 million credit balance to maintain sufficient foreign currency revenues to meet their current FX debt, targeting SMEs because there was a huge increase of foreign currency in the domestic currency. If a firm had a foreign currency loan after the exchange rate shock, it was very difficult to repay the foreign currency liabilities. For larger non-financial corporations, CBRT implemented more effective balance sheet monitoring. CBRT has been constructing a timely, standardized and detailed database of firms' foreign currency exposures that includes currency and maturity-based foreign currency liabilities and assets. The data is collected on a quarterly basis.
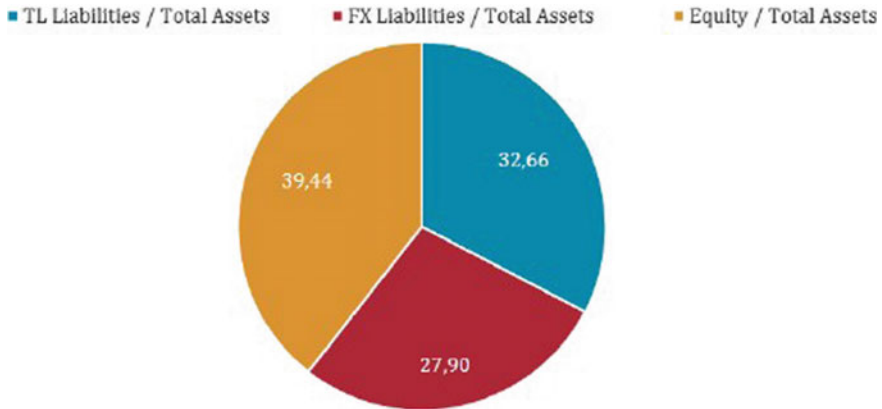
Fig. 9.16 Turkey: indebtedness and leverage ratios of non-financial companies listed on BIST (% share). *Source* FINNET; Public Disclosure Platform

Financial Liabilities of Corporate Sector at Reasonable Levels. The financial liabilities of the corporate sector are now at reasonable levels. Figure 9.16 shows a reasonable level of indebtedness and leverage ratios of non-financial companies listed on BIST.

Released Data Points to a Halt in the Contractionary Trend in the first quarter of 2019. There have been positive signs in terms of credit growth, with data pointing to a halt in the contractionary trend. We saw an increase in credit growth in the first quarter of 2019.

Concluding Remarks

Central banks have a large number of instruments and many tools to deal with spillovers from large capital flows, exchange rate volatility and credit booms but the Turkish experience highlights some challenging aspects regarding policy design, namely to decide which measures would best target the risks at the source in a timely manner without knowing the real transmission mechanism. In addition, macro-financial stability requires multiple instruments to achieve multiple intertwined targets, which necessitates effective coordination amongst policy institutions. Policy actions require a comprehensive perspective from all shareholders to assess potential externalities and avoid possible unintended consequences. Given the highly integrated international financial markets, domestic policy designs need to take into account possible spillovers from changes in external funding conditions.

Interaction

Participant: Is the inflation rate is the impact of Turkish lira depreciation or a supply-side effect? In terms of setting annual economic growth, which institution in Turkey is responsible for setting the annual economic growth target?

Speaker: It is mostly the depreciation of the Turkish lira because the exchange rate pass-through is very high in Turkey and there was huge uncertainty at that time, so the pricing behavior of the economic agents was negatively affected. Therefore, they reflect the rapid change in the exchange rate to prices, not supply-side driven. We can think of it from a supply-side perspective because there are many imported goods in the price index, but it was mostly exchange rate driven. Regarding your second question, the Ministry of Finance publishes a yearly program, setting the growth targets within that program.

Participant: Do you have any special policies to deal with your high current account deficit? In terms of the exchange rate pass- through and large current account deficit, do you have any special policies to deal with that?

Speaker: They are trying to contain the imported expenditures. We use macroprudential tools to control the current account deficit by containing the imported expenditures but we do not have a specific tool. They are working on structural policies to create more value-added exports but we do not have any *special* tools.

Empirical Study

In this session, I will explain some research at CBRT about macroprudential policy implementation. I will discuss some studies on macroprudential policy implementation in Turkey. The first paper I will present is about global liquidity and the impairment of local monetary policy transmission. It tries to understand why we need macroprudential policies and the impact of global liquidity conditions on domestic monetary policy transmission. The second paper I will present is about the transmission mechanism of reserve requirement ratios. The title of the paper is Reserve Requirements, Liquidity Risk and Bank Lending Behaviour. The last paper is about systemic externalities due to risky foreign currency loans, which explores the impact of risky foreign currency borrowing on the banks' lending behavior after a currency depreciation shock. The name of the paper is Foreign Currency Risk, Systemic Externalities and Real Effects.

Why Turkey?

Turkey has been quite active in its use of macroprudential policies in recent years, applying a wide range of tools to impose restrictions on both borrowers and financial institutions. The design and implementation of the macroprudential policy framework in Turkey reflects a purely emerging economy perspective, where special emphasis has been given to the role of capital flows.

Global Liquidity and the Impairment of Local Monetary Policy Transmission[2]

We are still working on this paper and welcome any comments and feedback. In this paper, our question is how global liquidity conditions impair local monetary policy transmission. This paper is about the interaction of global liquidity conditions, local credit markets and domestic monetary policy. How do global liquidity conditions affect local monetary policy transmission? For instance, the central bank implements a tightening policy by increasing the interest rate in order to tighten economic conditions and increase economic activity. If the global liquidity conditions encourage the banks to borrow from foreign lenders, they will not implement the change in domestic monetary policy to their own loan rates. This leads to a decline in the efficiency of local monetary policy transmission. Therefore, we have tried to understand how these global liquidity conditions impact domestic monetary policy transmission.

Motivation

There has been a dramatic increase in international financial linkages over the last few decades. There is also a large debate in the literature over the ability of local policymakers to steer their domestic financial conditions in the face of huge capital inflows. In this paper, we try to understand to what extent global liquidity conditions affect the strength of domestic monetary policy transmission. We are trying to understand the impact of global liquidity conditions on the bank lending channel of monetary policy. The monetary policy authority sets the policy rate, which the banks take into account in their lending behaviour because an increase in the policy rate increases the banks' funding costs, with implications on credit supply and lending rates. In the literature, there are many papers looking at how banks react differently depending on their ability to insulate their loan portfolios from changes in monetary policy, including bank capital, liquidity and size. Do larger banks with more capital and liquidity react differently to banks with different characteristics? We also

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[2] Fendoglu et al. (2019).

included the global liquidity exposure dimension to these characteristics. A bank is exposed to global liquidity conditions if it has more foreign currency non-core liabilities, such as borrowing from the wholesale market in a foreign currency. We are trying to understand if these banks have different lending behavior compared to less exposed banks after local monetary policy tightening.

We are also looking at the risk-taking channel of monetary policy. By risk-taking channel, we mean that does looser monetary policy encourage commercial banks to extend credit to riskier firms because the easier liquidity conditions help the banks to take more risk. We look at how bank lending and the risk-taking channel may differ for domestic monetary policy in an emerging market economy.

Another motivation for this paper is to understand how global liquidity conditions affect local credit market conditions. We are trying to understand three interactions. Local monetary policy is set and one of the aims is to influence local credit market conditions, but global liquidity conditions have an impact on this transmission mechanism. The mechanism is through carry trade after local monetary policy tightening since the banks that are more exposed to global liquidity are able to borrow more from abroad. If global liquidity conditions are easier, they reflect less the change in the local monetary policy conditions to their loan rates because they are able to borrow more from abroad so they do not require central bank funding. Consequently, local policy tightening will be less effective under these conditions. Since changes in local monetary policy do not have an effect on foreign lending rates, it creates a carry-trade mechanism for the banks, which is the underlying mechanism. Our paper provides sharper identification and inferences for these channels.

Data

We use Credit Registry data from Turkey to answer these questions. Credit registry data is micro-level supervisory data that contains very important information, such as which bank is lending to which firm, how much, at which rates and maturity as well as the collateral of such loans, risk provisions and so on. Credit registry data is very valuable. In the literature, many papers are using credit registry data in their analyses. Credit registry data encompasses the universe of corporate loans granted by all banks operating in Turkey, with unique lender and borrower identifiers, interest rates, loan outstanding, currency of the nomination, maturity, collateral property, cash versus non-cash, loan origination and termination dates and loan risk rating. This is very detailed granular information.

We studied the period from January 2006 to December 2016, looking only at local (domestically-owned) banks, with a sample of 20. We exclude foreign banks from our analysis because foreign banks can borrow from their headquarters if there is a local monetary policy tightening. The impact is seen on locally-owned domestic banks. There are a total of 881,606 firm-month observations. We categorize eight loan types, including domestic versus foreign currency, short (< 1 year) versus long-term, collateralized versus non-collateralized.

Empirical Strategy: Identification

Identification is based on firms that borrow from multiple banks with different levels of reliance on global liquidity. We use the variation in the banks' reliance on global liquidity because different banks have different access to global liquidity. We use this variation in access to global liquidity in our analysis. We look at the impact on similar types of loan, such as the same currency of the nomination or similar maturity and collateral properties. We also explore whether firms switch banks after a local policy tightening. We did this for the robustness analysis.

Empirical Framework

Baseline. The empirical framework in this project was to look at the impact of variations in banks' exposure to global liquidity on their lending behavior. In this regression, the dependent variable is the interest rate on a loan that bank *b* provides to firm *f* with type *a* at time *t*. The important coefficient for us is this interaction coefficient with the change in the domestic monetary policy and the foreign funding ratio of the bank. The foreign funding ratio of the bank is a measure of the bank's exposure to global liquidity. If a bank is more exposed to global liquidity, it has a higher foreign funding ratio. Therefore, we try to understand how these types of bank, that have more access to global liquidity, change their lending rates in response to an increase in the monetary policy rate. We also look at whether banks with a higher foreign funding ratio react differently to other banks. In our regressions, we also have a bunch of controls for domestic economic conditions, such as domestic economic activity indicators, exchange rate and monetary policy rate. We also added a bunch of controls for firms' demand in our regressions.

Global Liquidity versus Transmission. For the impact of global liquidity on transmission, we also added global liquidity indicators into our regressions as an interaction variable. For the global liquidity indicators, we used VIX as a benchmark indicator for global liquidity. An increase in the VIX implies a tightening in global liquidity conditions. We also use the Federal Reserve balance sheet size, US monetary base or the Shadow Federal Funds Rate as global liquidity indicators. We also checked if our results were robust to these alternative global liquidity indicators. The main question that we want to answer is whether easier global liquidity conditions make globally funded local banks set lower loan rates after a domestic monetary policy tightening? And, does it differ for risky and non-risky firms?

Risk-Taking. We also analyze the risk-taking behavior of the banks. We interact the firm risk indicator variable with the foreign funding ratio of the banks and the monetary policy interaction. The firm risk indicator is an indicator variable of whether a firm has defaulted ex-ante on any loan at a bank prior to borrowing at time *t*. Our hypothesis is that banks with a higher degree of reliance on global liquidity raise

their lending rates less for ex-ante risky firms following a domestic monetary policy tightening.

In the literature, most papers are looking at the impact of easier monetary policy on risk-taking behavior but in our case, we are looking in an alternative way by observing the impact on bank risk-taking when there is local monetary policy tightening.

In this regression, we also add interactions of monetary policy with other bank controls, such is the size of the bank, the liquidity ratio of the bank and the capital ratio of the bank.

Results

Bank Reliance on Global Liquidity and Transmission. I did not put a results table here, I have only included the benchmark results. The regression results show that banks with higher reliance on global liquidity set their loan rate 29 bps lower than a bank with a lower reliance on global liquidity after a cumulative 100 bps increase in the monetary policy rate (for a given firm). In other words, as domestic monetary policy is tightening, banks are raising their lending rates but if a bank is more exposed to global liquidity and, therefore, able to borrow from a foreign bank or financial market, it would raise its lending rate less than a bank with less borrowing from abroad. That is the baseline result. The table shows the interaction coefficients for different bank characteristics. From the table, the most important bank characteristic is the foreign funding ratio. The impact of other bank characteristics is insignificant and the economic impact is less than the foreign funding ratio.

Global Liquidity versus Transmission. Is the banks' planning behavior different under different liquidity conditions? From the triple interaction, we see that when log(VIX) is lower, namely that global liquidity conditions are easier, banks with higher reliance on global liquidity raise their loan rates by 36 bps less than banks with a lower reliance after a cumulative 100 bps increase in the domestic monetary policy rate (for a given firm). From the table, we see the impact of policy tightening on the loan rate is highest in terms of the foreign funding ratio under different global liquidity conditions.

Bank Reliance on Global Liquidity and Risk-Taking. For a given ex-ante risky firm, banks with higher reliance on global liquidity raise their loan rate by 10 bps less than a bank with lower reliance, after a cumulative 100 bps increase in the monetary policy rate. This means that if a bank is more able to borrow from abroad, it will show more risk-taking behavior after local monetary policy tightening because the bank has greater access to foreign funds so it can take more risk and lend more to riskier firms.

This effect is higher when global liquidity conditions are easier. When log(VIX) is lower by one standard deviation, banks with higher reliance on global liquidity raise their loan rate to a risky firm by 40 bps less and to a riskless firm by 35 bps less compared to banks with a lower reliance, after a cumulative 100 bps increase in the domestic monetary policy rate. A risky firm means a firm that has previously

defaulted on a loan. If global liquidity conditions are easier, banks behave with risky and riskless firms in a similar way. Easier global liquidity conditions exacerbate this behavior.

Interaction

Participant: Concerning the regression itself, I see that you take up to 3-month lags. What is the reason for this? Foreign funding is a binary variable? Is it continuous? You have presented it as high versus low so I am wondering if there was a threshold?

Speaker: The data is monthly and the impact is quarterly, so there is a 3-month lag. Foreign funding is a bank characteristic, expressed as a function of non-core liabilities to total liabilities. It is a continuous variable, changing over time. There is no threshold, it is continuous over time.

Mechanism: Data (Carry Trade)

Regarding the mechanism, we showed that banks exposed more to global liquidity conditions set lower rates compared to less exposed banks after a local monetary policy tightening because they are able to borrow more from abroad. We showed that banks with more exposure to global liquidity conditions tend to borrow more after a local monetary policy tightening. To show this mechanism, we use a different database showing cross-border lending through micro-level data. In the database, we see which local bank is borrowing from which foreign bank in which currency as well as the amount and so on. We use this dataset to see whether after a local monetary policy tightening, the banks with ex ante more exposure to global liquidity borrow more. In this dataset, we also see the jurisdiction in which the foreign bank is located as well as its headquarters. We control this information in our analysis to control for the supply side. We ran a regression to see how these banks with a high foreign funding ratio change their cross-border borrowing after a local monetary policy tightening. We added the interaction between local monetary policy and the foreign funding ratio of the bank with a bunch of controls for the supply side. The dependent variable is quarterly change in the logarithm of domestic bank b's volume of (or the cross-border interest rate on) borrowing in currency c from the global bank subsidiary g whose headquarters is in country h. The question we want to ask from this regression is whether domestic banks *demand* more funds from abroad after a local policy tightening?

Our regression showed that following domestic monetary policy tightening, local banks with higher foreign funding borrow (demand) more funds from abroad. Since we do not have any impact on foreign interest rates, after a local monetary policy tightening, the banks have a relatively lower interest rate for foreign funding, which

creates a carry trade mechanism for the banks. Consequently, as the local monetary policy tightening does not have any impact on foreign interest rates, which leads to carry trade, the banks borrow more from abroad after a local monetary policy tightening.

Conclusion

Our paper shows that easier global liquidity strongly attenuates the transmission of a tightening of local monetary policy rates on bank loan rates. This creates looser credit standards for banks with higher reliance on global liquidity. In terms of the risk-taking channel, we found that globally funded local banks set lower rates for ex-ante risky firms following a local policy tightening. The main mechanism of these results is the carry trade, with globally funded local banks borrowing more from abroad after policy tightening. This demonstrates a need for macroprudential policy actions to enhance monetary policy transmission because the banks that are more exposed to global liquidity conditions do not reflect the change in the domestic monetary policy. Therefore, to increase the effectiveness of local monetary policy transmission, we need macroprudential actions. When we extrapolated the results to when global liquidity cycles and domestic monetary policy are synchronized, the results became insignificant. We see that macroprudential tools help to strengthen monetary policy transmission when global liquidity conditions are easier. This provides positive evidence for the use of macroprudential tools when the global liquidity cycle is stronger to enhance local monetary policy conditions.

Interaction

Participant: You said that carry trade increases when the VIX increases. Intuitively, it should not be like that. It should be more correlated with LIBOR or the bond market. It seems to me that the foreign banks are somehow going into the derivative market to get the loans. Maybe you could share how macroprudential policy actions would help in this case.

Speaker: The derivative markets are off-balance sheet items so this could not be explored.

Participant: I think this is great research and a very interesting presentation. You are using very big panel data with millions of variables for the estimation. There is an assumption, however, of symmetry between monetary policy tightening and loosening. I feel there is some differences between the two and perhaps you could separate monetary policy tightening and loosening.

Speaker: I agree, we need to check if there is an asymmetric effect of local monetary policy tightening and loosening and what the impact

Participant: is of global liquidity conditions on the easing and tightening of domestic monetary policy.

Participant: Are there any bank regulations to hedge against foreign funding? Do you also differentiate between the type of ownership of the bank, for example foreign banks or local banks?

Speaker: There are some regulations. If there is an open FX position (more FX liabilities than FX assets) on the balance sheet, the bank is required to hedge using off-balance sheet items, such as derivatives or swaps. Furthermore, the open FX position must not exceed a certain threshold of the bank's equities. There is a regulation that the open FX position has to be less than 5% of total equity. In Turkey, we have many foreign and state-owned banks but in this analysis we only used locally-owned banks and state-owned banks, the foreign banks were excluded from our research.

Participant: Do you know how your results compare with the literature in terms of what you found and the coefficients?

Speaker: There are no papers that look at the impact of foreign funding ratios on local monetary policy tightening but there are other papers that look at other bank characteristics, such as size, capital and so on, which we also included in our regressions. We do have results consistent with the existing literature on those kinds of bank characteristics.

Participant: You only look at the Federal Reserve's balance sheet. Is that because most of the funding comes from the United States and not from Europe? Could you perhaps look at the ECB's balance sheet? What would happen to your results using the ECB's balance sheet? I am not sure of the characteristics of where the funding comes from.

Speaker: We used these measures of global liquidity indicators because they are the most commonly used indicators in the literature. The Federal Reserve's balance sheet is the main driver of global liquidity and also US monetary policy is the same. We just followed the literature. You are right though, nowadays the ECB is still implementing QE policy, whereas the US Federal Reserve has already stopped. Our sample ends at the end of 2016, so for now it is okay but we should take into account other advanced economies' balance sheets as well.

Participant: Have you included Islamic banks as well?

Speaker: We did not include Islamic banks because they have a different structure.

Table 9.1 A hike in the reserve requirement ratio and bank balance sheet

Before a hike in RR		After a hike in RR	
Assets	Liabilities	Assets	Liabilities
Loan: 90	Deposits: 100	Loan: 90	Deposits: 100
Unencumbered securities: 10	Repo: 0	Unencumbered securities: 5	Repo: 5
Encumbered securities: 0		Encumbered securities: 5	
Reserves: 0		Reserves: 5	

Source Alper et al. (2018)

Reserve Requirements, Liquidity Risk and Bank Lending Behavior[3]

The second paper is about reserve requirements, liquidity risk and bank lending behavior, published last year in the Journal of Money, Credit and Banking. I would like to briefly explain their findings.

Motivation

Following the global financial crisis, the size and volatility of capital flows into emerging market economies have increased substantially. This has created financial and macroeconomic stability challenges for emerging market economies, such as keeping policy rates at low levels in order to avoid excessive appreciation of domestic currencies, while engaging in macroprudential tightening to curb rapid credit growth. Therefore, reserve requirements have been one of the most commonly used tools among unconventional monetary policy instruments. This paper looks at the empirical evidence for the transmission channels of reserve requirements, identifying a new channel (liquidity channel), which works through the availability of liquid assets.

Table 9.1 shows an example balance sheet of a bank, showing the impact of a change in the reserve requirements. Before an increase in the reserve requirement, on the asset side, we suppose the bank has a loan of 90 Turkish lira and 10 unencumbered securities. Therefore, the total assets of the bank is equal to 100. On the liability side, the bank has deposits totaling 100 Turkish lira. After the change in reserve requirements, however, the bank maintains deposits totaling 100 Turkish lira but the bank must meet the increase in the reserve requirement by increasing repos to 5 because it was unable to immediately increase its deposits. By increasing the repos, the securities portfolio changed, with unencumbered securities decreasing to 5 and encumbered securities increasing to 5. In addition, the reserves also increased to 5. Consequently, the asset side of the balance sheet has increased from 100 to 105. Since the bank could not immediately change its loan- lending behavior, it changed

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[3] Alper et al. (2018).

its funding from the central bank to finance the additional financing needs of the hike in the reserve requirement. Therefore, the change in the repo part necessitates a change in the portfolio of securities. The bank decreased its unencumbered securities because they need to pledge some of their securities to be able to fund themselves from the central bank because they are using the securities as a guarantee, while they are funding themselves from the central bank. To fund themselves more from the central bank, they decrease their unencumbered securities and increase their income securities. In this study, the bank liquidity measure is calculated as the ratio of unencumbered government securities as a fraction of total liabilities. A bank with a higher liquidity ratio can handle changes in the reserve requirements by pledging their unencumbered government securities. The liquidity channel that the researchers are trying to understand is a hike in the reserve requirement, leading to more bank borrowing from the central bank by pledging collateral, which declines the liquid assets ratio of the banking system and the banks would subsequently tighten their lending behavior.

Liquidity Channel: Reserve Requirements and Funding from CBRT

The mechanism works in this way. This graph shows short-term funding from the central bank as a share of total liabilities as a black line and the reserve requirements held by banks as a share of total liabilities as a dotted line. From the graph, it is clear that after the reserve requirement ratio was increased, bank funding from the central bank also increases. Banks increase their funding from the central bank after reserve requirements are increased.

Liquidity Channel: Liquid Assets, Reserve Requirements and New Loans

We also see that the securities held by the banks decreased after the reserve requirements have been increased. The dotted line shows reserve requirements as a share of total liabilities, the dashed line shows new loans as a share of total liabilities and the solid black line shows securities as a share of total liabilities. After the reserve requirements were increased, banks held fewer securities on their balance sheets, pledging them to collateral, and also decreased new loans.

Liquidity Channel

According to the liquidity channel theory, deposits and central bank borrowing are assumed to be imperfect substitutes but most studies in the literature assume they are perfect substitutes. The researchers assume deposits and central bank borrowing

are imperfect substitutes because central bank borrowing/funding contains interest rate risk due to its short-term nature that is subject to changes in monetary policy. A tightening of local monetary policy would increase the funding cost, therefore, but if the bank holds deposits, the interest rate is predetermined and not as sensitive as funding from the central bank. The bulk of the existing literature not only assumes perfect substitutability but considers the transmission mechanism of reserve requirements through the traditional cost channel, namely that an increase in the reserve requirements represents an additional tax on deposits. On the other hand, the liquidity channel takes into account the composition of the securities of the banks as an impact of changes in the reserve requirement.

