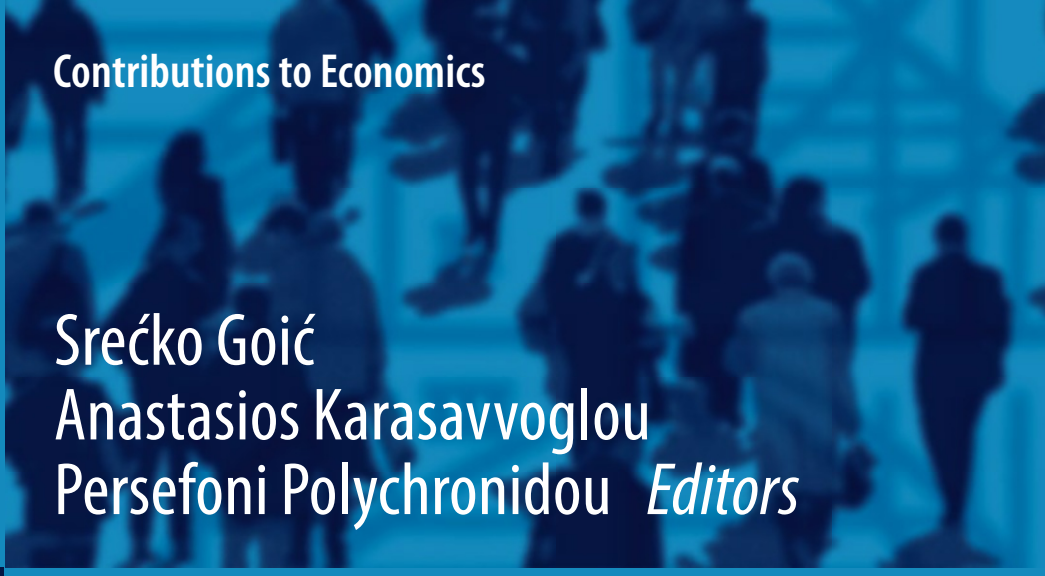

Contributions to Economics

Srećko Goić
Anastasios Karasavvoglou
Persefoni Polychronidou *Editors*

# Finance in Central and Southeastern Europe

Springer

# Contributions to Economics

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# Finance in Central and Southeastern Europe

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# Preface

Central and Southeastern Europe has been, in the past quarter of century, the scene of the many interesting processes and deep changes in different areas, including the fields of economics and finance. Most of the countries from this region have almost completed their transition from communist model of society and economy to the model of democratic society and market economy integrated in larger systems like the European Union and NATO. The paths they followed and results they achieved have been very different, but that makes things even more interesting and challenging. General and local crises and turbulences have been striking particular countries and the whole region during all that period.

All that certainly gives opportunity and encouragement for scientists and professional researchers to investigate, analyze, and develop new ideas and new knowledge. As a part of the development and changes that Central and Southeastern Europe has undergone over the past 25–30 years, we have witnessed a significant development in the area of academic and scientific work. Development and restructuring of old universities, new universities, and scientific institutes, journals, and conferences have been flourishing in the region. Central and Southeastern Europe has become not only interesting area for scientific research but the region where new knowledge and insights are being created and from where new knowledge is delivered and disseminated to the world.

International Conference, "The Economies of the Balkans and Eastern Europe (EBEEC)" through its eight previous editions, has become the forum where the knowledge and experiences of the economics and business in the region of Central and Southeastern Europe are exchanged, discussed, and checked. And they are not only discussed and verified but disseminated—new knowledge and ideas created in this area are made available to others—all over the world. Through its various publications, EBEEC is trying to make available new knowledge and ideas developed by scientists from the Central and Southeastern Europe to scientists and practitioners around the World. Big help and contribution in that sense is found in cooperation with renowned publishers such as Springer.

The eighth International Conference "The Economies of Balkan and Eastern Europe Countries in the changed world" was organized jointly by the TEI of Eastern Macedonia and Thrace, Department of Accounting and Finance (Greece), and the University of Split, Faculty of Economics (Croatia), and took place in Split, Croatia, May 6–8, 2016. The Conference's general aim was to present scientific papers and researches of theoretical and empirical character about the economies and business in this region, bringing together more than 200 papers prepared by more than 300 authors from 32 countries from the region and all over the world.

A broad range of issues—from Macroeconomics and Economic Policy, Monetary Economics, Finance and Banking, Globalization, Regional Integration with special reference to the EU, Economic Growth, Development and Sustainability, Labor Markets and Immigration, Management and Marketing, and Entrepreneurship to Corporate Governance, Accounting, and Auditing—have been discussed at the Conference and in the resulting papers.

This volume, as one of the publications resulting from the eighth International Conference "The Economies of Balkan and Eastern Europe Countries in the changed world," is trying to make available worldwide works and knowledge created under the auspices of EBEEC conference in a specific area—Finance. It contains ten selected works from the fields of finance, prepared and presented to eighth EBEEC Conference in Split. These papers, peer reviewed and carefully edited, are certainly making a significant contribution in the broader field of finance. They are concrete indication that the region of Central and Southeastern Europe is developing new knowledge and ideas even in this field. That is undoubtedly the result of two related, abovementioned, trends: dynamic development of new ideas and experiences in the economies of the region of Central and Southeastern Europe and the considerable progress in quality of the scientific potential and work in the region of Central and Southeastern Europe.

Countries from Central and Southeastern Europe have evidently experienced in recent decades very interesting developments and practices in the field of finance, some of which have served to the authors represented in this book as the objects for very interesting analyses and grounds for quality work. The papers presented in this volume cover the spectrum from monetary economics and electronic money to capital markets, banking, and insurance.

Since presented papers are independent and not directly related, their order of appearance in the volume is purely editorial, intended just to present a spectrum of topics in the field of finance that attract the attention of contemporary authors from Central and Southeastern Europe.

In the first chapter, Magdalena Szyszko from the WSB University in Poznań, Poland, presents a cross-country comparison of central banks' decision-making attitudes using a simple but very interesting index of "forward-lookingness" (FL). That index verifies whether the central banks consider their own inflation forecast and inflation expectations while making decisions on the interest rates.

Once it is possible to establish the FL of the central bankers, the conclusion on the relationships of their results and FL of the central banker and expectations of economic agents can be drawn. Furthermore, this chapter tries to assess the central

bank's decision compatibility with its own inflation forecasts. Inflation forecasts, consistently used by the central banks, may support the stabilization of inflation expectations exhibited by economic agents.

Analytic methodology developed by the author is applied in the empirical study of the cases of the Czech Republic, Poland, and Hungary. The results of this empiric research show the highest FL of the Czech National Bank which outperforms the National Bank of Hungary and the National Bank of Poland in both FL and decision consistence with the macroeconomic forecasts.

The second chapter, prepared by Biljana Rondović, Vujica Lazović, Tamara Đuričković, and Dijana Kovačević from the Faculty of Economics, University of Montenegro, studies a very interesting topic of issuance and widespread use of private electronic money. The main goal of this chapter is to show what changes occur in case of accelerated issuance and use of private digital money. The analysis was carried out for the case of Montenegro, which is especially interesting because Montenegro is a small open economy that adopted a foreign currency (Euro) as the national currency.

The research results showed that accelerated issuance of private digital money and its parallel use with the official electronic money can lead to negative outcomes: financial instability, difficulties in conducting monetary and fiscal policies, as well as problems in the operations of the Central Bank and deposit institutions.

Through the results and conclusions of this chapter, authors give a valuable contribution to the discussions on private digital currency and understanding of the attitudes of the monetary authorities and private clients in terms of digital money, especially in small and developing countries like Montenegro. Results can also be useful to professionals in the banking sector and regulatory bodies to better understand the environment in which private and official money is operating in parallel.

The next chapter, written by Srđan Marinković and Ognjen Radović from the University of Niš, Faculty of Economics, analyzes the question: What drives a local currency away from banking markets? The chapter explores determinants of currency substitution on a sample of countries of Southeastern Europe (Albania, Bosnia and Herzegovina, Croatia, FYR Macedonia, Romania, and Serbia) that follow a variety of exchange rate regimes within different monetary frameworks. Despite all differences, the level of currency substitution (with Euro substituting local currency) has been rather high in all sampled countries for many years. Foreign currency loans continue to dominate local loan markets, and broader money aggregates to a large extent consist of foreign currency deposits (financial "euroization").

Although the substituting currency (euro) does not undermine the substituted ones in their role of means of payment, it is the pervasive use of foreign currency as the store of value, or choice of currency for financial assets and liabilities, which becomes a persistent feature of all economies in question. The presence of financial euroization makes interest rate channel of monetary transmission inefficient. Moreover, the pervasive level of financial euroization leaves an economy dangerously exposed to external shocks.

Using multiple panel regression models fed by the official annual data that cover the last decade, authors give new and very interesting insights into this problem. They analyze and test the significance of a set of variables pointed out by two international parity conditions, i.e., uncovered interest rate parity and purchasing power parity.

Designed that way, they employ econometric models to trace wrong policy choices or unsustainable economic policy mix, trying to explain puzzling disparities of the international parity relationships, and understand better roots and mechanisms of financial euroization in Southeastern Europe and in general.

The chapter prepared by Alexandra Horobet from the University of Economic Studies, Bucharest, Romania; Aleksandar Shivarov from the University of Economics Varna, Bulgaria; and Lucian Belascu from the University of Sibiu, Romania, deals with the issue of exposure to exchange rate risk and competitiveness.

Authors analyze the economic exposure to currency risk of stock markets from nine countries in Southeastern Europe (Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania, Serbia, Turkey, and Russia) using bilateral exchange rates of the domestic currencies against their main trading partners' currencies between 1999 and 2015.

The results obtained through well-designed and founded analysis indicate that these economies show contemporaneous exposure to currency risk, but they are different in size and sign from one country to another and from one currency to another. There is smaller evidence for asymmetric exposures in linear specifications, which might indicate a general inability of companies in the region to use real or financial options in order to benefit from the positive effects of changes in exchange rates or to hedge the undesired expected exposures. The evidence for nonlinear exposures is strong for these economies and generally shows that companies' value is negatively influenced by higher volatility in exchange rates and more frequent appreciations of foreign currencies.

Overall, the findings of this chapter suggest that countries from Southeastern Europe face competitiveness challenges regarding their main trading partners, but also that companies from the region are less capable of using real and financial options to mitigate their exposures to currency risk, and this is reflected in their overall market performance.

Kemal Kozarić and Emina Žunić from the School of Economics and Business, Sarajevo, Bosnia and Herzegovina, offer in their chapter an interesting approach to the analysis of financial stability and non-performing loans.

The authors try to investigate connection between macroeconomic variables such as real GDP growth rate, inflation and unemployment, and the scope of non-performing loans. Based on quarterly data about non-performing loans, GDP rate, inflation, and unemployment from Croatia, Serbia, and Bosnia and Herzegovina for the period 2006–2015, they try to identify characteristics and differences in this relationship between these countries of Western Balkans.

Using panel cointegration analysis and Vector Error Correction Model, authors tried to assess whether there was a relationship between non-performing loans and macroeconomic variables of selected Balkans' countries in the short and long run.

Results indicate existence of at least one cointegration vector, which proves the existence of causality between non-performing loans and macroeconomic factors at the long-term level. Accordingly, authors conclude that improvement in macroeconomic conditions can ameliorate situation with the non-performing loans.

Sixth chapter in this volume is a contribution from Ana Kundid Novokmet and Andrijana Rogošić from the Faculty of Economics, University of Split, Croatia. They try to connect and explain banks' corporate social responsibility (CSR) performance with country development level. Based on modern institutional theory of corporate social responsibility, they start with the hypothesis that banks' CSR performance is positively driven by countries' macroeconomic and institutional development and their banking sectors' development. Development banks, rather than commercial banks, are at the center of the empirical evidence, mainly because they are perceived to be socially responsible institutions by their definition. Following Global Reporting Initiative's (GRI) Sustainability Reporting Guidelines, authors measure CSR performance throughout CSR reporting quantity and reporting form.

Using abovementioned approach and the World Bank's data, authors are analyzing a sample of development banks from 22 European countries (including banks from 15 Balkan and Eastern European countries). The results of that research confirm that GDP per capita, research and development expenditures over GDP, gross savings over GDP, and employment of total labor force are positively related to development banks' CSR performance, while banking sector variables (net interest margin and regulatory capital to risk-weighted assets) are negatively related to development banks' CSR. Countries' institutional development variables are also found connected to development banks' CSR performance but with rather small differences between better and lower performing development banks with regard to CSR.

Thus, authors conclude that more developed economic systems as well as less profitable banking systems, which have lower level of regulatory burden, have higher performance of development banks' CSR. An important caveat of this research is that there is a trade-off between cost of banking intermediation and development banks' CSR performance, while macroeconomic performance and CSR performance are in complementary relationship.

Anna Siekelová, Ivana Weissová, and Katarína Valášková from the Faculty of Operation and Economics of Transport and Communications, Department of Economics, University of Zilina, Slovakia, discuss in their chapter the proposition of interdependence between indicators used for identifying (predicting) impending bankruptcy and selected indicators of receivables level.

The majority of receivables have the nature of trade credit. Offering trade credit is a strategic tool in the hands of the company, but when payments in commercial transactions are (much) later than it was agreed, they endanger company's liquidity and can even lead to the firm's bankruptcy.

In this article, authors analyze a set of business indicators for 9821 Slovak companies (in 2015), trying to discover the relationship between the absolute amount of trade receivables and the ratio of equity to liabilities (as indicators

used for identifying impending bankruptcy) and the days sales outstanding and the total amount of trade receivables.

The results of quantitative analysis showed weak negative correlation between the absolute amount of trade receivables and indicators for identifying impending bankruptcy. In examining the correlation between sales outstanding days and indicator for identifying impending bankruptcy, the result of Pearson correlation coefficient was only −0.014, with no statistical significance.

Despite the low level of correlation between considered variables, authors claim that the amount of trade receivables and days sales outstanding have a major impact on the financial stability of the company.

A different kind of financial risk is analyzed in the chapter prepared by Sandra Pepur and Marija Tripović from the Faculty of Economics, University of Split, Croatia. As if questioning the old proverb "no risk–no profit," they are analyzing relationship between credit risk and bank profitability.

Credit risk is considered one of the most important and most influential factors affecting bank performance. In order to investigate credit risk–profitability relationship, these authors apply dynamic panel data analysis to the data set of commercial banks that operated in Croatia in the period from 2003 to 2013. Controlling for other potential determinants of profitability of the banks in Croatia, the results obtained by authors support initial proposition. Credit risk variable proved to be the second most influential variable (after the bank size) affecting (negatively and statistically significantly) bank profitability. This means that banks that have a larger amount of reservations compared with the total amount of loans experience lower profitability. Interestingly, the variables like liquidity risk and GDF growth showed no statistically significant correlation with banks' profitability.

With such conclusions, this chapter definitely gives a notable contribution to the understanding of the profitability determinants in the context of developing countries such as Croatia and gives additional insight into the main factors that may influence bank success, which is of unquestionable importance for both policy makers and bank management.

Marietta Janowicz-Lomott and Adam Sliwinski from the Warsaw School of Economics, Poland, discuss in their chapter the role of mutuals in the European insurance market.

Mutuals differ fundamentally from stock companies because in them consumers are also owners—they provide capital and bear the risk at the same time. Because of that, the mutual form is free of conflict of interest between the owner and the consumer.

Authors of this chapter try to find out if and how coexistence of mutual and commercial insurers is possible in the insurance market.

Starting from the positions of the theory of enterprises (mainly the theory of agency) and the theory of finance (in connection with the effectiveness or availability of capital), they point out that recent changes in the concept of financial institutions' operations and the financial crisis 2007–2008 have produced (among else) a loss of confidence in financial institutions by customers.

Building on this presumption, the authors analyze whether and how the operation paradigm shift of insurance affects the mutual insurance companies. Analyzing data on global level, and then from selected countries of Central and Southeastern Europe, authors verify the hypothesis that the formula of reciprocity allows mutual insurers not only easily to survive crises of confidence in financial institutions but even improve their market position.

Finally, Antonios Papathanasiou, Chris Grose, and Persefoni Polychronidou from Accounting and Finance Department, Eastern Macedonia and Thrace Institute of Technology, Greece, prepared a chapter dealing with listing and delisting from stock exchange. Using data from the Athens Stock Exchange (ASE), they study the forces driving companies' exit from the ASE.

For that research, authors analyze a sample of companies that were driven to delisting from the ASE during the years 2000–2014. They highlight the motives and the information on which this exit was considered as the most appropriate choice as well as the actions taken before, during, and after the delisting process from the ASE. Moreover, the differences between voluntary and not voluntary deletions are highlighted and useful and valid conclusions from investors who are placed in diversified portfolios are indicated.

In an effort to improve the role of the ASE and the market's prospects, authors concluded that in the past and along with the mistakes that have taken place, an important reason for companies' delisting from the ASE was the lack of control of listed companies, weak corporate governance, and audit mechanisms.

Hoping again that this selection of chapters from a combination of young and experienced scholars and researchers from Central and Southeastern Europe will confirm the initial statement that this region is producing new and genuine knowledge and ideas in the field of finance, we are leaving to the readers to finally assess their quality and use and disseminate ideas, questions, and solutions offered by these authors and their chapters.

Split, Croatia — Srećko Goić
Kavala, Greece — Anastasios Karasavvoglou
Serres, Greece — Persefoni Polychronidou

# Contents

# Is Monetary Policy Really Forward-Looking? The Case of the Czech Republic, Poland and Hungary

**Magdalena Szyszko**

**Abstract** The following chapter presents the cross-country comparison of central banks' decision-making premises. A simple index of forward-lookingness (FL) is created and applied for the Czech Republic, Poland and Hungary. This index verifies whether the central banks consider their own inflation forecast and inflation expectations while making decisions on the interest rates. The way how the modern central banks understand transmission mechanism justifies a search for an assessment of their forward-lookingness. Once it is possible to compare the FL of the central bankers, the conclusion on the relationships of their results and FL or the FL of the central banker and expectations of economic agents can be drawn. The additional goal of this chapter is to assess the central bank's decision compatibility with its own inflation forecasts. Inflation forecasts, consistently used by the central banks, may support the stabilization of inflation expectations exhibited by economic agents. The results for three countries covered by the examination show the highest FL of the Czech National Bank which outperforms the National Bank of Hungary and the National Bank of Poland in both: FL and decision consistence with the macroeconomic forecast.

## 1 Introduction

Modern monetary policy should be forward-looking. There are two main reasons for central bank's forward-lookingness: monetary policy lags and the role of economic agents' expectations in monetary transmission. Modern monetary strategy—inflation targeting—offers a framework, including institutional arrangements, for implementing expectations-oriented monetary policy. However, the framework itself does not mean that the central banker is forward-looking and uses preemptive strikes to affect the economy. Monetary policy decisions are the

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most important factors for the assessment of forward-lookingness. Should one want to conduct such an assessment, he would need to analyze the decision premises.

The following chapter presents an ex post analysis of the decisions made by three Central European central banks: the Czech National Bank (CNB), National Bank of Poland (NBP) and National Bank of Hungary (NBH). They are all inflation targeters and they use inflation forecasts in their monetary policy. The following study covers the period from 2011 to 2015. The three central banks in question started to produce inflation forecasts much earlier but up to 2011 they gained experience for the optimal level of forward-lookingness in their decisions. The more turbulent time for central bankers and financial market arising from global financial crisis is excluded from the time span of the following study.

The research does not focus on the standard ex post analysis which delivers the comparisons of the decisions versus the achievements of monetary policy goals. A simple index of forward-lookingness is created to compare the attitudes of the central bankers over time. The index assesses also the central bank's decisions compatibility with its own inflation forecast. In this research, a forward-looking decision of the central bank means that the decision considers two factors referring to the future performance of the economy: central bank's inflation forecast which is produced on the basis of predefined transmission mechanism, and inflation expectations of economic agents which are a driving factor of the economic performance.

Papers on the decision-making process performed by the central banks do not directly cover forward-lookingness of the central banks to such an extent as it is done in this chapter. The development of the forward-lookingness index (FL index) makes it possible to answer further research questions on the relations between the central bank's attitude and its effectiveness or economic performance. The approximation of central bank's forward-lookingness may also explain the extent to which economic agents form forward-looking expectations. The motivation for this research is to fill this gap in the literature. Therefore, the main purpose of this study is of methodological nature: to present a tool of the central bank forward-looking attitude assessment. Consequently, some comparisons of the central banks behavior will be possible.

The chapter is organized as follows: the second section delivers theoretical justification for the forward-lookingness importance in the monetary policy and a special position of the inflation forecast in the Monetary Policy Committee (MPC) deliberations. The third section is of methodological nature and it presents the index itself. The fourth section presents the examples of the index calculated for the CNB, NBP and HNB. The conclusions are drawn upon in the final section of the following chapter.

## 2 Theoretical Background

Modern monetary theory[1] underlines the importance of shaping expectation of the economic agents. Expectations are subjectively held beliefs of individuals about uncertain future outcomes or the beliefs of other individuals on the marketplace (Pesaran and Weale 2006). Basic equations of monetary transmission refer to expectations (Galí 2008; Goodfriend 2007):

$$\pi_t = \alpha E_t\{\pi_{t+1}\} + \beta y_t \tag{1}$$

$$y_t = -\frac{1}{\sigma}(r_t - E_t\{\pi_{t+1}\} - r_n) + E_t\{y_{t+1}\} \tag{2}$$

$$L_t = \frac{1}{2}\left[(\pi_t - \pi^*)^2 - \beta y^2\right] \tag{3}$$

where: $\pi_t$ denotes inflation, $E_t$—expectations of inflation given in period t, $y_t$—output gap, $r_t$—interest rate, $r_n$—natural interest rate, $L_t$—central bank's loss function and $\pi^*$—inflation target. Monetary policy rule, like Taylor rule, may complement the model. Equation (1) is New-Keynesian Phillips curve—inflation equation. Today's inflation depends on inflation expectations for the next period and on the output gap. The central bank's attitude may influence inflation expectations directly and via interest rates which drive the output (eq. 2, IS curve). Inflation equation is derived from the staggered prices model (Calvo 1983) where price-setters cannot change their prices continuously but at the randomly chosen moment. Enterprises changing their prices in *t*, do not know when the next possibility of the change will occur. That is why they take into consideration not only today's economic conditions but also the expected path of costs and demand. Therefore, the expectations about future economic conditions should be a significant determinant of the current behavior. If the central bank is able to affect expectations, it will have more opportunities to achieve the goals which have been set (Woodford 2003). This is probably the shortest possible description of the New Neoclassical Synthesis (NNS), modern economic theory which is broadly accepted by the central bankers. As the forward-lookingness of the economic agents expectations is crucial for the central bank's goal achievement, the central bank should facilitate expectations formation.

Inflation targeting (IT) framework is monetary policy framework designed to enhance stabilization of expectations. It is described in Bernanke et al. (2001) and Mishkin (2007). It imposes the main goal of the central bank which is price stability. The inflation target level should be given numerically as it constitutes a nominal anchor for expectations formation. A central bank which implements IT

[1]Main stream economic theory imposes the point of view of this chapter. Regardless of some critics of its assumptions and findings, it still gives a sound and consistent background for analytical models of the central banks all around the world. None of heterodox schools of economics have offered acceptable alternative up to know.

should be exempted from other commitments, such as, for example, exchange rate stabilization. Institutional arrangements: independence, accountability and transparency, enhance the central bank's focus on the main goal. Transparency means ascribing important role to communicating the plans, goals and rationale for the decision making to both the public and the markets. Central banks implementing inflation targeting are not obliged to focus their decision-making process on any variable. It is the information inclusive strategy in which many variables are used in order to set the policy instruments. However, to satisfy the need of forward-looking attitude, the central bank may focus in decision-making on predictive factors: the forecast of the inflation and the expectations analysis.

The question on possible central bank's impact on expectations arises at this point. It depends not only on the past outcomes of the central banker and institutional arrangements of monetary policy but—most crucially—on the way how private agents form their expectations. To simplify, the expectation formation hypothesis explains the relationship of public and private information while forming expectations. Under rational expectations hypothesis (REH) (Muth 1961), individual, specific private information plays no role in the expectations formation process. Expectations are essentially the same as the predictions made on the basis of the relevant economic theory: the theory that describes the cause and effect relations in the best possible way and that is known by policy-maker. Assuming that the central bank knows and applies the relevant theory, there is no information asymmetry between the central banker and the public. Inflation expectations for period $t$ should be equal, on average, to the inflation forecast with the same time horizon and to actual inflation in the future. REH was questioned in numerous studies, regardless of the territorial scope and time coverage of the research (Forsells and Kenny 2004; Dias et al. 2010; Mitchell and Weale 2007; Łyziak 2003). Nowadays, bounded rationality or adaptive learning which incorporate learning mechanism in economic model prevail in theoretical analyses. Non-rationality of the expectations (their bounded rationality) justifies the research on the best ways of supporting expectations formation. A number of recent papers focus on sticky information or rational inattentive behavior to explain how non-specialist form their expectations. As economic agents are facing costs of acquiring information and the costs of reoptimization, they may deny, purposely, acquiring and processing new information (Reis 2006a, b). Apart from the rational inattentive behavior, epidemiological expectations theory explains expectations formation of private agents, especially consumers. It argues that the consumers form their expectations taking into consideration professional forecasts distributed by the media. They need time to absorb the economic content of the news stories (Carroll 2003). The expectations formation process is analogous to the transmission of a disease. A common source of infection in a population for consumers' inflation expectations is the news media. The news spreads slowly among the economic agents. Bounded rationality of expectations may be the source of short term trade-off between inflation and unemployment. The last interesting theoretical model on expectations formation refers to adaptive learning. This approach relaxes the informational requirements on the expectation forming agent. Private agents do

not know the true parameterization of the economic model but they learn those parameters because they are processing new information (Evans and Honkapohja 2001; Orphanides and Williams 2004; Milani 2011).

The above extremely brief literature overview on the expectations formation presents both theoretical and empirical findings. Arguing that the expectations do not hold REH, the question on the practical nature arises: how may a central bank support expectations formation to lower costs of acquiring new information, reoptimising or learning? What kind of public information should be diffused and how to support forward-looking decisions of economic agents? IT frameworks should constitute a concise framework for forward-looking monetary policy. However, in practice, forward-looking policy means forward-looking decisions. Bearing in mind the necessity of forward-looking, expectations-centered monetary policy, inflation forecasts produced by the central bank on the basis of the predefined transmission mechanism should play crucial role in the decision-making process of the central banker. IT may become inflation forecast targeting (IFT). Apart from the inflation forecast, other important variables suggesting future development of the economy are inflation expectations. Inflation expectations are shaped by the central bank's actions and in the next decision round they may be an argument in making a particular decision on the interest rates. The research confirming the interdependences of inflation forecasts and expectations exists (Szyszko 2015, 2017a).