Data

Bank-level data is used for the sample period from June 2010, when macroprudential policy tools were first used, until December 2015. The researchers use the ratio of required reserves maintained with the CBRT against banks' deposits and other selected liabilities. The paper looks at the impact of Turkish lira (TL) denominated loan rates, with the impact on commercial and consumer loan rates explored separately). The central bank primarily used the reserve requirements for TL-denominated liabilities for countercyclical purposes. The liquidity ratio was calculated from the total securities held by bank i as a fraction of its total TL liabilities.

Empirical Analysis

They ran several regressions at the bank level. The dependent variable is the interest rate on commercial or consumer loans of bank i in month t. The explanatory variables on the right-hand side are the lagged loan rate, monetary policy rate, central bank overnight lending rate or the average funding rate in month t. The central bank uses an interest rate corridor, so the average funding rate takes into account the differences in the funding cost in this interest rate corridor, while the CBRT overnight lending rate tends to be fixed at the upper bound of the interest rate corridor. Another explanatory variable is the monthly percentage change in the USD/TL exchange rate. The authors control for changes in the exchange rate. In order to test the liquidity channel, the authors add interactions of the bank liquidity ratio with the reserve requirement ratios. If a bank is more liquid, with a higher liquidity ratio, it would be less affected by changes in the reserve requirement ratios. To understand this impact, the authors also added interactions between the bank liquidity ratio and the reserve requirement ratios.

Results

Regarding commercial loan rates, columns 1–4, the overnight lending rate has a positive impact on commercial loan rates. When there is an increase in the central bank's overnight lending rate, namely when there is an increase in the upper bound of the interest-rate corridor, commercial loan rates tend to increase. For the reserve requirement ratios, we see that when there is an increase in the reserve requirement ratios, commercial loan rates tend to increase for these types of banks. If there was perfect substitutability between central bank funding and deposits, the reserve requirements would not be significant, but we see a positive and significant coefficient for the reserve requirements in these regressions.

Liquidity Channel. In terms of the liquidity channel, the authors also interact the reserve requirement ratio with the liquidity ratio of the bank. We see in Column 3 that the reserve requirement still has a positive impact with a negative coefficient for the interaction variable. This means that for a given increase in the reserve requirement ratio, if a bank has a higher liquidity ratio, its increase in the lending rate will be less. If a bank has higher liquid assets, it will be more able to handle a short-term increase in the reserve requirement ratios. Therefore, the impact on its lending rates will be less. The final two columns show the impact on the consumer loan rate and deposit rate. For the consumer loan rate, the authors use the average funding rate because there is some research at the central bank that shows the average funding rate is more influential for consumer loan rate pricing. Therefore, the average funding route is used and similar results were found but the liquidity channel is insignificant for the consumer loan rate. For the deposit rate, however, the liquidity channel is significant with a negative coefficient for the deposit rate.

Conclusion

In conclusion, this study explores the interaction between reserve requirements, bank balance sheets and bank lending behavior in the context of Turkey. The authors show that the quantitative policies of the central bank affect lending behavior and the liquidity position of the banking system. The consequent shift in bank liquid assets is associated with a significant change in bank lending behavior. The study found that banks with a stronger liquidity position are less sensitive to changes in RR ratios. Overall, the results lend support to the view that reserve requirements have the potential to be an additional tool for the central banks in emerging market economies to relieve the policy trade-offs posed by the volatility of capital flows.

Foreign Currency Risk, Systemic Externalities and Real Effects[4]

Motivation

Capital flows to emerging market economies may be beneficial by financing productive investment and fostering financial deepening but may also sow the seed of financial vulnerabilities in the event of a sudden reversal through financial integration, and especially after the Asian financial crisis, we see excessive foreign currency borrowing as well as real consequences in the economy. This paper tries to understand the systemic externalities due to foreign currency risk. We look at a period of sharp depreciation, after which hedged borrowers are unable to service their foreign currency debt. This will adversely impact the banks' capacity to lend, while simultaneously negatively impacting the firms. Even if they do not have any foreign currency liabilities, the banks will no longer be able to provide loans as their foreign currency borrowers are unable to repay the loan, thus undermining bank lending capacity. Risky foreign currency lending has received attention within policy circles. Several chapters of the IMF Global Financial Stability Report are dedicated to risky foreign currency lending. The European Systemic Risk Board has also pointed out several risks associated with foreign currency lending, especially in Hungary where there is a huge amount of foreign currency lending. The research provides well identified, micro-level evidence for this mechanism.

Figure 9.17 shows what the paper is trying to understand. The green nodes show healthy institutions and red nodes indicate unhealthy institutions. A risky foreign exchange borrower does not take into account that its risky borrowing may adversely affect other borrowers through banks after a sharp exchange rate depreciation and similarly, for a bank lending to risky firms. This provides a basis for the use of FX-related macroprudential policies.

Our Question

Do systemic externalities due to risky FX loans matter for credit supply dynamics after currency depreciation? The paper uses micro-level data for identification, taken from the Turkish Credit Registry and CBRT Company Accounts database. The paper takes an exogenous and sharp domestic currency depreciation period during the global financial crisis from October 2008 to October 2009. We define a firm as a risky FX borrower if it has more short-term FX credit than exports. The short-term FX credit is a foreign currency liability. As a natural hedge, a firm might have foreign currency assets as exports but if it has more foreign currency liabilities, it will be more exposed to currency depreciation and the firm is said to be riskier. We calculate the weighted average exposure of each bank to risky FX borrowers because we see

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[4] Fendoglu et al. (forthcoming).

Fig. 9.17 Bank's debt structure
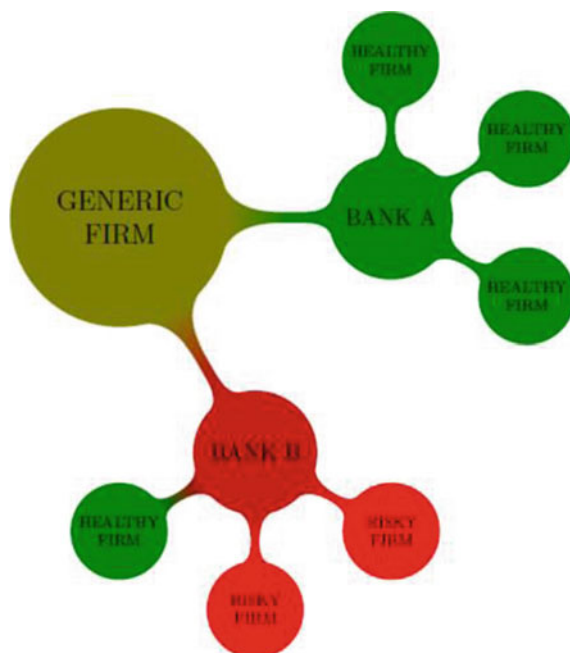
from the credit registry which firm is borrowing from which bank at which maturity and which amount. In this paper, the identification is a given firm borrowing from at least two banks with different ex-ante exposures to risky FX borrowers. Do credit supply dynamics differ across these banks? Banks with more exposure to riskier firms are cutting their loans more after currency depreciation and we are trying to look at differentiation in terms of bank exposure to riskier firms. We also looked for any binding effect at the firm level on bank credit supply because firms can switch between banks.

Data

We use Credit Registry data from Turkey, which contains extensive details on bank-firm loan-type level loan transactions. The sample period is from October 2008 to October 2009, encompassing 60,000 firms and 23 banks (excluding Islamic and development banks, which apply different lending structures). We matched the Credit Registry data with the Company Accounts Database using annual balance sheets and the income statements of a large sample of firms exceeding 10,000 for the period from January 2006 to December 2016. The coverage exceeds 96% of outstanding FX loans in October 2008. We controlled for the banks characteristics in our analysis using the Supervisory Bank Database from the Banking Regulation and Supervision Agency as well as the monthly balance sheets and income statements of banks.

Definition: FX Risk

Firm risk is defined by how much a firm can meet its short-term FX bank credit by its exports. A higher value implies a higher risk firm. Bank exposure to risky FX borrowers is the weighted average of these ratios at the bank level. This means that if a bank is working predominantly with riskier firms, the bank would also be more exposed to the risk of a currency depreciation shock. We calculated bank exposure at the bank level by using the firms' riskiness. Banks that extend more credit to riskier firms are potentially more exposed to a currency depreciation shock. We calculate and measure the shocks ex ante. We will see the impact of a shock by using the ex-ante variation in the banks' exposure to riskier FX borrowers.

Interaction

Participant: How did you define the weight?
Speaker: The weight is defined from the credit registry data, showing which firm is borrowing from which bank. For each firm, we calculate the weight in the bank's loan portfolio multiplied by the firm's riskiness to get a bank level of exposure to risky borrowers.

Empirical Model

How do banks adjust their supply of credit in response to sharp depreciation? Does exposure to risky FX borrowers matter? We ran a regression for our analysis. The dependent variables include the log change in outstanding credit from October 2008-October 2009. The explanatory variable is the exposure to riskier borrowers and we also added some other bank controls, such as non-core FX liabilities, tier-1 capital ratio, liquidity ratio, size, NPL and ROA. If a firm is always borrowing from one type of bank, they may have a different lending relationship, so we controlled for that as well by adding the share of bank b's credit in firm f's total bank credit. As a dependent variable, we also look at lending behavior at the extensive margin. By extensive margin, I mean that the banks that are more exposed to riskier borrowers are giving new loans to new borrowers or new firms or are they terminating their existing relationship? We also look at the impact on this extensive margin behavior of the banks.

Banks working more with ex-ante risky FX borrowers reduce their credit supply more. The dependent variable in this table is the change in the amount of credit from a bank. The explanatory variable is the exposure to risky FX borrowers and the other bank controls. We add some controls one-by-one in each column and the most saturated control is in the last column (6). We see that for the estimations of all regressions, the coefficient of exposure to risky FX borrowers is negative, which means that if a

bank is working with riskier firms, after currency depreciation, such a bank would cut their lending more to an average firm. Even if an average firm does not have any foreign currency loan, through the banking system they will have fewer loans due to the riskier foreign currency lending by the banks.

Ex-ante risky FX borrowers are more likely to default in the future. The banks are cutting their lending to average firms because the riskier firms are unable to pay back their loans. The dependent variable in this table shows the future default as an indicator variable. If a firm defaults on a loan within the next year, it receives a value of 1. No default gives a value of 0. We ran the dependent variables on the firm's characteristics. 'Firm FX Risk' means that the firm has an open FX position. We control for the firm size, age, net worth and exports. We see that if a firm has a higher open FX position, it would be more likely to default within the next year after a currency depreciation shock. Therefore, ex-ante risky FX borrowers are more likely to default in the future.

Banks working more with ex-ante risky FX borrowers have higher NPL later. For that reason, banks working with more ex-ante risky FX borrowers have a higher increase in their respective NPL ratios. The y-axis shows change in the bank NPL ratio and the x-axis shows bank exposure to risky FX borrowers. As a robustness check, we also use a different measure for exposure to risky FX borrowers. In the baseline case, we use the firms' short-term foreign liabilities as a foreign currency liability but for a robustness check, we use total foreign currency credit. For both cases, we see that if a bank is working more with risky firms, after a currency depreciation shock they show a higher increase in their respective NPL ratio.

Banks working more with ex-ante risky FX borrowers are more likely to terminate their relationship with existing clients. This table shows the results at the extensive margin for the amount of loans these banks are giving. The results demonstrate that banks working more with ex-ante risky FX borrowers are more likely to terminate their relationship with existing clients. We could not find any significant impact on the lead lending behavior of these types of banks.

The reduction in bank credit is binding (firm-level). Firm-level regressions showed that the reduction in bank credit is binding because the firms are unable to switch between banks. The declining credit, therefore, is binding at the firm level.

Conclusion

We found some robust evidence for systemic externalities through the banking system following an exchange rate depreciation shock. We saw a binding reduction in overall bank credit supply due to risky FX borrowers and binding financial constraints for firms. The firms are unable to switch from risky to less risky banks. A key insight is that an optimal policy design should pay attention to such externalities/spillovers. Ex-ante prudential policies should make borrowers/lenders internalise such externalities.

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Chapter 10
Reserve Bank of India Policy Mix

Anand Prakash and S. M. Lokare

Abstract With the background of the experience of the Reserve Bank of India (RBI) in implementing policy mix, this chapter will address recent issues and policy trade-offs faced by many economies. Among other issues are focusing on growth versus inflation, the interaction between monetary policy and the external sector, the challenges of liquidity management and the nonbanking sector, monetary policy versus fiscal policy, as well as surplus transfer to the government.

Keywords Policy mix · RBI · Global financial crisis/GFC

Introduction

In the last couple of years, what are the issues that we have been grappling with? What are the policy trade-offs we are facing? This chapter will answer those questions focusing on growth versus inflation, amongst others, along with the interaction between monetary policy and the external sector, the challenges of liquidity management and the nonbanking sector, monetary policy versus fiscal policy as well as surplus transfer to the government. In terms of the special issue on policy mix, I have chosen asset quality because that has been a major issue in recent times in India. I will close with the outlook as well as the key risks I would like to flag going forward.

Like many other central banks, the Reserve Bank of India (RBI) issues currency, acts as a banker to the government and banks and manages foreign exchange as its core functions. The control of credit used to be an RBI function but that is no longer the case. In terms of the non-monetary functions, RBI collects a whole host of information and data on macroeconomic variables that is published on the official website. RBI is also responsible for the regulation and supervision of the banking industry as well as development and promotional activities, such as spreading the institutional reach of the financial network and promoting some social activities.

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Issue 1: Growth Versus Inflation

Monetary Policy Framework: Recent Experience of Flexible Inflation Targeting (FIT)

The monetary policy framework in India has evolved over time. From the 1980s until the late 1990s, RBI applied a monetary targeting approach. After the late 1990s, we used a multiple indicators approach, under which there were basically two objectives: growth and inflation. With the progress of liberalization and globalization, however, financial stability emerged as the explicit objective of the central bank. Presently, what we have is the flexible inflation targeting framework, to which we shifted in 2016 through a legislative amendment. The current objective is to maintain price stability, while keeping in mind the objective of growth. RBI adopted CPI as a nominal anchor, with the target set at $4.0 \pm 2\%$. The interest rate path is set by the MPC, which has three external and three internal members for a total of six members. With this framework, we introduced many changes to the liquidity management framework. We did away with some refinancing schemes. We brought down the statutory liquidity ratio. Then, we implemented the bimonthly policy review cycle and biannual monetary policy report. Throughout its evolution, there has been a continuous rebalancing of weights between the different objectives of monetary policy. More so between growth and inflation. Although we have the primary objective of maintaining price stability, we must also keep in mind the objective of growth. There is always a rebalancing issue.

Why Did RBI Shift to FIT?

Since we are the latest entrant in the club of IT countries, I would like to share why RBI shifted to FIT. In India, there was a long debate about how the inflation targeting framework was not suitable for India's case, precisely because we did not have a single price index for the country. We had four different price indexes because of the vastness of the country and diversity of regions. Second, there was an administered prices mechanism. Many of the agricultural commodities were regulated in terms of prices. This meant that the Government of India announces the minimum support prices of agricultural commodities. Under the IT framework, this would not do. Third, the high share of food in the consumption basket, which is beyond the remit of the central bank's control. Fourth, imperfect markets. This prompted us to shift towards FIT. In terms of India's growth story, between 2003–2004 and 2007–2008, India encountered its highest growth phase, reaching nearly 9% (Fig. 10.1). At the same time, the country went through a phase of low inflation of less than 5% (Fig. 10.2). Post crisis, however, signs of stagflation suddenly appeared, namely low growth coexisting with high inflation. Consequently, RBI began to wonder what was wrong with its policy framework. It was precisely during Raghuram Rajan's time that we set up a committee which deliberated extensively and recommended FIT. At that time,
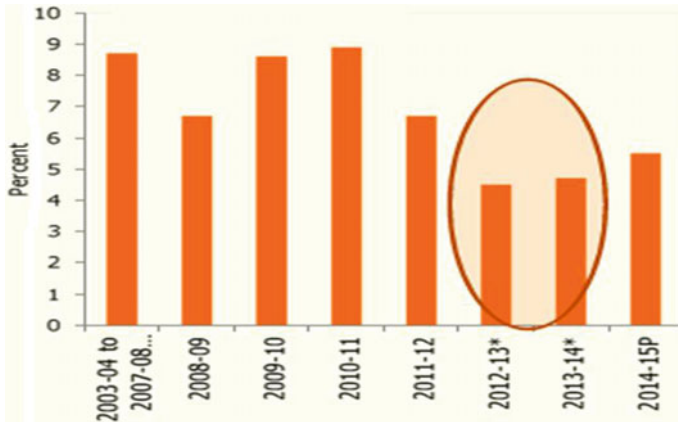
Fig. 10.1 India: GDP. *Source* RBI

Fig. 10.2 India: inflation. *Source* RBI

in 2011, India also launched a single price index, which provided further grounds for the shift towards FIT.

Outcomes Under FIT

We adopted FIT in 2016 and inflation has continuously been brought down since then from close to 11% to just 2.5% now, while India has maintained growth at 7%. This has greatly enhanced the effectiveness and credibility of our monetary policy. This has also enhanced the government's credibility because the government has committed to this target and it is part of this agreement. Therefore, this indicates
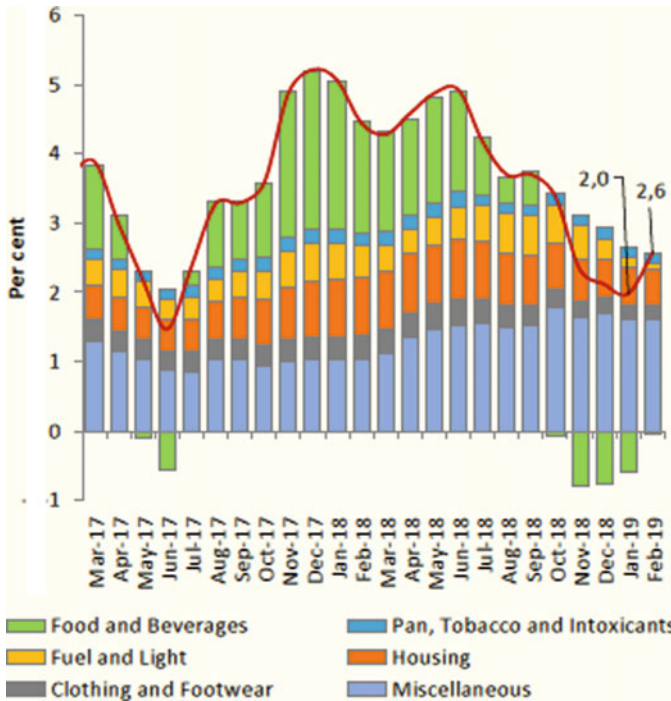
Fig. 10.3 India: contribution to headline CPI inflation. *Source* RBI

government commitment to fiscal prudence and reducing the burden on monetary policy. Food has a high contribution to headline CPI inflation, followed by fuel and light (Fig. 10.3).

Monetary Policy Operating Procedure

This is the corridor we have in India. It is just 50 basis points. We have a single policy instrument, namely the repo rate and our operating target is the weighted average core money rate (WACR). Our liquidity management operations ensure that the core money rate remains closely aligned with the policy rate. Volatility is restricted by the upper and lower bounds. The upper bound is defined by the Marginal Standing Facility (MSF) and the lower bound is defined by the reverse repo rate (floor), which is the reverse repo window through which the Reserve Bank accepts surplus liquidity from the banks. That is always 25 basis points below the policy rate. The Marginal Standing Facility is the facility available for the banks to avail central bank liquidity even as normal operations are taking place. That is 25 basis points above the policy rate.

Issue II: Interaction Between Monetary Policy and External Sector

Liquidity Management

This shows how we have conducted liquidity management. We have many instruments at our command, such as fixed repo, fixed reverse repo and marginal standing facility to manage the frictional liquidity. To manage the structural liquidity, which is long-tender durable liquidity, we have open market operations and the Market Stabilization Scheme (MSS). Just to be clear, we do not use our policy corridor to manage capital flows. It is entirely an instrument of monetary policy. During a phase of high capital flows, however, we have the Market Stabilization Scheme. This is a scheme under which a separate account is opened with the Government of India and government securities are sold or bought and credited to the remaining balance of that account. This means that the Reserve Bank is not bearing the cost of the sterilization operations (Fig. 10.4).

Interaction

Participant: Do you publish the bandwidth to the public?
Speaker: Yes, it is published in every monetary policy report. It is 50 bps;
                 25 bps above and 25 bps below. We recently augmented our
                 liquidity management toolkit with long-term forex swaps. To
                 give long-tenor liquidity to the market participants, we have
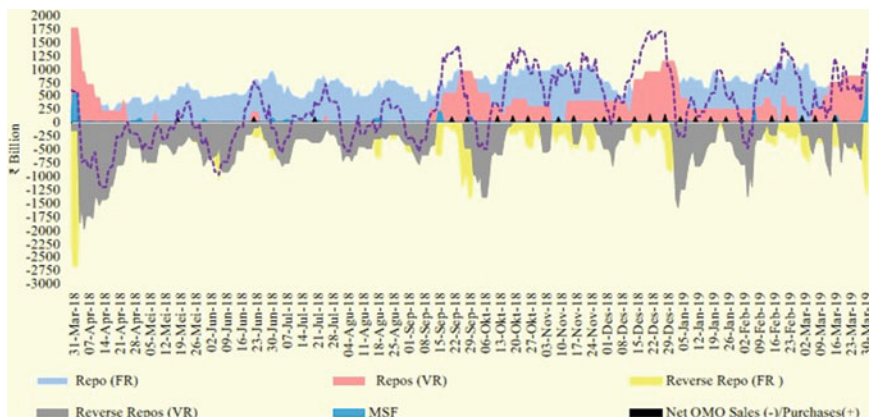

Fig. 10.4   India: monetary instrument. *Source* RBI

entered into forex swaps with the banks for three years. This means that banks will come and give dollars to the Reserve Bank and the Reserve Bank will give rupee liquidity to them. When the banks return to take the dollars, they must pay a swap premium and take back their dollars. We also have a 14-day term repo at a variable rate. Liquidity is provided for 14 days at a variable rate. We also use a reverse repo of varying tenors for fine-tuning purposes.

Before I turn to how our conduct of liquidity management was completed by the external sector, that is capital inflows, let me just tell you briefly about the Southeast Asian crisis. The biggest reason, we believe, for the Southeast Asian crisis was free capital account convertibility. At that time, the IMF was freely advocating capital account convertibility. Most of the Southeast Asian countries rapidly opened up their capital accounts. Suddenly, there were huge capital inflows but, in the process, the capital inflows were short-term in nature, which were susceptible to reversals. When a reversal happened, things came crashing down. In India, however, we went through the capital account liberalization process very cautiously. In India, it was not an event but more of a process and the process was sequenced by macroeconomic fundamentals and the sustainability of the balance of payments. Even today, India's current account is still not fully convertible. There are moderate controls but mostly it is free. FDI is free in most sectors, barring six sectors, and there are some interest rate ceilings on external commercial borrowings. We also have some sectoral caps on foreign institutional investment in government bonds and corporate bonds.