Producing and revealing inflation forecast is the immanent part of fully-fledged inflation targeting. The forecast incorporates a set of historical and current data. One variable—the forecast—includes the idea of analyzing various economic information. Instead of discussing the data one by one, the MPC may discuss only (or mainly) the forecast (Szyszko 2011). The inflation forecast may be produced but not published. However, rising transparency standards of the central banks enforce the forecast publication. Usually the central path of inflation is given on the fan chart but some central banks decide to reveal the policy path consistent with the forecast both verbally and numerically (assuming that their forecasting methodology covers interest rates endogeneisation). Focusing on the inflation forecast in decision-making and communication makes the inflation forecast a specific (not formally established) intermediate goal and inflation forecast targeting (IFT) a flexible monetary policy rule. Forecast targeting involves the commitment to a particular decision procedure of the central banker and a distinctive approach to communication policy: regular publication of quantitative projections together with the extensive discussion of the reasoning underlying these projections (Woodford 2012).

It is also argued that subscribing the function of an intermediate target to the inflation forecast simplifies implementing and monitoring the monetary policy (Svensson 1997). While setting the monetary policy instrument, the central bank analyses the relation between the inflation forecast and the inflation target in the monetary policy horizon. The interest rate should be set so as to make the inflation forecast equal to the inflation target in the monetary policy horizon. If the inflation target is above (below) the target, the main rate of the monetary policy should be

raised (lowered). The MPC uses this rule of thumb to adjust the rates if the forecast is conditional (for example on the constant central bank rate). If the central bank produces unconditional forecast with endogenous interest rates, the central bank's reaction functions or targeting rule implies such a policy path (set of current and subsequent interest rates) that should bring the inflation (and the forecast) to the target in the monetary policy horizon. Ex post inflation may differ from the targeted level because of the forecast errors (Svensson 1997). Occurrence of the forecast errors does not change the central bank practice: its models do not capture perfectly the economic relations and its control over inflation is not full. Inflation forecast produced on the basis of economic models is the best toll to detect future economic conditions. Supporting the decision-making procedure of the central bank is an internal function of the forecast. Expectations formation is, in turn, the most important external function. External function may be fulfilled if the forecast is published. While making decisions, economic agents take into consideration the whole expected interest rate path. The forecast, especially when the policy path is revealed, shows not only the next step of the MPC but possible subsequent actions as well (Szyszko 2015). Inflation forecast can also anchor expectations when the inflation target is temporarily missed. It can serve as such a temporary anchor, especially in situations where the target is missed because of shocks. Anticipated course of inflation, showed by a credible central bank may limit the expectations' growth (Skořepa and Kotlán 2003).

Perception of the central bank forward-lookingness through the way how it uses its own forecast is proposed by Brzoza-Brzezina et al. (2013). The authors argue that the forecast is de facto intermediate target of monetary policy. They estimated forward-looking Taylor rules on data from macroeconomic forecasts of three central banks to determine the extent of forward-lookingness of monetary policy decisions. The results differ from county to country.

Internal and external functions of inflation forecast in the context of forward-looking attitude of the central bank are summarized in Fig. 1.

The assumption of this chapter is that the central bank is forward-looking when it uses forward-looking premises in the decision-making process. Inflation forecast is one of the most important premises of this kind. Another aspect to be considered is the direct analysis of the inflation expectations. Expectations indicate probable inflation level in 12 M horizon.[2] As they are not holding REH, possible inflation outcomes are different from inflation expectations on average.

Central banks are monitoring expectations of consumers, business and financial markets. From the Calvo model point of view, price-setters' expectations are crucial for the actual inflation. However, consumers expectations are usually used as the proxy of companies' expectations. There are a few reasons why. First of all, individuals play a double role in the economy. They are not only consumers but

[2]The horizon depends on the way in which the expectations are examined. 12Y horizon refers to survey-based expectations among consumers. In the case of business and specialists expectations, longer horizons as well as alternative ways of measurement are applied.

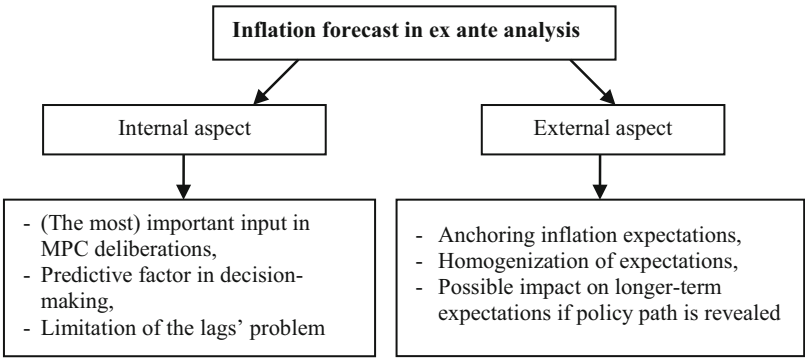


**Fig. 1** Inflation forecast and forward-lookingness of the central bank. Source: own

entrepreneurs who run small and medium sized businesses and employees in various companies. When the survey on expectations among businesses is held, non-experts (consumers) give the answers. Secondly, the data on consumers' expectations are relatively easily accessible. Surveys among consumers are commonly held on a regular basis while surveys among businesses are not a standard. Moreover, if the business survey is held, it can cover only corporations. There is no common methodology for business expectations examination. Sometimes quantitative surveys are held. Qualitative surveys with quantification of the answers by means of Carlson and Parkin method (Carlson and Parkin 1975) are standard for consumers. Thirdly, the research shows that consumers expectations are quite good proxy for business expectations (Coibion and Gorodnichenko 2015). For the purpose of the following study, it is assumed that the central bank should observe and use expectations of consumers or businesses in the decision-making process.

Inflation forecast and inflation expectations interchangeably occur as a forward-looking factor in the monetary policy analysis. Inflation gap in monetary transmission equations may refer to both of them. Forward-looking rules consider forecast of inflation and output, or contemporaneous expectations of economic agents regarding future deviations of inflation from its targeted level (Bullard and Mitra 2002). The rule of thumb in making decisions on interest rates covering a divergence of expectations from inflation target is also the proxy of the central bank's credibility as it verifies whether the economic agents believe in the central bank's promise expressed as the inflation target. This belief depends strongly on former central bank's ability to achieve inflation goal. Sometimes inflation gap that incorporates the deviation of expectations from inflation target is called the intermediate target (Pfajfar and Santoro 2010), alike inflation gap with inflation forecast is.

The need of using forward-looking premises in decision-making arises from the existence of monetary policy lags. Their existence is not questioned in the literature, however, the discussion on their length and variability is still going on. Moreover, it is usually argued that prices react to the monetary policy with a longer lag than output. The situation when the central bank's loss function consists

in the arguments with different lag (eq. 3) makes monetary policy conduct more complicated.

As a summary of the theoretical justification of forward-lookingness and its components, the definition of forward-lookingness applied in this research is once again given. Forward-looking central bank:

– produces inflation forecast,
– reveals it,
– makes decisions in accordance with the forecast message,
– considers at least consumers expectations in the decision-making process.

This operational definition makes it possible to create a simple index of forward-lookingness (FL) of the central bank that operates within IT framework.

## 3 Methodology of the Index

This sections presents a simple FL index. Prior to its description, it should be mentioned that the measurement of qualitative aspects of the monetary policy is broadly accepted in the literature. It is enough to mention some transparency measures (Fry et al. 2000; Bini Smaghi and Gros 2001; Eijffinger and Geraats 2006; Bajalan et al. 2012). They usually cover the description of the central bank's practice or legal arrangement and points attribution. The FL index covers aspects given in Table 1.

For *forecast as the public information* up to 2 points may be awarded. The first one for numerical publication of the policy path—the most probable inflation level in the monetary policy horizon. The second point may be attributed for policy path announcement. The assessment of the decision compatibility with the forecast depends on the interest rate assumption. Figure 2 refers to constant interest rate and conditional forecast. Figure 3 refers to unconditional forecast with reaction function in terms of instrumental rule or specific targeting rule. Producing and revealing unconditional forecast with policy path (even expressed descriptively) enhances the central bank's possibility to influence expectations. The effects of policy path publication are still under discussion. Its unarguable conclusion is that policy path publication brings lower marginal benefits than revealing policy central path of inflation (Brzoza-Brzezina and Kot 2008). However, due to some practical benefits of publishing the policy path it is claimed to be the next frontier in central bank's transparency (Kahn 2007).

*Decision and the forecast* component requires further comments as it is not a simple zero–one point attribution. As the IT is information inclusive strategy, the central bank is not obliged to follow any information including inflation forecast. This is why three possible options are given[3]:

[3]The assessment of decision compatibility with the forecast was developed on the basis of inflation forecast targeting index (Szyszko 2017b).

**Table 1** FL index component

| Component | Description of points attribution |
|---|---|
| Producing inflation forecast (max. 1 point) | If the forecast is produced at least quarterly—1 point<br>If the forecast is produced with lower frequency—½ point as the central bank access to the up to date forward-looking information is limited |
| Forecast as the public information (max. 2 point) | If the central path of inflation is published—1 point<br>If the policy path is described—½ point<br>If the policy path is published—1 point |
| Decisions and the forecast (max. 2 point) | Points attribution in Figs. 2 and 3 |
| Expectations in analysis (max. 1 point) | If expectations are discussed by the MPC in extended way and as a forward-looking factor—1 point<br>Limited discussion on the inflation expectations—½ point |

Source: own

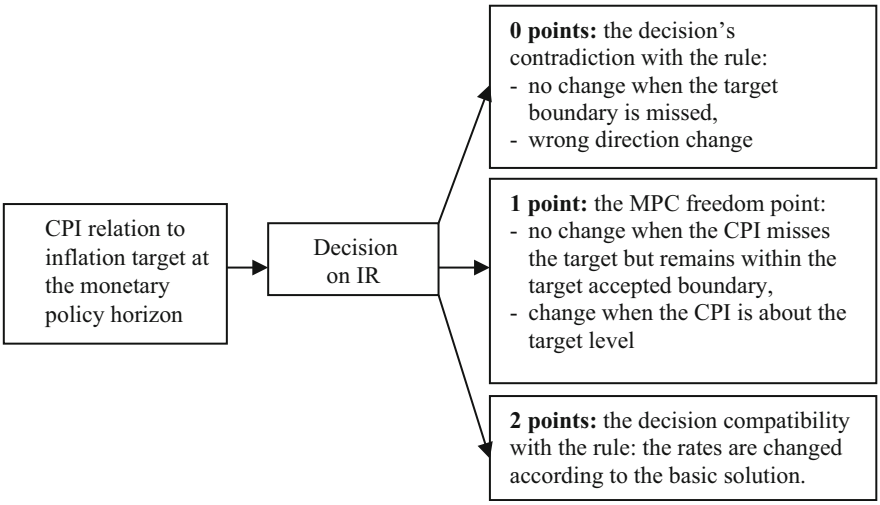


**Fig. 2** The MPC's decisions compatibility for the conditional forecast. *CPI* central path of inflation, the most probable inflation level during the forecast horizon. Source: own

– decisions contradiction with inflation forecast (0 points),
– the MPC freedom point (1 point),
– decision compatibility with the rule (2 points).

The total value of the FL index is 6. The data for its calculation are derived from Inflation Reports (inflation forecast and policy path) and central bank's documents published together with the decision on the interest rates: decision rationale or abridged minutes. It does not deliver detailed transcription of the discussion but only main deliberations of the MPC are presented.

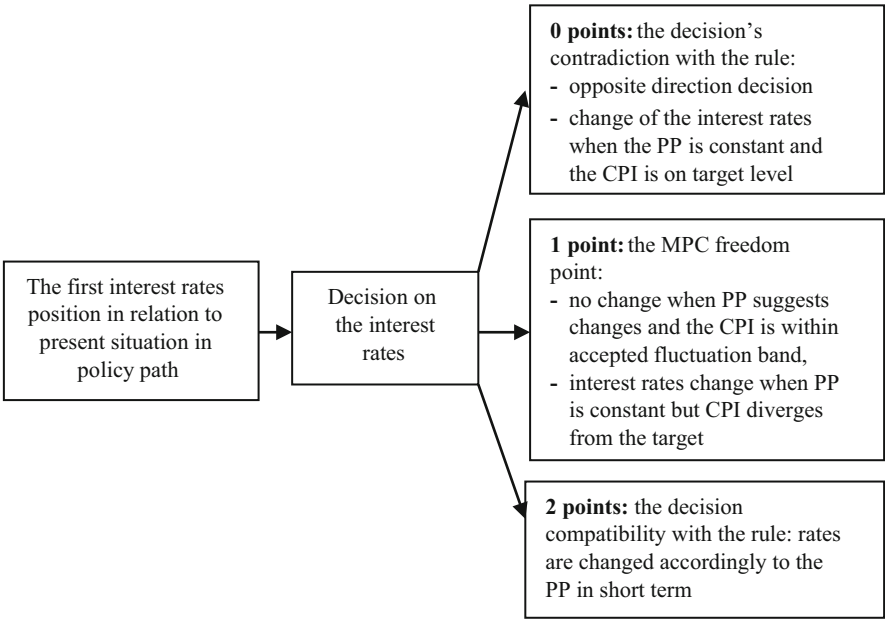


**Fig. 3** The MPC's decisions compatibility for unconditional forecast. *CPI* central path of inflation, *PP* policy path. Source: own

As the forecast appears with lower frequency than the MPC meetings schedule, the index is calculated as many times as the forecast is produced. The meeting during which the just prepared forecast is being discussed together with the subsequent meetings—up to the one when the new forecast is delivered - are considered to be one decision-making round. It means that the central bank may postpone the decision. However, if the decision is in line with the forecast, the points are attributed. The same situation refers to expectations: any form of discussing expectations of economic agents during MPC meetings is accepted.

## 4 Results

The study results for the Czech National Bank, National Bank of Hungary and National Bank of Poland are presented in Table 2. Table 3 presents additional qualitative analysis.

**Table 2** Average FL index for the CNB, NBH and NBP

| Central bank | CNB | NBH | NBP |
|---|---|---|---|
| Research period | 2011–2015 | | |
| Number of forecasts | 20 | 20 | 15 |
| Number of decisions | 40 | 60 | 54 |
| 1 forecast for: | 2 meetings | 3 meetings | 3–4 meetings |
| Mean FL index value | 85% | 63% | 54% |
| Mean decision's compatibility | 84% | 63% | 63% |

Source: own

**Table 3** Qualitative analysis of decisions' forward-lookingness

| Central bank | Description |
|---|---|
| CNB | Forecast-oriented monetary policy. Macroeconomic forecast is the most important factor discussed by the MPC. The discussion on the forecast and its risks prevails even in the months when the forecast is not produced. Expectations play secondary role in the analysis. In the abridged minutes there is no information on the expectations level. The MPC refers mainly to their anchoring. |
| NBH | Discussion oriented on the current economic development. Neither the forecast nor expectations are exposed in the abridged minutes. No common pattern of presenting the expectations—sometimes there is a reference to their anchoring, sometimes to their level. There is no information on expectations level. |
| NBP | Discussion oriented on the current economic development. Neither the forecast nor expectations are exposed in minutes. Forecast description when it is published. Qualitative reference to expectations level appears in most cases. |

Source: own

The FL index for each decision round[4] is presented in Charts 1, 2, and 3 for each country separately. The CNB which registers the highest mean value of the FL index and decisions' compatibility with the forecast, considered the forecast in discussion and decision meetings at the decision round. The analysis of forward-lookingness and decision accordance can be then accompanied by further steps of the research, which is mentioned in the conclusion.

The differences of the mean FL index value are substantial. On the basis of an immediate decision rationale (which does not register the full discussion of the MPC) and expressed in terms of FL index, the CNB is not only the most forward-looking central bank in the sample but it follows its own inflation forecast most consistently. Similar IT framework results in noticeable differences in its implementation in the three central banks in question. It is worth noticing that the

[4]As the forecast frequency is lower than the MPC meetings, decision round here means one forecast and each monetary policy meeting that occur to the next forecast publication. It means that one forecast may be discussed during 2–4 MPC meetings.

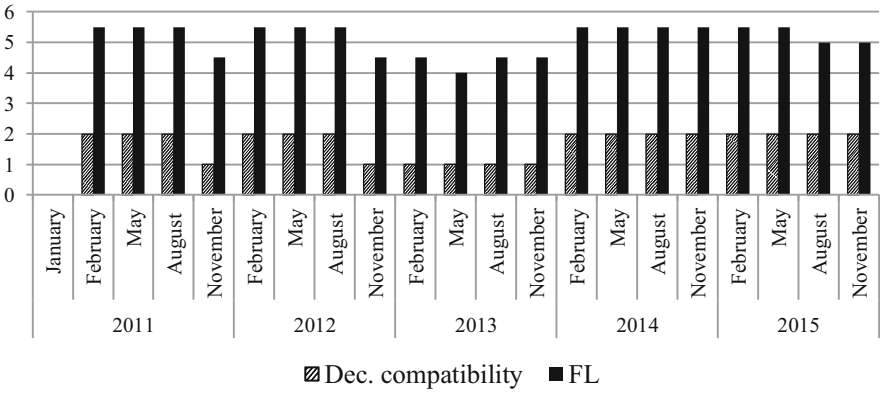


**Chart 1** FL index for the CNB. Source: own

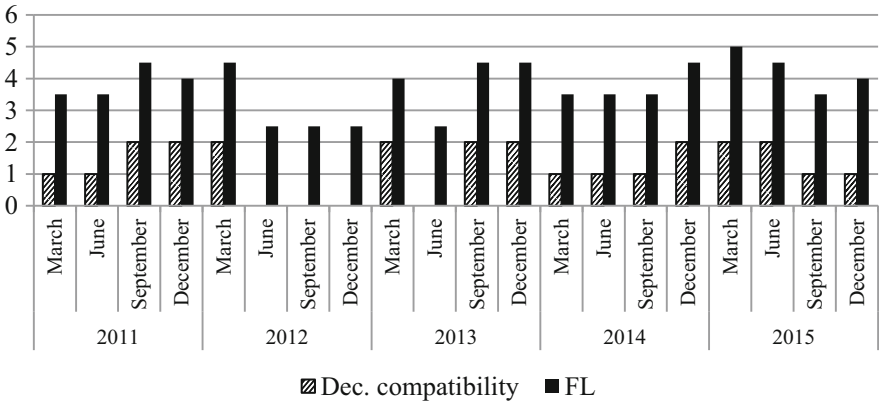


**Chart 2** FL index for the HNB. Source: own

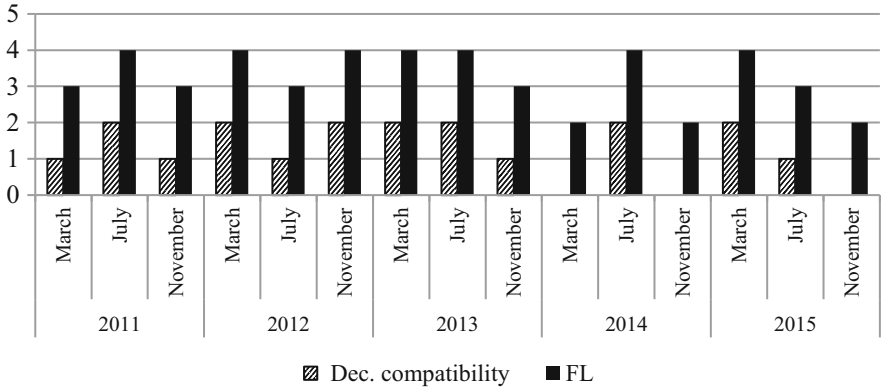


**Chart 3** FL index for the NBP. Source: own

differences in general transparency of these central banks were not so remarkable.[5] The CNB history with forecasting inflation and revealing its results is a bit longer than in the case of the NBH (which started to reveal the forecast in August 2001—4 months after the CNB did it) and 3 years longer than in case of the NBP (the first forecast was published in August 2004). The CNB was also the first in the sample that switched to unconditional forecast (July 2002) and started to reveal the policy path numerically (February 2008). It is the most transparent central bank—regarding the forecasts and their possible use. Enhanced transparency may encourage the CNB to consistent behavior relying on extended use of the forecast in the monetary policy. There is additional explanation of such a situation—at the CNB this is the Bank Board who owns the forecast. The central bank's staff play crucial role in producing the forecast but the Bank Board is involved as well. The forecast can closely reflect the views of the MPC on the economy. It is easier to follow such a forecast. In Poland there is no involvement of the MPC into forecasting procedures. Moreover, the frequency of forecast production is lower.

The decision contradiction with the forecast happened four times in Hungary and three times in Poland. There was no additional explanation in the decision rationale for such a situation. The CNB followed the message of the forecast (including the MPC freedom point—the situations when there is now unambiguous rule for rates movement in the message of forecast).

Surprisingly, none of the central banks paid special attention to expectations in the MPC discussion. There was neither explicit information on the level of expectations nor on the group of the expectations considered. Targeting expectations may be alternative information in the forward-looking analysis. The three central banks paid less attention to them. The forecast was more highlighted.

## 5 Conclusion

The following chapter provides a concise framework for the analysis of the monetary policy forward-lookingness on the basis of a simple index. It makes it also possible to compare the central banks' compatibility with their own inflation forecast. The index can be used for intertemporal and geographical comparison. Such a measurement opens the possibility to answer other research questions: does it pay off to be forward-looking in terms of monetary policy effectiveness? Does it pay off to target inflation forecast? The answer to the first question generates the recommendation for the way of IT implementation. The answer to the second one provides the feedback on the central bank's consistency in using its own inflation forecast in the

[5] According to the methodology presented at (Eijffinger and Geraats 2006), at the beginning of 2011 NBP transparency accounted for 12.5, CNB—12 and NBH—11.5. Five years later it was 13 for Poland, 14 for Czechia and 13.5 for Hungary.

decision-making process (external function) and communication. Again, some recommendations can be made.

The FL index has an additional advantage: it is quite simple and can be calculated on the basis of the information which is revealed by the central banks: inflation forecast and any kind of decision rationale. This level of transparency (and publication) is standard nowadays.

However, there are some drawbacks to this measure. First of all, the assumption that forward-lookingness is expressed only by the forecast and expectations used in the MPC elaboration is certainly some oversimplification. The problem arises after the latest financial crisis: the central banks declare the flexible inflation targeting implementation more courageously. The weight of the output in the transmission equations may be raised. The central banks never publish the weight system. Forward-lookingness is also expressed by the monetary transmission equations, including reaction function, which can cover both ex ante or current indicators.

Secondly, the official publication with decision justification may not reflect the real discussion of the MPC. It is usually built according to some pattern of the document structure. The actual discussion may differ from the pattern, which is not revealed.

Thirdly, the assessment of forward-lookingness should cover episodes of higher and lower inflation (or even deflation). The central bank may be asymmetric in its reactions, even if formally announced inflation target is symmetric. So its behavior, including the discussion patterns and premises, varies according to the current economic conditions.

Finally, it should be mentioned that nowadays situation is quite complicated from the central bank's point of view. Not only remarkable shift towards flexible IT was registered[6] but also the central bank mandate covers financial stability or macroprudential supervision more explicitly.

However, regardless of some shortages, the FL index contributes to the modern literature on central banking. It covers the aspects of the monetary policy which have not been yet covered in the literature.

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[6]Actually, prior to the latest economic crisis most of the central banks implemented flexible inflation targeting as well. Nowadays the central banks explain it more explicitly. Moreover, main focus on growth is justified with low inflation figures.

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# A Study of the Possible Consequences in the Event of an Accelerated Issuance and Widespread Use of Private e-Money: A Case Study of Montenegro

**Biljana Rondovic, Vujica Lazovic, Tamara Djurickovic, and Dijana Kovacevic**

**Abstract** The main goal of this chapter is to show what changes occur in case of accelerated issuance and use of private digital money. Respectively, in this work the authors analysed an environment that would arise in the case of parallel use of private and public electronic money. The analysis was carried out for the case of Montenegro.

For the analysis of the perception of the monetary authority, authors conducted a qualitative research that was based on deep interview, while for the testing of the attitudes of clients the authors have used the quantitative research that was based on a survey.

The research results showed that accelerated issuance of private digital money and its parallel use with the State electronic money can lead to negative impacts. Research has shown that the new conditions could lead to financial instability, difficulties in conducting monetary and fiscal policies, as well as to problems in the operations of the Central Bank and deposit institutions.

The results of this chapter may be a contribution to the discussions on private digital currency, understanding of the attitude of the monetary authorities and private clients in terms of digital money, especially in small and developing countries. Also, they can serve as a literary basis for a comparative analysis of this kind in developing countries, such as Montenegro. Results can also be useful to employees in the banking sector and regulatory bodies to better understand the environment in which private and state money are parallel operating.

According to the authors' knowledge, previous researches on the topic of private digital money are not faced with attitudes of clients and monetary authorities, so with this chapter, the authors have sought to rectify the literary gap.

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## 1 Introduction

The idea of potential issuers of private e-money emerged as a consequence of the fact that there has always been interest in issuing money that remains outside government control.

If electronic money is defined as monetary value stored electronically on devices such as a chip card or a hard drive in personal computers or a server, represented by a claim on the issuer, which is issued on receipt of funds for the purpose of making payment transactions, and which is accepted by persons other than the issuer (Fung et al. 2014), then private electronic money could be defined as e-money which comes from private institutions. To justify the description private, it must be beyond state control, that is, the control of the Central Bank and its monetary authorities. If we accept the idea that more extensive use of private e-money is yet to come, then, among other things, the possible macroeconomic consequences of the coexistence of private and public electronic money in Montenegro (MNE) must be considered and the probability of the survival of such a "currency" must be assessed.

Although in the past the issuance of money was often the private business of a privileged few, who, thanks to it obtained both a means for exchange and a personal or corporate identity, and the success of these emissions was measurable and known, the possible innovation that is discussed in this chapter must be observed through some other dimensions.

Across the world there is a regulatory framework for the issuance of private e-money; the technical platform is not a limiting factor, and there is an awareness that if it existed it would lead to great financial innovation. Montenegro is a developing country with an insufficiently mature financial market, where there is a delay in IT innovation and a chronic inertia when it comes to the acceptance of payment instruments that require adaptation of the monetary authorities (Rondovic et al. 2013). Bearing this in mind, we can define the research question: *Does the evolution of money in the direction of possible issuance of private electronic money could lead to a series of changes in the macro economy of Montenegro, and would these changes may be large and painful, especially in the finance sector.*

Given that private money is not a creation of the new economy, but rather has more or less successfully appeared throughout history, the analysis presented in this chapter is based on the assumption that the historical pattern of the issuance of private money could be repeated, only now in a digitized form. If one takes into account the fact that the use of classical electronic money in Montenegro is still modest, which is largely a consequence of a lack of confidence in electronic transactions, we believe that more widespread use of private electronic money will not occur in Montenegro in the near future.