Direct Investment and Portfolio Investment

In 2018, which also includes January 2019, the FDI India received was to the extent of USD29 billion, which was higher than last year if you take into account the latest month. In terms of portfolio investment, however, capital outflows were recorded from India in 2018. This was because of concerns regarding global growth at that time, along with trade war concerns, geopolitical tensions and the rising oil price. Sudden risk-on sentiment made the capital flows go back to their home countries. In 2019, positive portfolio flows returned to India due to the dovish monetary policy stance adopted amongst central banks in advanced economies and improving sentiment (Fig. 10.5). What was the impact of the capital outflows? How did they complicate liquidity management?
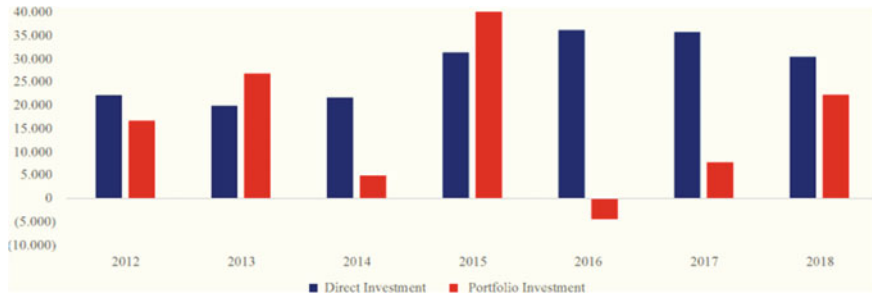
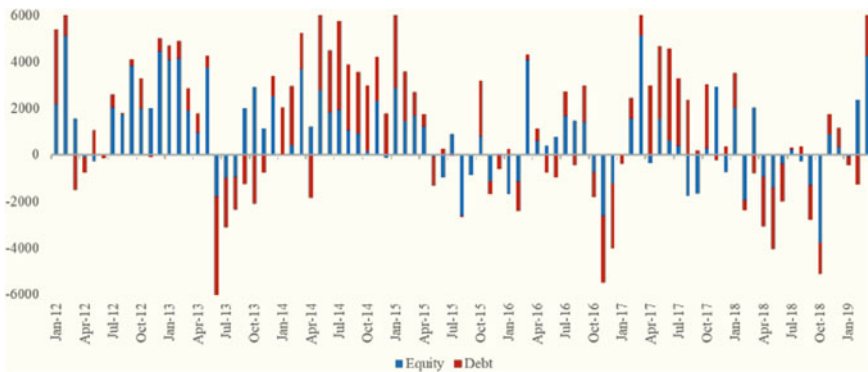**Fig. 10.5**   India: direct and portfolio investment (USD Million). *Source* RBI

Fig. 10.6   India: equity and debt flows (USD Million). *Source* RBI

Equity and Debt Flows

Among the FDI flows, equity was dominant, which is of a stable nature (Fig. 10.6).

Exchange Rate Movement

The Indian rupee came under depreciatory pressures in 2018. When the Indian rupee came under pressure, the Reserve Bank had to intervene in the foreign exchange market. Although the Reserve Bank does not control the exchange rate nor does it have any target for the exchange rate, it does intervene to bring orderly conditions in the market. The Reserve Bank had to give dollars to the market but, at the same time, this operation had to be counterbalanced by providing the liquidity to the market to avoid pressure on interest rates. These operations had to be conducted cautiously and in a calibrated way so that each would not impact the others. Since 2019, the rupiah has appreciated by around 5%, second only to the Turkish lira. Incidentally,

the Indonesian rupiah has been trending on a similar path, which is quite interesting. These are all the current account deficit countries and you can see the surplus countries above.

Interaction

Participant: Do you have any target for exchange rate?
Speaker: We do not have any target for the exchange rate but we do try to minimize the volatility in the foreign exchange market. We try to contain the volatility. If too much volatility is there, it creates problems for the trading community and all sorts of other problems in the economy. Therefore, we try to contain that volatility. There is no target for the volatility. It is a judgment call.

Drivers of Liquidity Management

Due to the operations and controls, the main drivers of liquidity management in 2018 and 2019 were foreign exchange operations and domestic currency in circulation. In the first half, it was foreign exchange operations and in the second half, it was currency in circulation. These were the structural drivers but the frictional liquidity was driven by government spending (Fig. 10.7).
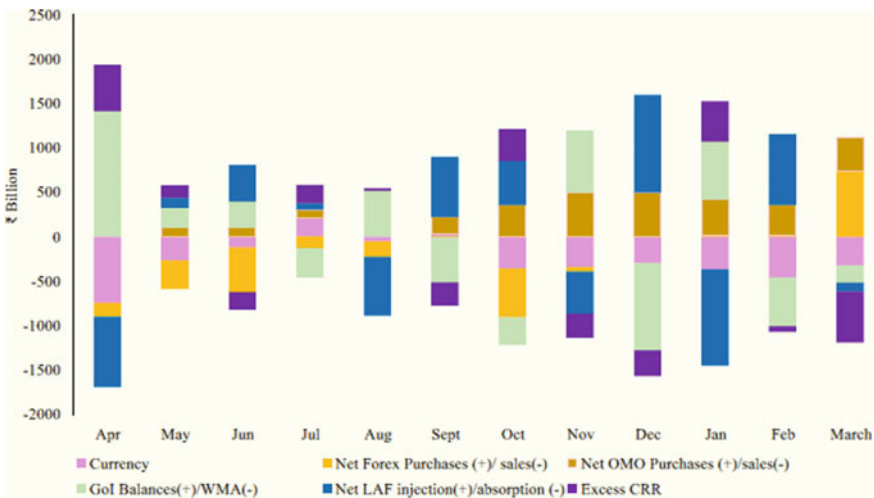

Fig. 10.7   India: drivers of liquidity management. *Source* RBI

Issue III: Liquidity Management Versus Nonbanking Sector

Currently in India, we have more than 10,000 nonbanking financial institutions registered with the Reserve Bank of India. Although they are not very systemically important, they are widespread across the breadth of the country. The exposure to sensitive sectors is low, however. Compared to several commercial banks, nonbanking sector exposure is just around 7%. Recently, some nonbanking financial institutions came under transient pressure due to several issues. Intense pressure was building on the central bank and through the government, demanding liquidity from the central bank, asking for a special window. Based on the quality of assets, the Reserve Bank did not give them any liquidity window. What they did instead was to provide enough liquidity to the other banks so they could on-lend to the nonbanking sector. RBI did relax some norms for the NBFC sector. Earlier, they were given 100% risk weights whenever the banks were lending, but now the banks are given the freedom to take their own ratings as given by the credit rating agencies and lend to the nonbanking financial institutions. These are the challenges that we were facing from the different sectors, from the government and from the external sector in the conduct of liquidity management.

Issue IV: Monetary Policy Versus Fiscal Policy

I would like to address a few things about central bank independence. With the recent adoption of the flexible inflation targeting framework, we have the MPC, which sets the interest rate. We have instrument independence. The Reserve Bank can use any instrument at its command and at its will. The interest rate is set by an independent committee. In Indonesia, the Ministry of Finance first sets the overall macroeconomic policy and the central bank works within that. It is the same case in India. I can recall one of our former governor's statements, "The Reserve Bank is independent within government." It is totally independent in its operations but it has to be subservient to the broad national objectives. Parliament and the government are answerable to the public, so we are subjected to that public mandate.

Government Market Borrowing

In India, the central bank manages the domestic debt of both the central government and the provincial governments. It manages on behalf of the government by raising resources from the market. In recent years, there has been a huge government borrowing program announced by the government. It is the same case with the state governments. Consequently, the huge government borrowing program and the expected slippage in the fiscal target meant the yield remain high in 2019 (Fig. 10.8).
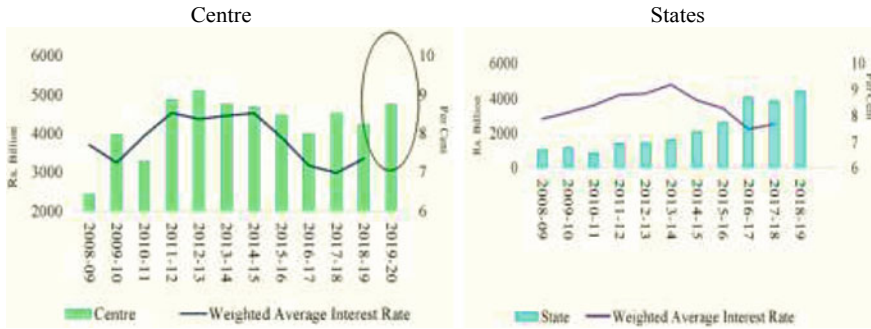
Fig. 10.8 India: government market borrowings. *Source* RBI

Transmission

In 2018, yield also remained high but because of other things. There were concerns at that time regarding the fiscal deficit, oil prices and geopolitical tensions but in 2019, yield continues to remain high. What did this do to our transmission? Here, we had a monetary policy tightening cycle up to 2019 yet since February 2019 we have followed an easing cycle. Here, the Reserve Bank of India reduced its policy rate by 25 basis points but despite the reduction in the policy rate, yield had continued to remain high because of the large government borrowing program. As a result, transmission to bank lending rates, namely the credit market, was very poor and delayed. On fresh rupee loans, the decline in interest rates was just 12% and on outstanding loans, it was just 2%. As a corollary of the government's borrowing program, monetary policy transmission was delayed. It was also clouded by some asset quality concerns but it was largely because of the government borrowing program. As we said, there has to be proper coordination between monetary policy and fiscal policy in India. Largely, it is conducted in coordination and they complement each other (Fig. 10.9).

Issue V: Surplus Transfer to the Government

In the recent past, there has been a debate in India. How much surplus transfer should go to the Government of India? The government is asking for more surplus transfer but the central bank is arguing that it needs enough capital at its disposal. That is the issue we are confronted with now. Why does the central bank need capital?
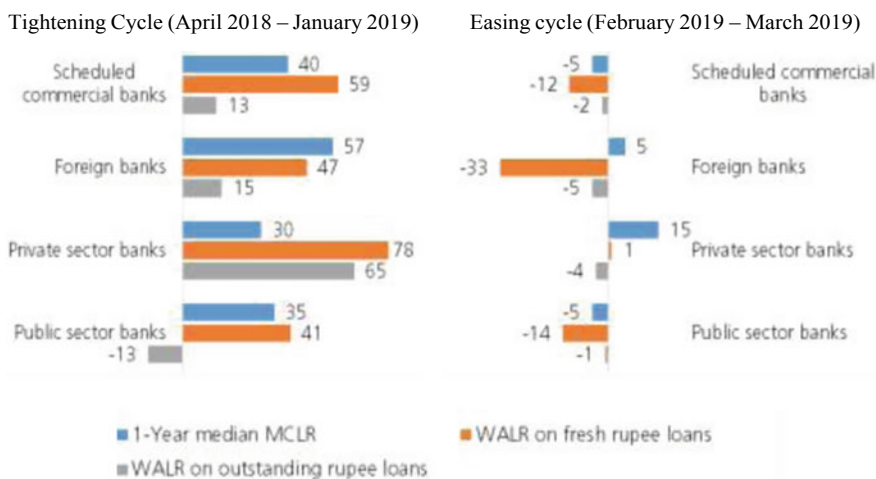
Tightening Cycle (April 2018 – January 2019)   Easing cycle (February 2019 – March 2019)

Fig. 10.9 India: monetary tightening and easing (on lending rates). *Source* RBI

Relevance of Capital for Central Banks

Many central banks have made losses in the past. Indonesia makes an appearance on that list too. In terms of central bank independence, recapitalization by the government may be at the cost of independence. In addition, capital is required to preserve the ability of central banks to conduct public policies that may lead to losses. The last factor is market confidence. The markets should have confidence in the central bank's monetary/exchange rate actions. It is because of these reasons that the central bank has been saying it should have enough provisions. Of course, by statute, the central bank is required to transfer the profits after making provisions for bad and doubtful assets, depreciation and contribution to staff.

After making provisions for doubtful assets plus depreciation plus contribution to staff and subordination funds, whatever remains is supposed to be transferred to the Government of India by statute. Nevertheless, this has been contended by the Reserve Bank of India, which feels it needs contingency reserves and other reserves because the central bank may incur losses due to undertaking risky operations. We are investing in the government securities of other countries and the bonds of international institutions. Between this debates, recently an expert committee has been appointed by the Government and Reserve Bank of India to examine the circumstances under which the central bank would like to hold more provisions and how much transfer it should make to the government. The jury is still out on this issue, but we are confronted with it.

Special Issue: Asset Quality of Indian Banking System

This has been a matter of great concern for us in recent times. Since post-crisis, banks in most countries, including advanced and developing economies, have experienced asset quality impairment. In other words, asset quality has deteriorated. In India, however, it was largely maintained with asset quality largely intact. Since 2012, however, the decline suddenly appeared. Asset quality has started to deteriorate. The situation worsened because before 2008, during the high-growth phase, we had a period of high credit growth (credit boom). During that credit boom period, bankers tended to relax their lending standards, leading to excessive lending. That started showing up in the latter phase and what happened in India around 2012.

Asset Quality Review (AQR)

The Reserve Bank then undertook a major exercise, an asset quality review. Under this review, the Reserve Bank supervised or closely inspected some 36 major banks based on the offsite data available. The Review examined the status of large borrower accounts through analysis of offsite data from the central repository for information on large credits (CRILC) and other data. It revealed significant divergence between the reported levels of impairment and actual positions, namely much higher than the reported levels. The banks had reported one thing, but our rigorous analysis revealed significant divergence between what we found and what was reported.

After the AQR in September 2015, asset quality has deteriorated. GNPA went up from 4% to 8% and 10% in more recent times. When the asset quality started deteriorating, credit growth dropped sharply from around 11% to just 4%. In recent times, however, efforts to resolve the asset quality problems and clean up the balance sheets have restored credit growth (Fig. 10.10).

Regulatory Steps

These are the regulatory steps we took to resolve the asset quality problems. The gist of the regulatory steps is to provide the bank's loan restructuring options and for the banks to come up with a Prompt Corrective Action plan to turn around the distressed entities. Third, converting the unsustainable debt into equity. The regulatory steps are as follows:

Framework on Revitalizing Stressed Assets in the Economy: Early recognition of financial distress, prompt steps for resolution and fair recovery for lenders
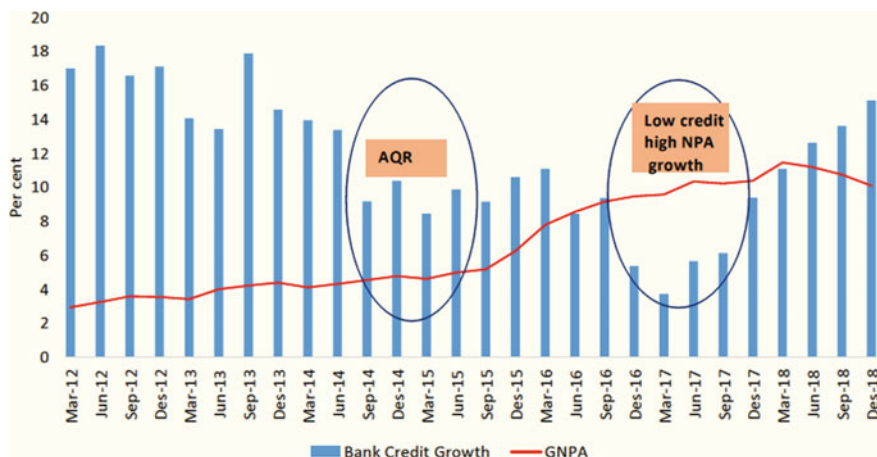
Fig. 10.10   India: NPAs and bank credit. *Source* RBI

- Central Repository of Information on Large Credits (CRILC)—Revision in Reporting
- Flexible Structuring of Long-Term Project Loans
- Strategic Debt Restructuring Scheme
- Scheme for Sustainable Structuring of Stressed Assets (S4A)
- Prompt Corrective Action
- The Insolvency and Bankruptcy Code, 2016.

Restructuring

Providing a longer amortization period for long-term loans and periodic refinancing, for instance, in the case of unstructured loans. Due to the long gestation period, we provided a long amortization period of, say, 24 years, along with periodic refinancing every 3–5 years.

Prompt Corrective Action (PCA)

This was the most debated scheme in India and has been called into question by many lobbying circles. Under this prompt corrective action plan, the Reserve Bank monitors key indicators of commercial banks, including capital, asset quality and profitability. Any breach of risk thresholds, in terms of capital, asset quality and profitability, invokes the PCA framework. Once the PCA framework has been invoked, other restrictions are imposed on the bank. They would not be able to undertake many

operations. A bank will be placed under the PCA framework based on the supervisory assessment made by the RBI. Leverage is also monitored and the key indicators tracked include CRAR/Common Equity Tier I ratio, Net NPA ratio and Return on Assets. The central bank has placed 11 commercial banks under the PCA framework. There were increasing calls from lobbyists that the norms should be relaxed. The government's emphasis is always on increasing credit, but the central bank's emphasis is always on financial stability. It is like boosting credit without regulatory forbearance, with implications on financial stability. This is the ever-present conflict between short-term vs. long-term costs and benefits. The Reserve Bank was aiming for financial stability and regulatory tightening, whereas the government and banking community were asking for forbearance.

Central Repository of Information on Large Credits (CRILC)

The essential objective of CRILC is to enable banks to take informed credit decisions and early recognition of asset quality problems. Meanwhile, CRILC is expected to play a pivotal role in activating and coordinating the mechanism to manage stressed assets. The repository only deals with large credits. It provides all the data in a consolidated form of bank exposure to different borrowers. Furthermore, we have online modules for dissemination of data on non-cooperative borrowers, facility-wise borrower exposure details, select borrowers' asset classification and fraud classified borrowers.

Functionalities in CRILC

We categorize different special mention accounts (SMA) based on these classifications:

- SMA-0: Not overdue for more than 30 days but with incipient signs of stress
- SMA-1: Overdue between 31 and 60 days
- SMA-2: Overdue between 61 and 90 days.

Once an account falls into the second category, it immediately alerts all the banks to be careful about these borrowers. No other bank should be lending to them. Corrective actions are immediately taken.

The Insolvency and Bankruptcy Code 2016

This is another major bank tool we are using in India. For a long time, India did not have any legally enforceable resolution mechanism. In 2016, however, we promulgated the Insolvency and Bankruptcy Code that empowers creditors to deal with the troubled entity's assets. In fact, creditors or banks can now take over the assets of borrowers and they can come up with a resolution plan. This has turned out to be quite an encouraging experience so far. According to the data, this resolution mechanism has been able to provide resolution plans to some of the large corporate debtors. The cases where liquidation has been required are higher than the cases of resolution.

Outlook: India in the World Economy

India continues to be one of or *the* fastest growing economies in the world. It has been there for the last 10 years. Presently, India is going through a period of demographic transition. The portion of the younger population is high in India. If we capitalize on that demographic dividend in terms of developing the infrastructure and imparting the required training and skillsets, India has tremendous potential. India has a sustainable current account deficit of 2.5% of GDP and a relatively moderate fiscal deficit of 3.5%. With such sound macroeconomic fundamentals, India has promising prospects going ahead but, as is the case with other countries, there are risks to us as well.

> **Interaction**
>
> *Participant*: Growth in India has increased compared with conditions last year. In other countries, however, GDP growth is lower. What is the source of the growth in India this year?
>
> *Speaker*: Growth this year has basically been driven by domestic investment. Growth in India is primarily consumption led. There is plenty of untapped demand in India so the growth story is always dominated by domestic consumption. In recent years, however, the investment cycle has fortunately turned around and growth is currently led by investment.

Key Risks Going Forward and Outlook

- Pace of US Fed's rate hikes and balance sheet unwinding, as well as the spill-over effects;
- Financial market volatility, risk-on and risk-off sentiment;
- Trade war concerns between the United States and China;

- Crude Oil Prices—Reversal of trend. So far we have been lucky but who knows when the tide will turn;
- Geopolitical Risks;
- Uncertainty over global growth conditions;
- Uncertainty over Southwest monsoon. India is primarily an agricultural country. The contribution of agriculture to GDP has come down to around 18%. Agriculture is basically driven by the monsoon. It is at the vagaries of the monsoon. That continues to be our concern and the challenge. In our CPI basket, we have a high share of food. If the monsoon turns bad, food prices go up and the inflation target will go;
- High food inflation. This is also a threat for Indonesia; and
- Likely slippage in fiscal deficit target.

Interaction

Participant: There is high demand for loans for the government. The government is demanding too much financing. Fiscal policy is now demand high to finance numerous projects. How does the central bank deal with that? The fiscal budget is very high to finance projects and how does the RBI deal with that? I checked and it seems the biggest problem in India is on the fiscal side. Interest is very high, growth is low and inflation is very high. India is facing something. How about NPL? A recent report has shown an increase in bad loans, which is also an economic indicator.

Speaker: They have their own financing sources. They are raising their own resources from the market. At the same time, the government is also mobilizing resources through the 'Made in India' program. Our current prime minister is very dynamic and has come up with many schemes to mobilize capital from various sources. Although I mentioned the huge borrowing program, our domestic debt is at a very low level compared to other countries.

Non-performing loans are a major problem in India, but they have just started coming down recently because of the regulatory steps we have undertaken. We now have some harsh draconian legislation in place, namely that the banks are fully entitled to acquire your assets the moment you default. Earlier, that was not the case, but the banks have now been given full power through a legislated mandate. The Indian Government is trying with the UK Government to get Vijay Mallya extradited to India because he has defaulted on many things. Recent legislation has given

Participant: these powers. I am just giving an example, this is not to name anybody.

Participant: How is the yield curve of your government bonds? For infrastructure development, we need longer-term government bonds, right? How do you define financial system stability? Do you have a central committee? Is RBI still lender of last resort?

Speaker: In 2018, it had become quite steep but now it has come down a bit because of other domestic factors. In India, it is inflation. Inflation is quite low now; the current account deficit is low and monetary policy is in easing mode so the yield curve is flatter. You are right though, in 2018 the yield curve was quite steep because of global factors, such as crude oil prices, trade war concerns, geopolitical tensions and the US Federal Reserve increased its policy rate. We have a Financial Stability and Development Council in India—in Indonesia, this is shared with the finance minister—but RBI has an important role to play there because we are regulating and supervising the banking system. RBI is still the lender of last resort. There are other stakeholders, including the insurance regulator and stock market regulator, but the Reserve Bank has a major say in financial stability because financial intermediation mainly (80%) takes place in India through the banks, which are regulated and supervised by the Reserve Bank. Actually, the Reserve Bank has more say in terms of financial stability.

Participant: Have you started implementation of International Financial Reporting Standards (IFRS)? For us in Oman, after IFRS implementation, we had an issue of increasing non-performing loans. Is it the same in India due to the changes in the accounting and reporting part? Which sectors in India our expanding currently? Which sector is doing better? If it is the services sector, it is an issue because although it helps India create more jobs it is not as good as manufacturing because manufacturing can give you more FX growth. The services sector provides more jobs.

Speaker: India will begin IFRS implementation shortly. Banks have been given the models and we expect the NPL to show up higher. There are many accounting problems. We are first preparing the banks for this new reporting format because they are not used to it. In India, the services sector is currently expanding. You are saying that the services sector can give notional growth but manufacturing is what is really going to add to your national production. India is an IT hub, including electronics and software. Having said that, manufacturing is not doing badly either. Manufacturing is doing well but not to the extent of services.

Participant: I have a question about the differentiated risk weights. How do you determine the sensitive sectors? Which variables are you following for these sectors to determine that they are sensitive?

Speaker: RBI has categorized some sectors going by the volatility in their asset prices, especially commodities, commercial real estate and housing. These are the sensitive sectors in India.

Participant: Regarding the interaction between macroprudential and monetary policies. You said there is some sort of coordination between the two policies, I was wondering whether it is coincidental coordination? If it is calibrated coordination, how was it calibrated? Was it by virtue of the governor deciding both or is there some sort of committee? Are all macroprudential policies taken by the FSDC now?

Speaker: It was calibrated coordination. The coordination that I mentioned earlier happened before the Financial Stability and Development Council was established. Financial system stability was only looked at by the central bank. At that time, coordination was easy because the policies were taken by the Reserve Bank. Even now, coordination is still being done because the governor of RBI is always present at major policy decisions and whatever policy decisions are taken by the FSDC, they are done in close consultation with the governor. All macroprudential policies are taken by the FSDC now but the Reserve Bank has a major say because macroprudential policies mean you have to apply regulations on banks and the central bank is responsible for regulating the banks. It is the central bank that applies the ratios. The announcement is made by the FSDC but the regulations are applied by the central bank, which is done in close coordination. It is the same case in Malaysia.

Participant: What is the average capital adequacy ratio of banks in India? How are the banks doing in terms of capitalization as well as short and long-term liquidity?

Speaker: The minimum CAR prescribed by Basel is 8% but in India it is 9%. Nevertheless, banks in India tend to hover around 11%. As far as the liquidity coverage ratio is concerned, the one thing that really came in handy for the Reserve Bank was the statutory liquidity ratio. That may be unique to India. As per that ratio, all the banks had to necessarily invest in government securities, which made that ratio. It used to be 30% but now it has been reduced to 19.5% of net demand of total liabilities of banks. Now banks are investing in government securities in the statutory liquidity ratio, yet to meet the LCR requirements, the Reserve Bank has given them the concession to make use of

	that ratio, up to 11%, to meet the LCR requirements because it is high-quality collateral/liquid assets.
Participant:	By giving emergency liquidity assistance to banks, does the Reserve Bank of India have a limit or threshold on the level of risk for the bank that is going to be given the ELA? Are there certain requirements before giving the emergency liquidity assistance to the banks?
Speaker:	We do not have any such requirements. On a day-to-day basis, we have a 1% limit in terms of the total liabilities of the banking system. 25% is provided under fixed rate auctions and the remaining 75% is provided under variable rate auctions. During the crisis, although India was not directly impacted by the global financial crisis, the country was impacted by indirect effects and knock-on effects, which put the banks under liquidity pressure. Consequently, RBI opened up special windows for them for additional liquidity with no such limits because we know their financials. The banks are well regulated and supervised by RBI so there is no question of putting any limits on them because all of their investments are with us.
Participant:	India has quite a high current account deficit. Do you have any plans to reduce the deficit?
Speaker:	Last year it was 1.8% but because of the capital outflows and high trade deficit, this year it has gone to 2.6%. The empirical studies in India have shown that a sustainable threshold is around 2.5%. Consequently, the intention is always to bring the current account deficit down. For emerging countries like India, however, it is better to have some deficit than to have a negative interest rate policy.
Participant:	India has increased and cut its policy rate within the last year. Have you observed any asymmetry in the transmission of monetary policy given the changing direction of monetary policy? Are banks prone to increasing their rates when the policy rate is increased but then reluctant to reduce rates the other way? How do you convince foreign banks to lower their rates?
Speaker:	As with all central banks, during a tightening phase, the banks are quick to respond. During an easing phase, however, they are quite reluctant. Once they have raised the rates, the downward stickiness is always there. The Governor of the Reserve Bank and the Minister of Finance try to persuade them at the various meetings. They inform the banks that they must pass the rate cuts to the customer. Bank managers always have their own excuses, such as deteriorating asset quality or higher transaction costs.

> Foreign banks also see that this is a competitive world, if they want to be in the market, they have to go with the tide.

Macroprudential Regulations

India started using macroprudential regulations in 2004. In fact, RBI was a pioneer and one of the first central banks to use macroprudential tools, which became more popular after the crisis. The measures RBI has include countercyclical provisioning, loan-to-asset value ratios and risk weights, particularly on housing and commercial real estate. This has been done in close coordination with monetary policy. Between 2004 and 2008, monetary policy was in tightening mode, and because that was a high growth and high credit period, the provisioning norms and countercyclical norms were also tightened. Monetary policy was tightened by increasing the policy rate by 300 basis points. At the same time, the provisioning norms were increased by 175 bps and 25 bps. From 2008 to 2009, monetary policy entered an easing phase and the macroprudential policy was also loosened. They were working in close coordination and as far as the effectiveness of these policies is concerned, a recent empirical study in the RBI showed that these risk weights and countercyclical provisioning norms were effective at containing the credit growth. They negatively affected credit growth with a one-year lag. There is an asymmetric impact, in terms of the macroprudential regulations on different credit cycles for different business cycles. They are more effective in containing credit growth, this means that they are unable to stimulate credit growth when it is low. This means, the macroprudential measures are effective during an upward cycle but ineffective during a downward cycle.

Interaction

Participant: What is your instrument for the interest-rate policy? Is it the repo rate?

Speaker: The repo rate is the single policy instrument.

Part V
Case Study on Central Bank Policy Mix

Chapter 11
Policy Mix Case Development

Solikin M. Juhro

Abstract This chapter describes the development of case study on the implementation of the policy mix. It describes underlying problems faced by the central bank after the GFC. It specially examines the linkages between monetary and financial stability—including the interaction among variables and different policy objectives—and the source of shocks and its implication on such linkage. It also seeks to analyze the policy strategy in mitigating the risks of macroeconomic imbalances amidst uncertainties.

Keywords Policy mix · Case study · Macro-financial model · Policy simulation

Introduction

Learning Objectives

The case study attempts to examine the existence of linkages between monetary and financial stability, including: (i) the interaction among macro variables (real sector, monetary sector and financial sector) and between two different policy objectives (e.g. monetary stability and financial stability); (ii) the source of pressures (shocks) and its implication on the linkage between monetary stability and financial stability. It also seeks to analyze the policy strategy in mitigating the risks of macroeconomic imbalances, amidst high global economic uncertainties, such as ones which emerge during the episodes of capital inflows and outflows, as well as to understand the integration between monetary and financial system stability frameworks and its possible implication on the change in central bank mandate.

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Target Audience

Central bank or monetary authority officials who have had at least five years' work experience in the field of policy analysis, such as formulating or implementing monetary policy, financial stability policy, macroeconomic analysis, or other related areas.

Key Issues

There are three key issues in this case, namely: the nexus between monetary stability and financial stability; whether they are the two mutually supportive (complementary) or do they work against each other (substitute) in the sense of a trade-off?; source of pressures affecting the linkage between monetary stability and financial stability, as well as the work of monetary policy transmission mechanism; and policy strategy to align the achievement of monetary stability and financial stability objectives or known as policy mix.

Case Description

The case is about the examination of some policy perspectives on the linkages between monetary stability and financial stability, including its dynamic interaction, source of pressures, policy strategy, and institutional implication. Participants are requested to explore the feasibility of utilization of some policy instruments in order to mitigate the risks of macroeconomic imbalances, using the standard macroeconomic model which is operated using Microsoft Excel software. Participants will be given advanced readings, content/scope/structure of the case study, and leverage to accomplish the case exercises within the allowed time. Policy exercises and discussion on the answers will be given by participants during presentations.

Identification of the Case

Case study combines factual and fictional studies.

(a) Factual experience of Indonesian economic experience: economic developments, challenges, and policy responses. The timeline is 2000 until 2012.
(b) Factual and fictional narration of some macroeconomic challenges (external shocks), possible policy responses, and possible economic outcomes. The timeline is 2013.

Associated with point (b) above, there are two conditions encountered as the impact of external shocks (e.g. the dynamics of capital flows) on domestic economy.

(a) First, normal condition (without feedback loops). A condition with a normal surge of capital inflows, which is in accordance with the latest trends. In this condition, it is assumed that there is no change in the risk perception/behavior in the financial markets.

(b) Second, abnormal condition (with feedback loop), a condition with a fairly massive and tend to be persistent capital inflows, which could potentially disrupt macroeconomic balance. In this condition, it is assumed that the risk perception in financial markets changed or worsened.

There are two scenarios related to policy exercises taking into account the utilization of policy instrument.

(a) Baseline scenario.

(b) Scenario with policy options. Under this scenario, several feasible policy instruments can be utilized under policy mix strategy, including interest rate policy, foreign exchange intervention, change in Reserve Requirement ratio (RR), and change in Loan to Value ratio (LTV). These instruments can be used partially (one instrument) or jointly (combination of several instruments).

Possible shocks include declining world economic growth, decreasing global interest rate, and change in domestic macro variables.

Supporting Evidence and Policy Issues

Country Economic Profiles: Indonesian economic profile and challenges amid high global economic uncertainties: maintaining internal and external balances and Chart Packs of Indonesian Economy. These materials are distributed separately.

There are several literatures that participants must read before examining the case.[1] Should the time allocated for the case study session rather limited, participants are suggested to read an article exploring related policy issues on the linkages between monetary stability and financial stability, e.g. "*The Linkages between Monetary and Financial Stability: Some Policy Perspectives*", Juhro (2014).

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[1] See Borio (2011), Committee on the Global Financial System (2010), De Nicolo et al. (2010), Moreno (2011), and Noyer (2010).

Activities

Participants are strongly recommended to read through some related materials/articles before the course. Since the time allotted for the workshop sessions is rather limited, advance reading will give Group participants extra leverage to accomplish the case exercises within the allowed time. During the workshop, participants will be divided into several Groups. Each Group should pick a Group leader. The assigned case facilitators will re-brief each Group on the content, scope and structure of the case study. During case study, there will be case study briefing, exercise (group work), group presentation, and wrap-up (takeaways).

Case Questions and Policy Exercises

Discuss with your Group to answers the following questions. You should use information provided.

(a) How close are monetary stability and financial stability interlinked?
(b) How do you compare the linkage between monetary stability and financial stability in pre and post Global Financial Crisis of 2008/09 (GFC) period?
(c) What are the source of pressures (shocks) on the economy that could affect the linkage between monetary stability and financial stability?
(d) What are the policy strategy for mitigating the risks of macroeconomic imbalances (internal and external) amidst high global economic uncertainties, e.g. during episodes of capital inflows and outflows?
(e) What are the implication of monetary stability and financial stability linkage on the central bank mandate?

Base Line Policy Exercises

Background

During the recent annual banking dinner in December 2012, the Governor of Bank Indonesia (BI) explained some progress of Indonesian economy in the last few years. He indicated that Indonesian economic growth remains strong with an average of 6.0% in the last five years, showing resilience amidst sharp fall in export as a result of pressures from the global economic slowdown. Business climate is improving, while consistent fiscal discipline has led to a downward trend of external debt. One thing that is interesting is the fact that this episode of robust growth did not occur with rising inflation. This was evidently reflected from the declining trend of inflation. Meanwhile, financial sector in particular domestic bank remains in a good shape.

However, he stressed the importance of increasing awareness of the potential risks stemming from global economic uncertainty.

(a)   Moderating global demand, paired with rebalancing source of growth toward domestic demand has led to a widening current account (CA) deficit (since the last quarter of 2011 the CA balance recorded a deficit), but also posed potential risk emerged from the increasing inflation expectation.
(b)   On the financing side, reliance on external financing such as FDI and portfolio investment would be required. Although the surge in capital inflows during 2011–2012 has reflected positive sentiments of the global economy and the solid outlook of domestic economy prospect, this in turn would give pressure to rupiah exchange rate and financial system stability, in particular during periods of heightened risk aversion.

During the annual Board Meeting scheduled for the second week of the following month (January 2013), all Board members put a clear policy direction that the central bank's policy formulation should evaluate the strategic role of monetary policy and financial system at the same time. In this case, monetary policy formulation needs to be further directed to anticipate macroeconomic instability risk stemmed from financial system. Therefore, the Board is planning to explore various policy options for managing internal and external balance and to deliberate on an optimal policy mix for 2013.

As a group of independent advisors recently appointed by BI, your group has been invited to share views and insights on the appropriate policy stance for 2013.

Baseline Exercise 1: No Feedback Loop—No Shocks

Consider that Indonesian economy is facing a normal surge of capital inflows, which is in line with the latest trends. In this condition, it is assumed there is no significant change in the risk perception in the financial markets.

Your Group is equipped with:

(a)   Information on economic profile of the Republic of Indonesia 2008–2012;
(b)   A small economic model summarizing the transmission mechanism of monetary policy in Indonesia;
(c)   Assumptions on key exogenous variables; and
(d)   A case guide for policy exercise exploring the framework and related technical aspects in addressing the case, including the impact of various policy measures.

Based on the above information:

(a)   Is it a correct decision for BI to keep the level of benchmark interest rate (BI Rate) constant at 5.75%, given the expected increase in financial inflows and rapid growth in financial indicators (credit, stock price, bond price) in 2013?

(b)   Propose a policy recommendation on the appropriate interest rate policy stance that BI should implement to control inflation rate in 2013.

(c)   Should the effectiveness of interest rate policy be constrained by the persistent of capital inflows to the country, you may also consider another monetary instrument on the table, namely foreign exchange intervention (a sell or purchase). In this case, a sale (purchase) of foreign exchange will induce the Rupiah appreciation (depreciation) and have impact in reducing (increasing) banking sector's liquidity. It should be informed that, in normal circumstances (pressures on the exchange rate tend to be small), to meet the demand for the dollar in the market, BI intervened the market by selling foreign exchange of around USD 1–300 million per month. In the case of moderate pressures, the amount of intervention increased by approximately 300–600 million per month. Keep in mind that the size of intervention will depend on the availability of foreign exchange reserves. Many central banks are eager to have a sufficient stock of foreign exchange reserves to be a cushion in the event of external shocks.

It should be noted that, in accordance with the Rupiah stability mandate of the BI, your target is to maintain inflation target in the range of 4.5% - 6.5% (4.5% ± 1%), so as to boost market confidence on monetary authority's commitment to achieving the internal balance. On the financial stability front, there is a growing thought that BI should consider conducive financial sector environment – reflecting the manageable pressures in the banking sector, stock market and bond market - measured by a composite index of Financial Pressure Index (FPI) that empirically stands at around 105 – 110. Moreover, you should consider real GDP growth could be maintained at around 5.5%-6.0% and current account deficit not to exceed 3.0%.

(a)   Discuss the viability of achieving those targets, using only interest rate policy and/or foreign exchange intervention, given the transmission mechanism of monetary policy in Indonesia.

(b)   What sort of monetary and financial stability linkage and policy implication has your Group observed from this baseline exercise?

Baseline Exercise 2: With Feedback Loop—With Shocks

In the midst of lingering global uncertainties, it is feasible to consider that Indonesian economy is facing a condition with a fairly massive and (tend to be) persistent capital inflows, which could potentially disrupt macroeconomic balance, such as excess liquidity in domestic markets, less competitive exchange rate, and increasing inflation pressures. This condition will potentially change (worsen) risk perception in financial markets. Worsening risk perceptions in financial markets will reduce capital inflows and aggravate pressures in the financial sector. This mechanism shows us that even excessive capital inflows can induce macro-instability (imbalance) and thus give a negative feedback loop on the prospect of capital inflows.

During their deliberation in January 2013, the Board of Governor decides to adopt your Group's interest rate policy (plus exchange rate intervention) recommendation. However, before the subsequent Board Meeting scheduled for April 2013, the global economy is hit by a major unfavorable news during the third week of May 2013.

> As reported, in a prepared speech to Congress in Washington, Fed Chairman Ben Bernanke initiated a dovish tone. He said that a highly accommodative stance will remain appropriate. However, he did hint that a scaling back of quantitative easing (QE) measures could happen "in the next few meetings" if the Fed sees a sustained improvement in the economy.

Immediately after the announcement, some emerging market countries (including Indonesia) subsequently experienced sharp reversals of capital inflows, resulting in sizable currency depreciation. Capital inflows to emerging economies peaked in January 2013, slowed in the first half of 2013, and sharply reversed in the months immediately following Chairman Bernanke's May comments. Thailand, Malaysia and Indonesia were particularly hard hit by capital outflows after Bernanke's comments, as investors bet on higher rates in the United States, as the Fed to begin reversing its low interest rate policies. This could lead to the increase in global interest rate. The global consensus forecasts released by a credible international organization projects that in the short-term world interest rate will rise by 0.25–0.5% p.a. This increase may lead world economic growth to decline by 0.25–0.5% p.a.

With this scenario:

(a) First consider that the impacts of global interest rate shock and global growth shock can be transmitted through financial channel and trade channel, respectively or simultaneously.

(b) Re-answer the questions as in the previous regime (Baseline Exercise 1). Are these answers different from the previous "no-feedback loop—no shock" regime, especially in terms of the impact on monetary and financial stability linkages and "the magnitude" policy response needed?

Exercises with a Menu of Monetary and Macroprudential Policy Mix

Policy Mix Exercise with Feedback Loop—With Shocks

It is realized that considering the complexity of the problems encountered, the use of monetary instruments is not enough to cope with a variety of issues, especially in the financial sector. The use of monetary instrument alone will increase the cost of the policy.

During the tranquil time before the global shocks, the Board of Governor members, asked your Group to recommend a policy mix, in addition to monetary policy instruments (the interest rate policy and foreign exchange intervention).

The design of policy mix should optimally integrate monetary and macroprudential policy instruments. Of particular interest is the feasibility of implementing a mix of policies containing interest rate adjustment, foreign exchange rate intervention, the reserve requirement (RR) and the loan to value ratio (LTV).

> Although the existing law limits BI's mandate to maintaining price stability, the Board is of the opinion that financial stability is very important in order to preserve macroeconomic stability, so as pre- empting excessing risk taking in the financial system is an important complementary goal for the BI. The Board members are confident that for such risk taking behavior, if left unregulated, may prompt endogenously driven shocks in the domestic financial system that may in turn affect monetary stability. The consequence of this is that the BI policy strategy should be based on the use of monetary and macroprudential policy instrument mix.

As the global shocks unfold, BI contacts your Group, requesting for immediate policy advice. One of the Board member specifically asks your Group to provide a recommendation on the appropriate policy mix to ensure that in 2013, internal and external balances will be well manageable. This means that:

(a)   Inflation rate will not reach 6.5%;
(b)   The Financial Pressure Index (FPI) should stand at around 105–110;
(c)   GDP growth will be maintained at around 5.5–6%;
(d)   Current Account deficit will not go above 3% of GDP.

Responding to this request:

(a)   Can your Group arrive at a combination of policy instruments to achieve monetary and financial stability targets? In formulating your Group's policy mix recommendation, carefully consider results of your exercises or policy perspectives, as indicated in the case guide

(b)   Does your Group observe policy trade-offs (conflicts in achieving policy objectives)? Can you arrive at a satisfying policy mix for those multiple wishes?

(c)   What would be your "first-best" advice to the Board? In this case, your Group may consider other policy aspects/tools beyond the scope of this exercises (given policy instruments available), such as communication strategy, policy coordination, etc.

Guide for Policy Exercise

The Model Structure and Feedback-Loop Mechanism

To help the participants answer the questions, we provide a tool for understanding the relationship among economic variables in the system, i.e. a small macroeconomic model of Indonesia. The model consists of six blocks, i.e. Aggregate Demand, Aggregate Supply, Price, Monetary, Financial, and External (Fig. 11.1). In the model, variables are classified into endogenous and exogenous. Here policy variables (blue-colored) are assumed to be exogenous. The policy variables are policy rate (BI rate), foreign exchange intervention, reserve requirement (RR), and loan-to-value (LTV). Other exogenous variables, including the shocks, are yellow-colored. Meanwhile there are two types of endogenous variables, i.e. one that is represented by behavioral equation (green-colored) and one that is represented by identity equation (light blue-colored). Detail explanation on the model can be read at Appendix (distributed separately).

In a more complete picture, the model structure describing relationship among economic variables in these blocks can be depicted below (Fig. 11.2).

In this case study, feedback loop refers to loop from disrupted macroeconomic balance (as implication of massive and persistent capital inflows) to reduced capital inflows and pressures in the financial sector, that works through worsening macro risk perception. Meanwhile there are two shocks, those are increase in world interest rate and decline in world economic growth. Linkages between variables in both "no feedback loop" and "with feedback loop" are shown in Figs. 11.3 and 11.4.