This study of attitudes towards the possible consequences of the coexistence of private and public electronic money in Montenegro's financial sector has several objectives;

- To consider the level of familiarity with the category of private e-money and to assess the potential role of the Central Bank of Montenegro in the

implementation of that monetary system as well as the conduct of monetary policy in the event of its more widespread use.
- to assess the willingness of commercial banks to operate in both markets in the event of the parallel use of private and state electronic money (in terms of lending and cooperation with private issuers of electronic money).
- To conduct an analysis of the attitudes of clients towards potential private issuers of electronic money, in relation to their acceptance of and demand for private electronic banknotes and their requirements in terms of convertibility and so on.
- For the results of the research to serve as the means of a deeper understanding of the issue of private e-money, its benefits and the risks which its existence brings.

Since no research of this kind has been done in Montenegro, we believe that this chapter, in addition to its theoretical contributions, could help the Central Bank of Montenegro, commercial banks and regulatory bodies to develop timely strategies to readily welcome a new monetary environment in which the following function simultaneously: classic state money, electronic state money and private electronic money.

Also, we believe a more widespread use of private e-money cannot be achieved without a critical mass of users and a favourable climate of confidence in the new electronic payment instruments. This condition cannot be satisfied if the clients are not familiar with private e-money, its implications for the economy and the benefits and/or problems that they may face in the event of its use. This chapter may, also, serve as a basis for future, broader research into this area.

Apart from the introduction, the chapter contains a presentation of the regulatory regime for the issuance of private electronic money and a review of the existing literature. In addition, the research method employed has been described, the results of the research presented, and finally concluding remarks are given.

## 2 Basic Characteristics of the Private Electronic Money

Historically, all forms of private money arose spontaneously in local communities, often as a result of the scarcity of national currencies.

Without neglecting the importance of the system of paperless payment methods, such as *tally sticks*, which were issued by English King Henry and which operated successfully for 726 years, we will briefly dwell on private issuers of paper money, and then give a brief overview of the regulatory regime for the issuance of non-state electronic money.

In the mid-eighteenth century, while suffering from high levels of debt due to wars, Britain tried to increase revenues from its American colonies. The colonists issued their own money called *Colonial Script*, which served as an interest-free means of purchase for their owners and which did not cause any problems in the financial environment. Also, dating back to the eighteenth century, the Scottish banking system is worth mentioning. The next century, known as the century of free

(liberal) banking, allowed for all banking institutions to issue money. The monetary history of classic money has recorded as many as 23 examples of parallel operation of "currencies" issued by privately owned organizations. For their establishment there was no need for approval from government authorities, only the ability to raise enough capital and public confidence, in order for the money to be accepted and to ensure profitability (Smith and Yeager 1990). In the twentieth century, the standard form of issuing private money was *stamp scrip*.

The idea of something similar to private electronic money, also came from a local community and was implemented thanks to Michael Linton, who in 1982 introduced the LETS or the Local Exchange Trading System. It was a computer network of members where credits were collected through transactions that can be further used within a group. In a LETS system, everything is supported by a computerized system for recording transactions and account management. Following the example of LETS, other systems for electronic exchange developed later.

An analysis of first, but also all private systems formed later, shows that they operate according to the following principles:

- the systems are independent of the standard monetary systems;
- the systems are self-regulating, but each system has its own controller responsible for the integrity of the system, and for supervision of the registers. They are also accountable to account holders and prevent transactions that may be considered inappropriate;
- the network has no owner, and in joint ownership there is no exchange without agreement between members of the system;
- the currency unit is usually expressed in the national currency;
- there is no interest on the amounts in the accounts, so a negative balance represents an obligation towards members in the future.

The need for an equivalent to traditional forms of money emerged as a result of the development of the concept of e-business. In order to foster competition and innovation in terms of electronic money instruments on the one hand, and the tendency to overcome inertia and suspicion of the financial sector on the other, in 1998 the European Commission drew up a draft EU directive on electronic money. Two years later the draft was refined into the final version—***Directive 2000/46/EC*** (EMI Directive 2000). This Directive together with ***Directive 2007/64/EC*** enacted 7 years later (Directive on Electronic Payment Services) was aimed at improving the system of electronic payments within the entire EU.

Due to the perceived shortcomings of these two directives and due to the slow development of the electronic money market, a new directive—***Directive 2009/110/EC***—was issued (E-money directive 2009). The direct intention of this directive was to reduce barriers for companies interested in the issuance of electronic money (especially in terms of reducing the requirement for an initial capital of 1,000,000.00 € to 350,000.00 €, whereby, the minimum initial capital may represent a maximum of 2% of the amount of e-money which is to be issued.

This directive allowed for other companies to be issuers of electronic money, not only institutions of the financial sector, in order to positively influence market

competition increase and the development of innovative products and services in the financial sector. By this act the foundations were laid for the idea of studying the consequences of the existence of private e-money and its issuers.

For an analysis of this kind, it is important to distinguish between the two types of schemes of private e-money:

- Closed-ended schemes of private e-money which are usually tied to a certain platform and are utilised by users of these platforms (e.g., digital money for members of a community for the purpose of exchanging content, using applications, games and the like). This type of digital note does not have any interaction with the state money (whether it be classic or electronical). Today, the vast majority of private digital money schemes operate as retail payment systems within a virtual community.
- Open-ended schemes of virtual currency (e.g. Bitcoin) are not related to a specific platform, they can be exchanged for classic money and that can also perform certain functions of classic money. Due to the very fact that they interact with state money and that the real and electronic markets are intertwined, these digital money schemes may have an impact on monetary or financial security. In this chapter we will address the possible consequences of open-ended schemes of private e-money.

The current number of these schemes, the number of their users and the transaction volume do not threaten financial security. However, it is realistic to expect that the situation will change in the future, although we believe that these developments should be monitored, monetary authorities should be informed in a timely manner and awareness of the possible implications that these types of payments might have on the financial sector, and the state economy as a whole should be raised.

## 3 Literature Review

All studies conducted on the topic of the issuance of private e-money show that it is difficult to monitor the impact of electronic payment technology on macroeconomic variables separately from the effect of other changes that have occurred due to the development of Information and Communication Technology (ICT).

It is clear that we should encourage the use of both state and private electronic money until Central Banks are able to manage the changes that occur as a result of their use.

Most of the research shows that, in the long run, great competitiveness between Central Banks and private issuers of electronic money is to be expected. This rivalry is most apparent in the struggle over seigniorage. In addition, there is a concern within Central Banks that with a growth in the number of new players in the e-money market it will not be possible to maintain financial stability.

A survey conducted in Canada, shows *that recent developments in retail payments do not seem to seriously impair the ability of the central bank to implement monetary policy and promote the stability of the Canadian financial system. However, in the unlikely case that privately-issued electronic money and electronic payments completely replace cash and reduce the demand for Central Bank settlement balances, adjustments to the way the Bank implements monetary policy might be required* (Fung et al. 2014).

A Report by the Working Group on Innovations in Retail Payments shows that the Central Bank and issuers of private e-money do not always have to be competitors and that a scenario is possible whereby, in order to stimulate innovation, a Central Bank may be in a position to provide operational support to the issuers. Such an assumption is justified by the very fact that some Central Bank strategies may at some point prove to be obsolete.

From the research which was developed into the paper *Some Economics of Private Digital Currency*, it is clear that virtual notes that are tied to a particular platform must be viewed separately from those that are designed in such a way to compete with state money (Gans and Halaburda 2014).

Similar conclusions are offered in the Report of the European Central Bank (ECB), from which it is clear that the issue of financial stability is associated with the type of virtual money scheme, its scope, geographic diversity and the number of users. It is logical that in open-ended schemes, virtual currencies (e.g. Bitcoin) interact with state currencies and that there is a risk in terms of the ability of Central Banks to conduct monetary policy. With closed-ended schemes, virtual notes do not interact with state money, and, therefore, carry no risk.

The authors are of the opinion that we should not neglect the possibility that a number of closed-ended schemes eventually turn into open-ended schemes.

Although the above-mentioned Report of the ECB concludes that open-ended schemes carry minimal risk for the time being, it remains an open question what will happen with the multiplication of schemes, their mutual interaction, their interaction with the real economy and the growing number of users.

None of the studies conducted so far has proved that any Central Bank could have a successful cooperation with private issuers of e-money in the long run and that conducting a monetary policy in this case would be smooth. This is all too logical, given the fact that both the participants, with their markedly different interests, policies, regulations, attitudes, expectations, and so on, would be fighting for the same piece of the pie.

Although all the research conducted so far has dealt with possible problems between Central Banks and issuers of private e-money, the fact that such systems would be a great financial innovation has never been ignored. Some papers have even ventured a step further in order to comprehend the economic benefits of the existence of such schemes of virtual money (Kaplanov 2012) or its impact on social infrastructure (Yglesias 2012).

From a certain number of papers it can be seen that some governments are willing to regulate the operation of open-ended schemes of private e-money in time

and thus prevent the occurrence of problems before these systems come to life more fully (Beck et al. 2010; Marshall and Regan 2013).

Certainly, before the popularization of such payment systems, a serious cost-benefit analysis should be conducted. An overview of the identified advantages and disadvantages of using these resources in relation to classic money is very clearly offered by the European Banking Authority. Another study conducted on Bitcoin could also be used for analyses of this kind, if we start from the assumption that most of the new open-ended schemes of private e-money function in a similar way (Badev and Chen 2014).

As state electronic money, as a product of the influence of ICT on banking, is a relatively new phenomenon, and issuance of private e-money is of a more recent date, the amount of research conducted on this topic is relatively small.

Researchers have not collected enough data yet to make accurate forecasts, and a large number of published papers are based on assumptions, which we, also, partially adopted during writing this chapter.

## 4 Research Methodology

The data for the purposes of this analysis were obtained by conducting our own research. The research subjects were CBM managers, managers from commercial banks, representatives of regulatory bodies in the field of finance and employees in the bank IT sector, on the one hand, and bank clients on the other.

The data from the clients were obtained through a survey and selected by random sampling. For the formation of attitudes of employees in the financial sector, we used qualitative research based on a semi-structured interview and we used the method of non-random (intentional) sampling.

Due to the nature of the problem which was the subject of our analysis, we decided that the basic research should be qualitative and additional research quantitative.

The aim of the qualitative research was to reflect more deeply on the perceptions of the respondents using the technique of a greater number of group interviews, to observe reactions to the questions more easily, to grasp the reasons for different views of the same problem, to perceive different ways of thinking in the case when you need to provide an answer about solving a problem and so on.

The qualitative study included 96 respondents and care was taken that these individuals had experience in the field of monetary and fiscal policies, and that their opinions were unbiased. We undertook the research with a clearly defined plan, focused on the research questions, but also with the intention of raising new questions and dilemmas during the discussion.

The survey was conducted for clients of 12 Montenegrin banks. A total of 500 questionnaires were circulated, whereby the following were taken into account when distributing questionnaires: the geographical distribution of clients, the level of education, gender and age, so that it complied with the criteria of

representativeness of the sample. Because of the incompleteness of the data, that is, of the responses to the questions raised by the survey and the quality of those responses, we have processed 360 questionnaires.

Given the nature of the research subject, we used induction and deduction as our primary methods.

## 5 Discussion-Analysis of Possible Changes in the Case of More Widespread Issuance of Private Electronic Money in Montenegro

In order to be able to answer the question of whether there is any chance of the more widespread operation of private electronic money in Montenegro, it is necessary to consider how issuers of e-money might operate in the future, how and to what extent that money could be used, and under what conditions the private e-money and its issuers could prosper?

For now, all discussions about potential issuers of private e-money end up in a "chicken and egg" dilemma. If there is no large user base for this money, there won't be companies interested in its issuance, and yet without a large base of issuers, there will be no users either (Hove 2001).

If we consider the question of to what extent the issuance of private electronic money may be permitted, then two scenarios are possible. If, in the future, the issuance of private e-money in most cases is controlled by the Central Bank, we believe that the existing regulatory framework will easily adapt to the new payment products, but innovation and competitiveness in the field of the private issuance of electronic money will be compromised. Conversely, if the principle of the liberalization of the issuance of e-money is adhered to, a large number of regulatory issues will remain unresolved.

The attitude of the respondents is that the laws that currently regulate banking operations in Montenegro protect the Central Bank and commercial banks from the possibility of the emergence of a greater number of issuers of private electronic money. Such a superficial attitude leads to the conclusion that there is a basic level of ignorance about the global impact of the system for electronic payments and that when it comes to the subject issue, the terms national-international are irrelevant.

In order for an institution to be interested in issuing private electronic money and for a demand for that money to exist, the issuer must have a good reputation and as a guarantee they must have state electronic money, ie. they must have deposit accounts in banks as collateral for private e-money. A private e-money issuer would have to reflect the reserves of state money and guarantee the possibility of converting the entire amount of the private money into state money, if users so desired.

We think that this is where a problem might occur, because the employees from all commercial banks in Montenegro view issuers of private e-money as

competitors, in that all showed a negative attitude towards the possibility of business operations with them.

It is clear that according to the current mindset of the people in the Montenegrin banking system, the existing banks simply will not want to take any risks that may arise from this form of business operation. In other words, the competitiveness between private issuers of e-money and commercial banks will intensify because both sides will fight for a greater number of clients.

Within the CBM, there exists the opinion that in the next 20 years state classic and electronic money will still be in full operation, and that in this period a larger number of issuers of private electronic money will not appear. Therefore, for the time being, it appears that there is little concern that issuance of private electronic money could undermine the ability of the Central Bank to control their operational goals in the short to medium term.

The managers gave a positive answer to the question whether a higher degree of the use of private e-money could reconstitute existing balance sheets and explained that it could consequently have negative implications for the flexible use of monetary policy instruments. If the further development of payment systems creates a good basis for the survival of issuers of private electronic money, it is logical that part of the proceeds will go into their hands. When asked what the CBM would do to insure itself against this type of risk, we did not succeed in getting an answer either from the managers or from the people dealing with risks. This leads us to the conclusion that within Montenegrin banks and regulatory authorities this problem has not been considered so far.

Within the conducted interviews the authors of this chapter told the managers and risk professionals that all the research done so far throughout the world has shown that in order to protect against this danger, managers of Central Banks have opted for one of the following alternatives:

- They could influence the Government to legally prevent the establishment of issuers of electronic money, which in turn would limit competition among financial institutions and reduce innovation in technologies of electronic payments in the private sector
- They could convince the Government to introduce high taxes on reserve requirements for private issuers, in order to reduce the incentive for their widespread emergence.
- They could try to establish cooperation with private issuers, and then to adapt their existing monetary policy step by step and introduce new monitoring instruments for the supervision of financial markets.

  They could establish cooperation with private issuers, but would ask that all their activities (including issuance) be under the supervision of the Central Bank. This choice questions the definition of private electronic money, because the moment issuance is taken in house by the CB again, that money ceases to be "private".

When asked which alternative they would choose the CBM managers answered that they would struggle to remain the only issuers of money.

Although this is technically the most feasible way to fight perilous changes, the authors hold a deeply rooted resistance against it for several reasons:

- Such a passive way of thinking hinders financial and technological innovation
- Electronic money knows no geographical boundaries, and, therefore, foreign issuers of private e-money can find their share of the market in Montenegro, whereby the CBM will not be fully able to control what share of the money will be transformed into the software,
- Electronic money is an irreversible trend and its further evolution is likely to move in the direction of the issuance of private electronic money; there is a possibility that the monetary authorities in Montenegro will be unprepared in the face of the changes it brings along.
- If one takes into account the fact that the monetary authorities of the Central Banks in the region are prepared to design strategies for a more daring use of electronic money issued by private providers, then the attitude of the CBM must be viewed as one of rigid indifference towards financial innovation.

When it comes to regulations, we need to consider whether the monetary authorities in Montenegro will be able to obtain a complete prohibition of the private issuance of electronic money in a national context. We believe that even without a ban, it is possible to create conditions for the use of these resources at a price that will make them ineffective, unattractive and unprofitable to use and issue, but the question is to what degree it fosters the spirit of promoting competitiveness and innovation.

When viewed from the perspective of the user, the strategy of permitting the issuance would be a valuable innovation in the system of payments. If issuers of private electronic money managed to find a way to ensure that e-money operated better than state money, performing both the existing and some new functions of money, without disturbing the financial system and so on, then private e-money could play a useful role in the economy.

The Law on the Central Bank of Montenegro prescribes the basic instruments of the monetary policy of the Central Bank[1]:

- Open market operations
- Credit transactions
- Lender of last resort
- Required reserves

As part of the consideration of the effects that the development of private electronic payment technology could have on the power of the Central Bank of

[1]The Statute of Central Bank of Montenegro (even though CBM is not in the euro zone but uses euro as a currency) gives the authority to CBM that among other things is in charge of affairs in the field of establishing and implementing monetary policy, the tasks related to the measures and activities in order to preserve and strengthen the stability of the financial system and control of the banking system (http://www.cb-cg.org/slike_i_fajlovi/fajlovi/fajlovi_o_nama/regulativa/statut-cbcg.pdf)

Montenegro to control the money supply, the question must be raised as to what path credit operations will take. We are, primarily, of the opinion that it is impossible for potential local issuers of electronic money to be in a situation of endless borrowing.

First, the nature of the demand for loans from private issuers would be the same as that of commercial banks. It will also be clear to issuers of private money that the number of "good" claimants is limited, and that they should not be interested in all the others who are not ready to meet their credit obligations. In other words, the curve of demand for loans from private issuers of electronic money would be similar to the curve of demand for loans from traditional banking (sloping down to the right with respect to the interest rate and it would be final). Otherwise, the justification for the existence of *Credit Regulatory Registry* would be put into question. The Credit Registry of the CBM can offer credit reports for citizens and businesses operating within the territory of Montenegro, which contain information on both the current and potential liabilities of citizens and businesses.

Second, the data obtained from commercial banks in Montenegro lead one to think about the cost of issuing loans, that is, lead to the conclusion that issuers of private electronic money will have difficulties covering administrative and other costs incurred in issuing loans. Therefore, the loan offer would again be final.

Third, if we know that through the instrument of reserve requirements the CBM affects the level of the banks' lending activities, that is, it indirectly affects the further process of the multiplication of money in the economy, it is clear that the instrument of required reserves must be used in the operation of private issuers as well. All the more so because the respondents from the CBM in their replies stated that in the case of the emergence of issuers of private electronic money, currency convertibility would only be possible if there were mandatory reserves harmonized with those prescribed for commercial banks. According to currently applicable laws, the rate for the reserve requirement is 9.5% on the portion of the base consisting of demand deposits and deposits with an agreed maturity of up to 1 year, or up to 365 days and 8.5% on the portion of the base consisting of deposits with an agreed maturity of over 1 year or up to 365 days. A bank that does not allocate the reserve requirement in the prescribed amount and terms is obliged to pay interest to the CBM at an annual interest rate of 12% on the amount of the difference between the prescribed and deposited reserve requirement.

Finally, in the case of lower reserve requirements, it is also impossible that issuers would have an interest in endless borrowing because, due to the links between the markets of private money, state money, credit and the bond markets, money would "leak" out of the scope of private issuers, which certainly could not be their goal and interest.

Along with the above mentioned potential problems, the question of the convertibility of electronic money arises. In order for this element to be secured, electronic money must be issued, controlled and treated under the same conditions as classic money. In this way, their values will be equivalent, it will always be possible to replace one with the other and there will be public confidence in the new forms of electronic transactions. Can e-money be unconvertible? Based on the

opinions of employees in the Central and commercial banks, we believe that issuers of private money will behave like other participants in the financial market, that is, in accordance with the basic principles of profit maximization. Learning from previous negative experiences with banks in Montenegro, citizens are reluctant to accept innovation. Therefore, also in the case of private issuers of money, the basic resource for managing customers would be confidence, and confidence, among other things, can be earned through a positive policy in terms of convertibility.

Private electronic money may affect all the other financial assets which can be considered close substitutes for money in transactions. Therefore, some changes in the field of redefining some of the monetary aggregates and their modes of analysis would be inevitable.

Respondents from the CBM show concern that with a greater level of issuance of private electronic money, in the long run it may lead to a reduction in demand for classic money, which might in turn influence the status and function of interest rates. This would mean that, even if the CBM properly defined its monetary goal, rapid development of electronic money in the transitional period could affect the stability of the demand for money, and, thus, create an unstable relationship between price and consumption.

Having accepted the fact that the effect that money supply has in an economy depends on the amount of money in circulation and the velocity of money circulation, during an interview with the monetary authorities in Montenegro, we tried to get an answer to the question of how serious a problem might arise if the Central Bank, using the instruments of monetary policy, managed to control the amount of money and failed to control the velocity of money in circulation (a scenario which is realistic). From the reactions of the respondents we unequivocally concluded that in that case the instruments of monetary policy would fail completely.

Some research done on open-ended schemes of virtual money has already led to the conclusion that the velocity of money circulation is something over which Central Banks will have virtually no control (Centi and Bougi 2004).

In accordance with the Law on the Central Bank of Montenegro, clearing accounting systems can also be built by other entities, not only by the CBM, but in this case, the Central Bank grants licenses and monitors the operation of such systems.

Given that all electronic money schemes are in need of clearing and settlement, representatives of the monetary authorities concluded that a problem might occur regarding the possibility that potential national issuers transfer to their own system of electronic money settlement without the participation of the Central Bank (which is technically feasible). However, we believe this will not occur for several reasons:

- In most other countries settlement through the Central Bank is mandatory;
- A large number of market participants consider the Central Bank the safest business partner; so, it is to be expected that issuers of private electronic money will behave similarly,
- It will take many years for issuers of private electronic money to become competition to Central Banks in terms of commissions for clearing;

- Finally, the CBM management expects that the Government will be able to create a legal obligation that all settlement must be made through the Central Bank. This attitude is logical, given that there is a close co-operation between the state apparatus and the Central Bank in Montenegro.

During interviews with respondents, part of the questionnaire concerned the possible impacts of private electronic money on exchange rates and the potential consequences on the foreign exchange market.

All respondents from the financial sector were unanimous that an increase in the risk of instability of exchange rates might occur. In interviews with respondents a question was put forward: "Can software be delegated the process of setting up exchange rates and will it be able to recognize negative foreign currency impulses?" The monetary authorities in Montenegro were not able to respond to this question either.

Although the legal framework regulating the area of electronic commerce (In Montenegro through the Law on Electronic Commerce and the Law on Electronic Signatures, complies with the regulations of the European Union, the existing legal provisions have not come to life in practice and management in the Montenegrin banking sector have no idea how to monitor and comply with the legal framework and strengthen judicial practice in the case of the parallel coexistence of private and state electronic money. The seriousness of this problem is intensified by the fact that issuers of private digital money do not usually prescribe the legal framework for their operation, and the Montenegrin law on the Payments System did not predict the possibility of the interaction between private and public money. This situation is not unusual in Montenegro, where regulations often do not keep pace with the changes occurring in the field of ICT.

When we asked whether in the case of the new monetary environment state help would be needed we received positive responses. The monetary authorities in Montenegro believe that the support of government programmes would be needed in terms of incentives for a more widespread use of state electronic money and that such support would prove especially important in the case of the emergence of private issuers, since the banking system could find itself on unfamiliar ground. As part of this analysis, a question arose: Will the state be interested in the promotion of this kind of money? The answer to this question could be found only after answering the following questions:

- Does a parallel use of private and state electronic currency allow the economy to overcome the problems caused by fluctuating prices?
- Can competition between private and public electronic money increase efficiency and play an important role in curbing inflation?
- Will the states (even those with strong economies) which inhibit the coexistence of private and public electronic money perhaps be in a position inferior to those which are in favour of creating the opposite environment?
- Can private e-money schemes incur a number of costs that can lead to a reduction in welfare?

Representatives of the monetary authorities in Montenegro were not able to offer us answers to these questions. We are of the opinion that in the case of the parallel coexistence of public and private electronic money it is very important that they operate in the future based on shared power, and not on the basis of competition.

If we accept the fact that almost no financial innovation has led to a decline in economic well-being, then there is probably not much room for pessimistic thinking.

Respondents from the banks' IT sector did not have answers to the questions in the field of monetary policy, but are of the opinion that with an increased use of electronic money (either private or state) a growth in the potential of electronic commerce can be expected along with the electronic stock exchange business and tourism in both national and foreign domains.

Generally speaking, the overall survey conducted on the employees of the Central Bank, commercial banks and regulatory authorities indicates that the Montenegrin banking sector will be unprepared for a more widespread phenomenon of private issuers of electronic money and an increase in the number of user of that money.

Although the largest number of the respondents answered that the development of private electronic money would not undermine the ability of Central Banks to control their operational goals in the short to medium term, we must bear in mind the fact that in the course of the interview they all agreed that any reconstruction of the balance sheet could have negative implications for the flexible use of instruments of monetary policy in Montenegro.

Also, it was concluded that the trans-national nature of private electronic money may cause some problems in the field of tax policy and, if strategies were not prepared, it might cause negative effects on the foreign exchange market.

Montenegrin bankers believe that, even a relatively minor displacement of classic money by private e-money would influence the control of cash flows, the money supply and interest rates. Similar results were obtained in earlier research within other financial systems.

With regards to previous problem, it is clear that in the CBM in the new environment the stability of money demand would be brought into question, and, therefore, exacerbate the problem of stability between price and consumption.

The lowest concern was observed in terms of credit policy, although the monetary authorities did not have an answer to this point, even for the purposes of this analysis.

The answer on the research question defined at the beginning of this chapter can be confirmed with the following paragraph: *The evolution of money towards the possible issuance of private e-money could lead to a series of changes in the macroeconomy of Montenegro. These changes could be large and painful, especially in the finance sector*.

The surveys conducted with 12 clients of Montenegrin commercial banks produced very incomplete answers, which present an obstacle to the authors in terms of a deeper analysis. Out of 360 participants in the survey, only 3 were

familiar with the term "scheme of private e-money". These three respondents understood Bitcoin as private electronic money.

After an adequate explanation of what the issuance of private electronic money means and how that money could function (an explanation was offered in the survey), we looked at the attitudes of clients.

In Montenegro, even the rate of the adoption of payment cards, as the main form of state electronic money, is at a much lower level than in more developed market economies, so it is clear why only 5.27% of the respondents answered "yes" to the question: In the case of a more widespread use private of electronic money would you use it (Fig. 1)?

All the other respondents stated mistrust in a currency that may be outside government control as the main reason for their thinking. There is an evident distrust of banks in Montenegro, along with a lack of confidence in new ICT solutions, a distrust of transactions conducted through the Internet and so on, and, therefore, the answers obtained were not unexpected (Table 1).

By analyzing the attitudes of clients on the issue of who they would trust most as issuers of private electronic money, the highest ranked were telecommunications operators (87% of respondents), and the lowest trust was placed in internet service providers (13% of respondents).

A total of 329 respondents (which is 97%) are of the clear view that private electronic money could be accepted if it performed basic functions in the same way as any other money (acting as a means of exchange, payment and measure of value). Only three respondents are of the view that the acceptance of private e-money

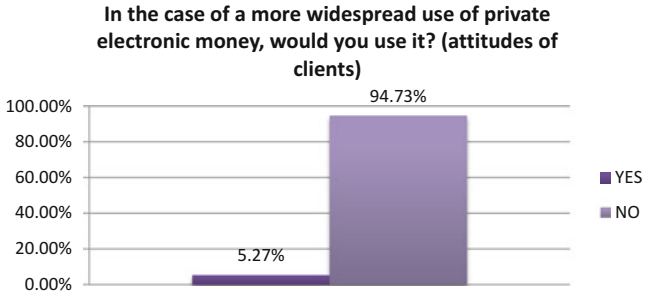


**Fig. 1** Attitudes of cliens about using of private electronic money in case of its more widespread use

**Table 1** The main reason regarding the attitude for not using of private electronic money in case of its widespread use (attitudes of clients)

| The main reason regarding the attitude for not using of private electronic money in case of its widespread use: |
|---|
| • mistrust in a currency that may be outside government control |
| • distrust of banks in Montenegro |
| • distrust of banks in Montenegro |
| • a distrust of transactions conducted through the Internet and so on. |

would also depend on whether it can be considered a globally recognised currency (which is an additional function of money).

323 respondents gave a negative answer to the question of whether lower interest rates offered by issuers of private electronic money could change the demand for loans from commercial banks? Nearly 80% of the respondents took the view that a private digital currency as an alternative payment system could cause a fall in prices of classic money use, but they all say that judging by the current understanding of the means of its operation, they would still opt for classic money. The main reason for such thinking is related to the perception of risk.

This analysis confirmed the opinion of the monetary authorities that private e-money would not have a significant impact on the credit policy of the Montenegrin banking system.

Both clients and respondents from banks and regulatory bodies confirmed by their answers that in the case of a more widespread use of private e-money, it would not be support from banks but a major intervention and support from the state that would be expected.

The replies received from the bank clients provided us with several conclusions, for the purpose of our analysis of the social aspect of private electronic money,

- The social effects of this type of money would differ essentially from the effects caused by some other forms of financial innovation that have appeared over the last few decades.
- We believe that the prospects of private e-money will depend on how fast it is accepted by users. Clients will want to use it if there are a large number of others who use it as well. This means that the promoters of private e-money are to face a challenge of big investment in promoting the new "currency" at the very beginning, That is, it will be necessary to involve users in the new electronic payment systems before the money is even commercially viable.
- We believe that applications for transferring new payment instruments can become an effective tool for improving social infrastructure.
- Without neglecting the importance of a "sense of community", the accelerating effect of electronic money can contribute to the acceleration of existing reforms, such as reform of the law, the globalization of economic activities, labour market reform and so on.
- At its core, this money will also be a "social construct" that relies on the reciprocal trust of a critical mass. Since trust is based on a subjective understanding of the future value and usefulness of a payment product, it is obvious that the future position of private electronic money will be determined by this very factor to a great extent.

Promoting confidence in new products of electronic payments among clients will not be easy given the inertia factor which is generally present when it comes to payment products. Evidence for this claim can also be found in the monetary history of Montenegro.

On the basis of the analysis of the data obtained from clients, *there is no doubt that a more widespread use of private electronic money in the near future will not occur*.

## 6 Conclusion

Montenegro is a small country, belonging to a group of developing countries, and as such is very sensitive to even the slightest turbulence coming from the segments of finance, ICT, law, politics, social policy and the like. This is why the authors felt that this kind of analysis may be of use before problems occur. The additional reason should be sought in the world's growing need for the popularization of financial instruments based on digitalization and virtualization on the one hand, and in financial systems becoming more and more complex and demanding on the other, so that if the effects of such financial innovations are not predicted in time, problems can be complicated further.

From the rather small number of studies performed across the world so far including this research conducted in Montenegro, it is unclear to what extent private e-money can be issued on a larger scale and whether it can prosper. It still cannot be accurately predicted whether there will be enough profit that can attract private issuers, and what the number of those willing and able to perform this kind of financial operations will actually be.

If the number of issuers of private electronic money increases, the acceptance and widespread use of this type of money is not going to happen overnight. On the contrary, a successful development of private e-money as a rival to conventional currency, in fact, will probably be quite a slow process and might last for much of this century, until all the critical issues are solved and answers are found to many, primarily economic, issues and dilemmas. Certainly, the largest private supporter of privately issued e-money should be a strong base of stakeholders.

Even if we assume that the issuers of private electronic money behave in a disciplined manner even in the absence of government regulation, documented experience with unregulated financial institutions will reassure us and show it to be no more than a naive assumption.

The Montenegrin banking sector is currently considering the problem of the consequences of the operation of private e-money schemes. But from our conversations with the monetary authorities we were able to draw the conclusion that private electronic money could cause enormous systemic risks if it remained outside the regulations, if the user base is enlarged, if the interaction between different schemes of private e-money increases and the interaction with the real money market and foreign exchange markets is accelerated.

Given the connection between private and state money and all the segments of the financial market, potential financial panic would lead the Central Bank towards an unenviable position.

When considering the possible social effects of privately issued electronic forms of payment, we believe that they will be significantly different from the effects caused by some other forms of financial innovation that have emerged in recent decades.

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# What Drives a Local Currency Away from Banking Markets? Some Southeast Europe Insights

**Srđan Marinković and Ognjen Radović**

**Abstract** The chapter explores determinants of currency substitution on a sample of countries of Southeast Europe that follow a variety of exchange rate regimes within different monetary frameworks. In the sampled countries, the level of currency substitution remained rather high despite years-long efforts to address the issue. Although the substituting currency (euro) does not undermine the substituted ones in their role of means of payment, it is the pervasive use of foreign currency as the store of value, or choice of currency for financial assets and liabilities, that becomes a persistent feature of all economies in question. Foreign currency loans continue to dominate local loan markets, and broader money aggregates to a large extent consist of foreign currency deposits (financial euroization). The presence of financial euroization makes interest rate channel of monetary transmission inefficient. Moreover, the pervasive level of financial euroization leaves an economy dangerously exposed to external shocks. This is why understanding roots and mechanisms of financial euroization becomes an increasingly important policy issue. We employed multiple panel regression models feed by the official annual data that cover the last decade. In this study, the choice of explanatory variables is firstly based on the so-called portfolio view which considers economic agents' choice between the classes of domestic and foreign assets driven by risk–return relationship. We have tested the significance of a set of variables pointed out by two international parity conditions, i.e., uncovered interest rate parity and purchasing power parity. The common variable for those international parity relations is exchange rate expectations, or future path of exchange rate. We also included different proxies for external fragility. Those proxies may shape public view of growth and stability prospects, and further on explain puzzling disparities of the international parity relationships, calculated based on current level of exchange rate. Designed that way, econometric models are able to trace wrong policy choices or unsustainable economic policy mix.

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## 1 Introduction

In the strict meaning of the word, currency substitution means substitution of local/domestic currency with foreign one(s) in its use as a means of payment (transaction purposes). There are other types of dollarization/euroization. The so-called real dollarization appears as indexation of wages, real estate, or durable products prices in foreign currency. At the end, more widely seen phenomenon is financial dollarization. It is the fact that in developing and transition economics agents hold on massive scale financial assets (financial contracts) denominated in foreign currencies since a local currency is considered an inferior store of value (Ize and Parrado 2002). We are naturally inclined to restrict our research focus solely on financial dollarization.

The chapter explores determinants of financial euroization on a sample of countries of Southeast Europe that follow a variety of exchange rate regimes within different monetary frameworks. In the sampled countries, the level of financial euroization remained rather high despite years-long efforts to address the issue. Although the substituting currency (euro) does not undermine the substituted ones in their role of means of payment, it is the pervasive use of a foreign currency as the store of value, or choice of currency for financial assets and liabilities, that becomes the persistent feature of all the economies examined. Foreign currency (FX) loans continue dominating local loan markets. During the period and across the countries, the share of FX loans has been varying in range from 37.6 to 84.1%. Moreover, bank financial liabilities consist of foreign currency deposits and foreign interbank borrowings (financial euroization) to a large extent. The share of FX liabilities has been varying in range from 32.1 to 81.8%. In both cases, the top numbers belong to Serbia. Note that in this study we used the term liability not in the sense that is more or less usual in currency substitution literature. Here, the notion of liability is used as it stems from banking industry side and henceforth means all financial sources of the banking industry.

The remaining part of this chapter is structured as follows. We begin in Sect. 2 with a review of theoretical literature on the roots and consequences of financial euroization, proceeding in Sect. 3 with empirical findings on the drivers of financial euroization. Section 4 describes data set and methodology. Section 5 proceeds with the discussion of results. Finally, Sect. 5.2 presents the conclusion.

## 2 Financial Euroization: Roots and Consequences

Financial euroization is a complex phenomenon so far enlightened from theories that come from different traditions. Early literature (e.g., Filosa 1995) explores money demand function in the ambience of multiple currencies. However, it is more suitable to explain roots and mechanism of narrowly defined currency substitution and has little to say about drivers of financial euroization. Nevertheless,

from this tradition we know that higher domestic inflation, as an opportunity cost of holding local currency money holdings, contributes to a lesser share of local currency, the same as higher foreign inflation does the opposite. Therefore, inflation differential may matter. If inflation differential per se does not explain exchange rate fluctuations, then real exchange rate may matter, too. Some studies of currency substitution although not clearly focused on comprehensive evaluation of drivers shed some light on the issue. For instance, Guidotti and Rodrigues (1992) explain hysteresis of currency substitution, or the so-called ratchet effect with network externalities and weaker currency effect. According to the former argument, people get used to keep their wealth in foreign currency; it is already widespread throughout an economy, so that even after a serious decline in inflation, high substitution will persist. The latter one is not conflicted with the former, since current fundamentals cannot fully change the public view of an economy strength (weak economy-strong currency inconsistency).

Three competing theories that theoretically explore causes of financial euroization are: portfolio optimization view, market imperfection/failure argumentation, and institutional view. The portfolio optimization view (Ize and Levy-Yeyati 2003) set up the level of substitution as a market equilibrium outcome driven by agents that optimize individual asset portfolio toward minimum variance. The model shifted attention from levels to the volatility of inflation and nominal exchange rate. If the inflation is more volatile (risk of local currency deposits), then exchange rate (risk of foreign currency deposits) depositors will run into foreign deposits and deposit euroization will be higher.

Market imperfection theory argumentation can be summarized in a few sentences. The very idea is that lending institutions are prone to engage in foreign currency intermediation because they take into calculus devaluation risk of soft (local) currency, but neglect the risk associated with transferring currency into default risk when they lend in hard (foreign) currencies. However, this behavior is not to be necessarily caused by myopia, since devaluation/depreciation would have immense and contemporaneous effect on losses while borrower default-driven losses are possible to avoid as long as borrower equity or collateral are safe, despite the losses taken by borrower, so that lenders should be rationally inclined to foreign currency lending. Broda and Levy-Yeyati (2003) propose a model where financial intermediaries choose the optimal currency composition of their liabilities with foreign liabilities being above the socially desirable level because of currency-blind safety net (e.g., deposit insurance). The results are model specific since the model assumes that only foreign lending brings default risk (in case of depreciation) that can be eventually transferred to deposit insurer (moral hazard). In this strand of literature, domestic banking system is the main "culprit" for the financial euroization, since the models allow banks to do imperfect currency hedging (or speculation), by leaving their books open. Cataõ and Terrones' (2000) banking market imperfection model stresses two imperfections: credit market segmentation and limited competition. The model assumes two market segments: the tradable borrowers (large corporations or natural hedgers) and non-tradable borrowers (small firms and households). There is relative market power of banks over

borrowers from different segments. Banks exert monopoly power over clients who can only borrow locally, so that interest margin (spread) for FX intermediation tends to be higher, which makes local currency loans more attractive. It is different than the case with firms that have direct access to foreign funds that can press for less costly foreign currency borrowing. This model defines the level of loan euroization as an outcome of divergent forces. The more likely and severe currency depreciation, the higher interest margin on foreign currency intermediation, and the availability of natural hedgers, the more attractive will foreign currency loans be for banks. On the other hand, domestic currency loans will be more attractive to banks if the banks have monopoly power over non-natural hedgers; the lower probability of depreciation (and its impact on loan default), the higher interest margin on domestic deposit to loan intermediation. Therefore, credit market structure, relative costs of intermediation, and macroeconomic shocks will matter.

Fresh argumentation comes from the institutional view theories which underline the role of credibility of macroeconomic policy and policymakers (De Nicoló et al. 2003). This strand of literature looks for macroeconomic drivers of euroization. In the world of paper currencies, "it is the good money that displaces the bad money," so that "monetary authorities need to improve the quality of their product." Namely, the level of euroization reveals the public view about future path of inflation, interest rates, and exchange rate. There may be a huge gap between current values of the fundamentals and the respective values foreseen by the public. This theory offers novel explanation for euroization hysteresis as being well-established empirical fact. A complementary approach is explanation that blames past macroeconomic mismanagement for contemporary dollarization (Barajas and Morales 2003). Moreover, though exchange rate policy is commonly seen as being held captive by deposit (or loan) euroization, the causal relationship may be exactly the opposite. Namely, if a central bank provides implicit exchange rate guarantee by intervening large-scale and with bias to restrain currency depreciation it will reveal its weak position and foster euroization.

Official dollarization (no separate legal tender) is sometimes suggested to rather small and open countries as a way to import stability from a better performing (anchoring) country. The very essence of this policy alternative is to "close exits" in order to discipline policymakers and ensure their commitment to the announced policy goals. It is a high-stake strategy to overcome a weak currency issue. To increase the credibility of exchange rate parity, policymakers raise exit costs, i.e., expose the economy to the risk of balance-of-payment crisis (De la Tore et al. 2003). Nevertheless, even the countries that rule out this policy option are frequently forced to admit that their own legal tender is squeezed out of monetary area. Economic science points out several drawbacks of unofficial financial dollarization. Losing control over monetary policy, more likely economic contraction or bank distress in case of sharp currency depreciation, and bank run, are among the most prominent examples.

There is almost a consensus among researchers (Reinhart et al. 2003 appears as an exception) that high level of financial euroization harms monetary authority ability to use the full set of instrumental portfolio for monetary management (Kraft

2003; Šošić and Kraft 2006; Levy-Yeyati 2006). For example, Aleksić et al. (2008) found that the effects of policy interest rate (2-weaks repo rate) vanished when the level of euroization exceeded a threshold of 64.5%. At the same time, exchange rate pass through on domestic prices grows stronger, which is the regularity that appears clear in international studies (Reinhart et al. 2003). Using bank-specific data, Kujundžić and Otašević (2012) support the abovementioned estimate, highlighting that the dynamics of local and foreign reference rates may explain only a local currency denominated fraction of banks credit activity while FX credit volume stays largely out of the influence. On the case of four biggest Central European countries, Brzoza-Brzezina et al. (2010) found a side effect of restrictive monetary policy, i.e., the increase of local policy rate on foreign currency denominated credit activity, which even accelerates with small overall effects on total lending.

High level of financial euroization is also a serious macro-prudential issue. Economies with higher levels of financial euroization are exposed to balance of payment and financial crisis in the presence of large exchange rate fluctuations. While financial intermediaries can easily hedge their books passing currency risk to their borrowers, this is not an available solution for borrowers that have a large part of their revenue stream in local currencies (absent natural hedge). If there is no available (derivatives) market for currency risk hedging instruments, there is nothing left that can help them to match their books (balance sheet exposure). Reinhart et al. (2003) stressed different implications of loan and deposit euroization on the economy fragility. If banks heavily lend in foreign currencies, sharp depreciation can bring severe economic contraction or bank distress (solvency type of bank disturbances) while deposit euroization makes a banking system faced with foreign liquidity drainage exposed to bank run.

Such economies are not only exposed to currency risk, but also they lose an effective instrument to cope with it. Since sharp depreciation may harm domestic economy, authorities do not resist the tendency to respond to high dollarization with a "fear of floating" (Calvo and Reinhart 2002). This policy does not help in the long run, but instead further amplifies fundamental disparities and dollarization.

## 3 Survey of Empirical Literature

There is vast empirical literature on determinants of financial dollarization. It was initially oriented to the developing Latin American countries that were straggling desperately for control of inflation (Guidotti and Rodriguez 1992; Sevastano 1996). Since former communist economies have launched and gone underway their transition to market economy, issue of euroization arose there. In this chapter, the prime focus is on (post) transition economies. The summary of the review of empirical literature is presented in Table 1, so we would restrict detailed discussion only to a few most recent multi-country studies.

**Table 1** Summary of empirical literature survey

| Study | Geographical/time coverage | Methodology | Core findings |
|---|---|---|---|
| Naceur et al. (2015) | Caucasus and Central Asia (2001–2014 quarterly) | Dynamic panel regression (FE, RE) | Volatile exchange rate, asymmetric exchange rate policy, and inflation drives DE |
| Pepić et al. (2015) | Southeast Europe (2003–2014, annual) | Panel regression (FE, RE) | Currency depreciation, DE, and interest differential drives CE |
| Manjani (2015) | Albania | Johansen cointegration approach and VEC | Interest rate differential, inflation, exchange rate, and credit euroization trigger DE |
| Rajković and Urošević (2014) | Central and Southeast Europe (2005–2013 monthly) | Panel cointegration and dynamic panel regression | Portfolio optimization matters in the long run, while interest rate spread, nominal exchange rate drive short-run euroization |
| Luca and Petrova (2008) | 21 transition economies (1990–2003, annual) | Panel regression (FE, RE) | Financial depth, DE drives CE |
| Basso et al. (2007) | 24 transition economies (2000–2006, monthly) | Panel regression (FE) | Interest rate differential and availability of foreign funds matter |
| Arteta (2005) | 92 developing and transition economies (1990–2000, annual) | Pooled OLS regression | Flexible exchange rate regime increases DE and decreases CE |
| Barajas and Morales (2003) | 14 Latin American and Caribbean economies (1980–2001, quarterly and annual data) | Panel regression (OLS and FE) | Official FX interventions boost DE, loan to deposit spread differential matters |
| Komárek and Melecký (2001) | Czech Republic (1994–2001, quarterly) | Johansen cointegration approach | Macroeconomic instability and illegal economy drive currency substitution |

Notes: FE stands for fixed effects, RE for random effects, CE for credit euroization, DE for deposit euroization.

Despite a bulk of available empirical studies, just a few explored the drivers of both loan and deposit euroization. In a most recent study, Naceur et al. (2015) found frequent depreciation and high volatility of nominal exchange rates associated with a rise in FX deposits (but not FX loans). The authors also found dollarization persistent, financial depth (availability of currency risk sharing market mechanisms), low and stable inflation decreasing dollarization. Moreover, specific to the sampled countries (Table 1) asymmetric nature of exchange rate policy, i.e., official FX intervention that places more weight on supporting local currency (sales of pivot currency dominate in official FX trade) increases deposit dollarization.

Rajković and Urošević (2014) employ Minimum Variance Portfolio model on the sample of Central European countries (added Albania, Romania, and Serbia) and differ between short- and long-run determinants of deposit euroization. The authors found beneficial distinguishing between them since deviation from the international parity conditions based on relevant interbank rates (UIP) generates effects only in the short run, in the same way as nominal exchange rate movements do influence while inflation does not influence transitory component of euroization. The authors challenge the sustainability of generated effects based on manipulation of interest dis(parity) and advocate for a credible inflation targeting policy and more flexible exchange rate policy.

Previous estimates for sampled countries (Pepić et al. 2015) rule out importance of domestic inflation, current account balance, while FDI has been on the borderline of significance for loan euroization. Interest differential between local and the policy rate of European Central Bank is tested and proved significant, as well as nominal exchange rate and total bank liability euroization.

Since they are less relevant for our study, some single-country studies are compiled (Table 1) but not discussed in details.

## 4 Data and Methodology

This chapter analyzes the impact of a set of variables on the level of financial euroization. We examined how much these variables contributed to the high loan euroization in six countries of Southeast Europe: Albania, Bosnia and Herzegovina, Croatia, Macedonia FYR, Romania, and Serbia.

According to IMF classification, three out of six countries in this sample adopt floating regimes, i.e., allow market to determine their local currencies' exchange rate. Nevertheless, all three countries are not freely floaters. Some authors (Grubišić and Kamenković 2013) differ between those three regimes, marking Albania and Romania as loosely managed floaters while Serbia is assessed as a country that tightly manages its float. Croatia and Macedonia FRY adopt soft peg type of regime (with category differing between them) while Bosnia and Herzegovina adopt hard peg type. According to IMF, crawl-like arrangement assumes increased interventions in response to one-sided exchange rate pressure, or the unintentional outcome of foreign exchange reserve management in a shallow market. This description fits rather well the exchange rate management that Serbia followed during its exchange rate anchoring period, i.e., till mid 2006. Since Serbia shifted to inflation targeting (from mid 2006 onwards), the nature of official interventions changed. Stabilized arrangement may reflect the tendency of countries with such arrangements to manage their exchange rate in response to events in the external environment, including differences in inflation across countries, capital flow pressures, and new trend in world trade.

In the following, we will discuss rationale for the data set, as well as the expected sign of influence for each variable.

Uncovered interest parity (hereafter UIP) is a non-arbitrage supported condition that links the rates on two comparable assets denominated in different currencies. If UIP holds, interest rate differential should be explained by the expected change in nominal exchange rate and should not matter as a determinant of financial euroization. The deviations from uncovered interest parity (UIP) may take both positive or negative values, with negative numbers meaning that the interest differential grants positive return in excess of (not completely offset by) currency depreciation, for those who borrow in foreign currencies and lend in domestic (carry trade). It makes local currency assets more attractive for lenders, decreases loan euroization, and increases bank liability euroization. Thus, the relation between UIP deviations and loan euroization should be positive, and inverse one with total bank liability euroization. Another problem in using variables that incorporate exchange rate expectations (UIP) is an implicit assumption that market participants are perfect forecasters.

It is not clear how variables that indicate either a temporary disequilibrium or a fragile external liquidity/solvency position of a country may behave in terms of their influence on the level of euroization. For example, annual rate of change of real effective exchange rate (REER) takes positive values in the case of currency real appreciation while the values are negative in the case of real depreciation. We also experimented with cumulative REER index, but the change produced no difference in results. We believe that the influence of REER on the level of financial euroization is ambiguous because it goes through both direct and indirect channels. Directly, the real appreciation favors local currency as a choice of financial assets currency. Based on this channel, the sign of influence should be negative. Nevertheless, an appreciated local currency may damage trade balance. If the appreciation is taken as unsustainable in the long (or even short) run, public will expect depreciation to take place in future. The developments are very similar to the well-known peso problem. Therefore, the depreciation means that "dam is broken" while appreciation may mean that the pressure is accumulated to the level that "dam is just about to get cracked." Either depreciation or appreciation may indicate the same risk, possibility that local currency will move downside. This is exactly the rationale for ambiguous predicted effect of REER on the level of financial euroization.

Inflation differential (tested in Guidotti and Rodriguez 1992) is a common input both in REER and UIP formulae although more directly in former than latter one. This is why we expect to get more complete picture by testing the above more sophisticated measures. Despite that, we also included inflation differential itself. By way of construction, positive sign of estimate for inflation differential indicates that increasing the difference between local and foreign inflation would boost loan euroization, and consequently, decreasing of the difference will help reversing the euroization.

The variables like current account balance (tested in Barajas and Morales 2003) and foreign direct investment stream indicate a county competitiveness and attractiveness, respectively. Both indicators encapsulate foreign currency inflow/outflow

that come from the side of real economy. However, trade imbalance is a fragile position, with deficit indicating possible currency depreciation. We expect current account surplus to be negatively associated with both loan and bank liability euroization, so that increase of positive values of this explanatory variables should be associated with decrease of euroization. If current account deficit is financed to a large extent by FDI, the trade pressure on exchange rate will diminish. Thus, FDI to GDP ratio is expected to be negatively associated with euroization.

The same way we would discuss rationale for including three indicators that are here to point out external financial fragility. Higher external debt to GNI ratios should indicate problems with sustaining external solvency. However, it is country specific. There is no one-size-fits-all threshold able to indicate a critical point-of-no-return. The stock of external debt tells nothing about maturity structure of the debt. This is why we include debt service variable as a better proxy for external debt burden.

International reserves to external debt stock is a ratio that indicates foreign liquidity position. Seemingly, higher levels of the ratio tell us that an economy is more likely to handle successfully an adverse impact of foreign debt on currency value in the short run. Nevertheless, similar to liquidity of banking organizations, external liquidity is a concept that makes sense in the short run. What makes banks sound in the long run is not the ratio of liquid to total assets or liabilities, but the quality of assets. Banks will never have liquid reserves to the level that makes them able to cover all liabilities (fractional reserve banking). Furthermore, in economies that are already highly dollarized (from the bank liability side) the high share of international reserves comes from the required reserves applied on foreign currency savings and funds that banks borrow from abroad (Marinković 2009). This part of reserves moves up when FX liabilities move the same way, covering just a part of total FX liabilities. In the analysis, we use gross international reserves since data for net reserves are not readily available for all countries. The high level of international reserves may also indicate strong commitment of authorities to support the currency in the ambience of unbalanced flow of capital or trade deficits of chronic nature (fragile position). This is why we take the possible influence of reserves to external debt to be ambiguously aligned to the level of euroization.

The idea to include lagged value of dependent variables in the set of explanatory variables is not a novel one (see, e.g., Naceur et al. 2015). This intervention changed the panel regression model into dynamic panel. The economic rationale is the so-called inertia, hysteresis, or euroization persistence. It is a well-documented empirical fact that the level of euroization is persistent despite strong authorities' efforts to change fundamentals in favor of local currency. Therefore, we experimented with Arellano and Bond (1991) dynamic panel-data estimation and found lagged value of both FX/total loans and FX/total liabilities statistically significant in corresponding specifications.

In this study, we have omitted a range of institutional variables, or policy undertakings aimed to tackle financial euroization. The list is not exhaustive and

may include such measures like capital regulation (risk weights), loan classification and provisioning, liability-based required reserves, etc. If those measures or policies are designed the way that differ between currency classes of bank assets and liabilities, then they clearly have the potential to influence on the level of financial euroization (for a review of implemented measures, see Dimova et al. 2016).