The impacts of central bank policy using a variety of instruments available are as follows (Figs. 11.5, 11.6, 11.7 and 11.8).
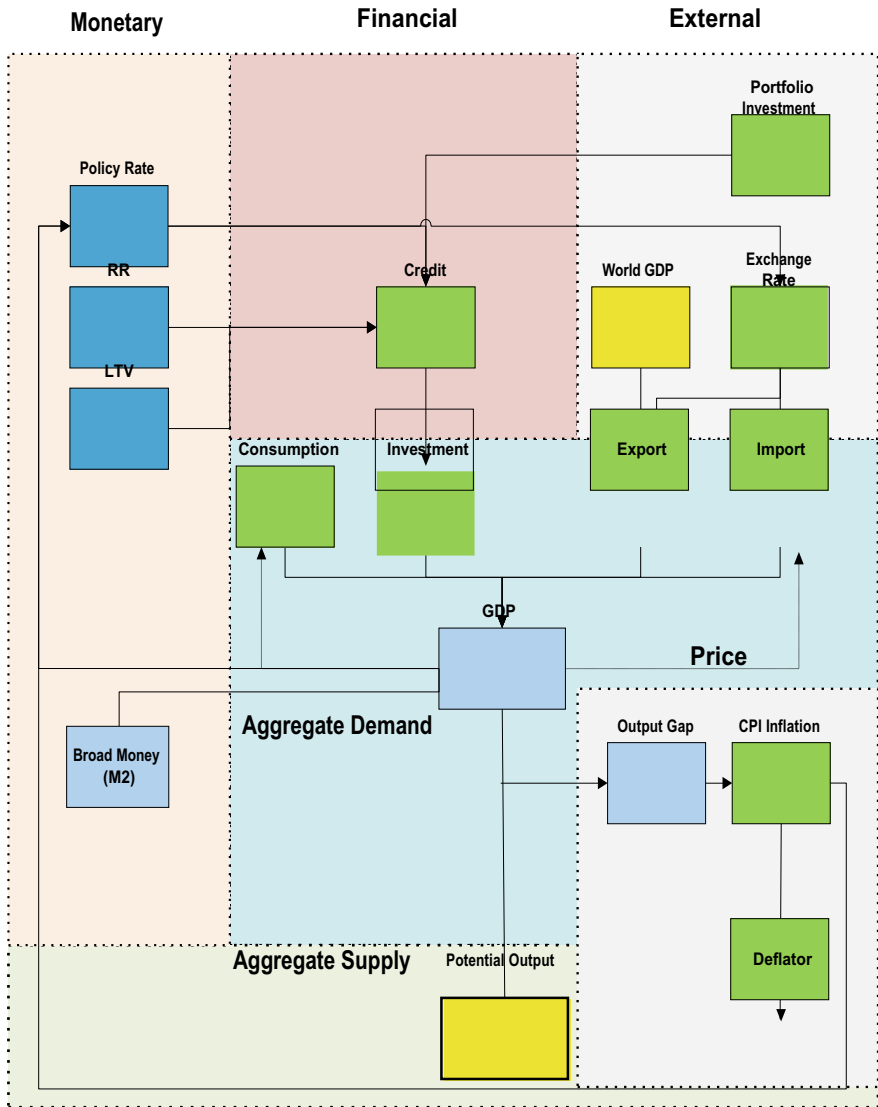
Fig. 11.1 Model block. *Source* Bank Indonesia

The Exercises

In this policy exercise, the participants are requested to explore feasibility to implement some policies, using either (only) monetary policy instruments (interest rate policy and/or foreign exchange intervention) or policy mix of monetary policy and macroprudential policy [interest rate policy, foreign exchange intervention, the reserve requirement ratio (RR), and the loan to value ratio (LTV)].
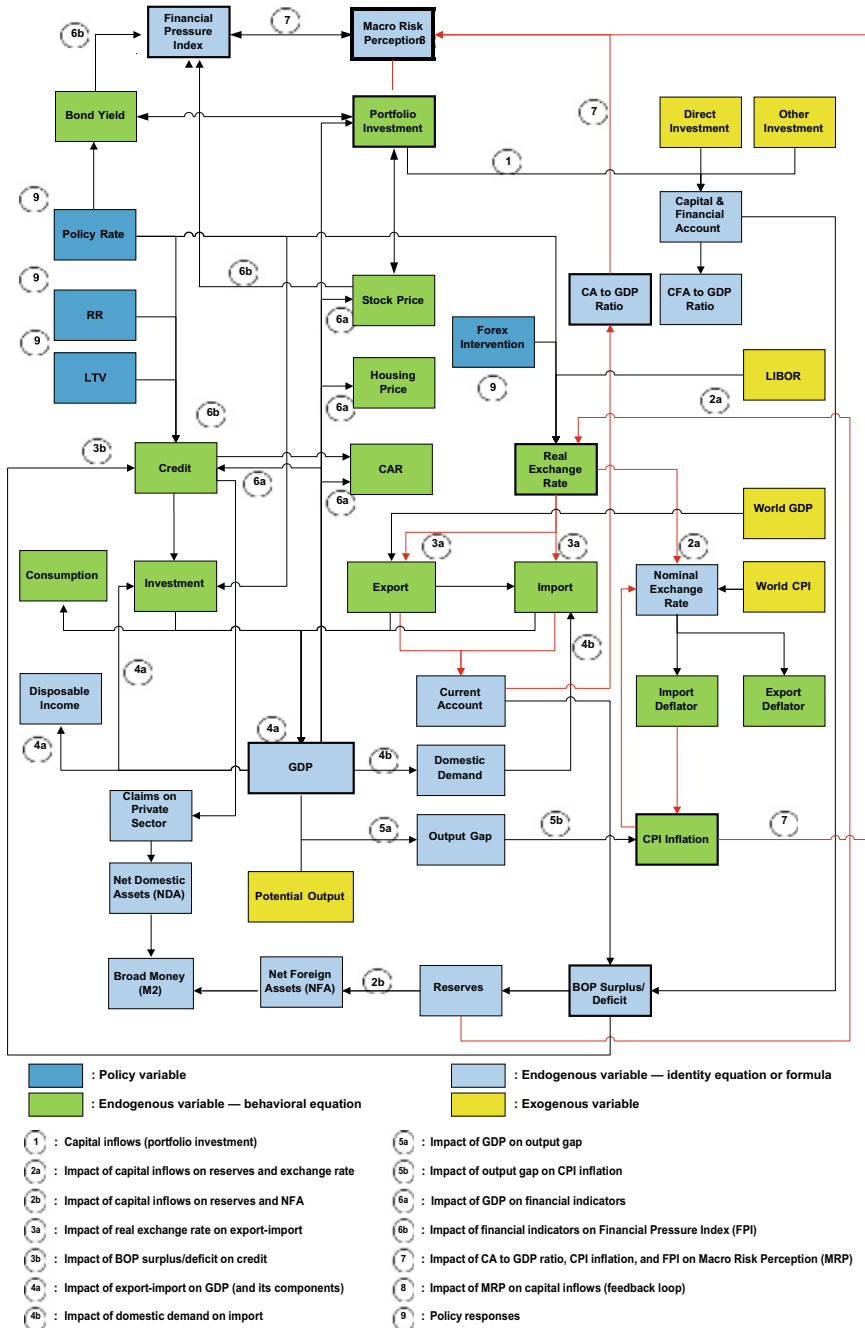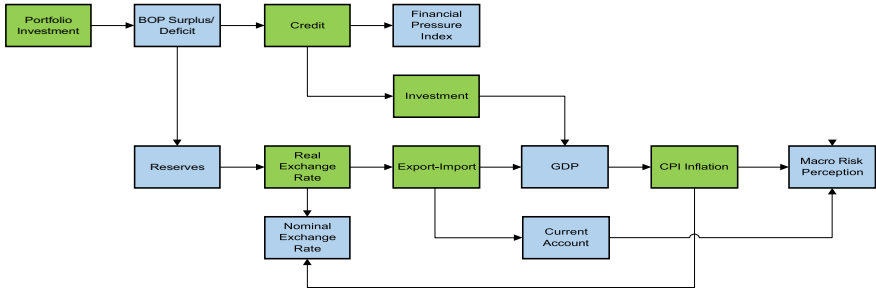
Fig. 11.2   Model structure. *Source* Bank Indonesia
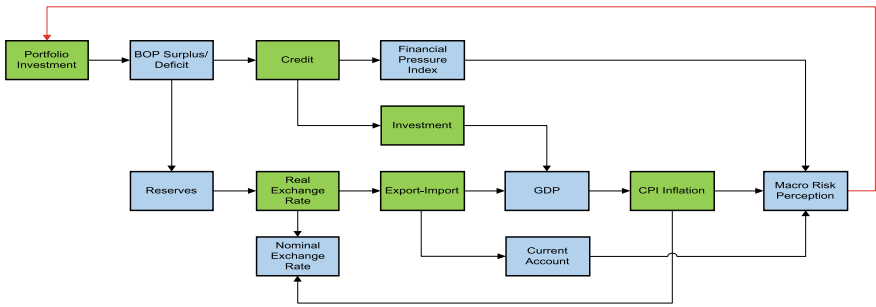
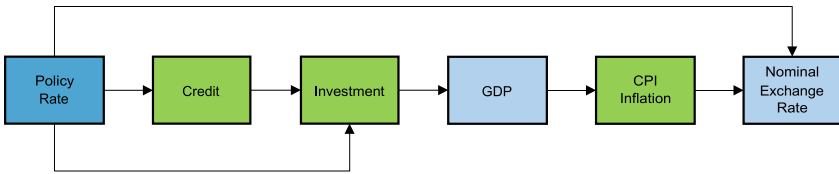**Fig. 11.3** No feedback loop. *Source* Bank Indonesia

Fig. 11.4 With feedback loop. *Source* Bank Indonesia

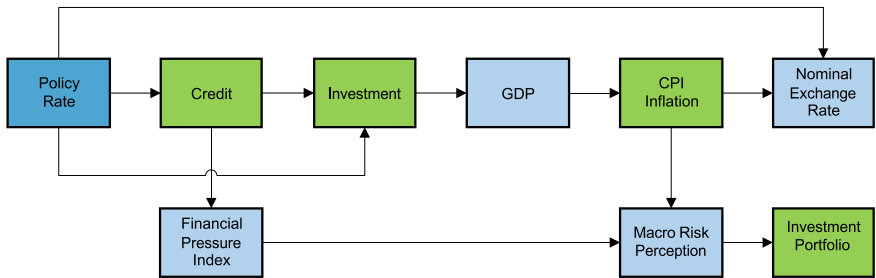## No Feedback Loop

With Feedback Loop

Fig. 11.5 Policy rate. *Source* Bank Indonesia
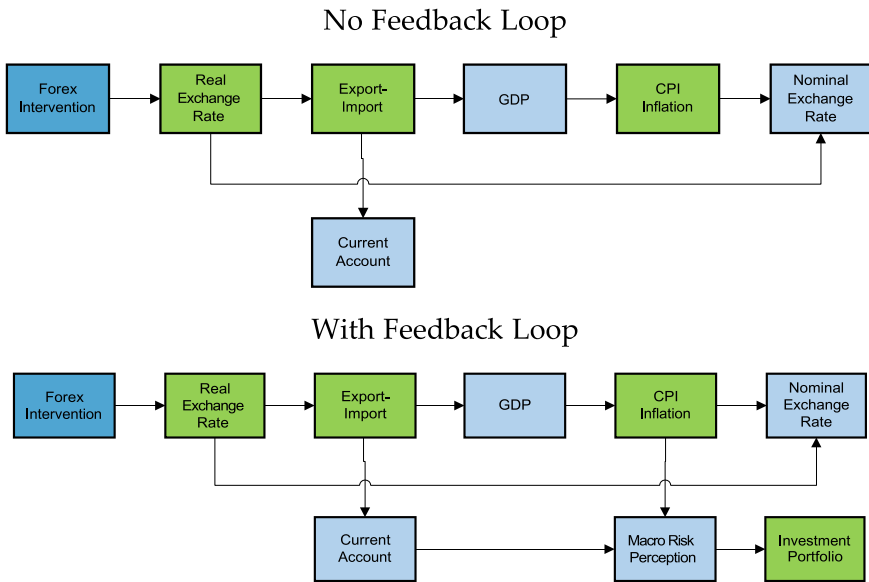
No Feedback Loop

With Feedback Loop

Fig. 11.6   Foreign exchange intervention. *Source* Bank Indonesia

No Feedback Loop

With Feedback Loop
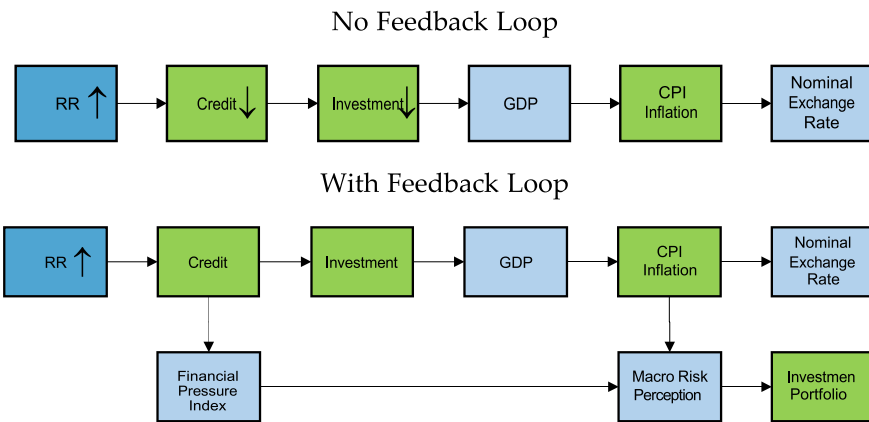
Fig. 11.7   Reserve requirement. *Source* Bank Indonesia

No Feedback Loop

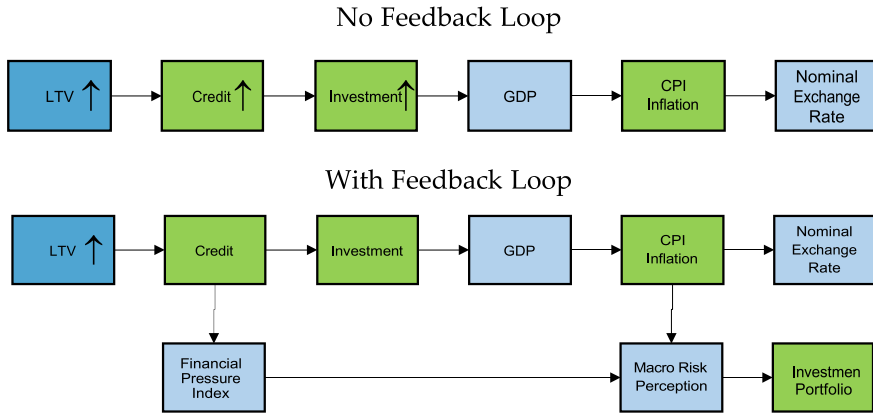## With Feedback Loop

Fig. 11.8 Loan to value. *Source* Bank Indonesia

(a)   **Baseline policy exercises**

This exercises are intended to explore various policy options for managing internal and external balance. The participants are requested to:

propose a policy recommendation on the appropriate interest rate policy to control inflation rate, given the expected increase in capital inflows and rapid growth in financial indicators, and (ii) should the effectiveness of interest rate policy be constrained by the persistent of capital inflows, consider foreign exchange intervention.

The participants are also requested to discuss the viability of achieving BI's targets, i.e. to maintain inflation target in the range of 4.5–6.5% and Financial Pressure Index (FPI) that stands around 105–110, using only interest rate policy and/or foreign exchange intervention.

There are two cases, namely:

- Baseline exercise 1—no feedback loop—no shocks
- Baseline exercise 2—with feedback loop—with shocks.

(b)   **Exercises with a menu of monetary and macroprudential policy mix**

In addition to monetary policy instruments, i.e. interest rate policy and foreign exchange intervention, the participants are also requested to consider a policy mix. It is integration of monetary and macroprudential policy instruments, consisting of interest rate policy, foreign exchange rate intervention, the reserve requirement (RR) and the loan to value ratio (LTV).

There is one case, namely:

• Policy mix with feedback loop—with shocks

In this exercise, the policy mix is intended to achieve internal and external balances, i.e. inflation rate will not reach 6.5%, Financial Pressure Index (FPI) should be around 105–110, the GDP growth can be maintained at around 5.5–6%, and the CA deficit will not go above 3% of GDP.

How to Do the Exercises

To do the exercises, the participants should do several steps are as follows.

Firstly, do the baseline (No Policy) scenario for 2013. In doing this, participants can simply put (or change) values of policy variables and some exogenous macroeconomic variables (e.g. potential output, world economic growth, and world interest rate) in the Dashboard. A 'feasible' value of variable can be calculated using standard statistical approaches, such as averaging and trending (of its past values). For possible values of policy variables participants may also assume a "status quo", whereby there is no change in policy stance.

Secondly, participants can simulate the model by putting different values of shocks originating from exogeneous variables and then adjust initial policy variables to response the shocks.

Thirdly, participants can further simulate a policy mix (changes in some policy variables)

Participants should pay close attention that by putting new values of these variables, the model will recalculate its equilibrium. Macroeconomic variables and financial indicators are linked to other parts of the model. Therefore, please do not change the cells as they consist of formulas.

The dashboard

Variables	Sequence of transmission	2010	2011	2012	2013										Actual
					No Feedback Loop			With Feedback Loop							
					No Policy	With Policy		No Policy	With Policy						
						BI Rate	BI Rate + Fx Intv.		BI Rate	BI Rate + Fx Intv.	RR	BI Rate + RR	BI Rate + RR + Fx Intv.	BI Rate + RR + LTV	
Policy Variables															
Policy Rate (BI Rate, %)	9														
Reserve Requirement (RR, %)	9														
Loan To Value (LTV, %)	9														
Forex Intervention (in millions USD)	9														
Macroeconomic Variables															
GDP (%)	4a														
Domestic Demand	4a														
Export of goods and services	3a														
Import of goods and services (-/-)	3a, 4b														
Potential Output															
CPI Inflation (%)	5b														
Exchange Rate (%)															
Nominal Exchange Rate (appr.(-)/depr.(+))															
Real Exchange Rate (appr.(-)/depr.(+))	2a														
Balance of Payment															
CA to GDP (%)	3b														
Capital & Financial Account (CF, in mills USD)	1, 8														
Monetary Aggregates															
Broad Money (M2, in trillions Rp)	2b														
Net Foreign Assets (in trillions Rp)	2b														
Financial Indicators															
Credit Growth (%)	3b, 6a														
Bond Yield (10 y, %)	6a														
Stock Price (index)	6a														
Financial Pressure Index (FPI)	6b														
Macro Risk Perception	7														
External Variables (Shocks)															
World GDP (%)															
LIBOR (3 months, %)															

Notes Macroeconomic variables and financial indicators are linked to other sheets. Please do not change the cells as they consist of formulas. We can change values of policy variables and other exogenous variable (potential output). We can simulate the model and exercise some policies, either monetary, macroprudential, or policy mix. By putting new value of policy variables, the model will recalculate its equilibrium and the results will be shown in other parts of the Dashboard. We can also simulate the model by putting different values of shocks (world economic growth and world interest rate)

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Chapter 12
Policy Mix Case Discussion

Solikin M. Juhro, Reza Anglingkusumo, Arlyana Abubakar, Sahminan, Ferry Syarifuddin, Alexander Lubis, and Tarsidin

Abstract The policy mix exercise starts with each group choosing one policy mix combination from many possibilities, in the case of "no feedback loop" and in the case of "with a feedback loop". In making the choice, the group should consider economic growth, inflation or financial pressure index. The group presentation and interaction focused on the conceptual question, analysis of baseline policy chosen, and the policy mix exercise.

Keywords Policy mix · Case study · Policy simulation

Introduction

During the case discussion, each group will address one question only. The following task after that is for each group to make a baseline policy exercise. Each group will have to make an exercise regarding the baseline scenario, which is no policy change from the policy in the last year. Looking at the baseline policy exercise, the green colored area is the policy with no change compared with last year's policy and its outcome. Assuming that in 2013 there is a shock in the form of capital outflows. If we do nothing, namely that there is no policy change, the result will be like this. You can explain about the conditions in 2012 and 2013. You can get the data from the various files we have given to you. You can also find in the suggested reading about the time condition data in order to answer Question 2, which is the baseline exercise. There are two kinds of explanation. This is without the feedback loop and this is with the feedback loop. Without means instant. Right after we enter 2013, in just one or two months, the result will be like this. Then there will be the response from the investors, namely withdrawing their investments through capital outflows. Therefore, this is the scenario with the feedback loop. Just make an analysis exercise like that. One or two pages would be enough.

S. M. Juhro (✉) · R. Anglingkusumo · A. Abubakar · Sahminan · F. Syarifuddin · A. Lubis · Tarsidin
Bank Indonesia, Jakarta, Indonesia

Please have a look at page 6. This is the policy mix exercise. The policy mix exercise means that you have to choose one policy mix combination. Therefore, there will be many combinations and you have to make a combination of that. You have to choose which one is better, considering economic growth, inflation or financial pressure index. You must choose the policy focus and then make an analysis. Please make two analyses: one without a feedback loop, which means instant, just one or two months, and one with a feedback loop for the long-term of more than three months. We will provide the Excel files in the Google Drive. Please look at the first sheet only. Please do not make any changes to the latter sheets because if you input any data in their letter sheets, it will break the file and you will have to copy new files. To do the third question, which is the policy exercise, have a look at this combination. You may only change the policy variables. The result will automatically change. Sheets 2, 3, 4 and 5 are there to show that this is a complicated process but the result is actually very simple. The results will update automatically. We have made it very simple for you.

We will help you in order to make it easier because we provide several options. This is to answer Question 2 of the baseline policy exercise. On the next page, we make some combinations. In the case without a feedback loop, you may choose one option, for instance, the first option is high policy rate with high FX intervention. The second option is high policy rate with low FX intervention. In the case with a feedback loop, there are some other options/combinations between monetary policy and macroprudential policy. You may consider economic growth, inflation, the current account deficit and financial pressure index; which one is better according to you? I would like to remind you that there is no correct answer and no wrong answer. In other words, everything is right based on your analysis and argument to explain about the option you have chosen. We have limited time.

Please remember, there are only three questions to answer. First, the conceptual question, which has no bearing on the second and third questions. Second, analysis of baseline policy. Third, the policy mix exercise. Please choose one option in the case of no feedback loop and one option in the case of with a feedback loop. After a 15-min presentation, we will provide an opportunity for the other groups to ask questions. Due to time limitations, however, if Group 1 has presented, for example, the first opportunity to ask questions will be given to Group 2. After Group 2 has presented, the first opportunity to ask questions will be given to Group 3 and so on. If we still have time, the other groups may also ask questions. After Group 1 has presented, Group 2 will *have* to ask questions so please prepare some questions. Please do not forget to wear your nametag at all times.

Please open the Excel file: worksheet of policy exercise 2019a. Please make a 'save as' copy so if anything goes wrong, you still have the original. Please begin discussing and answering the questions. There are three questions: A, B and C. A is the conceptual question and has no relation to questions B and C. Question B is the baseline exercise and question C is the policy mix exercise.

Finally, we have reached the concluding part of today's session. I am very sure you enjoyed number crunching and playing around with the Excel file. Did you have fun? I hope that you noticed one thing from today's exercise, namely that

policy formulation involves weighing the trade-offs between various policy options. This is due to a scarcity of resources. In fact, economics is a science of scarcity. As a policymaker, you have to find an optimal solution to maximize welfare, which, in this case, is low inflation–high-growth, within the resource constraints. I wonder whether any of the groups introduced positive productivity shocks in their presentation. If positive productivity shocks were introduced, you have changed the parameters of the constraints and increased potential growth, which solves many issues. That is okay because we have been dealing with cyclical issues not structural issues. Let us see what you have come to propose as the optimal solutions. Today will consist of two sessions. The first session will include three group presentations, with the final three groups giving their presentations in the second session. You will have 15 minutes to present your optimal policy solutions, followed by a five-minute Q&A session with comments from your peers.

Group 1

Good afternoon, ladies and gentlemen. We are from Group 1 and would like to propose several policies to overcome the problems in the Indonesian economy in 2013. To start our presentation, allow me to introduce the members of this group. We have representatives from Bangko Sentral ng Pilipinas, Bank Indonesia and BNM. We will take turns presenting our case. First, we will address how far monetary and fiscal stability are interconnected. I would like to first explain about monetary policy transmission. Monetary policy transmission will function after the policymakers examine their monetary policy response and instruments and affect the expectations of the economic agents regarding macroeconomic indicators, such as inflation and financial conditions. Monetary policy will also affect the resilience and efficiency of the financial system, consisting of financial intermediaries and financial markets. At the same time, however, financial conditions are also affected by the expectations of economic agents. Furthermore, the financial system will react to the expectations of monetary policy, as reflected by the interest rate, exchange rate, lending, balance sheet asset prices as well as money. At the same time, it will also directly influence the aggregate conditions of the economic agents, as reflected in terms of aggregate demand and supply. This will also affect the savings and investment behavior of households and the corporate sector as well as employment, wages and price setting. Aggregate supply and demand may also be affected directly by the expectations of the economic agents as well, ultimately influencing other aggregate outcomes, such as economic growth and employment. My colleague will explain further the connection with financial stability.

Participant:
    Just to continue the discussion of the linkages between monetary and financial stability. We all know that monetary policy actions influence risk perception and risk-taking in the financial system, such as banks. That could be reflected, for example,

in risk-taking activities through lending or on the balance sheet, whether they are focusing on credit of the securities portfolio and so on. Based on this premise, we can say that in supporting monetary policy, there must be a stable financial system that would support that. That is when the financial stability framework comes in. That involves two-way directions which banks to each other and to other sectors, so it requires a holistic view of the system. That is when macroprudential policies come in. This is basically more on systemic risk management. This slide just tells us the linkages between financial stability and monetary stability.

Participant:

I would like to focus on assessing global economic developments and the impact on our national economy. Then we will move on to the policy we have suggested. In 2012, world economic growth moderated to around 3% and uncertainty in the global economy increased. Commodity prices also decreased. Despite the global economic slowdown, the Indonesian economy in 2012 maintained robust growth at 6.26%. Inflation was 4.3%, which is within the target corridor. We were aware that the uncertainty would continue throughout the year so my colleague will explain our projections of economic conditions in 2013.

Participant:

We are now in January 2013 and our outlook for the rest of the year is global economic moderation to 3% from 3.09% in 2012. We expect global interest rates to remain low given the ongoing QE measures in advanced economies. On the domestic side, given weaker global demand, we expect our domestic GDP growth to also moderate but still anchored by domestic demand. Our current account deficit is going to widen, given lower exports and higher imports. As a result, the rupiah will depreciate, and inflation will trend higher. Next, we will show our policy deliberations and what we decided was the most optimal policy mix. A word of caution, however, given the time constraints, instead of coming with all the potential options, we have just followed whatever was given in the Excel spreadsheet. We have just chosen between the two, without coming up with more combinations. Neither did we come up with any additional shocks, we just followed whatever was given. Likewise, for potential output.