The list of used variables is attached in the Appendix, along with definitions and data sources (Table 7). The data set is shown in diagrams of time series (Table 8) in the Appendix. We used data from official sources. The relatively short time series of annual data were used due to the problems with consistency of data. We examined the combined impact of nine independent variables on the degree of loan euroization for the period from 2003 to 2014. We analyzed the so-called panel data, as a combination of cross section data and time series. Panel data enable significant increase in the sample, greater variability, and higher efficiency of evaluation. For baseline panel regressions (Tables 2 and 3), as well as for the disaggregated sample regressions (Table 4) we apply the random-effects Generalized Least Square (GLS) model, while fixed-effects estimations are available too,

**Table 2** Benchmark models (RE–GLS): dependent variable FX/total loans

| Regressor | Estimation without lag | Arellano-Bond dynamic estimation |
|---|---|---|
| FX/total loans (t−1) | – | 0.336*** |
| | | (0.0956) |
| FX/total liabilities | 0.308***<br>(0.0633) | 0.238**<br>(0.103) |
| Inflation differential | 0.971**<br>(0.469) | 0.0865<br>(0.228) |
| External debt stock/GNI | 0.246***<br>(0.0584) | 0.113**<br>(0.0516) |
| Reserves/external debt stock | 0.522***<br>(0.120) | 0.187**<br>(0.0775) |
| Debt service/export | –0.0945***<br>(0.0362) | –0.242***<br>(0.0713) |
| Constant | 13.57<br>(8.554) | 20.55*<br>(10.49) |
| Diagnostics | | |
| Observations | 64 | 54 |
| *R*-squared (within group) | 0.207 | – |
| *R*-squared (between groups) | 0.641 | – |
| *R*-squared (overall) | 0.489 | – |
| Wald $\chi^2$ (5) | 138725 | 65.10 |
| Sargan | – | 65.06 |

Notes: Standard errors in parentheses: ***$p < 0.01$, ** $p < 0.05$, *$p < 0.1$

**Table 3** Benchmark models (RE–GLS): dependent variable FX/total liabilities

| Regressor | Estimation without lag | Arellano-Bond dynamic estimation |
|---|---|---|
| FX/total liabilities (t-1) | – | 0.665*** |
| | | (0.0955) |
| REER | –0.268*** | –0.286*** |
| | (0.0953) | (0.0771) |
| Current account/GDP | –0.467*** | –0.314*** |
| | (0.130) | (0.116) |
| External debt stock/GNI | 0.226*** | 0.0375 |
| | (0.0811) | (0.0381) |
| Constant | 40.77*** | 15.13*** |
| | (6.568) | (5.813) |
| Diagnostics | | |
| Observations | 69 | 57 |
| *R*-squared (within group) | 0.176 | – |
| *R*-squared (between groups) | 0.771 | – |
| *R*-squared (overall) | 0.491 | – |
| Wald $\chi^2$ (5) | 23.99 | 67.33 |
| Sargan | – | 49.75 |

Notes: Standard errors in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

**Table 4** Dependent variable FX/total loans—Random-effects GLS

| Regressor | Floaters | Fixers |
|---|---|---|
| FX/total liabilities | 0.282*** | 0.754*** |
| | (0.0793) | (0.0752) |
| External debt stock/GNI | 0.251 | 0.286*** |
| | (0.244) | (0.0565) |
| Reserves/external debt stock | 0.496*** | 0.212* |
| | (0.143) | (0.113) |
| Debt service/export | –0.248 | –0.325*** |
| | (0.196) | (0.0688) |
| Constant | 21.63* | –3.814 |
| | (11.27) | (9.151) |
| Diagnostics | | |
| Observations | 32 | 32 |
| *R*-squared (within group) | 0.187 | 0.465 |
| *R*-squared (between groups) | 0.999 | 0.998 |
| *R*-squared (overall) | 0.693 | 0.849 |

Notes: Standard errors in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

**Table 5** List of tested explanatory variables

| Explanatory variables | Expected sign of influence | |
|---|---|---|
| | Loan euroization | Bank liability euroization |
| FX/total loans (t−1) | + | |
| FX/total liabilities | + | |
| FX/total liabilities (t−1) | | + |
| UIP | + | – |
| REER | ± | ± |
| Inflation differential | + | + |
| Current account/GDP | – | – |
| FDI/GDP | – | – |
| External debt stock/GNI | + | + |
| Reserves/external debt stock | ± | ± |
| Debt service/export | + | + |

Notes: (+) positive influence; (–) negative influence; (±) ambiguous influence.

but only for models that operate with full set of variables, whether significant or not (results are enclosed in the Appendix, Tables 5 and 2). States (countries) are used as a group variable, with all variables varying by group.

## 5 Results and Discussion

### *5.1 Drivers of Loan Euroization*

In the table below (Table 2) are shown variables that are proven statistically significant as determinants of loan euroization. The model includes five out of nine tested variables. The results for the models extended to include all variables are enclosed in the appendix (Tables 9 and 10). Apart from three variables that indicated fragility of external position, two more variables appear significant.

It is quite obvious that banks match their books. It is a consequence of prudential regulation that limits bank net open position in foreign currencies. Therefore, the currency composition of liabilities may drive the currency composition of assets, or even vice versa.

In the first specification, inflation differential appears significant. Therefore, the countries that are better performing in terms of inflation may account on less euroized economy. Further on, if more rigid regime or exchange rate anchoring strategy may help in doing that, then the choice of exchange rate regime and monetary strategy may matter.

Three indicators of external fragility proved significant in both specifications, with reserves to external debt ratio negatively associated with loan euroization.

According to the above argumentation, it may mean that authorities by accumulating strong international reserves position actually send a signal to the market that they hold strong the last line of defense, but it also reveals that the first line is broken.

It is likely that dirty data dismissed UIP variable from the specifications. Namely, not all countries in the sample are issuing public debt instruments or offer any kind of risk free investments in local currencies, so we have in some cases to use policy rates instead. That's way, deviation from UIP time series are not that clean that a rigorous research would demand. For future research, we suggest using more clean data for nominal interest rate differential. The researchers would benefit if they had readily available data for loan to deposit interest rate spread in different currencies. If we assume that banks match currency composition of assets with that of liabilities, they will opt either for local currency or foreign currency intermediation, and thus, relative interest rate spread will matter.

## *5.2 Drivers of Bank Liability Euroization*

In the majority of empirical studies, loan euroization is treated as determined by deposit euroization (e.g., De Nicoló et al. 2003) while there are also rare examples where the two variables are causally linked opposite way (Manjani 2015). Although, due to prudential regulation, bank total liability euroization stays closely linked with bank assets euroization (Table 2), there is a good reason to delve into examination of driver of bank total liability euroization itself. In some empirical studies, deposit euroization is found differently determined than asset euroization (e.g., Naceur et al. 2015). The empirical regularity has clear economic justification. "Investors" (depositors) whose decisions drive the level of deposit euroization belong to the less informed market participants, opposite to the key players on the loan market (banks). Those groups may behave differently.

Yet, our proxy for bank liability euroization does not correspond fully to the frequently studied deposit euroization. It comprises both foreign currency deposits and banks international borrowings. Those flows may have different drivers. Cross-border interbank loans may be driven the same way as loan euroization since in both cases banks are players that make decisions. Moreover, those two alternative financial sources may move divergently. For instance, a decrease of interest rates on international credit funds will consequently decrease FX deposit rates, and change the composition of bank liabilities in favor of international funds on the account of local FX deposits. Deposit euroization will decrease while loan euroization will probably stay the same.

Implicitly, we assume that depositors are free to choose between assets of different classes: foreign currency or local currency denominated. According to the portfolio view, savers will opt for one or another currency according to the

relative risk–return relationship, with return expressed in the same currency based on the holding period nominal exchange rate changes. Moreover, transaction costs (costs of conversion to another currency) may also matter.

The key differences in terms of drives of loan and bank liability euroization are as follows. REER appears significant for liability euroization while it is clearly ruled out of the set of significant variables for loan euroization. Here, the REER sign is negative, which means that the real currency depreciation boosts liability euroization, the same way as the real appreciation decreases the level of euroization. In the dynamics of REER, the movement of nominal exchange rate overpowers movements of relative inflation, with the latter component remaining less visible and hence less relevant for depositors' choice of currency. Although exchange rate dynamics and inflation rate have common determinants, and often go hand in hand in the long run, they are crucially different in terms of visibility. Inflation rate can be polished by official statistics and takes time to become obvious. The data on exchange rates are published daily and can be carefully monitored by anyone. This is probably why exchange rate plays a greater role in shaping the public view about financial stability than inflation reports.

The same as previous, current account balance plays the role in shaping liability euroization. Worsening of this external stability indicator generates no immediate cost to depositors. We know that trade deficit can be ignored for some time, since it has no immediate impact on exchange rates, as long as the deficit can be successfully financed, but it can have a snowball effect, which can be eventually triggered.

Finally, more sophisticated measures of external fragility proved insignificant for liability euroization. It is not surprising since more sophisticated measures are not readily available to general public. Opposite to that, data on external debt stock are frequently communicated to the public and may shape public opinion about policy sustainability.

## *5.3 Decomposing the Sample Based on Countries' Exchange Rate Regime/Policy*

Thus far, we have looked at the sample of countries as homogenous. However, if it is not the case, the above baseline regression results are nothing more but an average, silent in terms of the role that the choice of exchange rate regime may have on euroization. Other stimuli to explore possible effects of the choice of exchange rate regime on loan euroization came from surveying the empirical literature. Ize and Levy-Yeyati (2005) suggest that more flexible exchange rate regimes combined with inflation targeting framework, if successful, provide nominal exchange rate that is more volatile than inflation, what contributes to less incentives to dollarize. Arteta (2005) also found flexible regimes positively

associated with deposit dollarization and to a smaller extent with credit dollarization.

It is rather trivial empirical regularity that countries that adapt more rigid exchange rate regimes, e.g., conventional peg, currency board, or soft peg regimes express lower nominal exchange volatility (if any). Volatility of nominal exchange rate is a variable of choice in many empirical studies (e.g., Yinusa 2007). At the same time, the "fixers" are expected to better perform in terms of inflation records, which may mean that economic agents have less incentive to dollarize. But if they fail to converge domestic inflation to foreign, "fixers" will be more sensitive to the risk of having over-valuated exchange rate in the long term.

Since we use yearly sampled (annual) data, it is not feasible to regress to exchange rate volatility indexes directly, so we have experimented with introducing a dummy variable (binary indicator) as a proxy for nominal exchange rate variability. If a country follows a rigid regime, it is marked with zero, otherwise 1. Unfortunately, the results were not stable, and we finally went into decomposing the total sample along two groups of countries. The sample is equally weighted with three countries going into each subsample according to IMF classification of de facto regimes based on 2014 report (Table 6). The procedure will not be ideal if during the period countries shift from one to another regime. However, each country position was more or less stable.

As expected, the groups differ in terms of significant explanatory variables. Different external fragility indicators matters for each group. For the group of "floaters," gross international reserves help explaining the level of loan euroization. In a way peculiarly, higher reserves to external debt ratio is associated with higher level of euroization. It seems that market participants are not persuaded that the reserves can guarantee sustainable external position, but contrary, high level of international reserves indicates a burdensome task taken by authorities to support the currency in the ambience of unbalanced flow of capital or trade deficits of chronic nature. Interestingly, for the group of "fixers," external liquidity is secondary, with debt stock and service seeming to be the prime concern.

**Table 6** List of sampled countries, exchange rate regimes, and monetary strategies

| Country | De facto ER regime | Monetary policy framework |
|---|---|---|
| Albania | Floating | Inflation-targeting |
| Bosnia and Herzegovina | Currency board | Exchange rate anchor (Euro) |
| Croatia | Crawl-like arrangement | Exchange rate anchor (Euro) |
| Macedonia FRY | Stabilized arrangement | Exchange rate anchor (Euro) |
| Romania | Floating | Inflation-targeting |
| Serbia | Floating | Inflation-targeting |

Source: IMF (2014) Annual report on exchange arrangements and exchange restrictions 2014. International Monetary Fund, Washington, DC.

## 6 Conclusion

This study has proved that different proxies for external fragility (trade balance, external debt stock to GNI, debt service to export, etc.) explain the choice that players on credit and deposit markets make in term of currency composition of their assets (liabilities). Those findings comply with institutional view of financial euroization. External fragility indicators may shape public view of growth and stability prospects, and further on explain puzzling disparities of the international parity relationships, calculated based on the current level of exchange rate. Even strong international reserves were of no use for the sampled economies in their attempts to raise policy credibility.

Here, we came to the crux of the debate. A common policy element of all countries in the sample is that authorities by opting rigid exchange regimes, or leaning strong against currency depreciation, actually are sending a message to the public that holding strong value of the local currencies is not beyond their means. It is a wrong idea persuading market participants that everything goes well when serious risks are there. If we simplify, a peculiar game takes place between authorities and market. Market participants expect that in some point in the future fundamentals must align (disparities will disappear), but the authorities use their (limited) power to give a lesson to them that economic science may go wrong, and that what ultimately must happen, will happen when they want to. That's way, none will concentrate to forecasting market forces, but, opposite, to guessing when the authority will pull out, i.e., decide (or be forced) to give up. Moreover, what matters is not professional economists' assessment (precise calculations) of the level of fragility, but public perception of what is "unsustainable" in any specific episode. This is why we expect that less sophisticated measures of external fragility play bigger role in shaping public opinion.

When it comes to policy agenda, we would comment that inflation targeting remains a good choice for financially euroized economy, if it produces a real effect on inflation records. The same holds for exchange rate anchoring monetary strategy, or rigid exchange rate regimes, if this type of regime may guarantee better inflation records. If not, real appreciation is an unavoidable outcome with its potential to amplify euroization in the long run.

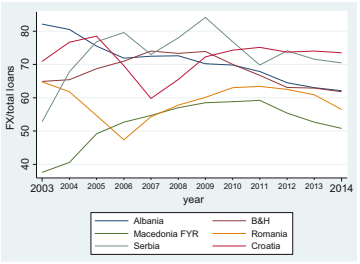
**Acknowledgement** The authors are grateful to the Republic of Serbia Ministry of Education, Science and Technological Development for the funds and support that made this research possible.

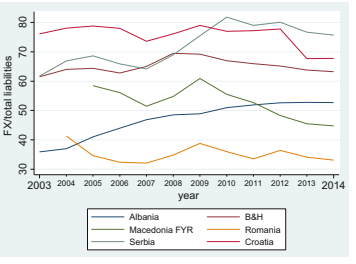
# Appendix

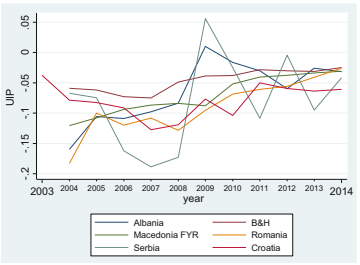
**Table 7** Variable definition

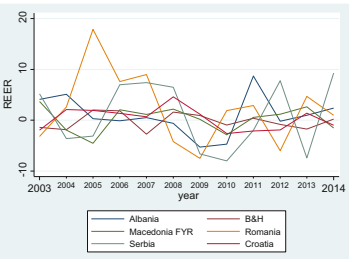
| Variable | Definition | Data source |
|---|---|---|
| FX/total loans | Foreign currency denominated loans to total loans (in percentage); for B&H, Macedonia FYR, and Croatia, the numerator also includes foreign currency indexed loans; for Romania, the denominator includes only loans to private sector (non-governmental loans). | IMF (Country Reports) |
| FX/total liabilities | Foreign currency denominated (or indexed) bank liabilities to total bank liabilities (in percentage), except for Macedonia FYR where the figures includes only deposits. | IMF (Country Reports) |
| UIP | Deviations (extra return) from uncovered interest parity calculated based on change in nominal exchange rates of national currencies vis-à-vis euro (direct quotation) and interest rate differential. Local policy rates (end of period): for Albania, one-week repo rate for open market operations, for B&H deposit rate (CBB&H); for Romania before 2006 open market operations deposit facility interest rate, afterwards repo rate for various maturities; for Serbia open market two-weeks repo rate before 2012, afterwards one-week repo rate; for Croatia, official discount rate. For foreign rate used, German 3-months bond yield. | IMF (Country Reports), official national sources, and Investing.com online data base |
| REER | Index of annual change of real effective exchange rate (positive values indicated real appreciation). | IMF (Country Reports) |
| Inflation differential | Difference between annual domestic and foreign inflation based on CPI (end of period). | IMF (Country Reports) and Eurostat |
| Current account/GDP | Current account balance to gross domestic product (in percentage). | IMF (Country Reports) and complementary sources. |
| FDI/GDP | Foreign Direct Investments to Gross Domestic Product (in percentage). | IMF (Country Reports) and complementary sources. |
| External debt stock/GNI | Total external debt (public and private) to country Gross National Income. | The World Bank (International debt statistics) |
| Reserves/external debt stock | Gross international reserves to external debt stock (in percentage). | The World Bank (International debt statistics) |
| Debt service/export | Debt service due in each year to value of export (in percentage). | The World Bank (International debt statistics) |

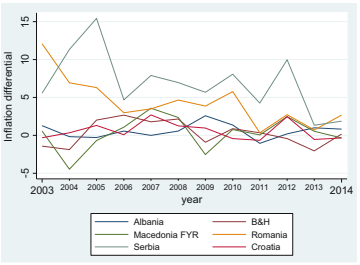
**Table 8** Time series of variables

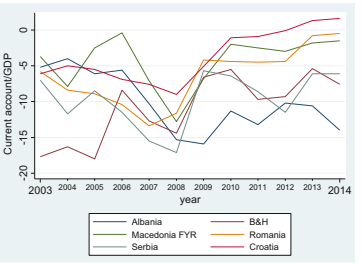


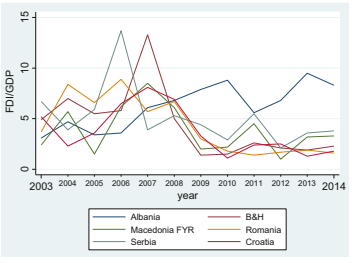



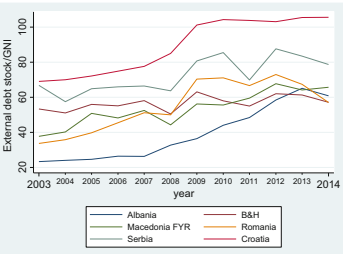



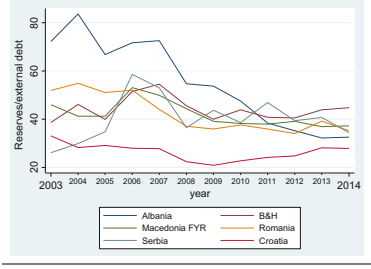



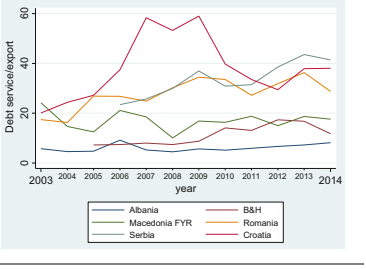



**Table 9** Extended models: dependent variable FX/total loans

| Regressor | Fixed effects | Random-effects GLS |
|---|---|---|
| FX/total liabilities | 0.0796 | 0.246*** |
| | (0.153) | (0.0748) |
| UIP | 7.821 | 0.792 |
| | (16.40) | (20.74) |
| REER | –0.153 | –0.110 |
| | (0.136) | (0.191) |
| Inflation differential | 0.122 | –0.285 |
| | (0.367) | (0.403) |
| Current account/GDP | –0.0814 | –0.615** |
| | (0.243) | (0.271) |
| FDI/GDP | –0.449* | –0.397 |
| | (0.256) | (0.353) |
| External debt stock/GNI | 0.124 | 0.337*** |
| | (0.0882) | (0.107) |
| Reserves/external debt stock | 0.312** | 0.568*** |
| | (0.124) | (0.123) |
| Debt service/export | –0.239*** | –0.0458 |
| | (0.0877) | (0.106) |
| Constant | 48.41*** | 6.342 |
| | (16.02) | (9.575) |
| Diagnostics | | |
| Observations | 63 | 63 |
| $F$-test | 2.900 | – |
| Prob $> F$ | 0.00804 | – |
| $R$-squared (within group) | 0.352 | 0.165 |
| $R$-squared (between groups) | 0.0770 | 0.738 |
| $R$-squared (overall) | 0.137 | 0.557 |
| *Rho* | 0.776 | – |
| Wald $\chi^2$ (5) | – | 66.75 |

Notes: Standard errors in parentheses: ***$p < 0.01$, **$p<0.05$, *$p < 0.1$

**Table 10** Extended models: dependent variable FX/total liabilities

| Regressor | Fixed effects | Random-effects GLS |
|---|---|---|
| UIP | 11.57 | –5.637 |
| | (15.19) | (37.69) |
| REER | –0.264** | –0.359 |
| | (0.121) | (0.343) |
| Inflation differential | 0.312 | –1.349* |
| | (0.339) | (0.710) |
| Current account/GDP | 0.0516 | –1.522*** |
| | (0.226) | (0.447) |
| FDI/GDP | 0.116 | –0.196 |
| | (0.238) | (0.641) |
| External debt stock/GNI | –0.157* | 0.862*** |
| | (0.0791) | (0.155) |
| Reserves/external debt stock | –0.323*** | 0.425** |
| | (0.106) | (0.216) |
| Debt service/export | 0.000270 | –0.0546 |
| | (0.0817) | (0.192) |
| Constant | 81.94*** | –20.12 |
| | (9.263) | (17.19) |
| Diagnostics | | |
| Observations | 63 | 63 |
| *F*-test | 3.254 | – |
| Prob > *F* | 0.00475 | – |
| *R*-squared (within group) | 0.347 | 0.0175 |
| *R*-squared (between groups) | 0.224 | 0.897 |
| *R*-squared (overall) | 0.000156 | 0.538 |
| *Rho* | 0.946 | – |
| Wald $\chi^2$ (5) | – | 62.93 |

Notes: Standard errors in parentheses: ***$p < 0.01$, **$p < 0.05$, *$p < 0.1$

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# Exposure to Exchange Rate Risk and Competitiveness: An Application to South-Eastern Europe

**Alexandra Horobet, Aleksandar Shivarov, and Lucian Belascu**

**Abstract** Our chapter investigates the economic exposure to currency risk of stock markets from nine countries in South-Eastern Europe using bilateral exchange rates of the domestic currencies against their main trading partners' currencies between 1999 and 2015. The relevance and magnitude of exposures are investigated through changes in exchange rates in linear and non-linear specifications. Our results indicate that these economies show contemporaneous exposure to currency risk, but they are different in size and sign from one country to another and from one currency to another, a result that can be explained by the dissimilar economic structures in the region. There is smaller evidence for asymmetric exposures in linear specifications, which might indicate a general inability of companies in the region to use real or financial options in order to benefit from the positive effects of changes in exchange rates or to hedge the undesired expected exposures. The evidence for non-linear exposures is strong for these economies and generally shows that companies' value is negatively influenced by higher volatility in exchange rates and more frequent appreciations of foreign currencies. Overall, our findings suggest that countries from South-Eastern Europe face competitiveness challenges regarding their main trading partners, but also that companies from the region are less capable to use real and financial options to mitigate their exposures to currency risk and this is reflected in their overall market performance.

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## 1 Introduction

Corporate exposure to currency risk is understood as the impact of unexpected exchange rate changes on a number of key business elements: shareholder's wealth, firm's assets and liabilities or the company's financial position. Adler and Dumas (1984) are the first authors to define exposure to currency risk as the change in the value of the firm induced by changes in exchange rates and the subsequent literature has built on their approach. Two mechanisms are responsible for the existence of economic exposure: a conversion effect—when the foreign currency depreciates, a lower amount in the home currency will be obtained after converting a given amount in a foreign currency, the reverse is true for appreciations of foreign currencies; and a competitive effect—the change in the firm's competitive position following an asymmetric sensitivity of its revenues and expenses to exchange rate changes.

Empirical evidence on corporate exposure to currency risk is rather concentrated on companies from developed countries, although more recent research has revealed exposure specificities for emerging economies. Most studies address the impact of unexpected changes on nominal rates, based on the hypothesis that inflation rates are small and changes in nominal rates will directly cause changes in real exchange rates. This hypothesis is generally valid for developed economies, where inflation rates were historically low, but it is less accurate for emerging economies, some of them experiencing even hyperinflationary environments after 1990.

The seminal work of Jorion (1990), which investigated the exposure to currency risk of US multinationals and concluded that the share prices of these companies were not systematically affected by changes in nominal exchange rates of the US dollar against foreign currencies, has opened the way for research in the field, but later studies found mixed results concerning the presence of exposures to currency risk—while Bartov and Bodnar (1994), Choi and Prasad (1995) confirm Jorion's findings, other authors detect significant links between companies' values and unexpected changes in exchange rates—see, for example, Gao (2000) or Koutmos and Martin (2003a, b). Glaum et al. (2000) and Entorf and Jamin (2002) investigated German companies' exposure to the US dollar and found significant exposure and two factors explaining it: the company's level of involvement in international business and the exchange rate level. Doukas et al. (2003) examine the currency exposure for Japanese companies between 1975 and 1995 and find higher significance for exposures of multinational and exporting companies, while El-Masry (2006) studies British companies and finds significant exposures but depending to a large extent on their industries.

One important addition to studies on currency risk exposure is represented by tests of the presence of asymmetric exposures to unexpected changes in exchange rates. Miller and Reuer (1998) are among the first to observe that previous studies assume symmetry in financial performance effects induced by appreciations or depreciations of currencies and thus exclude the companies' ability to use real

options to hedge economic exposures or to benefit from changes in exchange rates—if this happens, then one should find different exposure coefficients depending on phases of appreciations or depreciations of a currency. The authors work with periods of currency appreciation and depreciation and estimate two exposure coefficients for a firm, finding limited evidence for asymmetric exposures, but also weak symmetric exposure. De Jong et al. (2002), on the other hand, find more significant exposures in phases of the Dutch guilder depreciation, after investigating 117 Dutch companies between 1994 and 1998. In the same vein, Koutmos and Martin (2003a, b) study nine U.S. industries over the 1992–1998 period and find significant contemporaneous asymmetric exposures in 25% of the cases and significant one-lag asymmetric exposures in 79% of the companies. Oh and Lee (2004) find that most Korean firms face asymmetric exchange rate exposures and that the pricing-to-market theory carries more conviction than the real option theory in explaining these asymmetries.

The traditional tests of currency exposure were based on linear models, which might explain to some extent their mixed results. More recently, the literature advanced the possibility that linear models are less appropriate to estimate firms' currency exposure due to the potential non-linear structure of companies' cash flows induced by unexpected changes in exchange rates. From a theoretical perspective, various reasons can generate non-linearities in companies' currency risk exposure, as follows: (1) the firm's risk management policy can cause non-linear payoffs through the use of financial derivatives such as options, thereby prompting towards non-linear exposures to currency risk [see, in this respect, the works of Allayannis and Ofek (2001) and Muller and Verschoor (2006)]; (2) the companies' pricing-to-market policy of fixing prices in the currency of the country where they sell their products, which impedes an automatic transfer (pass-through) of changes in exchange rates to the final prices; thus are created non-linear cash-flow structures particularly when small fluctuations in exchange rates are absorbed in firm's profits but high fluctuations are transmitted into profits—Pollard and Coughlin (2003) confirm pass-through non-linearities conditional on the size of the fluctuation in exchange rates; (3) the presence of hysteresis in international trade, whereby investment irreversibility requires companies to maintain investment in host countries after strong appreciations of foreign currency, thus generating operating losses and declines in firm's value—see Baldwin and Krugman (1989), Ljunqvist (1994) and Christophe (1997); (4) government's intervention in the foreign exchange market aimed at smoothing out exchange rate fluctuations and limiting the size of companies' currency risk exposure; for example, the government limits the default risk associated with debt denominated in foreign currencies when it intervenes to limit the domestic currency's depreciation against foreign currencies, which in turn reduces the negative impact of such depreciations on company's value—see Rossi (2009); (5) eventually, investors' difficulties in understanding and interpreting the impact of fluctuations in exchange rates on firms' value, as a result of their inabilities in identifying a shock in exchange rate as being temporary or permanent, of lack of transparency in firms' reports regarding hedging policies, or of uncertainties in companies' future strategies, as argued in Muller and Verschoor (2006).