Participant:

Based on the outlook at the beginning of 2013, we have the problem of combining several policies to optimize GDP growth, inflation, current account deficit and the financial pressure index. We have three options: (i) no policy (dark blue column); (ii) 25 bps hike in policy rate (orange column); and (iii) 50 bps hike in policy rate and FX intervention (light blue column). Based on the simulation, we concluded that taking no policy measures would produce very high GDP growth yet a spike in inflation to 6.72%, which is beyond our target. On the other hand, the current account deficit would also narrow but the financial pressure index would increase. Based on these considerations, we proposed option three, namely a 50 bps increase in the policy rate along with FX intervention.

Participant:

Following the announcement in May by the US to taper their QE measures, we saw that global economic growth would continue to moderate more than expected and interest rates would increase given the scaling down. As a result, our domestic economy would be impacted. Based on this set of factors, we have another set of policy measures. Given the time constraints, I will just quickly go through our set of policy measures. In terms of monetary policy, we realize that option 2 is the best, namely a 75 bps hike in the BI Rate. If we have a policy mix, however, we would go with the second option, which is to increase the BI Rate by 100 bps and increase the LTV ratio by 12.5%.

Participant:

In conclusion, we know that by comparing the policy options with only monetary policy and the orange one is the policy mix of monetary and macroprudential policy, the output is better if we do a policy mix. In terms of GDP growth, we saw that if only monetary policy, we would get 5.09% but if we combine with macroprudential policy, we can maintain GDP growth of more than 5.15%. In terms of inflation, we can control the rate within the inflation target at 6.41%. Regarding the current account deficit, we think that 3.29% of GDP is still manageable in Indonesia. We have also effectively maintained the financial pressure index within the target. We felt this was the best option considering the prevailing global and domestic economic dynamics.

Interaction

Group 2:   The policy mix you chose included tightening policy by 100 bps and increasing the LTV ratio by 12.5%. Sorry, I thought you were tightening the monetary policy but also tightening macroprudential policy but you are loosening macroprudential policy. My mistake, sorry.

Participant: I just wanted to ask you how to communicate to the public this kind of stance? You have given a mixed signal to the public whether you are tightening or loosening so how would you communicate that to the public?

Group 1:   In our communication, the central bank maintains a balance of conditions. Our main target is balance in the macroeconomy and financial sector. Consequently, we have tightened monetary aspects but loosened the financial system.

　　　By increasing the policy rate by 100 basis points, we would also like to maintain the interest rate differential between rupiah and US dollars, which would help reduce the external issues.

Instructor: Do you expect capital inflows to continue in 2013 or tighter liquidity conditions in the global economy?

Group 1:   Given the new data points we got, namely that the US announced
                  its plans to taper QE, there is a definite tightening of financial
                  conditions going forward so we would expect a sharp reversal
                  and even worse conditions moving forward, especially if other
                  central banks in advanced economies follow suit. That is why
                  we chose to increase our policy rate.
                      Just to add some information, the capital account balance was
                  positive in 2012. Depreciation was mostly caused by the current
                  account deficit, so we were not worried about the inflows.

Group 2

Instructor:

We answered Question 2. I would like to talk a little bit about the drama we had trying to answer this question. It was difficult to come to a conclusion with the answers because our colleague from BSP saw that there was no difference before and after the GFC.

Participant:

I thought it was already a given that monetary policy and financial stability should go together because under the Bangko Sentral ng Pilipinas (BSP), we monitor the banks and undertake monetary policy.

Instructor:

According to her, it is supposed to be the same because monetary policy and microprudential policy are in the same institution. I have explained to her that the situation is different in Indonesia, which she accepts. The question we answered was "how do you compare the linkages between monetary and financial stability in the pre-and post-global financial crisis periods?" The short answer is that it is different and the long answer will be explained by our colleague from Bangko Sentral ng Pilipinas (BSP).

Participant:

Back then, there were fewer linkages and a lack of coordination between supervisors and monetary policymakers. If the crisis happened because of exchange rate factors, tight monetary policy has the potential to stabilize exchange rates and the financial sector. In the event of a banking crisis, however, the opposite occurs, namely that a tight monetary policy stance will reduce the probability of a reversal due to a currency mismatch at domestic banks and the discretionary powers of the central bank in terms of supplying liquidity in a crisis.

During the global financial crisis, Borio and Zhu (2008) put forward the existence of the risk-taking channel, while Altunbas et al. (2009) found evidence that unusually

low interest rates over an extended period cause an increase in the banks' risk-taking behavior. That is what happened before in Indonesia. There was a rise in risk-taking behavior amongst banks. Such risk-taking behavior will eventually drive up demand for new loans and asset prices. The GFC provided a key lesson that the financial sector plays a crucial role in macroeconomic stability because of its behavior that triggers excessive pro-cyclicality, which is not just the result of interactions between the business cycle and financial cycle but also affected by the risk-taking cycle, characterized by over-optimism during economic booms and over-pessimism in times of economic bust.

Before the crisis, there was a lack of coordination among supervisors and policy-makers but post crisis, Bank Indonesia addressed several measures, such as liquidity in the financial system, raising the reserve requirement from 5 to 8%, effective in 2010, and increasing the frequency of auctions from monthly to weekly. This is because there was a need to strengthen the macroprudential regulatory framework. This limited risk-taking behavior among banks.

Conclusion. Dynamics during financial crises have shown that monetary policy needs to be further directed towards anticipating macroeconomic instability risk stemming from the financial system. This implies that healthy macroeconomic management should also consider financial system stability as the foundation to realize a sustainable macroeconomic environment. Quoting Juhro (2014) "*There is no macroeconomic stability without financial stability*." Without the two policies working together, there would be instability.

Participant:

I would like to share the baseline policy exercise. The conditions are the same as Group 1 so I will not repeat it again here. We will go straight to the scenario. If Bank Indonesia holds the benchmark interest rate at 5.75%, it would increase financial indicators, such as credit from 18.01 to 18.86%, with the stock price index increasing from 4119 to 5025 and bond yield decreasing 5.85–5.45. Notwithstanding, it would not be the correct decision to maintain a constant BI Rate at 5.75% because inflation is so high, which would also increase from 4.3% in 2012 to 6.72%, exceeding the central bank's inflation target of 5.5% $\pm$ 1%. We propose increasing the BI Rate by 25 basis points to 6% per Scenario 1. Inflation would therefore decrease to 6.12%. Nevertheless, there is a trade-off with lower GDP and a wider current account deficit. We tried several scenarios using different monetary instruments, such as foreign exchange intervention, to optimize the inflation rate and GDP growth. Under Scenario 2, we see that inflation will be better than Scenario 1 but there is still a trade-off with GDP growth and the current account deficit. By increasing the intervention, we would lower the financial pressure index. In terms of the no feedback loop and no shock scenario, we propose Scenario 2, using a combination of interest rates and foreign market intervention. Under Scenario 4, we want to show that we can only use foreign intervention so we did not increase the interest rate. This would achieve the inflation target at a rate of 6.49%, which is within the target range. According to this scenario, we have better GDP growth and narrower current account deficit. Combining the instruments is better than using a single instrument.

Participant:

For the baseline exercise 2b: with feedback loop and with a shock, we found that as a small open economy, Indonesia is vulnerable to global/external developments. Immediately after the US announced a potential future scaling back of quantitative easing measures, Indonesia experienced sharp reversals of capital inflows (feedback loop). Compared to conditions without a feedback loop, some indicators deteriorated, including exchange rate depreciation due to capital outflows (selling domestic assets), CPI inflation through imported inflation and, most dangerously, risk perception in the financial markets (financial pressure index and macro risk perception). Therefore, the magnitude of the policy response required would be higher compared to when there was no feedback loop.

As we can see from the table, with no monetary policy, CPI inflation will increase to 8.12%, which is above the central bank's inflation target of 5.5% ± 1%. In order to maintain the target, therefore, the central bank should increase its policy rate by at least 75 basis points to 6.5%, which is higher than the first baseline (6.0%), but that would reduce GDP growth from 6.03 to 5.15%. Therefore, the central bank needs to implement another policy, namely forex intervention (selling US dollars) to optimise the inflation rate and GDP growth. By only increasing the BI Rate to 6.25%, inflation would again exceed the target at 6.84%. Increasing the BI Rate to 6.75% would lower GDP growth to 4.86%, which is very low compared to the readings in 2011 and 2012 at 6.49% and 6.26% respectively. According to Scenarios 2 and 3, forex intervention by selling US dollars would provide greater flexibility for us to increase the policy rate to 6.25% while maintaining higher GDP growth at 5.19%.

Participant:

Concerning the policy mix, a policy rate of 5.75% in 2013 would push inflation beyond the target corridor and the current account deficit beyond 3% of GDP. We tried various policy mixes. The first option was to raise the policy rate to 6.25% with USD2 billion worth of forex intervention, which would result in on-target but higher inflation and a larger current account deficit. We can see that the financial pressure index 104.75. Another option was to loosen the LTV ratio combined with the same amount of forex intervention. This produced a worse result for inflation and the current account deficit. After the simulation, we increased the policy rate to 6.75% and loosened the reserve requirement from 11.50 to 10.50%. We also adjusted the LTV ratio and the intervention. We found that the optimal solution in 2013 would produce an inflation rate of 6.37% but GDP would still fall below 6% and the current account deficit would be 3.37% of GDP. We also see that the financial pressure index is within the target. We had to choose this solution because our trade-off was that we had to maintain low and stable inflation to ensure financial stability but for GDP growth and the current account deficit we had a strategy to communicate with the government to introduce fiscal stimuli and perhaps restrict consumer imports. The

central bank would simultaneously need to communicate with the public regarding the current conditions and what needs to be done about our future policy path. That would ensure that all stakeholders could accept the policies.

Interaction

Group 3:   You recommended applying consumer import restrictions. What kind of consumer goods would you restrict? As we know, Indonesia depends on imported goods, such as raw materials and consumer goods. If we restricted consumer imports, I would be afraid of the spillover effect in the trade sector, which is one of the main contributors to GDP growth in Indonesia.

Group 2:   We proposed consumer import restrictions because when we raised the policy rate, the bigger current account deficit with exchange rate appreciation, would lead Indonesia to import more and more goods. Therefore, we would only need to restrict imports of consumer goods, not raw materials and capital goods.

   We did not come up with any specific product to restrict but the intention was to reduce the current account deficit induced by a stronger currency.

Participant: You recommend restricting imports but is that within Bank Indonesia's mandate?

Group 2:   We would do that in close coordination with the government. We could make a recommendation to the government.

Instructor: As part of your strategy, you recommended implementing fiscal stimuli. I would like a comment from our colleague at the fiscal policy office on how to explain the strategy. Given the conditions at that time, the fiscal deficit was around 2.8%.

Group 2:   We consider a deficit of below 3.0% to be manageable and sustainable. According to the regulations, we are not allowed to exceed 3%. Rather than restricting imports of certain goods, previous experience has shown that higher taxes for luxury goods help to reduce imports.

Instructor: One of the weaknesses of our Excel-based simulation models is a lack of fiscal policy explicitly in the model. Actually, there would be a feedback loop from fiscal stimulus. Next year, we will have to include fiscal policy into the model.

Group 3

Participant:

The first test for our group from the conceptual question was No. 3 about the sources of pressure or shocks on the economy that could affect the linkages between monetary and financial stability. Here, we already indicate some internal and external shocks. At that time, in 2013, the Federal Reserve planned to hike its federal funds rate. We were concerned that the FFR hike would trigger capital outflows. To maintain capital in our economic system, the central bank should increase the BI Rate, which would feed through to higher lending rates and potentially higher non-performing loans in the banking sector. That was the first external shock that we indicated at the time.

Participant:

The second external shock that we discussed in our group was a global economic slowdown. Global economic moderation could reduce international commodity prices. Consequently, exports would also decline, thus increasing the current account deficit. Furthermore, this could lead to rupiah depreciation and increase the risk of private sector debt, for example companies in the agricultural and mining sectors.

Participant:

Thank you for coming to our press conference. In terms of the internal shocks, we discussed one potential internal shock that could happen in the Indonesian economy. The economic structure of Indonesia still depends on domestic markets and government spending, especially in every province of Indonesia. Before provincial budgets have been approved, we see muted local economic activity. If budget realisation by the central government and local administrations is slow, it would create a shortage of liquidity in the market. The problems would go to the banks due to lower repayment capacity. If the cost of funds in the banking industry from securing loans from other banks in the money market increases due to higher interest rates, because higher interbank rates pass through to consumer loan rates, there are two possibilities. First, credit risk will be higher for outstanding loans disbursed by the banking industry due to higher lending rates. Second, demand for new loans would decrease due to a higher lending rate. Consequently, businesses may be reluctant to expand after the interest rate hike. This would undermine investment in Indonesia and GDP growth due to a business slowdown. That is why internal shocks could be a problem for the Indonesian economy if government spending decelerates.

Instructor:

To further emphasize what participant mentioned as potential sources of pressure to the Indonesian economy, namely capital outflows, in the bottom chart you can see that the composition of funds flowing in are mostly short-term placements in bonds. If you look at the top chart, you can see that most of those bond holders are foreign nationals. This validates our concern about the potential for a sudden reversal when the FFR increases.

   This takes us to baseline exercise 1. We mentioned the possibility of capital outflows. At the same time, we have an issue of high inflation at 6.72% if no policy actions are taken. In this light, under the no feedback loop scenario, it would be better if the BI Rate increased to 6.25% from 5.75%, accompanied by forex intervention totaling USD3 billion. This would maintain inflation within the target range of 6.22% at the cost of slower GDP growth yet still above 5%, solid credit growth and a wider capital account deficit yet still manageable at around 3% of GDP. This would also lead to a healthier financial pressure index. We feel that this would be the best policy choice moving forward under the no feedback loop model.

Participant:

   According to baseline exercise 2, we need a larger policy response under the feedback loop scenario to achieve a similar outcome. For this scenario, we think the best move is to only increase the BI Rate to 6.5%. This would maintain inflation within the target range and GDP growth above 5%, which we think is good enough. The current account deficit is slightly larger than 3% of GDP and FDI is also within the range. Therefore, we think this would be the best policy response.

Participant:

   In terms of the policy mix, after a long discussion we came to the conclusion that it would be better to increase the BI Rate to 7.25% and conduct forex intervention to the tune of USD5 billion. Of course, this monetary policy would not be enough to maintain the economy, so we also loosened the LTV ratio to 82.5%. Inflation would thus remain on target at 6.44% with GDP growth in excess of 5%. Nevertheless, the current account deficit widened slightly beyond 3%. Furthermore, FDI would remain in a suitable range to sustain investor trust with adequate foreign exchange reserve assets for intervention efforts.

Interaction

Group 4:   The source of pressure is correct and the end result is right but the linkages are not correct because whenever there are liquidity shortages, the central bank is always there to prop up the liquidity. Although lower government spending may result in lower investment and lower GDP, it does not occur through the credit market channel.

Group 3:   We assume here without any policy intervention from the authorities first.

Participant: You said that rupiah depreciation would lead to the risk of increasing private sector debt. Do you know roughly by how much in US dollars private sector debt would increase? I do not have any idea how many FX loans there are in Indonesia.

Group 3:   We do not have the data on hand but from recollection it was not as low as people might think it should be, but I do not have the actual data on hand.

Instructor: Actually, you can see the figures in the presentation by Nathan of the IMF.

Participant: You have explained the channel which external shocks are transmitted through the credit market. What is your view of the exchange rate channel? Is there any transmission? Capital outflows can also affect exchange rate volatility. Could you explain to us your view on that transmission?

Group 3:   I think capital outflows would result in a shortage of US dollars if demand for US dollars in Indonesia remains high. On the other hand, however, we do not have a stock of US dollars in the event of a capital outflow. It is an issue of supply and demand. When demand remains but supply decreases, the rupiah will depreciate. There are not enough US dollars in the market but we still need US dollars to pay for imports and repay debt. This may lead to rupiah depreciation. That is the mechanism.

Group 1:   I think the FX reserves are not only to cover intervention measures but also to cover short-term liabilities and import payments as well.

Instructor: USD5 billion in forex intervention is actually very bold.

Group 1:   Is it applicable to raise the LTV ratio to 82.5% rather than a whole number in terms of implementation?

Group 3:   If you look at the marginal increase, it is 10%, so from 72.5 to 82.5%. With the constraints given to us, where we had to hit a maximum of 6.5% inflation and GDP growth of 6%, which we were unable to achieve, we opted to push for stability rather than growth. In order to do so, one of our policy responses was to loosen the LTV ratio since we had already tightened monetary policy.

Participant: This was one of the discussions that made us almost miss lunch. Yes, 82.5% is a weird number but like Doni just explained, as the central bank, our main target is price stability by increasing the BI Rate. To maintain dynamic economic activity, however, we chose a policy mix that incorporated tighter monetary policy with looser macroprudential policy by increasing the LTV ratio. We are pro-stability and pro-growth.

Group 3:   The main reason we put 82.5% is because the default was 72.5% so we assumed it was possible to use something like that.

Group 4

Participant:

Good afternoon ladies and gentlemen, we are from Group 4 as advisers to the governor. I would like to allow our honorable Governor to clearly communicate Bank Indonesia's policy response to current conditions. Mr. Governor the floor is yours.

Participant:

Before I begin, we have a follow-up question from our governor regarding the conceptual question that I would like to answer. *What are the policy strategies for mitigating the risk of macroeconomic imbalances, internal and external, amidst high global economic uncertainty during periods of capital inflow and outflow*?

In general, we should use the policy mix strategy. We combine monetary policy and macroprudential policy. In addition, we also want to pursue exchange rate intervention to manage the volatility and some agreements with other counterparts, such as bilateral swap agreements and also promoting the use of local currency. There are two episodes, which I would like to discuss separately. First, the period of capital outflow. During this period, I think we should increase the policy rate such that the interest rate differential is sufficient to attract foreign investors. However, higher interest rates will have a negative impact on economic growth, so we will loosen the macroprudential policy measures by increasing the LTV ratio, lowering the reserve requirements and increasing the LDR in order to stimulate the economy. Furthermore, to manage exchange rate volatility, we need to intervene in the domestic exchange rate market using the central bank's reserve assets. I also recommend bilateral currency swap agreements with other central banks in foreign currencies and to promote the use of local currency.

Second, during the period of capital inflow, we recommend the opposite. To limit foreign investors, we should maintain the policy rate. In a situation where economic growth and inflation are low, we could reduce the policy rate, however. To mitigate the negative impact on financial stability, we will tighten the macroprudential measures. Exchange rate appreciation has a negative impact on exports, therefore we would need to coordinate with the fiscal authority to stimulate export growth. In addition, we also need to accumulate reserve assets as a buffer for future adverse episodes.

Baseline Scenario: No Feedback Loop—No Shocks (2)

It is the correct decision for Bank Indonesia to maintain the BI Rate constant at 5.75% *if* we also tighten macroprudential measures. On one hand, we want to contain the capital inflow which could have a negative impact on economic sustainability yet, on the other hand, we want to stimulate economic growth.

Since our mandate is to achieve the inflation target of $5.5\% \pm 1\%$, we assumed that an interest rate of 5.75% would be sufficient to control inflation. Therefore, we will not propose a new policy recommendation. The effectiveness of interest rate policy is constrained by the persistence of capital inflows due to potential exchange rate appreciation that could widen the current account deficit (trade channel). Capital inflow persistence will also increase credit growth that could overheat the economy and create inflationary pressures (financial channel). Consequently, we should consider other intervention measures to deal with the exchange rate appreciation and also macroprudential policy to deal with the effect of capital inflows to the financial sector.

Baseline Exercise 1: No Feedback Loop—No Shocks (3)

Next, we were unable to achieve the desired targets only using interest rate policy and intervention. Instead, a policy mix approach is required. In order to have sustainable economic growth, we have to maintain monetary and financial stability. Based on the baseline exercise, if we increased the policy rate it would endanger financial stability by amplifying capital inflow. Therefore, macroprudential measures should be used to manage financial stability.

Baseline Exercise 2: Feedback Loop—Shocks (1)

An increase in the global interest rate would lower global economic growth and also reduce the international commodity price index. This would impact Indonesia's national economy through the export sector. In this case, a higher global interest rate shock would contribute to capital outflows from emerging markets (financial channel). It would also undermine global growth and compress global demand, leading to lower international commodity prices. Decreasing commodity prices would have a huge impact on the Indonesian economy because most Indonesian exports are raw materials/commodities, including coal, crude palm oil (CPO), rubber, nickel and so on.

It would not be enough to maintain a constant policy rate at 5.75% because policy intervention itself is not enough to contain the capital outflows. We propose increasing the interest rate to limit the capital outflows that could harm the rupiah and reducing the inflation rate to achieve the desired target.

Policy rate effectiveness is constrained by potential capital outflows and a potential decline in commodity prices because capital outflows can trigger exchange rate depreciation and, thus, inflationary pressures. Furthermore, lower commodity prices would contribute to flatter economic growth.

Policy Mix Exercise—No Feedback Loop (Near Term)

We can effectively accomplish the desired targets through a mix of monetary and macroprudential policies. We suggest increasing the policy rate and loosening macroprudential policy through the following measures:

(i) increasing the interest rate by 50 bps; (ii) lowering the reserve requirement by 50 bps; and (iii) setting the LTV ratio to 85%.

Based on the model, those measures would achieve the following outcomes:

- 6.15% inflation (within the target);
- 5.86% economic growth (slightly below target but okay);
- 3.2% CAD (slightly above target); and
- FPI of 110 (within the target).

Policy Mix Exercise—Feedback Loop (Long Term)

We can accomplish some of the desired targets through a mix of monetary and macroprudential policies. We suggest increasing the policy rate and loosening macroprudential policy through the following measures:

(i) increasing the interest rate by 100 bps; (ii) lowering the reserve requirement by 50 bps; and (iii) setting the LTV ratio to 85%.

Based on the model, those measures would achieve the following outcomes:

- 6.49% inflation (within the target);
- 5.2% economic growth (slightly below target but okay);
- 3.29% CAD (slightly higher); and
- FPI of 107 (within the target).

Policy Mix Exercise

There is a trade-off in achieving the policy objectives. On one hand, we want to promote sustainable growth but, on the other hand, we want to achieve price stability (inflation target) and financial stability. We need to coordinate with the fiscal authority to stimulate export growth and the Indonesian Financial Services Authority (OJK) to ensure the compliance of related policies. We also need to clearly communicate the central bank's policy stance to the public to align public expectations with the central bank's policies.

Interaction

Instructor: You are proposing a hike in the interest rate so much so that the interest rate differential becomes so high that it will attract foreign investors. This means that you are targeting your interest rate for capital flows but your core mandate is price stability. First, you must secure price stability, while simultaneously considering growth. Just loosening the macroprudential policy would not be able to boost credit or the economy because the cost of credit will go up once you have increased the policy rate by so much. These are still normal conditions with no shocks. You are assuming that macroprudential policy instruments have already been applied and you want to loosen them. That is my observation.

Participant: You are absolutely right. The main target is to keep inflation within the target range. We achieved that. Otherwise, there are some conditions next to the main target given by the board of governors, such as a stable current account deficit at 3% of GDP. So far, nobody has achieved that. High GDP growth is another target. As a developing economy, Indonesia is developing very well from my point of view but growth exceeding 5% would be very welcome. That is why we set our targets like we did, with all the goals in mind.

Participant: You have tightened monetary policy by increasing the interest rate and reserve requirements. On the other hand, however, you have loosened macroprudential policy by increasing the LTV ratio. Such policy measures, in my view, would encourage the banks to switch focus from SMEs towards the property sector because the property sector is becoming more attractive in terms of lending activity compared with the other sectors. This could make the risks on the macroprudential side higher than before. What is your opinion about this?

Instructor: The perspective of the bank to choose the specific sector in this case, meaning housing loans, depends on the risk appetite of the banks. There is a slightly different procedure if you want to disburse loans to specific sectors, especially housing loans and for SMEs. Special expertise is required to disburse loans to those sectors. Therefore, we tried to loosen macroprudential policy here through an LTV ratio of 85% in order to provide a signal to the public that we are not only doing monetary policy, but we are also concerned about macroprudential policy, which can have a positive impact on economic growth.

> *Group 4*: If we set the LTV ratio to 85%, it would perhaps encourage the banks to give more loans to construction because it moves more quickly than other sectors. We are also observing economic conditions, consumer conditions and financial conditions when applying the LTV ratio. In the near term, loans disbursed to the construction sector would be relatively stable.
>
> *Participant*: In summary, the best way for us is to increase the interest rate by 50 bps to attract capital, while decreasing the reserve requirement in order for the banks to provide credit to the real economy. The LTV ratio will increase demand for credit. The reason we chose these three scenarios was basically to meet our targets. That was our main objective. If this was transferred more to the property side, we could revise our decision.

Group 5

Participant:

We had an intense discussion and we learned a lot. Determining the most effective policy mix is a difficult decision due to the numerous trade-offs. If we wanted to tackle inflation, for example, it would cause an economic slowdown or higher unemployment. This is a challenge.

Participant:

What are the implications of monetary and financial system stability linkages on the central bank mandate?

The central bank's conflict (trade-off) is between targeting monetary stability and financial system stability itself. Strengthening the monetary and financial system stability framework requires appropriate monetary and macroprudential policy integration. In order to strengthen the framework of monetary and financial system stability, the central bank must be more flexible and creative in responding to emerging uncertainties within the economy and to think beyond public perception.

We know that there are monetary policy tools at Bank Indonesia, for example reserve requirements. On the other side, there is also financial system stability, for which Bank Indonesia mainly applies loan-to-value ratios or reserve requirements and sometimes they use buffers. This should be based on soundness and communication, as we have studied over the past few days. For the central bank, we know that during the period in question there was high inflation and capital inflows. As a team, we decided that the exchange rate should be more flexible coupled with dual intervention between the national currency and US dollar. Nevertheless, in this case the LTV and RR-linked financing-to-deposit ratio (FDR) are more appropriate.

Baseline Exercise 1: No Feedback Loop—No Shocks

During the period from 2010 to 2012, GDP was declining. In terms of inflation, the rate decreases at the beginning of the period before experiencing a slight increase by around 13%. The current account surplus is declining before experiencing a deficit due to a decline in exports and imports and sliding international commodity prices. Broad money (M2) and Net Foreign Assets are increasing. There is an increase in credit growth, lower bond yields and stock prices are rising. In addition, the Financial Pressure Index (FPI) is also in decline. The global economy is moderating.

Assuming there is no change in the interest rate (5.75%), the potential impact would be rising inflation, reaching 6.72% (exceeding the target). On the other hand, GDP would also decrease to 6.03%. We therefore propose to take no action, presuming there are no shocks.

Proposed Policy Actions

1. Option 1: Increase the policy rate to 6.25% (BI Rate + FX intervention):

    *   CPI index will increase moderately to 6.22% (within target);
    *   GDP will decline to 5.78% from 6.26% in 2012;
    *   Current account deficit will increase to 3.12% from 2.78% in 2012.

2. Option 2: Increase the policy rate to 6% (BI Rate + FX intervention):

    *   CPI index will increase moderately to 6.8% (not within the target);
    *   GDP will decline to 6.06% from 6.26% in 2012;
    *   Current account deficit will increase to 3.06% from 2.78% in 2012.

Conclusion. We propose Option 1 because we want to focus primarily on price stability. Maintaining inflation within the target corridor, however, would have a moderate impact on growth and the current account deficit. This option is the least costly because any increase in the policy rate (BI Rate + FX intervention) beyond 6.25% would result in high inflation, breaching the core mandate.

Question 4: In order to control the excess liquidity in the financial market due to capital inflows, we propose that BI adopts dual intervention policy through FX intervention and selling bonds to absorb the excess liquidity. Assuming high credit growth, we propose tightening the LTV ratio and countercyclical provisioning.

Proposed Policy Actions:

*   Policy rule
*   Reserve requirements
*   Loan to value
*   FX intervention.

Baseline Exercise 2—With Feedback Loop and Shocks

We chose the worst-case scenario. Given the global interest rate increase of 0.5% and global economic growth decline of 0.5%, the potential impact will be as follows:

- GDP rate: 5.42% (initially 5.47%)
- CPI: 7.62% (initially 7.34%)
- CAD: −3.07% (initially −3.13%)
- FPI: 109 points (initially 107.67 points).

In order to tackle the external shocks, we would increase the policy rate 50 bps to 6.75% (initially 6.25% without shocks). As a result, CPI would decrease to 6.22%, GDP would increase to 5.78%, the current account deficit would be −3.12% and the FPI would decrease to a level of 105.96.

The team also thought about the optimal policy mix to ensure stability as our main goal. We just increased the policy rate due to inflation as our main target. We maintained the reserve requirements because we had no conflict between the two systems. We can see that there is financial stability and monetary policy are going along the same path. Therefore, we just increased the LTV ratio from 72.5 to 87%. This is our fixed policy, which we thought was the best choice. From the table, we can see that GDP is 5.21% and inflation is less than 6.5% but we were unable to reduce the current account deficit to less than 3%. Our most important recommendation at this level is to have good internal and external communication. In addition, fiscal policy would also have to support this path. This policy mix yields better outcomes in terms of the least cost.

Interaction

Instructor: Thank you for your presentation. I would like to ask about the impact of these macroprudential tools. Which macroprudential tool do you think is most effective in terms of GDP growth: LTV ratio or reserve requirement ratio?

RBI: LTV.

Instructor: That also affects CPI inflation. What is the combination of macroprudential variables? Do you have any opinion?

Participant: The main idea here is that we tried to find the best policy mix solution in this area. We have maintained GDP growth. The largest impact was on CPI and GDP, more than the current account deficit. It was harder to adjust to our last target (CAD).

Participant: From the slide, I see you have an optimal solution because CPI inflation is within target and GDP is not too low. GDP in Indonesia is lower than inflation so how would you communicate to the public what has happened and what to do next? I am afraid that GDP is lower than inflation in 2013 in this case.

Participant:	At this stage, we are not moving to the expansionary policy, we have maintained a contractionary policy. The policy is trying to constrict rather than expand because our main target is inflation. We do not want to make our inflation higher, which would affect price stability in the country. The goal to which the committee has agreed is price stability, so we tried to make contractionary policies. This may restrain GDP growth but inflation is the primary target. The policy mix always yields to better outcomes in terms of the least cost.
RBI:	Just to add that securing price stability is a necessary condition for securing sustainable growth in the medium term. Therefore, price stability should always come first.
Participant:	Addressing the last question about lower GDP than CPI inflation, the main objective of the central bank is to maintain price stability. Therefore, although GDP is lower, I do not think this is a problem because the main objective is price stability. The mandate of Bank Indonesia is price stability, but the central bank also strives to maintain the value of the rupiah and contribute to economic growth. For the central bank, in addition to maintaining price stability, it must also think about economic growth.
Participant:	Regarding my own point of view, as far as I am concerned during the global financial crisis era, Indonesia was one of the least unstable countries in the region compared with other ASEAN nations. Indonesia performed well in terms of GDP despite moderation compared to many other countries, excluding India and China. Despite decreasing GDP growth slightly, during that period if we tackle the inflation rate, it should be okay. In my point of view, 5% GDP growth is quite reasonable during that period.
Instructor:	These are my kind of central bankers. They are hawkish. Policy mix yields in better outcomes in terms of least costs.
RBI:	An adviser from the Bank of England visited RBI and, in his talk, he was saying that his job was not to advise his boss but to defend what he is doing. Sultan is our governor and we are here just to defend him.

Group 6

Participant:

What we have learned from the workshop is that policy implementation is very complicated and debatable. To achieve the goal, we must stick to the principles and policymaking mandate. We had the same questions as Group 1 but we will answer in a different way.

How Close Are Monetary Stability and Financial Stability?

Regarding the relationship between monetary stability and financial stability, there are two hypotheses that mention the relationship between monetary stability and financial stability:

- Monetary Stability $\Rightarrow$ Price Stability
- Financial Stability $\Rightarrow$ Sound banking system, stable asset prices and efficient interest-rate transmission.

According to the conventional definition for the first hypothesis, monetary stability supports financial stability. There is no trade-off between monetary stability and financial stability. According to the proponents, monetary stability is a sufficient condition for financial stability. Monetary stability is affected by (1) economic growth; and (2) employment, which both determine inflation according to the Phillips curve rule. Then, inflation affects asset prices and deteriorates the banking system's health, so it affects financial stability.

According to the second 'New Environment' hypothesis, there is a trade-off between monetary stability and financial stability through the central bank's actions, which could determine investor behavior. Successful inflation control by the central bank leads to overly optimistic perceptions. Therefore, asset and credit market activity exceeds potential (overheating). In the short-term, the empirical evidence shows that disinflation leads to lower nominal interest rates and moral hazard, high-risk lending, low inflation and asset price bubbles.

Participant:

To keep our mandate, namely low inflation, we had to increase the policy rate by 25 bps from 5.75 to 6.00%. The higher rate would squeeze broad money and lower GDP growth to 5.74%. There is a trade-off. As an impact of lower GDP growth, the current account deficit would increase slightly to 3.14% of GDP. Furthermore, the FPI would decrease to a level of 107.5. Consequently, CPI inflation would decrease to 6.12%, which is within the target.

Baseline Policy with No Feedback Loop and No Shocks

Participant:

I would like to offer another alternative, not only raising the BI Rate but also using FX intervention. The second alternative is to raise the BI Rate by 50 basis points to 6.25%, accompanied by FX intervention to the tune of USD3000 million. The result is quite similar to the first alternative. GDP growth would increase slightly to 5.78% but CPI inflation would also increase to 6.22%. Both indicators are still within their respective targets. The current account deficit would increase to 3.12% of GDP, which is slightly lower than the first alternative. Those are the two alternatives we would like to propose for the baseline policy with no shocks and no feedback loop.

Baseline Policy with Feedback Loop and Shocks

Participant:

We know that after the announcement of the US Federal Reserve Chairman, Ben Bernanke, it could lead to an increase in the global interest rate. From the impact of global interest rates and global growth shocks, world economic growth is expected to decline from 3 to 2.5% and the LIBOR rate increase from 0.3 to 0.8%. Under these conditions, a policy was made to increase the BI Rate to 6.5%. With this policy, inflation would decline to 6.49% from 8.41% previously, with GDP growth at 5.03%, a current account deficit of 3.22% and the FPI level of 104.28.

Participant:

Continuing to the second alternative with the same scenario as Lukman, to maintain inflation at a maximum of 6.5%, we would increase the BI Rate to 6.75% with FX intervention totaling USD2000 million. Inflation would remain under control, even lower than the first alternative, at 6.42%. There would be a trade-off with lower GDP growth from 5.97 to 5.05% and a large current account deficit from 3.03 to 3.23%. We think that this is the best policy response.

Participant:

I will talk about our policy mix recommendation with the feedback loop. We propose a combination of the following instruments, namely to tighten the policy rate and ease the macroprudential policy tools as follows:

- BI Rate hike: +100 bps
- RR Ratio: +150 bps
- LTV Ratio: +750 bps
- No FX intervention.

That combination would lead to GDP growth of 5.3%, inflation of 6.65%, a current account deficit of 3.2% and an FPI of 108.53. We are still a long way from the GDP growth target but we were able to achieve the inflation target. Furthermore, the financial pressure index is also within the target range. When we used only the short-term interest rate, we were not able to achieve multiple targets. Multiple targets require multiple instruments. Therefore, we eased the macroprudential tools. We need to keep in mind that there is a trade-off between using different instruments. Macroprudential instruments also influence inflation, so when deciding upon an optimal policy mix, the policy trade-offs must be considered. We did not offer any FX intervention in order to be consistent with monetary policy tightening. Under global financial tightening, it would not be a good recommendation to sell reserve assets. To decrease the current account deficit, it would be better to depreciate the domestic currency but to do so, the central bank would need to buy FX dollars. Nevertheless, this would also confuse the monetary policy communication because while you are tightening your domestic currency it is hard to buy FX dollars to depreciate the currency. That is why we did not offer any foreign currency intervention in our policy mix.

Interaction

Group 1: Thank you for the nice presentation. When you apply the policy mix recommendation, what is the reasoning behind letting inflation exceed the target range? What is the reason you push GDP growth?

Instructor: We added more weight to GDP growth in order to increase growth but inflation is still very close to the target corridor. If we did not ease the macroprudential parts, GDP growth would be very low. There was a trade-off so we decrease the weight of the price stability objective. We push GDP growth because there would be capital outflows. At that time, there were tighter global liquidity conditions due to the Taper Tantrum, which would also undermine GDP growth. Credit growth would be negatively affected by the capital inflows so for that reason, to support credit growth and GDP growth, we implemented these measures.

Group 2: You tighten the policy rate to 6.75% but according to this scenario you buy dollars and sell rupiah to the market. I think such measures would make the BI Rate not run effectively because it will decrease your call to reduce inflation. Could you give an explanation? The policies contradict one another.

Participant: We have already run the simulations and when we manipulate the BI Rate and the FX intervention, there is a trade-off between GDP growth, the CAD and inflation. Therefore, I feel that this is the optimal response when we get the maximum target at 6.42%. If we increase the BI Rate beyond 6.75% and reduce FX intervention, it would breach the maximum target of 6.5%.

Participant: We had two alternatives. First, to increase the BI Rate to 6.75% without intervention but if the situation deteriorated, we wanted to raise again the BI Rate to 6.75% with FX intervention. This is a solution to solve the problem of a higher global interest rate and declining global growth.

Instructor: I am curious why you chose not to intervene.

Participant: There are two ways to intervene, namely to buy or sell US dollars. If you buy dollars, your currency will depreciate and negatively affect price stability (inflation) through pass through. If you sell dollars, it would decrease foreign exchange reserves and under tighter global financial conditions it would also be negative for your position. For those reasons, we did not offer any FX intervention.

Instructor:

We have finally reached the conclusion of our four-day international workshop. From the presentations, we are quite happy because the message has been well delivered that policies involve trade-offs. Juggling these trade-offs is the day-to-day business of central banks. I hope you have gained knowledge and insights from this four-day workshop but most importantly, you have gained friends from all over the world. There is a Persian saying '1000 friends are not enough; one enemy is too many'. We all need more friends. For our colleagues from other domestic institutions, including the Fiscal Policy Office, MOF and Deposit Insurance Corporation (LPS), thank you very much for your participation. Please tell your colleagues good stories about this program and hopefully next year we can invite more of your colleagues. To our colleagues from other central banks, I would like to express sincere appreciation from Bank Indonesia for coming all the way from your respective countries to Jakarta.

On behalf of Bank Indonesia, thank you.

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Chapter 13
Central Banking Practices in the Digital Era: Salient Challenges, Lessons, and Implications

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Abstract The complexity and uncertainty of issues faced by central banks have and will continue to evolve in line with the advancement of digital technology. Navigating central banking practices in the digital era, therefore, is a very challenges task that requires the central bank's ability to create breakthroughs and orchestrate policy innovations. While the central bank policy mix is still a viable strategy, central banks are required to operate beyond conventional wisdom, with novel practices. Optimizing the benefits of technological advances and becoming a relevant regulator in the digital era must anchor the central bank's strategy in the future.

Keywords Central bank policy · Digital transformation · Central bank digital currency

Introduction

The two decades prior to the Global Financial Crisis (GFC) in 2008/09 witnessed a shift in the focus of central banks towards achieving and maintaining price stability. On one hand, the shift was in response to overcoming high inflation, while simultaneously providing greater central bank independence from the earlier period of government control. This was also consistent with emerging public perception concerning the importance of strong governance in terms of macroeconomic policy practices, including central bank policy. Academically, strengthening central bank policy governance was in line with rational expectations theory, policy consistency using a policy rule approach and the importance of transparency when forming expectations (Barro and Gordon 1983). This mindset encouraged central banks in many jurisdictions to apply monetary policy with price stability as the overriding objective, otherwise known as the Inflation Targeting Framework (ITF), encompassing standard and flexible ITF.

Notwithstanding, the Global Financial Crisis in 2008/09 (GFC) upended those central banking theories and practices. Not because ITF-based central bank policy

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had failed, in fact ITF had successfully brought inflation down to low levels, which, accompanied by low interest rates, stimulated solid economic growth and activity. The problem was that prolonged economic stability and boom periods contributed to rapid credit expansion and asset price bubbles affecting shares and housing, while accelerating leverage. Finance accelerated to the extent that the financial cycle amplified the economic cycle. Economic stability had created financial system instability, leading to the biggest crisis in 2008–2009 since the Great Depression of the 1930s. Evidently, price stability alone is insufficient to maintain macroeconomic stability if financial system stability has not been maintained; "*there is no macrostability without financial stability*." Financial frictions are inevitable due to information asymmetry, financial product innovation, price setting and valuation as well as risk-taking, leaving the financial system in a constant state of imbalance that accelerates the financial cycle and increases vulnerability to systemic risk (Warjiyo & Juhro 2019; Juhro and Goeltom 2015).

Consequently, the GFC reminded central banks of their original mandate at inception, namely to achieve price (and exchange rate) stability and support financial system stability. Central bank credibility and the established ITF framework were a solid foundation upon which the dual mandate could be achieved. This was not sufficient, however. Macro-financial linkages demand a macroprudential policy response from the central bank to mitigate procyclicality between the financial sector and economic activity that leads to economic and financial crises, such as the GFC. Foreign exchange intervention policy and foreign capital flow management are also required to stabilise exchange rates under a flexible regime. Such developments encouraged many central banks to apply macroprudential policies and foreign capital flow management to strengthen monetary policy effectiveness. In short, a monetary and macroprudential policy mix, together with foreign capital flow management, represent a new paradigm for central banks after the GFC, including Bank Indonesia since 2010. Such innovation in terms of central bank policy practices demands the development of solid underlying theories and empirical studies (Warjiyo and Juhro 2019; Warjiyo 2021).

The fact that a crisis is an unprecedented event that potentially distorts economic welfare is shown by the emergence of the COVID-19 pandemic at the end of 2019. For the first time since the Great Depression of the 1930s, both developed and developing countries are facing the Covid-19 pandemic. The Covid-19 pandemic has caused enormous pressure on the economy both globally and nationally; reflected in world economic growth that is predicted to contract around 4% in 2020. Extraordinary economic policies including the provision of very large economic stimulus by fiscal and monetary authorities have not been able to withstand the economic downturn of many countries.

Changes in the strategic environment do not stop there, however. The complexity and uncertainty of issues faced by central banks have and will continue to evolve in line with the advancement of digital technology. By its very nature, digital technology develops with rapidity, is transformative and influences various aspects of our lives. Ultimately, digital transformation is part of the digital technology development

process, viewed as "the total and overall effect of digitalisation on the public". Digitisation has facilitated digitalisation, thus providing greater opportunity to transform and evolve existing business models, socio-economic structures, laws and policy measures, organisational patterns, cultural barriers and so on (Khan 2016; Collin et al. 2015). Digital transformation is fundamentally a phenomenon of disruption that is inextricably linked to the inevitable development and revolution of industrial technology. Klaus Schwab (2017) introduced the Industrial Revolution 4.0 concept that has fundamentally disrupted the lives and work of everyone. Three industrial revolutions have taken place before, but none boasted the scope and complexity of the Industrial Revolution 4.0. The advancement of new technology that integrates the physical, digital and biological worlds has impacted all scientific, economic, industrial and government disciplines. Several technology platforms across various fields have experienced rapid breakthroughs thanks to the advancement of technology during the Industrial Revolution 4.0, including the Internet of Things (IoT), big data analytics, artificial intelligence, blockchain technology and cybersecurity.[1]

The development of various technologies has changed public and corporate behaviour in terms of performing transactions and conducting economic activity. E-commerce activity is also playing a larger role in supporting the development of increasingly interconnected economic sectors. In this regard, banking activity and other financial services are expected to optimise the use of technology to meet the customers' needs and compete with the FinTech industry. This will ultimately influence the response, transmission mechanisms and effectiveness of central bank policy. Therefore, central banks must anticipate such developments, including the emergence of digital currency, either one issued by private sector (cryptocurrency) or by a central bank (central bank digital currency/CBDC).

Digital currency, when designed and protected by good regulations, offers greater efficiency in the near term and economic stability in the long run. From a policy perspective, digital currency allows a central bank to fully realise its responsibility as sole issuer of the national currency. Digital currency issued by a central bank (CBDC) could operate under the same principles as physical currency. Central banks could regulate digital currency simply and effectively, while only the central bank can make, destroy and circulate digital currency as legal tender. By maintaining supervision simplicity using existing technological advancement, this will increase control of the monetary policies implemented. From a user perspective, digital solutions facilitate secure and efficient digital transactions. Digital currencies would work securely in all payment systems and solve the interoperability problem, which itself could increase the utility of digital financial services.

There is currently growing interest amongst the central banking community and experts to study the possibility of issuing CBDC. Besides the potential impact on

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[1] Beyond the aforementioned technologies, other technology platforms are also utilised liberally in various industries, including augmented reality (AR) and nanotechnology. In addition, numerous parties are currently linking the IoT with cloud computing services, which combines the use of networked computer technology with internet-based development. This is used to run programs or applications simultaneously across various connected computers. The integration of both will provide sophisticated solutions to future problems.

enhancing payment, settlement and economic transaction efficiency, experts are also focusing on the possible contribution to strengthening monetary policy transmission mechanisms and maintaining financial stability.[2] The concept of digital currency will affect the central bank mandate. Furthermore, this concept has applications in terms of cyber risk, monetary policy instruments, influencing payments infrastructure in the transaction process, impacting financial stability and others. In the process of implementing digital currency, the central bank must coordinate with various parties, such as the internal and external policy authorities, technology providers, regulators, government and other central banks, which will require careful management.

Ultimately, the world's gone from flat, to fast, to smart, to deep (Friedman 2019). Central bank policy practices and services will also experience a significant paradigm shift. Cloud computing solutions, as an industry that has mushroomed in recent years, allows industries and organisations around the world to take advantage of flexible, scalable and cost-effective solutions. Financial services institutions are reliant on services that support information technology. Therefore, cloud computing is being adopted at scale, with the main advantage of storing massive amounts of data in the cloud that can continue to grow without having to invest in individual servers. Security is also an advantage of cloud computing solutions, making cloud computing compatible with central bank network infrastructure that demands impenetrable security. Moreover, central banks can enhance service quality through the best industry practices without having to invest to improve their own infrastructure.