The empirical evidences in favor of non-linear currency exposure are reasonably strong, existing results confirming the importance of non-linearities in companies' exposure to currency risk, although differences emerged conditional of exchange rate specific evolution (appreciation or depreciation), size of exchange rate fluctuation or industry. This strand of literature developed in time in terms of methodological approaches towards the study of non-linear exposures, from simple or multiple regressions based on non-linear convex or concave functions to autoregressive models, including here ARCH and GARCH type of models. Koutmos and Martin (2003a) test for the presence of second-moment exposure to currency risk and find that the US financial sector is sensitive to exchange rate volatility in a linear model where the conditional variance of changes in exchange rates is defined as a GARCH(1,1) process. Bartram (2004) identifies significant linear and non-linear exposures against bilateral and multilateral foreign exchange rates for a comprehensive sample of German firms using convex non-linear specifications in multiple regressions. Tai (2005) uses a multi-factor model with multivariate GARCH parameterization to explore asymmetric currency exposures of US banks and finds strong evidence for asymmetric exposures that suggests that asymmetry and conditional heteroskedasticity are important for estimating currency exposure. Muller and Verschoor (2006) show that US multinationals are asymmetrically exposed to currency risk and the introduction of non-linearity in the models increases the precision and significance of estimated exposure coefficients. Priestley and Ødegaard (2007) employ a different methodological framework to examine linear and non-linear currency exposure by including a market portfolio and macroeconomic variables in regressions and by using two exchange rate regimes based on periods of depreciation and appreciation of the US dollar. They find that non-linear currency exposure is statistically and economically significant but higher when bilateral exchange rates are used, as opposed to a currency basket. Rossi (2009) finds that the use of non-linear smooth transition autoregressive model (STAR) leads to an increase in the number of Brazilian firms exposed to exchange rate fluctuations.

Emerging countries were less interesting for researchers in the field: Kho and Stulz (2000) are the first authors to study the currency exposure of banks from five East Asian countries during the Asian financial crisis and find that only Indonesian and Philippine banks have been negatively impacted by currency depreciations. Kyimaz (2003) directs its attention to Turkey, his findings indicating significant exposures to currency risk but with variable size from one industry to the other. Also, Domingues and Tesar (2006) found that the largest part of Thai companies used in their research display negative exposure when the domestic currency appreciates. Chue and Cook (2008) investigate the exposure to currency risk for companies from 15 emerging markets from Latin America, Asia and Africa using an instrumental variable approach that isolates the currency risk exposure of a company from the influence of confounding macroeconomic shocks and find that currency depreciations had a negative impact on stock returns for the 1999–2002 period, while disappearing in the subsequent 2002–2006 period. Rossi (2008) investigates Brazilian companies' financial policies in relation to currency risk

and finds that the exchange rate regime plays an important role in companies' foreign vulnerability and the adoption of a floating exchange rate regime has a negative impact on companies' foreign currency borrowing and a positive effect on hedging activities. Horobet and Lupu (2005) analyse for the first time Romanian companies' exposure to currency risk against the euro and the US dollar between 2000 and 2005 and find only weak significant linear exposures to both foreign currencies, but they extend their analysis (see Horobet and Lupu 2006) to ten Central and East European countries using linear exposures to unexpected changes in real exchange rates. They find very weak contemporaneous and lagged exposures and interpret them as a failure of investors in the stock markets of these countries to include a competitiveness risk premium in the stock returns of companies from these countries. Bodnár (2009) used a survey to investigate the exposure to currency risk of Hungarian firms from a financial stability perspective and showed that the majority of small and medium-sized Hungarian companies were positively exposed to depreciations of the Hungarian forint, but they were unfamiliar with currency risk management techniques. Fedorova and Vaihehoski (2008) find that currency risk is priced into stock prices of companies from Poland, Czech Republic, Hungary, Bulgaria, Slovenia and Russia, in a research that explores global and local sources of risk in Eastern European stock markets. Korzeb (2015) analyses the impact of the Swiss National Bank's decision to float the Swiss franc in 2015 on the market value of twelve Polish banks using the event study methodology and finds inconclusive results, as the predicted decline in market value was less significant than indicated by the reaction of investors on the day after the floating announcement.

Our chapter is the first to study the linear and non-linear exposure to currency risk of stock markets from nine South-Eastern European countries, using nominal bilateral exchange rates of the national currencies against the currencies of their main trading partners. Since theoretical arguments in favor of non-linear exposure exist and empirical evidences so far indicate that the non-linear component of the exposure is least commonly hedged even in developed economies, there are reasons to believe that companies from these countries show non-linear exposures to currency risk and that these are translated at the economy-wide level. One would normally expect some industries to be positively influenced by appreciations or depreciations of domestic currencies against foreign currencies, while others are negatively affected by the same evolutions. For example, a depreciation of the domestic currency is typically seen as boosting the revenues of export-oriented companies, while an appreciation of the domestic currency would increase the profits of importing companies. At the aggregate stock market level, though, these opposite effects could compensate each other and the resulting market exposure to currency risk might be weak or insignificant. On the other hand, if the exposure is significant, its sign should offer insight into the cumulative residual exposure of the economy to currency risk and into its competitiveness against its main trading partners.

The chapter is structured as follows: Sect. 2 presents the data and methodology used in our empirical analysis, Sect. 3 shows our main findings and discusses them, and Sect. 4 concludes and delineates further research directions.

## 2 Data and Research Methodology

The empirical analysis is conducted on nine economies from South Eastern Europe, of which six are European Union members—Bulgaria, Croatia, Czech Republic, Hungary, Poland and Romania, two are associated countries to European Union—Serbia and Turkey, and Russia, for the sample period between January 1999 and September 2015.

We use monthly data on stock market indices and bilateral exchange rates for each economy. For what concerns data on exchange rates, we use bilateral nominal exchange rates of the countries' currencies against the currencies of the main trading partners—specifically, we have taken into account the trading partners with a share of at least 5% in exports and/or imports at end 2014, according to data published by WTO (see Table 1). Although the European Union is the most important trading partner for Bulgaria, we have excluded from the analysis the BGN/EUR exchange rate given the fixed exchange rate of the Bulgarian currency against the euro as a result of the currency board implemented in the country since 1997 (initially the Bulgarian Lev had a fixed exchange rate against the Deutsche mark). Also, in the case of Croatia we have excluded the Croatian Kuna exchange rate against the Bosnian Convertible Marka (BAM) due to the BAM fixed exchange rate against the euro since 2002 (initially BAM was fixed to Deutsche mark by the 1995 Dayton Agreement). Data on bilateral exchange rates was collected from the Pacific Exchange Rate Service. Table 2 presents the specific set of exchange rates used for each country.

In order to track the stock market performance we use MSCI (Morgan Stanley Capital International) indices for Czech Republic, Hungary, Poland, Russia and Turkey, and local stock market indices for Bulgaria (SOFIX), Croatia (CROBEX), Romania (BET) and Serbia (BELEX15). Since some of these indices were not available from January 1999, we have used the highest time span available for each of them (see Table 2). Due to countries' increased economic and financial integration at regional and global level, our analysis also includes two indices—DAX and S&P500—that capture the countries' exposure to regional and global factors. Data on these indices was collected from Bloomberg.

Currency risk exposure might be the effect of purely exogenous movements in the exchange rate on the firm's value, but most often it reflects the impact of the same shocks that drive exchange rates and stock prices, which is relevant when one studies the currency risk exposure of an entire economy. Also, as Priestley and Ødegaard (2007) show, stock market evolutions are influenced by economic policies, which points toward examining the relationship between stock prices and exchange rates in more complex methodological frameworks. Nevertheless, the

**Table 1** Main trading partners of South-East European countries, end 2014

| Country | Breakdown of economy's total exports by main destination (%, 2014) | | Breakdown of economy's total imports by main origin (%, 2014) | | Country | Breakdown of economy's total exports by main destination (%, 2014) | | Breakdown of economy's total imports by main origin (%, 2014) | |
|---|---|---|---|---|---|---|---|---|---|
| Bulgaria | 1. European Union (28) | 62.1 | 1. European Union (28) | 61.4 | Romania | 1. European Union (28) | 70.9 | 1. European Union (28) | 75.2 |
| | 2. Turkey | 9.4 | 2. Russian Federation | 15.2 | | 2. Turkey | 4.5 | 2. China | 4.0 |
| | 3. Singapore | 2.6 | 3. Turkey | 5.7 | | 3. Russian Federation | 2.8 | 3. Kazakhstan | 4.0 |
| | 4. China | 2.4 | 4. China | 3.3 | | 4. United States | 1.9 | 4. Russian Federation | 3.9 |
| | 5. Russian Federation | 2.4 | 5. Ukraine | 2.0 | | 5. Moldova | 1.6 | 5. Turkey | 3.4 |
| Croatia | 1. European Union (28) | 63.7 | 1. European Union (28) | 76.1 | Russian Federation | 1. European Union (28) | 45.8 | 1. European Union (28) | 42.6 |
| | 2. Bosnia and Herzegovina | 11.9 | 2. Russian Federation | 5.1 | | 2. China | 6.8 | 2. China | 16.9 |
| | 3. Serbia | 5.6 | 3. Bosnia and Herzegovina | 2.7 | | 3. Japan | 3.7 | 3. United States | 5.3 |
| | 4. Russian Federation | 2.6 | 4. China | 2.6 | | 4. Kazakhstan | 3.3 | 4. Ukraine | 5.0 |
| | 5. United States | 2.1 | 5. Serbia | 2.1 | | 5. Belarus | 3.2 | 5. Belarus | 4.4 |
| Czech Re public | 1. European Union (28) | 82.0 | 1. European Union (28) | 66.5 | Serbia | 1. European Union (28) | 64.6 | 1. European Union (28) | 63.1 |
| | 2. Russian Federation | 3.1 | 2. China | 11.3 | | 2. Bosnia and Herzegovina | 8.9 | 2. Russian Federation | 11.4 |
| | 3. United States | 2.2 | 3. Russian Federation | 4.1 | | 3. Russian Federation | 6.9 | 3. China | 7.6 |
| | 4. Switzerland | 1.6 | 4. United States | 2.4 | | 4. Montenegro | 5.1 | 4. Turkey | 2.9 |
| | 5. Turkey | 1.2 | 5. Korea, Republic of | 2.0 | | 5. FYR Macedonia | 4.1 | 5. Bosnia and Herzegovina | 2.6 |

(continued)

**Table 1** (continued)

| Country | Breakdown of economy's total exports by main destination (%, 2014) | | Breakdown of economy's total imports by main origin (%, 2014) | | Country | Breakdown of economy's total exports by main destination (%, 2014) | | Breakdown of economy's total imports by main origin (%, 2014) | |
|---|---|---|---|---|---|---|---|---|---|
| Hungary | 1. European Union (28) | 78.3 | 1. European Union (28) | 74.7 | Turkey | 1. European Union (28) | 43.4 | 1. European Union (28) | 36.7 |
| | 2. United States | 3.5 | 2. Russian Federation | 7.1 | | 2. Iraq | 6.9 | 2. Russian Federation | 10.5 |
| | 3. Russian Federation | 2.5 | 3. China | 5.2 | | 3. United States | 4.0 | 3. China | 10.3 |
| | 4. Ukraine | 2.0 | 4. United States | 1.9 | | 4. Russian Federation | 3.8 | 4. United States | 5.3 |
| | 5. China | 1.9 | 5. Ukraine | 1.7 | | 5. United Arab Emirates | 3.0 | 5. Iran | 4.1 |
| Poland | 1. European Union (28) | 76.8 | 1. European Union (28) | 57.7 | | | | | |
| | 2. Russian Federation | 4.4 | 2. Russian Federation | 10.8 | | | | | |
| | 3. United States | 2.3 | 3. China | 10.6 | | | | | |
| | 4. Ukraine | 2.0 | 4. United States | 2.5 | | | | | |
| | 5. Norway | 1.8 | 5. Korea, Republic of | 2.0 | | | | | |

Source: World Trade Organization

**Table 2** Data description

| Country | Bilateral exchange rates | Stock market index | Sample period |
|---|---|---|---|
| Bulgaria (BG) | BGN/RUB, BGN/TRY, BGN/USD | SOFIX | 11/2001–09/2015 |
| Croatia (CR) | HRK/EUR, HRK/USD, HRK/RUB, HRK/RSD | CROBEX | 01/1999–09/2015 |
| Czech Republic (CZ) | CZK/CNY, CZK/EUR, CZK/USD | MSCI CZ | 01/1999–09/2015 |
| Hungary (HU) | HUF/EUR, HUF/RUB, HUF/USD | MSCI HU | 01/1999–09/2015 |
| Poland (PL) | PLN/CNY, PLN/EUR, PLN/RUB, PLN/USD | MSCI PL | 01/1999–09/2015 |
| Romania (RO) | RON/EUR, RON/USD | BET | 01/1999–09/2015 |
| Russian Federation (RU) | RUB/CNY, RUB/EUR, RUB/UAH, RUB/USD | MSCI RU | 01/1999–09/2015 |
| Serbia (SR) | RSD/CNY, RSD/EUR, RSD/RUB. RSD/USD | BELEX15 | 10/2005–09/2015 |
| Turkey (TU) | TRY/CNY, TRY/EUR, TRY/RUB, TRY/USD | MSCI TR | 01/1999–09/2015 |

Note: *BGN* Bulgarian Lev, *CNY* Chinese Yuan, *CZK* Czech Koruna, *EUR* Euro, *HRK* Croatian Kuna, *HUF* Hungarian Forint, *PLN* Polish Zloty, *RON* Romanian Leu, *RSD* Serbian Dinar, *RUB* Russian Rouble, *TRY* Turkish Lira, *USD* US Dollar

authors of this chapter chose to stay closer to traditional factor models that include only the exchange rate and regional or global factors as independent variables.

The relevance and magnitude of exposures to currency risk were identified through 18 linear and non-linear simple and multiple regression specifications, which test for contemporaneous, asymmetric and non-linear exposures. The regressions used to test for contemporaneous exposures were the following:

$$R_{i,t} = \beta_{0,t} + \beta_{1\to k,t} s_{1\to k,t} + \varepsilon_{i,t} \quad (1)$$

$$R_{i,t} = \beta_{0,t} + \beta_{1\to k,t} s_{1\to k,t} + \beta_{k+1,t} R_{DAX,t} + \varepsilon_{i,t} \quad (2)$$

$$R_{i,t} = \beta_{0,t} + \beta_{1\to k,t} s_{1\to k,t} + \beta_{k+1,t} R_{SP500,t} + \varepsilon_{i,t} \quad (3)$$

For market i, $R_{i,t}$ is the return on the stock market index (logarithmic return from end-of-month values), $s_{1\to k}$ is the logarithmic return of the nominal bilateral exchange rates (from 1 to k) of domestic currencies against foreign currencies, $R_{DAX}$ is the logarithmic return on the German stock market index DAX and $R_{SP500}$ is the logarithmic return on the US stock market index S&P500—these notations are preserved for the subsequent regressions. Contemporaneous currency exposure coefficients are $\beta_{1\to k}$. Domestic currencies are quoted directly in all bilateral exchange rates, which means that positive values for $\beta_{1\to k}$ indicate that a depreciation of the domestic currency against foreign currencies results in higher returns in

the stock market and a higher aggregated value of domestic companies, while negative values for $\beta_{1\to k}$ indicate that appreciations of the domestic currency have the opposite effect.

We also investigate for the presence of asymmetric exposure using the following methodology: we construct a dummy variable ($D_t$) that captures the changes in the exchange rates and takes the value of one if $s_{i,t} > 0$ and zero otherwise. The regression specifications we used are described in equations (4) to (6), where $\gamma_{D,1\to k}$ are the asymmetric exposure coefficients.

$$R_{i,t} = \gamma_{0,t} + \left(\gamma_{1\to k,t} + \gamma_{D,1\to k,t} D_t\right) s_{1\to k,t} + \omega_{i,t} \tag{4}$$

$$R_{i,t} = \gamma_{0,t} + \left(\gamma_{1\to k,t} + \gamma_{D,1\to k,t} D_t\right) s_{1\to k,t} + \gamma_{k+1} R_{DAX,t} + \omega_{i,t} \tag{5}$$

$$R_{i,t} = \gamma_{0,t} + \left(\gamma_{1\to k,t} + \gamma_{D,1\to k,t} D_t\right) s_{1\to k,t} + \gamma_{k+1} R_{SP500,t} + \omega_{i,t} \tag{6}$$

Contemporaneous and asymmetric exposures were estimated using the Generalized Method of Moments (GMM), where the instruments are all independent variables and the constant. We have used the pre-whitening procedure that runs a preliminary VAR(1) prior to estimation to "absorb" the correlation in the moment conditions. In order for GMM estimates to be robust to heteroskedasticity and autocorrelation of unknown form we have used Bartlett kernel and the Newey-West bandwidth.

The last part of our empirical analysis is focused on identifying non-linear exposures to currency risk. In general, non-linear exposures might be detected using either convex or concave functions—quadratic, cubic and sinus hyperbolicus functions can be used to estimate convex exposures, while the cubical root and the inverse sinus hyperbolicus functions can be used to estimate concave exposures. We estimate only convex exposures using quadratic and cubic functions, based on the result found by Bartram (2004) that concave specifications are typically not statistically more significant than linear ones. Our purpose in testing for non-linear exposures is to relax the assumption of linearity between exchange rates and the market values of companies in the countries under analysis, which might be suggested by companies' exposure profiles and their pricing and/or hedging decisions, on one hand, and the economy's foreign trade structure on the other hand. At the same time, the convex quadratic specification may be thought of as indicating exposure to the exchange rate volatility—or second-moment exposure—, while the cubic specification may be understood as showing exposure to exchange rate returns' skewness—or third-moment exposure (thus being close to linear asymmetric exposure). We investigate the convex exposures in two ways: first, we estimate regressions only with non-linear variables (exchange rates) and, second, we estimate regressions with both types of variables (linear and non-linear), following the methodology proposed by Bartram (2004). Regressions using quadratic and cubic functions for the exchange rates are presented below.

$$R_{i,t} = \phi_{0,t} + \phi_{1\to k,t} s^2_{1\to k,t} + \upsilon_{i,t} \tag{7}$$

$$R_{i,t} = \phi_{0,t} + \phi_{1\to k,t} s^2_{1\to k,t} + \phi_{k+1,t} R_{DAX,t} + \upsilon_{i,t} \tag{8}$$

$$R_{i,t} = \phi_{0,t} + \phi_{1\to k,t} s^2_{1\to k,t} + \phi_{k+1,t} R_{SP500,t} + \upsilon_{i,t} \tag{9}$$

$$R_{i,t} = \phi_{0,t} + \varphi_{1\to k,t} s_{1\to k,t} + \phi_{1\to k,t} s^2_{1\to k,t} + \upsilon_{i,t} \tag{10}$$

$$R_{i,t} = \phi_{0,t} + \varphi_{1\to k,t} s_{1\to k,t} + \phi_{1\to k,t} s^2_{1\to k,t} + \phi_{k+1,t} R_{DAX,t} + \upsilon_{i,t} \tag{11}$$

$$R_{i,t} = \phi_{0,t} + \varphi_{1\to k,t} s_{1\to k,t} + \phi_{1\to k,t} s^2_{1\to k,t} + \phi_{k+1,t} R_{SP500,t} + \upsilon_{i,t} \tag{12}$$

$$R_{i,t} = \lambda_{0,t} + \lambda_{1\to k,t} s^3_{1\to k,t} + \varsigma_{i,t} \tag{13}$$

$$R_{i,t} = \lambda_{0,t} + \lambda_{1\to k,t} s^3_{1\to k,t} + \lambda_{k+1,t} R_{DAX,t} + \varsigma_{i,t} \tag{14}$$

$$R_{i,t} = \lambda_{0,t} + \lambda_{1\to k,t} s^3_{1\to k,t} + \lambda_{k+1,t} R_{SP500,t} + \varsigma_{i,t} \tag{15}$$

$$R_{i,t} = \lambda_{0,t} + \delta_{1\to k,t} s_{1\to k,t} + \lambda_{1\to k,t} s^3_{1\to k,t} + \varsigma_{i,t} \tag{16}$$

$$R_{i,t} = \lambda_{0,t} + \delta_{1\to k,t} s_{1\to k,t} + \lambda_{1\to k,t} s^3_{1\to k,t} + \lambda_{k+1,t} R_{DAX,t} + \varsigma_{i,t} \tag{17}$$

$$R_{i,t} = \lambda_{0,t} + \delta_{1\to k,t} s_{1\to k,t} + \lambda_{1\to k,t} s^2_{1\to k,t} + \lambda_{k+1,t} R_{SP500,t} + \varsigma_{i,t} \tag{18}$$

Non-linear exposure coefficients in the above regressions are $\varphi_{1\to k}$ in regressions (7) to (12) and $\lambda_{1\to k}$ in regressions (13) to (18). We estimated regressions from (7) to (18) using Non-linear Least squares (NLS) and ARMA under Newey-West heteroskedasticity consistent coefficient covariance.

In the above regressions, coefficients $\beta_{k+1}$, $\gamma_{k+1}$, $\varphi_{k+1}$ and $\lambda_{k+1}$ show the countries' exposure to the German stock market index DAX and the US stock market index S&P500. We include in regressions' specifications these indices with a double goal: first, to identify the potential residual exposure to currency risk of South-East European economies, above the exposure to regional systemic factors (proxied by DAX) or global systemic factors (proxied by S&P500), and second, to check the robustness of exposure results when DAX and S&P500 are added to initial regression specifications. The regressions' constants are given by $\beta_0$, $\chi_0$, $\gamma_0$, $\varphi_0$ and $\lambda_0$, while the regression error terms are $\varepsilon_{i,t}$, $\omega_{i,t}$, $\upsilon_{i,t}$ and $\varsigma_{i,t}$, all (i.i.d).

## 3 Results and Discussion

This part of the chapter presents the most important results identified in our research and discusses the possible reasons for exposure presence or lack for each country and for the entire sample of countries. We begin by presenting the unit root and multicollinearity tests and afterwards we discuss the most relevant results in terms of various types of exposure identified.

One of the stylized facts of individual economic time series is that they tend to be non-stationary in levels and stationary in the first differences; that is, they are I(1).

We used two traditional unit root tests, the Augmented Dickey–Fuller (ADF) and the Phillips–Perron (PP) to test for stationarity—both tests investigate the presence of a stochastic trend in the individual series—, to examine the I(1) property of time series used in our research. Both ADF and PP test statistics failed to reject the null hypothesis of the existence of a unit root in log levels but reject the same null hypothesis in the log first difference of the series. Thus, all time series are integrated I(1).

For what concerns multicollinearity, which is one of the common sources of undecided results in multiple regressions, we have performed correlation tests and excluded from multiple regressions, either linear or non-linear, variables that had statistically significant and higher than 0.65 correlation coefficients. As a results, for some countries we conducted multiple regressions with pairs of two currency pairs instead of three (as indicated in Table 2—Hungary, Poland and Russia) and for some countries we decided to run simple linear contemporaneous and lagged regressions or even simple non-linear regressions due to the high values of correlation coefficients between some exchange rates (for Czech Republic and Turkey).

## *3.1 Linear Exposures*

The presence, size and sign of linear exposures were identified using regressions (1)–(6) described above. These exposures indicate changes in the competitiveness of an economy towards each of its trading partners in three different frameworks, pointing towards different reactions of the stock market to unexpected changes in exchange rates: while contemporaneous exposures show the "immediate" reaction to such changes, the asymmetric exposures offer insight into the potential different stock market responses to appreciations or depreciations of the domestic currency. A number of 270 linear simple or multiple regressions were performed; in all regression specifications we identified linear exposures, although of different sizes, signs and for different currencies from one country to the other. The percentage of significant exposures is higher for contemporaneous exposures to bilateral exchange rates (57.4%) compared to asymmetric exposures (14.8%).

### 3.1.1 Linear Contemporaneous Exposures

Table 3 presents the results of contemporaneous exposures to unexpected changes in bilateral rates for each country in our sample. In this and subsequent tables (Tables 4, 5, 6, 7 and 8) we report only statistically significant exposures at least at 95% level.