In short, the future role of central banks will not be as simple as today. Increasingly complex conditions, more volatile global economic conditions, elevated uncertainty and ambiguity have become known as VUCA (Volatility, Uncertainty, Complexity and Ambiguity). In fact, the persistent dominance of uncertainty and ambiguity has led to unprecedented global economic turbulence (novelty), otherwise known by the acronym TUNA (Turbulent, Uncertain, Novel and Ambiguous). Therefore, the characteristics of the issues and challenges faced will change, with a high risk of uncertainty (unpredictable). The causes of the problem created by the policy to be taken is thus unclear (unknown). Consequently, the policy direction taken by economic players, including the authorities and market players, is thereby uncertain. As Donald Rumsfeld once stated, the challenges facing management moving forward are unknown unknowns.[3]

This paper explores salient issues of central banking practices, especially on challenges confronted by central banks in the digital era, lessons learned, as well as their implications. The following section presents challenges and opportunities in the digital era, coloured by digital transformation that significantly affects corporate business models, banking and financial digitalization, and the future of money. The third

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[2] The argument that CBDC could enhance monetary policy effectiveness lies in the assumption that CBDC paid interest. Nevertheless, an interest bearing CBDC would place pressure on bank deposits. On the other hand, if the CBDC paid zero interest, the CBDC would place pressure on the zero-lower bound (ZLB). Therefore, the potential impact of CBDC on monetary policy must be explored in depth, requiring various central bank efforts to understand such currencies comprehensively.

[3] Delivered by Donald Rumsfeld (US secretary of defence) on 12th February 2002. See Juhro (2019).

section elaborates new realities will be navigated by central banks moving forward, particularly in terms of several technology trends that are developing with rapidity. The last section derives conclusions as well as academic and policy implications.

Digital Transformation: Challenges and Opportunities in the New Era

In a world characterised by rapid technological advancement, the challenges faced by central banks and other policy authorities moving forward will become more complex, thus demanding and testing the ability of policy authorities to develop innovative new ideas. One of the challenges set to face central banks stems from the central bank's role in terms of managing macroeconomic and financial stability in an era when digital transformation touches various aspects of the economy, including corporate business models, banking practices and the future of currency. Therefore, agile central banks must adapt quickly and appropriately to the changes. The rapid development of innovation and technology will also create massive benefits and risks regarding the future role of central banks. Consequently, it is critical for central banks to monitor and respond quickly in order to manage activity in the entire financial system. For that reason, such environmental changes could potentially broaden the central bank mandate moving forward.

Corporate Business Models

The rapid pace of industry innovation is bringing enormous benefits to companies that can take advantage, particularly in terms of increasing business productivity and efficiency. A salient future challenge for most businesses will be to discover significant and sustainable new sources of growth or income. Businesses must think outside the box. To that end, transformation is a common term used in the business community, where the transformation strategy implies a change in the business model. The most common form of transformation is digital reinvention. Currently, companies are open to digital reinvention, seeking new revenue sources. For a company, developing something new outside of the core business can provide tangible benefits. In this case, digital transformation is a necessary and critical step. If the business transformation is successful, the company will reap radically higher revenue through top-line growth, productivity, cost efficiency, operational effectiveness, customer satisfaction and others. Transformation combined with an appropriate strategy to leverage breakthroughs will change an ordinary business into a game changing business that can promote sustainable innovation and create new sources of growth (Juhro and Aulia 2019; Juhro et al. 2020).

Digital technology has changed market supply and demand. On one hand, digital technology development has increased access or exposed new sources of supply previously unavailable. On the other hand, digital technology has removed demand-side distortions, provided comprehensive information to the consumer and re-bundled aspects of products and services to increase corporate profit. The newly exposed

supply, combined with newly undistorted demand gives new market makers an opportunity to connect consumers and businesses by lowering transaction costs, while reducing information asymmetry (McKinsey 2017). New supply and demand imply giving consumers what they have always wanted but in more efficient ways. Consumer expectations have increased in line with market development. Companies have tried to meet those high expectations through new and enhanced value propositions. In turn, delivering new propositions requires a significant rethink of the business. Any changes to the business model would impact the value chain, cost structure as well as products and services.

The digital transformation era has also exacerbated labour market polarisation between high and low skilled workers, along with youth unemployment, stagnant income amongst most households and income inequality. Automation facilitated by robotics and artificial intelligence technologies is increasing productivity, efficiency, security and convenience. Various developments and ideas that have emerged in recent years have shown that the future working environment will depend on several factors, such as long-term competitiveness and demographics. Automation may not destroy all jobs, but it will change the labour structure dramatically. Higher skills will be required to enter the labour market moving forward, meaning digitalisation and automation will affect the quality and quantity of jobs. New types of work will change the nature of work and working conditions, including the requisite skills, traditional work patterns and sources of income. Technology is opening the opportunity for countries, developing economies in particular, to unlock new fast-growth sectors and close the gap on advanced economies. At the same time, technology has disrupted the labour market, with broad implications on the quantity, quality and variety of jobs.

Banking and Financial Digitalisation

Digitalisation is also strengthening the financial system. For instance, the dematerialisation of financial assets has contributed to the emergence of e-commerce platforms. Digitalisation is clearly visible in the payment system. Until recently, retail payments were only available using cash and cheques. Now, however, both have been largely eschewed due to technological development. Innovation in the payment system has evolved, with payment instruments available directly from a smartphone or smartwatch. At first, the public was only aware of the cash payment system for daily activities, but the cash payment system has been sidelined by technological advancement towards more convenient payments. Various cash payment methods have been replaced through digitalisation by e-money, e-banking, credit cards, debit cards and other payment methods. The recent surge of users switching from the cash to non-cash payment system demonstrates growing public confidence and trust in payment instruments and institutions. Consequently, demand for a fast, efficient and secure payment system has increased, thereby forcing banks to compete to create more efficient alternative payment systems by exploiting various technological advances.

For the banking industry, rapid advancement of digital technology has prompted significant changes in the business of banking. Two decades ago, technological innovation centred on internal innovation, yet now technological innovation has penetrated customer and consumer services. In general, the banking industry has adopted two responses to technological advancement, namely digitalisation to provide faster, more affordable and simpler services as well as integration of banking activities into the customers' daily lives. Through myriad innovation, FinTech has helped the banking industry reach a broader consumer base and access customers previously unbankable through the traditional banking system. FinTech has also provided services with lower operating costs, thereby bringing down the costs passed on to the consumer. The various benefits afforded by payment system digitalisation have encouraged central banks to promote banking industry digitalisation more broadly. The benefits include boosting international economic transactions, suppressing the shadow economy, contributing to economic growth (consumption and higher velocity of money) and increasing monetary policy effectiveness in terms of convenient money supply controls and mitigating illegal activity, such as corruption, money laundering, terrorism funding and tax evasion.

Digital transformation, particularly within the payment system, has created opportunities and risks like two sides of a coin that cannot be fully maximised or eliminated. In this case, digital technology can influence monetary policy and financial system stability in a country. The evolving use of digital technology has created numerous economic benefits. *First*, digital innovation facilitates broader access to financial services. Previously unbanked persons are now able to utilise banking services due to greater convenience and affordability. This means that banking digitalisation has facilitated broader financial inclusion. *Second*, creating more efficient business processes by lowering operating costs. A digitalised payment system can create products and offer services with greater cost efficiency, thereby lowering the costs passed on to the consumer. In addition, the use of technology has expanded the variety and choice of services available to consumers. *Third*, potential security gains through technology. Most banking activities can be automated through the use of technology. Business services and monitoring are also more convenient and secure because the bank can monitor all activities with ease.

Notwithstanding the benefits, payment system digitalisation also creates risks that could disrupt financial stability in a given jurisdiction or globally. *First*, the threat of cybercrime increases when all banking processes are automated. Technological advancement is always accompanied by larger cyber threats. Therefore, rapid technological advancement in the banking industry must be accompanied by sophisticated cyber security efforts to avoid massive losses triggered by cyber-attacks. *Second*, the potential impact on monetary policy effectiveness and financial system instability. Technological advancement facilitates higher asset volatility that could undermine or at least delay the impact of tighter monetary policy. Meanwhile, broader use of technology in the banking sector, accompanied by the emergence of various new industry players, could increase cyber-attacks and the risk of bank runs facilitated by fast and convenient transfer services, which have created the threat of financial system instability. *Third*, the erosion of consumer protection. In the era of banking

digitalisation that prioritises convenience in transacting, coupled with the automation of all service processes, consumer protection has been eroded. Larger cyber-attacks and greater access to confidential consumer data have created massive consumer losses.

Future of Money

The fundamental consequence of digital transformation on the existence and role of central banks refers to the future of money. Payment transaction convenience supported by various existing facilities will reduce cash use. Cashless payments, such as e-money, e-banking, credit cards and debit cards, create inherent advantages, thus usurping cash payments. This trend is leading towards a cashless society, namely a significant reduction of cash use. Payment instruments generally have strong network externalities, where a larger network of users increases the utility for each user. For example, if several payment instruments are accepted widely in the retail space, the utility of such instruments for the users will increase. In practice, cash will lose its network externality, making it more difficult to obtain cash moving forward (Ingves 2020).[4]

On the other hand, since Nakamoto (2009) developed blockchain technology, start-ups have sought to create alternative financial transaction systems that have hitherto remained the domain of the banking industry. The emergence of peer-to-peer (P2P) transactions and cryptocurrency have ushered in a new era of convenient alternative services for the public, including financial transactions that were previously the preserve of the banking industry. Cryptocurrencies are attractive to the public, particularly in terms of potentially higher prices moving forward as well as the freedom and speed afforded by blockchain technology without the involvement of a third party, namely banking. Therefore, there are no rules or regulations that could potentially impede the payment process. For example, when initiating an international transfer, the process no longer requires several working days, instead taking just hours or even minutes. In addition, cryptocurrency obviates the possibility of money counterfeiting. A problem with using cash or credit cards is vulnerability to theft and fraud. Cryptocurrency, however, is created using a unique computational algorithm, which is almost impossible to hack.

The emergence of cryptocurrencies has increased competition amongst payment service providers. Therefore, financial authorities must intervene to ensure financial system stability. Cryptocurrencies are small in scale with limited interconnectedness and, thus, systemic risk concerns are negligible. Nevertheless, without supervision by the relevant authorities, cryptocurrencies could become embedded in the main financial system and threaten financial stability. Most importantly, cryptocurrency cannot erode the central bank's role as custodian of public trust. Private digital tokens obfuscated as currency cannot destroy public confidence in the central bank. Although cryptocurrencies are considered high risk and with the potential to disrupt

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[4] Several banks in Sweden, Norway and Denmark, for example, have recorded cashless transactions exceeding 90%, or even 97% when peer-to-peer (P2P) products are reflected. This trend will be replicated in all countries due to the need and consequences of rapid technological innovation. This is inevitable, including central banks and financial supervision institutions (Wijaya 2019).

economic stability, it cannot be denied that they have unlocked a new era of currency digitalisation.

Moving forward, digital currency will become more attractive than cash, where convenient access and flexibility will override public demand for cash. Access to cash to and from the central bank is limited to traditional operating hours, namely less than 24 h per day and only five days per week. Many central banks already offer real-time or near real-time settlement available 24/7. There are, of course, exceptions, such as cross-border retail payments, which are generally slower, less transparent and more expensive than domestic retail payments. In this regard, central bank efforts lag behind the potential afforded by digital currency.

Under such conditions and considering the characteristics and potential risks associated with cryptocurrencies, various academics have opined that central banks must utilise digital technology to increase use of central bank digital currency (CBDC). Prevailing opinion is that CBDC would facilitate risk-free payments for the public and create digital instruments for daily transactions. In addition, CBDC offers a viable alternative to cryptocurrencies, providing a higher level of security. In reality, however, central bank reaction to developing digital currency is cautious and defensive. Nevertheless, the future development of digital currency is not a choice but an inevitability. Moving forward, the availability of digital currency in the form of tokens or accounts held directly by the central bank is required due to FinTech developments, such as bitcoin and various other advances in other sectors that will persist. Therefore, studies regarding the pros and cons of issuing digital currency will continue to be published (Murray 2019; Panetta 2018; Yanagawa and Yamaoka 2019).

In the case of Indonesia, for instance, the monetary policy authority, e.g., Bank Indonesia (BI), always pays attention to the urgency of adopting digital currencies. BI considers public behaviour or demand for digital money, which can be in the form of cryptocurrency, or just digital money, which is currently very widely used; and its potential impact on the macroeconomic stability and growth. BI prohibits cryptocurrencies (such as Bitcoin) from being used as a means of payment, because the official means of payment (legal tender) in Indonesia is the rupiah. However, cryptocurrency still can be used as traded goods.[5]

BI, in a forward-looking perspective, also plans to issue a digital currency or CBDC in the future. In this case, there are three considerations in this CBDC issuance plan (Bank Indonesia 2021). *First*, digital currency is the authority of BI as the central bank. This is a mandate from the 1945 Constitution (UUD), which is spelled out through the Currency Act and the Bank Indonesia Law. In this context, BI plans to issue rupiah CBDC as legal tender in the future. As a legal payment instrument, this rupiah CBDC will be prepared 'end-to-end', both in terms of design and circulation, as BI does for banknotes and cards, both debit and credit cards. *Second*, the CBDC will support the implementation of monetary, macroprudential and payment

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[5] The Commodity Futures Trading Regulatory Agency (Bappebti) has issued Regulation number 5 of 2019, concerning technical provisions for the implementation of the physical market for crypto assets on futures exchanges in Indonesia.

system policies, including the preparation of integrated financial market infrastructure, foreign exchange, and the financial sector. *Third*, BI will really consider the technology to be utilised optimally. This, among others, can be done by observing and adopting which technologies or platforms are used by other countries.[6]

The impact of CBDC on monetary policy effectiveness is heavily dependent on whether CBDC pays interest. Account-based CBDC that pays interest would unavoidably impact monetary policy implementation and transmission. An interest bearing CBDC would allow central banks to target negative interest rates in response to dire economic conditions as well as avoid or at least minimise the need for unconventional monetary policy. In other words, monetary policy could become fully symmetrical. Interest rates could be adjusted downwards without limit, while monetary policy would not change operationally. Inflows and outflows would be accommodated automatically and the impact on reserves neutralised similar to current paper money mechanisms. The difference lies in the central bank's greater ability to stabilise prices and output.[7] Another monetary policy benefit of account-based CBDC is direct control over interest rates by the central bank. Account-based CBDC provides central banks with a direct channel to the interest rates faced by households and businesses, and avoids potential unwanted biases that can happen under the current system, where central bank target movements are distorted through interest rates in the capital markets and commercial banks. Account-based CBDC would also offer real-time interaction between economic activity and changes in monetary policy.

From a financial stability perspective, one of the benefits of CBDC replacing cash would be to eliminate the risk of bank runs. If a central bank issued account-based CBDC, where the function is similar to term deposits at commercial banks, this would eliminate the risk of bank runs during periods of financial distress because CBDC is managed and guaranteed directly by the central bank and, therefore, could never collapse. Fundamentally, CBDC is free from credit risk and liquidity risk. Furthermore, account-based CBDC is fully guaranteed and secured by risk-free central bank securities, making it safer than other types of currency. Another benefit of issuing CBDC for the central bank would be latitude in terms of controlling credit growth and existing sources of debt financing within the economy.[8]

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[6] The issuance of the CBDC is an integrated part of the development strategy of the Indonesia Payment System Blueprint of 2025 (Bank Indonesia 2019).

[7] Currently, however, the most binding constraint to symmetrical monetary policy is the ability of households and businesses to circumvent the impact of negative interest rates by converting term deposits and financial assets into cash.

[8] Another consideration regarding the future use of CBDC is whether paper money will continue to circulate, but commercial banks may remain and compete freely for the retail sector. Market pressures would cause a concentration of term deposits at commercial banks as a means to fund loans extended to households and businesses. The critical difference from a financial stability perspective would be more limited in terms of incompatible maturity and liquidity.

New Realities and Lessons Learned

It is common knowledge that central banks are going to face new realities moving forward, particularly in terms of several technology trends that are developing with rapidity. Therefore, central banks must work diligently to observe the potential benefits and risks of each technology as prospective innovative options to be exploited.

First, the ability of technology to use big data and big data analytics to design quantitative algorithms that transform data into comprehensive information for effective consumption. All FinTech players use big data analytics for their products and services to learn about their consumers and garner input when making business decisions. To that end, big data analytics can help bridge market supply and demand by contributing and innovating business models for financial technologies. *Second*, artificial intelligence allows computers or mobile applications to perform tasks typically requiring human intelligence, such as feeling, understanding, behaving, learning and taking final decisions. This technology has massive potential to stimulate innovation in all business sectors and financial services. *Third*, blockchain is the backbone of cryptocurrency and central bank digital currency, in which its development will determine how far central banks can play a strategic role in the digital era with an increasingly decentralized financial system. *Finally*, cybersecurity, namely a technology development strategy to identify, authenticate, integrate and facilitate information systems and electronic data. The hacking of business units belonging to financial technology players must be meticulously guarded against to safeguard system security.

Although digital technologies are believed to help businesses become more productive, create more job opportunities and improve public services; we must ensure the economy receives optimal benefits from the digital dividend. This is possible by building solid foundations of analogue complements through strong regulations to nurture innovation, develop skills to optimise the opportunities that arise and institutional strengthening to ensure the authorities can provide public services accountability (World Bank 2016).

Therefore, authorities and other stakeholders must consider various aspects when taking action against future technologies and innovations that are constantly evolving by building comprehensive understanding of digital economic and financial practices in accordance with respective jurisdiction (Berger 2017a, b). Mapping the innovations based on the characteristics of each respective services provider (new technologies or updated technologies). Preparing clear rules and regulations to accommodate new activities and ensure risk control, minimal regulations to manage money-laundering, consumer protection and consumer data, applied to all financial services providers and payment platforms. Innovation in the financial sector is a worldwide phenomenon, and services providers work across borders. Therefore, it is important to preserve inter-authority cooperation and coordination when developing regulations to be enforced globally. Equally important, as a regulator, the central bank

must utilise technologies and other analytical skills to develop toolkits to increase supervision capacity.

Of the diverse strategies that a central bank might have to undertake, fundamentally, central banks will need to take comprehensive and holistic actions as they face various new technology-driven challenges that will disrupt their businesses in ways we cannot even imagine right now. The future of unknown-unknowns shall remain a challenge, requiring central banks to ensure resilience and efficiency by creating reliable and nimble organisations in response to any environmental changes (PwC 2016). Addressing such developments, central banks must clearly understand the dynamics and prepare the full panoply of tools at their disposal. Central banks require an organisational structure and human resources agile to change. The qualities of competent human resources must be accelerated to keep pace with rapid technological development rather than increased business as usual. Central banks must remain ahead of the curve, thus requiring an agile non-hierarchical organisational structure to respond quickly to shifts and changes in the environment.

Ultimately, strategic environmental change after the crisis, which will inevitably accelerate in the digital era moving forward, will determine how the economic system works as well as the presence and mandate of the central bank.

The following lessons learned can be derived from the above discussion. *First*, experience from various financial crises has shown that central bank concerns over maintaining financial system stability will continue to increase. New monetary and financial policy instruments must be developed and integrated into a policy mix strategy, which will ensure a broader central bank policy impact in the real sector. Such ideas contradict the views of some, however, who have stated that financial crises occur due to a central bank mandate that is too broad, giving the impression that the central bank's task is becoming less effective. Therefore, institutional strengthening of the central bank is unavoidable. Furthermore, central bank independence must be upheld as sacrosanct, accompanied by accountable and transparent policy implementation. In addition, stronger coordination is required amongst policy authorities within their respective jurisdictional corridors, supported by an effective communication strategy to articulate policy messages unequivocally to financial market players and stakeholders.

Second, with greater economic openness and strong interlinkages between economic activity in the real and financial sectors, the dimension of international interconnectedness in the globalisation is an emergent aspect that will feature prominently in central bank policymaking moving forwards. Therefore, central banks must prepare a policy strategy and response from the perspective of a hyperconnected and borderless world. The challenge of unknown-unknown environment demands stronger international cooperation initiatives to build catalytic collaboration and ensure inclusive and sustainable economic prosperity.

Third, as companies continually hone their business models in response to environmental changes, central banks must also be able to adjust their business processes to strategic environmental changes in the TUNA era. Central banks need to work hard not only to optimise the benefits afforded by digital technological advances but also to remain relevant in the era of digital transformation, which will only continue to

accelerate moving forward. While the central bank policy mix is still a viable strategy, central banks are required to operate 'beyond conventional wisdom', with novel practices. Non-hierarchical business processes and multidisciplined procedures must be adapted by central banks through integrated policymaking. The introduction of new technologies in various economic lines has opened the door to new economic threats. Cyber-attacks have enormous potential to threaten financial systems and infrastructures in a country. Therefore, it is critical to develop systemic resilience through a reliable supervision and cybersecurity system. Clear supervision and regulation to overcome cyber-attacks, the ability of cyber security to detect attacks quickly and developing solid systems and structures are a necessity moving forward.

Conclusion and Implications

As explained above, navigating central banking practices in the digital era, blighted with high uncertainties, is a very challenges task that requires the central bank's ability to create breakthroughs and orchestrate policy innovations. Hence, optimizing the benefits of technological advances and remaining relevant in the digital era must be the anchor of the central bank's strategy going forward.

Tough problems always provide good opportunities for us to learn. The series of previous economic crises have spawned new economic theories or ideas, including next practices. In this regard, rapid changes in the strategic environment have fundamental implications on theories underlying central bank policymaking. Likewise, policymaking and implementation practices at various central banks have undergone change and strengthening that require development of the underlying theories. 'Practice ahead of theory', as extolled by King (2005). In other words, this evolution is influenced by reciprocity between the development of monetary economics and financial theory in academia with the ideas and concepts underlying policymaking practices in the central bank.

Academia, in its efforts to explain or offer solutions to the problems, has contributed an abundance of conceptual and theoretical ideas regarding various economic phenomena and behaviours in society. Such theoretical thinking is advanced and profound at the philosophical-conceptual level, supported by the use of advanced quantitative methods and empirical studies,—although often based on certain assumptions to simplify complex economic behaviours in the real world.

In many central banks, on the other hand, various concepts and innovations have occurred in the discipline of policymaking as solutions to complex financial and economic problems that have emerged and developed quickly. In many cases, policy innovation is also facilitated by close interaction within the central bank community at various global and regional forums and meetings. Theoretical ideas that develop in the academic world certainly form the basis of central bank policymaking. Nonetheless, the complexity of real-world problems often demands an innovative policy response from the central bank, which provides further impetus for the academic community to test the underlying theoretical merit and empirical evidence.

Therefore, in a world characterised by rapid technological advancement, the challenges faced by the central bank and other policy authorities moving forward will become more complex, thus demanding and testing the ability of policy authorities to develop innovative new concepts as the authority/regulator, which is always relevant. One challenge central banks will face stems from their role to maintain financial stability in the era of digital transformation from various economic aspects, including banking, currency and core business. Central banks must remain agile to adapt quickly and appropriately in the face of change. Rapid development in terms of innovation and technology creates large benefits and risks for the central bank function moving forward. Therefore, it is critical for central banks to develop early monitoring and rapid responses in terms of managing activities in the entire financial system. Consequently, the various environmental changes will also influence the future mandate of the central bank.

The rapid evolution of policy and institutional ideas in the central bank environment, encompassing the academic theories and innovative policy responses, must also be reviewed, studied and documented. The conceptual thinking underlying the central bank policy response is a critical reference for other central banks and policymakers to draw lessons from conventional practices and the best practices to resolve the problems faced, and for the academic community to explain and develop the theories in more depth. On the other hand, the theories that continue to flourish in academia are a useful reference for central banks to assist the policymaking process in response to the unfolding problems.

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