Seven countries out of nine show contemporaneous exposures—the exceptions are Romania and Turkey. We found exposures for four foreign currencies, but the signs of regression coefficients are different. There are negative exposures to CNY (Czech Rep., Poland and Russia), to EUR (Czech Rep., Hungary, Poland and

**Table 3** Linear contemporaneous exposures; 1/1999–12/2015

| Country | Eq. | $\beta^{CNY}$ | $\beta^{EUR}$ | $\beta^{RSD}$ | $\beta^{RUB}$ | $\beta^{TRY}$ | $\beta^{UAH}$ | $\beta^{USD}$ | $\beta^{DAX}$ | $\beta^{SP500}$ | Adj. $R^2$ | J-stat. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulgaria | (1) | | | | 0.201 | 0.807 | | −1.516** | | | 0.160 | 0.000 |
| | (2) | | | | 0.091 | 0.542 | | −1.257** | 0.392** | | 0.220 | 0.000 |
| | (3) | | | | 0.026 | 0.508 | | −0.911** | | 0.733* | 0.252 | 0.000 |
| Croatia | (1) | | 0.541 | 0.135 | 0.435** | | | −0.564 | 0.405* | | 0.034 | 0.000 |
| | (2) | | 0.862 | 0.083 | 0.332** | | | −0.488 | | | 0.157 | 0.000 |
| Czech Rep. | (1) | −0.544** | | | | | | | | | 0.054 | 0.000 |
| | (2) | −0.474* | | | | | | | 0.458* | | 0.232 | 0.000 |
| | (3) | −0.325* | | | | | | | | 0.664* | 0.220 | 0.000 |
| | (1) | | −1.259* | | | | | | | | 0.062 | 0.000 |
| | (2) | | −1.038* | | | | | | 0.450* | | 0.232 | 0.000 |
| | (3) | | −1.001* | | | | | | | 0.678* | 0.242 | 0.000 |
| | (1) | | | | | | | −0.515* | | | 0.050 | 0.000 |
| | (2) | | | | | | | −0.448* | 0.459* | | 0.229 | 0.000 |
| | (3) | | | | | | | −0.301** | | 0.668* | 0.218 | 0.000 |
| Hungary | (1) | | −2.073* | | 0.171 | | | | | | 0.209 | 0.000 |
| | (2) | | −1.513* | | 0.072 | | | | 0.613* | | 0.437 | 0.000 |
| | (3) | | −1.350* | | 0.095 | | | | | 0.950* | 0.454 | 0.000 |
| | (1) | | | | 0.361* | | | −1.168* | | | 0.178 | 0.000 |
| | (2) | | | | 0.244 | | | −0.917* | 0.644* | | 0.439 | 0.000 |
| | (3) | | | | 0.161 | | | −0.644* | | 0.961* | 0.420 | 0.000 |

(continued)

**Table 3** (continued)

| Country | Eq. | $\beta^{CNY}$ | $\beta^{EUR}$ | $\beta^{RSD}$ | $\beta^{RUB}$ | $\beta^{TRY}$ | $\beta^{UAH}$ | $\beta^{USD}$ | $\beta^{DAX}$ | $\beta^{SP500}$ | Adj. $R^2$ | J-stat. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Poland | (1) | −0.966* | | | 0.105 | | | | | | 0.164 | 0.000 |
| | (2) | −0.560* | | | 0.094 | | | | 0.604* | | 0.426 | 0.000 |
| | (3) | −0.356* | | | −0.011 | | | | | 0.904* | 0.401 | 0.000 |
| | (1) | | | | 0.056 | | | −0.902* | | | 0.156 | 0.000 |
| | (2) | | | | 0.063 | | | −0.556* | 0.608* | | 0.423 | 0.000 |
| | (3) | | | | −0.031 | | | −0.324* | | −0.000* | 0.400 | 0.000 |
| | (1) | | −1.271* | | −0.091 | | | | | | 0.166 | 0.000 |
| | (2) | | −0.583* | | −0.078 | | | | 0.599* | | 0.401 | 0.000 |
| | (3) | | −0.564* | | −0.062 | | | | | 0.897* | 0.409 | 0.000 |
| Russia | (2) | −0.330* | | | | | 0.136 | | | 0.793* | 0.241 | 0.000 |
| Serbia | (1) | −0.733 | −0.982* | | 1.041 | | | −0.844 | | | 0.145 | 0.000 |

Note: *Significant at 1%, ** 5%. Adjusted $R^2$ shows the explanatory power of the models. J-statistic (Hansen 1982) is a test statistic for model mis-specification used in GMM. Equations (1), (2) and (3) refer to regression specifications presented in Sect. 2

**Table 4** Linear asymmetric exposures; 1/1999–12/2015

| Country | Eq. | $\gamma^{RUB}$ | $\gamma_D{}^{RUB}$ | $\gamma^{TRY}$ | $\gamma_D{}^{TRY}$ | $\gamma^{USD}$ | $\gamma_D{}^{USD}$ | $\gamma^{DAX}$ | $\gamma^{SP500}$ | Adj. $R^2$ | J-stat. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulgaria | (4) | 0.023 | 0.369 | 0.109 | −3.773 | 0.320 | 1.927* | | | 0.263 | 0.000 |
| | (5) | −0.086 | 0.362 | −0.177 | −3.757* | 0.571 | 1.980* | 0.397* | | 0.327 | 0.000 |
| | (6) | −0.090 | 0.216 | −0.222 | −3.223** | 0.614 | 2.110* | | 0.696* | 0.345 | 0.000 |
| Czech Rep. | (4) | | | | | 0.142 | −1.234** | | | 0.075 | 0.000 |
| Hungary | (4) | 0.166 | 0.457 | | | −0.132 | −1.858* | | | 0.225 | 0.000 |
| | (5) | 0.041 | 0.302 | | | 0.061 | −1.786* | | | 0.484 | 0.000 |
| | (6) | | | | | 0.053 | −1.293* | | | 0.441 | 0.000 |
| Poland | (5) | −0.058 | 0.326 | | | −0.171 | −0.698** | 0.608* | | 0.426 | 0.000 |

Note: *Significant at 1%, ** 5%. Adjusted $R^2$ shows the explanatory power of the models. J-statistic (Hansen 1982) is a test statistic for model mis-specification used in GMM. Equations (4) to (6) refer to regression specifications presented in Sect. 2

**Table 5** Non-linear exposures using convex quadratic specifications; 1/1999–12/2015

| Country | Eq. | $\varphi^{CNY}$ | $\varphi^{EUR}$ | $\varphi^{RSD}$ | $\varphi^{RUB}$ | $\varphi^{TRY}$ | $\varphi^{UAH}$ | $\varphi^{USD}$ | $\varphi^{DAX}$ | $\varphi^{SP500}$ | Adj. $R^2$ | F-stat (prob) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulgaria | (8) | | | | −0.366 | 7.087* | | −40.132* | 0.548* | | 0.285 | 17.465 (0.000) |
| | (9) | | | | −0.240 | 6.705** | | −32.582* | | 0.895* | 0.311 | 19.631 (0.000) |
| Croatia | (7) | | −38.579** | 0.298* | −1.238 | | | −19.223** | | | 0.050 | 3.616 (0.000) |
| | (8) | | −5.306 | 0.282** | −0.584 | | | −16.135** | 0.396* | | 0.165 | 8.836 (0.000) |
| | (9) | | −11.237 | 0.238** | −0.527 | | | −11.876** | | 0.661* | 0.195 | 10.653 (0.000) |
| Czech Rep. | (7) | −13.102* | | | | | | | | | 0.068 | 15.476 (0.000) |
| | (8) | −9.388** | | | | | | | 0.435* | | 0.224 | 29.665 (0.000) |
| | (9) | −7.504* | | | | | | | | 0.650* | 0.222 | 29.425 (0.000) |
| Hungary | (7) | | | | | | | −12.102* | | | 0.062 | 14.053 (0.000) |
| | (8) | | | | | | | −8.772** | 0.440* | | 0.222 | 29.312 (0.000) |
| | (9) | | | | | | | −7.000** | | 0.656* | 0.221 | 29.215 (0.000) |
| | (7) | | −30.071** | | −1.513 | | | | | | 0.089 | 10.727 (0.000) |
| | (8) | | −26.300* | | 9.065 | | | | 0.681* | | 0.387 | 42.957 (0.000) |
| | (9) | | −16.461** | | −0.366 | | | | | 1.041* | 0.340 | 44.122 (0.000) |
| | (7) | | | | −0.254 | | | −13.217* | | | 0.159 | 19.758 (0.000) |
| | (8) | | | | 0.412 | | | −10.879* | 0.656* | | 0.431 | 51.236 (0.000) |
| | (9) | | | | 0.312 | | | −7.689* | | 0.980* | 0.417 | 48.520 (0.000) |
| Poland | (7) | −10.160* | | | −0.227 | | | | | | 0.095 | 11.438 (0.000) |
| | (8) | −6.534* | | | 0.111 | | | | 0.643* | | 0.409 | 46.813 (0.000) |
| | (9) | −3.043* | | | 0.294 | | | | | 0.967* | 0.387 | 42.849 (0.000) |
| | (7) | | | | −0.293 | | | −9.667* | | | 0.086 | 10.420 (0.000) |
| | (8) | | | | 0.090 | | | −6.353* | 0.648* | | 0.407 | 46.530 (0.000) |
| | (7) | | −16.815* | | −1.231 | | | | | | 0.047 | 5.855 (0.000) |
| | (8) | | −7.856* | | −0.545 | | | | 0.663* | | 0.379 | 41.519 (0.000) |
| Serbia | (7) | −0.675 | −9.895* | | −1.309 | | | −14.504* | | | 0.209 | 8.777 (0.000) |
| | (8) | −2.938 | −6.534 | | 1.918 | | | −12.120* | 0.536* | | 0.285 | 10.391 (0.000) |
| | (9) | −3.09 | −4.628 | | 2.087 | | | −9.269* | | 0.757* | 0.283 | 10.321 (0.000) |

Note: *Significant at 1%, ** 5%. Adjusted $R^2$ shows the explanatory power of the models. Equations (7) to( 9) refer to regression specifications presented in Sect. 2

**Table 6** Non-linear exposures using convex cubic specifications; 1/1999–12/2015

| Country | Eq. | $\lambda^{CNY}$ | $\lambda^{EUR}$ | $\lambda^{RSD}$ | $\lambda^{RUB}$ | $\lambda^{TRY}$ | $\lambda^{UAH}$ | $\lambda^{USD}$ | $\varphi^{DAX}$ | $\varphi^{SP500}$ | ADj.$R^2$ | F-stat (prob) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulgaria | (13) | | | | 8.057 | 24.744 | | −477.799** | | | 0.103 | 7.291 (0.000) |
| Croatia | (13) | | 831.667 | 0.896* | 7.948** | | | −289.234** | | | 0.054 | 3.853 (0.005) |
| | (14) | | 1474.188* | 0.7128* | 5.016* | | | −236.733** | 0.397* | | 0.171 | 9.224 (0.000) |
| | (15) | | 1584.558* | 0.510* | 4.159** | | | −128.468 | | 0.665* | 0.189 | 10.299 (0.000) |
| Czech Rep. | (13) | −196.399* | | | | | | | | | 0.115 | 26.891 (0.000) |
| | (14) | −156.269* | | | | | | | 0.421* | | 0.261 | 36.211 (0.000) |
| | (15) | −117.368* | | | | | | | | 0.598* | 0.237 | 31.976 (0.000) |
| | (13) | | −931.272* | | | | | | | | 0.065 | 14.906 (0.000) |
| | (14) | | −777.643* | | | | | | 0.450* | | 0.236 | 31.764 (0.000) |
| | (15) | | −725.678* | | | | | | | 0.673* | 0.242 | 32.800 (0.000) |
| | (13) | | | | | | | −178.808* | | | 0.103 | 23.792 (0.000) |
| | (14) | | | | | | | −141.039* | 0.426* | | 0.253 | 34.657 (0.000) |
| | (15) | | | | | | | −103.298** | | 0.611* | 0.232 | 30.994 (0.000) |
| Hungary | (13) | | −694.725* | | 17.099** | | | | | | 0.205 | 26.669 (0.000) |
| | (14) | | −528.132* | | 13.086 | | | | 0.620* | | 0.442 | 53.513 (0.000) |
| | (15) | | −408.672* | | 13.321 | | | −115.337* | | 0.937* | 0.434 | 51.809 (0.000) |
| | (13) | | | | 20.352** | | | | | | 0.222 | 29.427 (0.000) |
| | (14) | | | | 15.507 | | | −87.310* | 0.609* | | 0.449 | 55.115 (0.000) |
| | (15) | | | | 14.614** | | | −64.308* | | 0.914* | 0.429 | 50.782 (0.000) |
| Poland | (13) | −105.970* | | | 6.799* | | | | | | 0.157 | 19.497 (0.000) |
| | (14) | −64.414* | | | 4.003 | | | | 0.608* | | 0.424 | 49.834 (0.000) |
| | (15) | −34.877* | | | 3.791 | | | | | 0.919* | 0.393 | 43.957 (0.000) |
| | (13) | | | | 6.570* | | | −105.478* | | | 0.156 | 19.364 (0.000) |
| | (14) | | | | 3.879 | | | −64.362* | 0.609* | | 0.424 | 49.878 (0.000) |
| | (15) | | | | 3.711 | | | −34.607* | | 0.920* | 0.393 | 43.931 (0.000) |

(continued)

**Table 6** (continued)

| Country | Eq. | $\lambda^{CNY}$ | $\lambda^{EUR}$ | $\lambda^{RSD}$ | $\lambda^{RUB}$ | $\lambda^{TRY}$ | $\lambda^{UAH}$ | $\lambda^{USD}$ | $\varphi^{DAX}$ | $\varphi^{SP500}$ | ADj.$R^2$ | F-stat (prob) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | (13) | | −329.934* | | 2.635 | | | | | | 0.112 | 13.561 (0.000) |
| | (14) | | −156.229* | | 1.144 | | | | 0.629* | | 0.392 | 43.771 (0.000) |
| | (15) | | −117.387* | | 2.526 | | | | | 0.948* | 0.392 | 43.842 (0.000) |
| Russia | (13) | −16.734* | | | | | −0.407 | | | | −0.001 | 0.948 (0.000) |
| | (14) | −11.938** | | | | | 0.062 | | 0.806* | | 0.232 | 20.995 (0.000) |
| | (15) | −5.595 | | | | | −1.458** | | | 1.426* | 0.334 | 34.203 (0.000) |
| | (13) | | −13.598* | | | | −0.146 | | | | −0.004 | 0.636 (0.531) |
| | (15) | | −4.052 | | | | −1.380** | | | 1.430* | 0.333 | 34.130 (0.000) |
| | (13) | | | | | | −0.382- | 13.745* | | | −0.001 | 0.865 (0.422) |
| | (14) | | | | | | 0.080 | −9.642** | 0.806* | | 0.231 | 20.932 (0.000) |
| | (15) | | | | | | −1.450** | −4.450 | | 1.427 | 0.333 | 34.180 (0.000) |
| Serbia | (13) | −13.955 | −156.608* | | 27.872*** | | | −105.819* | | | 0.2 | 8.360 (0.000) |
| | (14) | −5.524 | −129.483* | | 13.715 | | | −78.515* | 0.525* | | 0.273 | 9.855(0.000) |
| | (15) | 0.322 | −129.845* | | 6.427 | | | −50.182* | | 0.778* | 0.283 | 10.292 (0.000) |

Note: *Significant at 1%, ** 5%. Adjusted $R^2$ shows the explanatory power of the models. Equations (13) to (15) refer to regression specifications presented in Sect. 2

**Table 7** Linear and non-linear exposures using convex quadratic specifications; 1/1999–12/2015

| Country | Eq. | $\Phi^{CNY}$ | $\varphi^{CNY}$ | $\Phi^{EUR}$ | $\varphi^{EUR}$ | $\Phi^{RSD}$ | $\varphi^{RSD}$ | $\Phi^{RUB}$ | $\varphi^{RUB}$ | $\Phi^{TRY}$ | $\varphi^{TRY}$ | $\Phi^{USD}$ | $\varphi^{USD}$ | $\varphi^{DAX}$ | $\varphi^{SP500}$ | Adj. $R^2$ | F-stat (prob) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulgaria | (10) | | | | | | | 0.19 | 1.052 | 1.161* | 11.313* | −1.441* | −37.458* | | | 0.310 | 13.347 (0.000) |
| | (11) | | | | | | | 0.084 | 1.039 | 0.918* | 12.019* | −1.179* | −37.427* | 0.410* | | 0.378 | 15.319 (0.000) |
| | (12) | | | | | | | 0.032 | 0.869 | 0.964* | 12.461* | −0.918* | −32.647* | 0.683* | | 0.388 | 15.927 (0.000) |
| Croatia | (10) | | | 0.701 | −28.815 | 0.071 | 0.073 | 0.423 | 0.767 | | | −0.504 | −17.405** | | | 0.065 | 2.723 (0.000) |
| | (11) | | | 1.021 | 0.895 | 0.000 | 0.237 | 0.359** | 1.102 | | | −0.462 | −14.975** | 0.390* | | 0.176 | 5.734 (0.000) |
| | (12) | | | 0.862 | −8.713 | −0.044 | 0.333 | 0.276 | 0.712 | | | −0.207 | −11.820** | 0.641* | | 0.192 | 6.265 (0.000) |
| Czech Rep. | (10) | −0.404** | −10.566** | | | | | | | | | | | | | 0.093 | 11.217 (0.000) |
| | (10) | | | | | | | | | | | −0.411** | −10.175** | | | 0.090 | 10.874 (0.000) |
| | (12) | | | | | | | | | | | −0.380** | −7.038 | 0.433* | | 0.246 | 22.674 (0.000) |
| Hungary | (11) | | | −1.316* | −15.921** | | | 0.108 | 0.240 | | | | | 0.607* | | 0.453 | 33.936 (0.000) |
| | (10) | | | | | | | 0.415** | 1.690 | | | −0.950* | −10.163* | 0.617* | | 0.250 | 17.556 (0.000) |
| | (11) | | | | | | | 0.314 | 1.860 | | | −0.762* | −8.492* | | | 0.489 | 39.126 (0.000) |
| | (12) | | | | | | | 0.223 | 1.319 | | | −0.561* | −6.357* | | 0.882* | 0.444 | 32.800 (0.000) |
| Poland | (10) | | | | | | | 0.048 | 0.187 | | | −0.746* | −4.923** | | | 0.167 | 10.973 (0.000) |
| | (11) | | | | | | | 0.079 | 0.559 | | | −0.451* | −3.909** | 0.601* | | 0.429 | 30.903 (0.000) |
| Serbia | (10) | −0.51 | −2.001 | −0.37 | −10.278** | | | 0.816 | 1.321 | | | −0.45 | −10.967** | | | 0.213 | 4.992 (0.000) |
| | (11) | −0.569 | −4.034*** | −0.192 | −7.113*** | | | 0.777*** | 3.883*** | | | −0.361 | −9.578** | 0.506* | | 0.28 | 6.092 (0.000) |
| | (12) | −0.501 | −3.929 | −0.26 | −4.953 | | | 0.700 | 3.652 | | | −0.228 | −7.874*** | | 0.692* | 0.271 | 5.881 (0.000) |

Note: *Significant at 1%, ** 5%. Adjusted R2 shows the explanatory power of the models. Equations (10) to (12) refer to regression specifications presented in Sect. 2

**Table 8** Linear and non-linear exposures using convex cubic specifications; 1/1999–12/2015

| Country | Eq. | $\delta^{CNY}$ | $\lambda^{CNY}$ | $\delta^{EUR}$ | $X^{EUR}$ | $\delta^{RSD}$ | $\lambda^{RSD}$ | $\delta^{RUB}$ | $\lambda^{RUB}$ | $\delta^{TRY}$ | $\lambda^{TRY}$ | $\delta^{UAH}$ | $\lambda^{UAH}$ | $\delta^{USD}$ | $\lambda^{USD}$ | $\lambda^{DAX}$ | $\lambda^{SP500}$ | Adj. $R^2$ | F-stat (prob) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Bulgaria | (16) | | | | | | | 0.424 | −12.787 | 1.276* | −81.218* | | | −1.023** | −289.531 | | | 0.193 | 7.571 (0.000) |
| | (17) | | | | | | | 0.239 | −8.120 | 1.071* | −87.271* | | | −0.836 | −246.822 | 0.392* | | 0.253 | 8.980 (0.000) |
| | (18) | | | | | | | 0.093 | −4.853 | 1.184* | −104.920* | | | −0.741 | −107.537 | | 0.787* | 0.291 | 10.694 (0.000) |
| Croatia | (16) | | | 0.636 | −250.725 | 0.112 | 0.183 | 0.673** | −17.529 | | | | | 0.115 | −399.486* | | | 0.086 | 3.328 (0.001) |
| | (17) | | | 0.800 | 216.143 | 0.035 | 0.536 | 0.550** | −15.410 | | | | | 0.045 | −321.952* | 0.370* | | 0.186 | 6.060 (0.000) |
| | (18) | | | 0.522 | 688.872 | 0.009 | 0.570 | 0.4330 | −11.764 | | | | | 0.153 | −238.766** | | 0.611* | 0.195 | 6.367 (0.000) |
| Czech Rep. | (16) | 0.142 | −224.380* | | | | | | | | | | | | | | | 0.112 | 13.582 (0.000) |
| | (17) | −0.004 | −155.458* | | | | | | | | | | | | | 0.421* | | 0.258 | 24.018 (0.000) |
| | (18) | 0.032 | −123.764* | | | | | | | | | | | | | | 0.597* | 0.234 | 21.218 (0.000) |
| | (16) | | | | | | | | | | | | | −0.411* | −10.175* | | | 0.090 | 10.874 (0.000) |
| | (17) | | | | | | | | | | | | | −0.380* | −7.038* | 0.433* | | 0.246 | 22.674 (0.000) |
| Hungary | (16) | | | −1.243* | −393.418** | | | 0.130 | 7.359 | | | | | | | | | 0.234 | 16.184 (0.000) |
| | (17) | | | −0.809** | −324.257* | | | −0.020 | 11.569 | | | | | | | 0.601* | | 0.454 | 34.135 (0.000) |
| | (16) | | | | | | | 0.325 | 4.484 | | | | | −0.632* | −82.267* | | | 0.243 | 16.953 (0.000) |
| | (17) | | | | | | | 0.195 | 5.667 | | | | | −0.548* | −57.053* | 0.604* | | 0.467 | 35.883 (0.000) |
| | (18) | | | | | | | 0.029 | 12.689 | | | | | −0.337 | −44.900* | | 0.892* | 0.434 | 31.530 (0.000) |

| | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Poland | (16) | −0.557* | −60.181* | | | | | −0.027 | 8.473 | | | | | | | | | 0.185 | 12.274 (0.000) |
| | (16) | −0.366** | −37.610** | | | | | 0.043 | 2.871 | | | | | | | 0.588* | | 0.431 | 31.150 (0.000) |
| | (16) | | | | | | | −0.061 | 8.216 | | | | | −0.485** | −62.956* | | | 0.178 | 11.782 (0.000) |
| | (17) | | | | | | | 0.022 | 2.670 | | | | | −0.317 | −39.742** | 0.592* | | 0.429 | 30.869 (0.000) |
| Russia | (16) | −0.775* | 3.242 | | | | | | | | | 0.336 | −3.155** | | | | | 0.029 | 2.483 (0.000) |
| | (18) | 0.054 | −11.794 | | | | | | | | | 0.143 | −2.367* | | | | 1.419* | 0.331 | 20.658 (0.000) |
| | (18) | | | −0.122 | −5.072 | | | | | | | 0.177 | −2.493** | | | | 1.407* | 0.330 | 20.639 (0.000) |
| Serbia | (16) | −0.531 | 11.592 | 0.0609 | −245.4639* | | | 1.094 | −24.211 | | | | | −0.724*** | −37.054 | | | 0.212 | 4.976 (0.000) |
| | (17) | −0.622 | 17.003 | 0.234 | −224.400* | | | 1.014 | −27.893 | | | | | −0.644*** | −18.929 | 0.498* | | 0.278 | 6.044 (0.000) |
| | (18) | −0.580 | 21.796 | 0.170 | −206.757* | | | 0.945 | −32.458 | | | | | −0.4816 | −9.4078 | | 0.7125* | 0.278 | 6.057 (0.000) |

Note: *Significant at 1%, ** 5%. Adjusted R2 shows the explanatory power of the models. Equations (16) to (18) refer to regression specifications presented in Sect. 2

**Table 9** Summary of exposures, 1/1999–12/2015

| Country | Exposure | CNY | EUR | RSD | RUB | USD | UAH | TRY |
|---|---|---|---|---|---|---|---|---|
| Bulgaria | Linear—contemporaneous | | | | No | Yes (−) | | No |
| | Linear—asymmetric | | | | No | Yes (+) | | Yes (−) |
| | Non-linear—quadratic function | | | | No | Yes (−) | | Yes (+) |
| | Non-linear—cubic function | | | | No | Yes (−) | | No |
| | Linear and non-linear quadratic function | | | | No | Yes (−) | | Yes (+) |
| | Linear and non-linear cubic function | | | | No | Yes (−) | | Yes (−) |
| Croatia | Linear—contemporaneous | | No | No | Yes (+) | No | | |
| | Linear—asymmetric | | No | No | No | No | | |
| | Non-linear—quadratic function | | No | Yes (+) | No | Yes (−) | | |
| | Non-linear—cubic function | | Yes (+) | Yes (+) | Yes (+) | Yes (−) | | |
| | Linear and non-linear quadratic function | | No | No | No | Yes (−) | | |
| | Linear and non-linear cubic function | | No | No | Yes (−) | Yes (−) | | |
| Czech Republic | Linear—contemporaneous | Yes (−) | Yes (−) | | | Yes (−) | | |
| | Linear—asymmetric | No | No | | | Yes (−) | | |
| | Non-linear—quadratic function | Yes (−) | No | | | No | | |
| | Non-linear—cubic function | Yes (−) | Yes (−) | | | Yes (−) | | |
| | Linear and non-linear quadratic function | Yes (−) | No | | | Yes (−) | | |
| | Linear and non-linear cubic function | Yes (−) | No | | | Yes (−) | | |
| Hungary | Linear—contemporaneous | | Yes (−) | | Yes (+) | Yes (−) | | |
| | Linear—asymmetric | | No | | No | Yes (−) | | |
| | Non-linear—quadratic function | | Yes (−) | | No | Yes (−) | | |
| | Non-linear—cubic function | | Yes (−) | | Yes (+) | Yes (−) | | |
| | Linear and non-linear quadratic function | | Yes (−) | | No | Yes (−) | | |
| | Linear and non-linear cubic function | | Yes (−) | | No | Yes (−) | | |

(continued)

**Table 9** (continued)

| Country | Exposure | CNY | EUR | RSD | RUB | USD | UAH | TRY |
|---|---|---|---|---|---|---|---|---|
| Poland | Linear—contemporaneous | Yes (−) | Yes (−) | | No | Yes (−) | | |
| | Linear—asymmetric | Yes (−) | Yes (−) | | No | Yes (−) | | |
| | Non-linear—quadratic function | Yes (−) | Yes (−) | | No | Yes (−) | | |
| | Non-linear—cubic function | Yes (−) | Yes (−) | | Yes (+) | Yes (−) | | |
| | Linear and non-linear quadratic function | No | No | | No | Yes (−) | | |
| | Linear and non-linear cubic function | Yes (−) | No | | No | Yes (−) | | |
| Romania | Linear—contemporaneous | | No | | | No | | |
| | Linear—asymmetric | | No | | | No | | |
| | Non-linear—quadratic function | | No | | | No | | |
| | Non-linear—cubic function | | No | | | No | | |
| | Linear and non-linear quadratic function | | No | | | No | | |
| | Linear and non-linear cubic function | | No | | | No | | |
| Russia | Linear—contemporaneous | Yes (−) | No | | | No | No | |
| | Linear—Asymmetric | No | No | | | No | No | |
| | Non-linear—quadratic function | No | No | | | No | No | |
| | Non-linear—cubic function | Yes (−) | Yes (−) | | | Yes (−) | Yes (−) | |
| | Linear and non-linear quadratic function | No | No | | | No | No | |
| | Linear and non-linear cubic function | No | No | | | No | Yes (−) | |
| Serbia | Linear—contemporaneous | No | Yes (−) | | No | No | | |
| | Linear—Asymmetric | No | No | | No | No | | |
| | Non-linear—quadratic function | No | Yes (−) | | No | Yes (−) | | |
| | Non-linear—cubic function | No | Yes (−) | | Yes (+) | Yes (−) | | |
| | Linear and non-linear quadratic function | Yes (−) | Yes (−) | | Yes (+) | Yes (−) | | |
| | Linear and non-linear cubic function | No | Yes (−) | | No | No | | |

(continued)

**Table 9** (continued)

| Country | Exposure | CNY | EUR | RSD | RUB | USD | UAH | TRY |
|---|---|---|---|---|---|---|---|---|
| Turkey | Linear—contemporaneous | No | No | | No | No | | |
| | Linear—asymmetric | No | No | | No | No | | |
| | Non-linear—quadratic function | No | No | | No | No | | |
| | Non-linear—cubic function | No | No | | No | No | | |
| | Linear and non-linear quadratic function | No | No | | No | No | | |
| | Linear and non-linear cubic function | No | No | | No | No | | |

Serbia) and to USD (Bulgaria, Czech Rep., Hungary and Poland) and positive exposures to RUB (Croatia and Hungary). This indicates that local companies' value increases when domestic currencies appreciate against CNY, USD and EUR, but it decreases when domestic currencies depreciate against RUB.

Contemporaneous exposure is identified using regression specifications as in Equation (1) for all currencies, but not all of them are confirmed when DAX or S&P500 are used. Specifically, the EUR exposure for Serbia is not confirmed when DAX is used, as well as the RUB exposure for Hungary. Also, the EUR exposure for Hungary and Serbia is not confirmed when S&P500 is used; the same is true for all RUB exposures. This result might be explained by the "absorption" of these exposures into the local economies' exposure to regional factors (DAX) or global ones (S&P500). Still, there are no changes in exposures' signs regardless of model specification, which, in our view, is a strong indication of a consistent type of exposure—positive or negative.

### 3.1.2 Linear Asymmetric Exposures

Table 4 presents the results of the tests aimed at assessing the asymmetry in the exposure to currency risk for our nine economies. We found significant asymmetric exposure to a lower extent than expected. Only four countries carry asymmetric exposure to currency risk—Bulgaria, Czech Rep., Hungary and Poland—with respect to two currencies—TRY and USD. The only positive exposure is for BGN/USD, while for all the other exchange rates asymmetric exposures are negative. The small relevance of asymmetric exposures is accentuated by the lack of exposure confirmation when testing for models specified as in Equation (4) compared to Equations (5 and 6): only the asymmetric exposure to changes in BGN/USD rate is confirmed when DAX and S&P500 are used in regressions. On the other hand, the remaining exposures are identified only when DAX and/or S&P500 are independent variables in our models.

The small evidence for asymmetric exposures confirms the findings of Horobet and Dumitrescu (2008) on the asymmetric exposure of Central and Eastern European countries and they might be explained by the low ability of companies from these countries to capture the potential positive effects of changes in exchange rates on their market values through the use of real or financial options either for investment or hedging purposes. This results might also mean that investors do not include a premium for asymmetric changes in exchange rates in the market return, due to a general lack of understanding of their consequences on companies' values or, if one assumes more mature investors, to an acknowledgement of companies' inability to benefit from asymmetric changes in exchange rates. On the other hand, the negative asymmetric exposures found for all four economies seem to tell a different story, where companies from these countries take advantage from times when the domestic currency appreciates against TRY or USD and use these periods of appreciation positively to increase their market value. On the contrary, Bulgaria is on the opposite situation concerning its positive exposure to TRY.

### *3.2 Non-linear Exposures*

We investigated the presence of non-linear exposures through four types of regression models with convex specifications—quadratic and cubic (see Equations (7) to (18) in Sect. 2). From the beginning it should be noted that the aggregated statistical significance of non-linear exposures is higher than the one for linear exposures: we found significant exposures in 50% of regressions with non-linear quadratic specifications and in 72.2% of regressions with non-linear cubic specifications. 33.3% of regressions display significant non-linear exposures with linear and non-linear quadratic specifications and 48.1% with cubic specifications. Tables 5 and 6 show the results for non-linear exposures using convex quadratic, respectively cubic specifications, while Tables 7 and 8 display the results for statistically significant non-linear exposures identified in linear and non-linear specifications.

With non-linear convex quadratic specifications, six economies show important non-linear structures in their exposures—the exceptions are Romania, Russia and Turkey. Five currencies are responsible for non-linear exposures and in most cases the exposures are negative for CNY (Czech Rep. and Poland), EUR (Hungary, Poland and Serbia), and USD (Bulgaria, Croatia, Hungary, Poland and Serbia). We found positive exposures for TRY (Bulgaria) and RSD (Croatia). Bulgaria shows the highest number of currencies with non-linear exposure (4), followed by Hungary and Poland (3 each) and Croatia and Serbia (2 each). The Czech Rep. is exposed only to CNY. The most consistent exposures—the ones confirmed by regression specifications that include DAX or S&P500—are RSD and USD for Croatia, EUR and USD for Hungary, CNY and EUR for Poland, and USD for Serbia.

In the case of non-linear convex cubic specifications, all economies except Romania and Turkey show non-linear exposures for six currencies, mostly

negative. We identified positive exposures only for EUR (Croatia), RSD (Croatia) and RUB (Croatia, Hungary, Poland and Serbia) and negative exposures for CNY (Czech Rep., Poland, and Russia), EUR (Czech Rep., Hungary, Poland, Russia and Serbia), UAH (Russia) and USD (all seven economies). Croatia, Poland and Russia show exposures to four currencies, followed by Czech Rep., Hungary and Serbia (three currencies) and Bulgaria (exposed only to USD). The regression specifications including DAX or S&P500 confirm exposures for all currencies and countries with two exceptions: Bulgaria's exposure to USD and Russia's exposure to UAH.

In order to further investigate the relationship between linear and non-linear exposures, regression specifications that include both linear and non-linear variables—exchange rate returns—were estimated, with results presented in Tables 7 and 8. Our results confirm that exposures to currency risk have a strong non-linear structure, given the high number of countries exposed to convex quadratic non-linearities (six countries, except for Romania, Russia and Turkey) and/or to convex cubic non-linearities (seven countries, except for Romania and Turkey). In convex linear and non-linear quadratic specifications three currencies have negative non-linear exposures—CNY (Czech Rep. and Serbia), EUR (Hungary and Serbia) and USD (all countries)—and two have positive non-linear exposures—RUB (Serbia) and TRY (Bulgaria). Serbia is the most exposed country (4 currencies), followed by Czech Rep., Hungary and Bulgaria (each with 2 currencies) and Croatia and Poland (one currency). Exposures to USD for all countries and exposure to EUR for Serbia and TRY for Bulgaria are confirmed in regression specifications including DAX or S&P500. An interesting observation is that USD non-linear exposures are confirmed by linear exposures (except for Croatia and Serbia), as well as TRY exposure for Bulgaria, EUR exposure for Hungary, CNY exposure for Czech Rep. and RUB exposure for Serbia—although the non-linear exposures outside USD are significant only in one regression specification. At the same time, the sign of linear and non-linear quadratic exposures is identical, regardless of country and currency.

The confirmation of non-linearities in currency exposure is also strong when both linear and non-linear convex cubic specifications are used. We found seven economies with non-linear cubic exposures (all except Romania and Turkey) that are all negative for CNY (Czech Rep. and Poland), EUR (Hungary and Serbia), TRY (Bulgaria), UAH (Russia) and USD (Croatia, Czech Rep., Hungary and Poland). Five countries show non-linear cubic exposure to two currencies each (Bulgaria, Czech Rep., Hungary, Poland and Russia) and two countries to only one currency (Croatia and Serbia). Some of the non-linear exposures are confirmed by linear exposures with the same sign: USD (Czech Rep., Hungary, Poland and Serbia), EUR (Hungary), CNY (Poland); for Bulgaria, the non-linear exposure to TRY is negative and the linear exposure to the same currency is positive. All non-linear exposures are confirmed when DAX or S&P500 are included in specifications and the exposure signs do not change.

If we understand the convex quadratic specification as indicating exposure to exchange rate volatility, the negative sign of most exposures points toward a logic influence of currency volatility on stock returns: when exchange rate volatility

increases these markets' stock returns drop, which is consistent with the argument that exchange rate volatility should lead to higher transaction costs and/or volume of hedging for non-financial companies (and these companies are the most important components of indices in our sample of countries). In the case of cubic specifications, the negative sign indicates that higher positive asymmetry in exchange rate changes—or more frequent high appreciations of foreign currencies—has a negative impact on companies' values. This might be the result of firms' adjusting their prices in response to movements in exchange rates or of firms' inability to use real options as a reaction to large changes in exchange rates. On the other hand, the positive sign of non-linear exposures in cubic specifications to the Russian Ruble shows that firms are positively influenced by more frequent Ruble appreciations, a result that is surprising and not consistent with the net importing position of these countries in relation to Russia.

Table 9 shows a summary of exposures for each country and currency, thus allowing us to make a series of observations regarding the various ways in which changes in exchange rates impact the aggregate domestic companies' value. First, seven countries display linear and non-linear exposures to the same currency and of the same sign. In most cases, these exposures are negative and found for Bulgaria (USD), Czech Rep. (CNY, EUR and USD), Hungary (EUR and USD), Poland (CNY, EUR and USD), Russia (CNY) and Serbia (EUR). Positive exposures are found only for Croatia (RUB) and Hungary (RUB). Non-linear exposures are mostly identified in both quadratic and cubic specifications, with the exceptions of Croatia (RUB) Czech Rep. (EUR), Hungary (RUB), Russia (CNY), where non-linear exposures are present only when cubic specifications are used. Second, there are countries that show non-linear exposures but not contemporaneous linear exposures: Croatia (CNY, RSD and USD), Poland (RUB), Russia (EUR, USD and UAH), and Serbia (CNY, RUB and USD). Third, there are countries in whose case both linear asymmetric and non-linear exposures are found in cubic specifications—in a way, the non-linear exposure should represent a confirmation of asymmetric linear exposures; the signs of these both exposures are negative for Bulgaria (TRY), Hungary (USD) and Poland (CNY, EUR and USD), mixed for Bulgaria (positive asymmetric exposure and negative non-linear exposure to USD) and Czech Republic (negative asymmetric exposure and positive/negative non-linear exposure to USD).

For what concerns the aggregate exposure of these countries to the currencies of their main trading partners, by far the most questionable currency is the USD, followed by EUR, RUB and CNY. For the USD, most exposures are negative (with the exception of the asymmetric exposure for Bulgaria) and involve seven countries—except Romania and Turkey. Seven countries are also exposed to EUR: contemporaneous linear and asymmetric exposures and non-linear exposures are negative (except for Croatia). In the case of RUB four countries show contemporaneous linear and non-linear exposures in cubic specifications; the signs of these exposures are all positive. Four countries are linearly and non-linearly exposed to CNY (Czech Rep., Poland, Russia, Serbia and Turkey) and the exposures are all negative. These results suggest that these economies are less competitive on their

export markets where the US dollar and the euro are the currencies of denomination—clearly, the appreciations of US dollar and euro in the last years have hurt these economies. On the other hand, the appreciations of the Russian Ruble seem to have had an opposite effect—these countries' competitiveness on Russian markets has increased.

Three important observations need to be made regarding the importance of changes in exchange rates for stock market returns in these countries, whether we understand them in a linear or non-linear framework. First, in all model specifications that include the German or the US stock market indices the regression coefficients for these indices are positive and statistically significant, typically at 1% level of significance, which reveals the aggregate exposure of these economies to regional factors (in the case of DAX) or global factors (in the case of S&P500), beyond the relevance of exposure to changes in exchange rates. Second, all countries included in our sample show significant exposure to regional and/or global factors, even in the absence of exposure to currency risk. Third, as it can be observed in Tables 3–8, the Adjusted R-squared are always lower for model specifications that include only changes in exchange rates as independent variables, compared to models that take into account DAX and/or S&P500. For regressions that show significant exposures to currency risk, the average Adjusted R-squared for model specifications that include only changes in exchange rates varies between 0.054 and 0.188, while the average Adjusted R-squared for regressions that include DAX varies between 0.301 and 0.412, and for regressions that include S&P500 varies between 0.274 and 0.393. In all cases, the smallest values are found for non-linear quadratic exposures and the highest for linear asymmetric exposures. This might be interpreted as an indication of stronger asymmetric and non-linear cubic exposure of these economies to currency risk that is significant as a distinct influence on stock market returns, beyond the presence of influences coming from regional or global macroeconomic factors.

## 4 Conclusions

The results presented in this chapter are based on the first study of linear and non-linear exposure to currency risk of stock markets from South-Eastern European countries, using nominal bilateral exchange rates of the national currencies against the currencies of their main trading partners. Overall, these countries exhibit significant linear and non-linear exposure to various exchange rates, although the exposure signs are different depending on the currency.

The linear contemporaneous exposures indicate that domestic companies' value increases when domestic currencies appreciate against the Chinese yuan, US dollar and euro, but it decreases when domestic currencies depreciate against the Russian Ruble. On the other hand, the small evidence for linear asymmetric exposures might be explained by the low ability of companies from these countries to capture the potential positive effects of changes in exchange rates on their market values

through the use of real or financial options for investments or hedging purposes. Also, this might mean that investors do not include a premium for asymmetric changes in exchange rates in the market return, due to a general lack of understanding of their consequences on companies' values or to an acknowledgement of companies' inability to benefit from asymmetric changes in exchange rates.

Somehow surprisingly, our results demonstrate the presence of a significant non-linear structure in exposures to currency risk. We found that these economies are negatively affected by higher exchange rate volatility, a result consistent with the reality of higher transaction costs and/or volume of hedging for non-financial companies. At the same time, higher positive asymmetry in exchange rate changes also has a negative impact on companies' values, possibly as a consequence of firms' price adjustment policies in response to movements in exchange rates or as their inability to effectively use real options in response to large changes in exchange rates. Overall, our results indicate that these economies became less competitive on their export markets where the US dollar and the euro are the currencies of denomination, but more competitive on Russian markets, despite their net importing position towards Russia.

An important result of our study is that all countries show significant exposure to regional and/or global factors, even in the absence of exposure to currency risk, which is an indication of stronger asymmetric and non-linear exposure of these economies to currency risk that is significant as a distinct influence on stock market returns, beyond the presence of regional or global macroeconomic factors.

Our study has limitations that can be further amended by extending the research in various directions, such as: (i) the analysis of exposure to currency risk of individual companies from these countries, aimed at revealing the industry specificity of exposure; (ii) the use of higher frequency data in order to better capture the potential short-term reactions of investors to surprises in exchange rates; (iii) the use of more complex model specifications with the goal of understanding exposure to currency risk in a more realistic and less simplifying framework; (iv) the identification of factors that explain currency exposure for each industry and economy. Thus, this research needs to be continued on these directions with the goal of thoroughly understanding the exposure to currency risk of companies in the region and of the underlying factors that generate this exposure.

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# Cointegration Analysis of Non-performing Loans and Macroeconomic Conditions

**Kemal Kozarić and Emina Žunić**

**Abstract** Until the appearance of financial crisis, share of non-performing loans in bank portfolio for most of the countries were satisfactory. Since then, average asset quality has sharply decreased which caused a lot of turmoil in financial stability of countries. This chapter investigates causation of non-performing loans, from macroeconomic variables such as real GDP growth rate, inflation, and unemployment. Accordingly, we try to identify differences in this causality between selected Balkan countries. For that purpose, quarterly data about non-performing loans, GDP rate, inflation, and unemployment for Croatia, Serbia, and Bosnia and Herzegovina for the period 2006–2015 were collected. The aim of this research is establishment of causality model between non-performing loans and macroeconomic factors, as well as analysis of differences in intensity of influence between countries covered by this research. Then by applying Vector Error Correction Model examines whether there is a causality between non-performing loans and macroeconomic variables of selected Balkans' countries in the short and long run. The same methodology was applied to all data from analyzed countries in order to provide comparison between obtained models. Cointegration analysis of non-performing loans and macroeconomic variables has been conducted through Johansen test of cointegration. Results indicate existence of at least one cointegration vector, which proves existence of causality between non-performing loans and macroeconomic factors. Results of this methodology application indicate long-term connection of these variables and causality of non-performing loans from macroeconomic factors in analyzed countries. However, results indicate differences in intensity of influence of macroeconomic factors on non-performing loans. Also, this chapter aims to, by considering these three countries as representatives of Western Balkan, bring conclusions about causation between non-performing loans and macroeconomic variables at Western Balkan level. For that purposes, panel cointegration analysis was employed. Results have shown that improvement in macroeconomic conditions cause changes in non-performing loans.

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## 1 Introduction

Increasing turbulences of financial market led to deterioration in various macroeconomic conditions and decrease in bank's loan portfolio quality. High level of non-performing loans demands an increase of asset allocation for bad loans, which potentially cause decrease in profitability and capital adequacy of banks. Reasons for non-performing loans' occurrence and increase are numerous, but they are usually divided into following groups: macroeconomic factors and bank-specific factors. Therefore, this problem could be observed from macro- and from micro-level. This chapter analyzes macro-perspective of non-performing loans problem that includes real GDP growth rate, inflation, and unemployment influence on non-performing loans. The starting assumption is that better macroeconomic conditions can contribute to lower level of non-performing loans.

Purpose of this chapter is to identify macroeconomic factors that impact on non-performing loans and comparison of results between selected Balkan countries. The recent global financial crisis in Bosnia and Herzegovina and other neighbor countries has caused difficulties in banking business. The selection of this theme is guided by the importance of non-performing loans that proved to be a great threat to financial system. Namely, according to financial stability reports of central banks, the greatest threat to financial stability of banking sector is non-performing loans. Macroeconomic conditions becoming even more important and its effects more meaningful when non-performing loans are observed. Therefore, this research should show if these variables are connected and how. Actually, by the help of adequate econometric methodology it will be possible to disclose if these variables move together in the short and long run. Therefore, from the following review of theoretical and empirical literature, it can be concluded that it is important to provide empirical evidence of macroeconomic factors that impact on non-performing loans for selected Balkan countries.

The remainder of this chapter is organized as follows. Second section gives an overview of existing literature regarding non-performing loans and macroeconomic factors. Third section covers state of non-performing loans and macroeconomic factors for selected Balkan countries. Fourth section includes methodological approach explanation. Fifth section gives presentation of results and last section presents conclusion, research implication, and recommendations.

## 2 Literature Review

Existing literature mainly analyzes macroeconomic determinants of non-performing loans. Firstly, authors have researched factors which have an influence on level of non-performing loans in the Indian banking sector. For that purpose primary data have been collected from bank credit managers. It was shown that external factors are much more meaningful than internal (Sanjeev 2007).

Further, authors have analyzed problem of non-performing loans as macroeconomic problem, rather than problem of financial system. They have concluded that central banks need to take responsability for the maintenance of procyclicality and balancing imalances (White 2009).

Further, Gaganis et al. (2010) collected the factors affecting banking stability under four general categories: Regulations, Other Banking and financial sector attributes, Institutional Environment, and Macroeconomic Conditions. The following research analyze level of non-perfoming loans and risk levels in Croatia banking sector. The correlation between ascertain variables and macroeconomic indicators was conducted (Šverko et al. 2010). Then, authors have to define a model whose subject is the cumulative effects of macroeconomic shocks in a time horizon of three years and their impact on non-performing loans. Therefore, they have applied VAR model on panel data in order to test settled model (Espinoza and Prasad 2010).

The following research focuses only on the financial system in general and its correlation with global imbalances. It was shown that the global imbalance has only a weak correlation with the financial imbalance, in comparison with the indicators obtained from the financial system (Taylor 2013). Further, research showed significant negative impact of export and industrial production on non-performing loans. With an increase of export and industrial production, economy also increases and level of non-performing loans decreases (Fawad and Taquadus 2013). Also, it was disclosed that following variables have significant impact on level of non-performing loans: GDP growth, stock prices, exchange rates, and interest rates. Direction of exchange rate impact depends on volume of lending in foreign currencies to uninsured clients. When it comes to stock price, there is a bigger impact in countries with higher stock market/GDP ratio (Beck et al. 2013). Analysis of non-performing loans in Central Eastern Southeastern Europe countries has shown that non-performing loans has increased since the appearance of financial crisis. Also it was disclosed that a sharp rise occurred a year later, when the GDP in most CESEE countries experienced contractions (Klein 2013). Authors recommend creating a healthy macroeconomic environment in order to reduce the level of non-performing loans in commercial banks of Pakistan. The accent is, also, on adequate culture and lending policy designed in accordance with the relevant economic and financial factors (Mehamood et al. 2013).

By the usage of Granger causality test, authors disclosed that inflation and exchange rate causes non-performing loans. In addition, financial stability in the 14 countries of Asia from 2003 to 2010 and the impact of banking competition, concentration, control, and state institutions on the likelihood of bankruptcy banks were analyzed (Xiaoqing et al. 2014). Authors have also investigated the strengths of Central Eastern Europe banking market as well as financial crisis impact. The chapter presents three conclusions as follows: there is an obvious convergence of the country's development and market power in the pre-crisis period, asset quality and capitalization have direct impact on margin in pre-crisis as well as in crisis period (Efthyvoulou and Yildirim 2014).

## 3 Non-performing Loans and Macroeconomic Indicators

In order to gain better insight into a situation at banking sectors of Balkan countries such as: Bosnia and Herzegovina, Croatia and Serbia, quarterly data for macroeconomic variables and non-performing loans for the period 2006–2015 were used. As a source of data, data of the World Bank and national Central bank were used. Before conducting econometrical analysis, some screening of these indicators movement was performed. Firstly, non-performing loans ratio was analyzed. By observing this indicator for the above-mentioned period, it is noticeable that it had most increasing trend in all analyzed countries. Actually, from the end of 2008 this ratio has started to increase. Also, it was disclosed that Serbia has the greatest non-performing loans while Bosnia and Herzegovina and Croatia recorded a slight decrease in this ratio in the second half of 2014. As it can be seen from the following figure, the movements of this indicator for those three countries is similar, only that Serbia's ratio is all the time significantly higher from that of Croatia's and Bosnian's (Fig. 1).

Since we treat macroeconomic factors as independent variables, before applying adequate econometric methodology the movement of this indicators for observed period was analyzed. As it can be seen in the following figure, the turning point for all observed indicators in all of the three countries was in the year 2009. It was expected since that was year when effects of crisis started to affect these countries. Since this year, real GDP growth rate and inflation started to decrease and unemployment started to increase for all analyzed countries. A slight recovery in all indicators for analyzed countries is noticeable from 2013 (Fig. 2).

According to the above presented figures, it can be concluded that macroeconomic factors move together with non-performing loans ratio. Namely, after 2008 real GDP growth rate and inflation started to decrease and unemployment together with non-performing loans ratio, started to increase. This type of connection between non-performing loans ratio and macroeconomic factors is approval of theoretical grounds. The strength of connection between analyzed variables differs

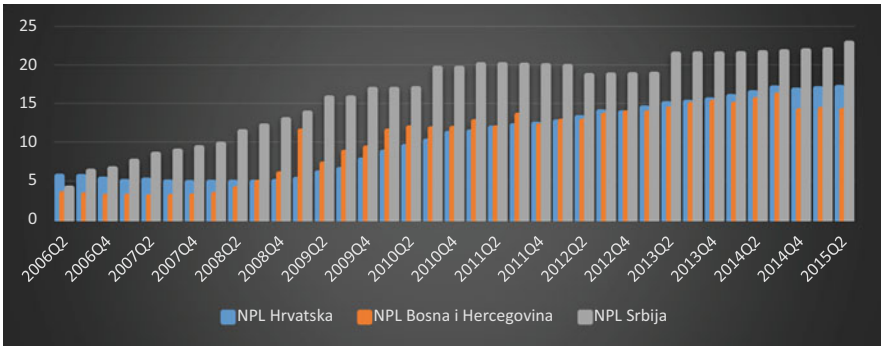


**Fig. 1** Non-performing loans ratio. Source: World Bank Data

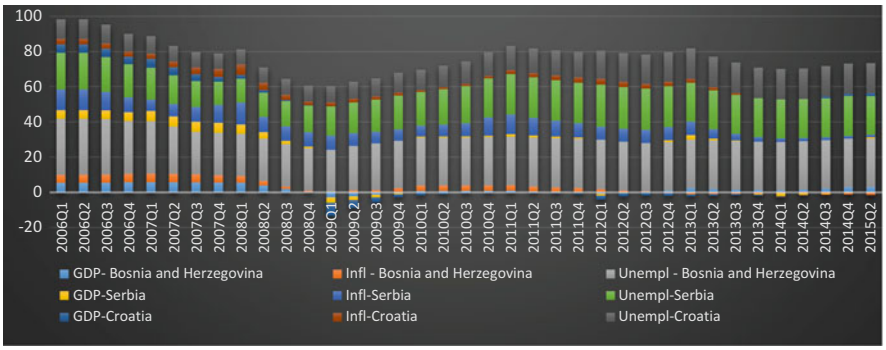


**Fig. 2** Macroeconomic indicators. Source: National Central banks data

between observed countries. From 2013 a slight improving in observed indicators is noticeable. Since this conclusion is derived from only screening method, adequate econometric technique will be employed in order to check this conclusion and test its causality in the long and short run.

## 4 Research Methodology

Econometric techniques were used to determine impacts and causations of macroeconomic variables on non-performing loans. Thus, the subject of this study is modeling multivariate time series. Actually, it is an autoregressive model that assumes the dependence of non-performing loans at time $t$ , not just from independent variables, but also from its value in the previous periods. The study by the help of vector auto-regression model examines whether there is a causality between non-performing loans and macroeconomic variables of selected Balkans' countries in the short and long run. For the purpose of analysis, quarterly data about non-performing loans ratio, GDP rate, inflation, and unemployment for the period 2006–2015 was used. Since the Johansen cointegration test has showed existence of one cointegration vector, Vector Error Correction Model was applied in order to adequate measure and model dynamics of changes and causality between variables. Therefore, this model is applied on data for the following countries: Croatia, Bosnia and Herzegovina, and Serbia. This will enable comparison of results in order to bring conclusions and give some recommendations.

As it was mentioned above for the purposes of this model, World Bank Data for those selected countries were used. Since we are talking about macroeconomic data which are usually nonstationary (Nelson and Plosser 1982), regression results could be false, the stationarity was tested at the beginning of cointegration analysis. For that purposes, Augmented Dickey-Fuller Test will be conducted. This test is based

on t-ratio of parameters in the following regression model (Bahovec and Erjavec 2009):

$$\begin{aligned} Y_t &= \alpha_0 + \sum_{i=1}^{p-1} \beta_i \Delta Y_{t-i} + \gamma Y_{t-1} + \alpha_2 t + \varepsilon_t \Delta Y_t \\ &= \alpha_0 + \sum_{i=1}^{p-1} \beta_i \Delta Y_{t-i} + \gamma Y_{t-1} + \alpha_2 \mathrm{t} + \varepsilon_t \Delta Y_t \\ &= \alpha_0 + \sum_{i=1}^{p-1} \beta_i \Delta Y_{t-i} + \gamma Y_{t-1} + \alpha_2 \mathrm{t} + \varepsilon_t \end{aligned} \tag{1}$$

where $Y$ denotes observed variable, $\Delta$ is first difference operator, $t$ is time trend, $\varepsilon_t$ is error term, $\alpha_0$ represents constant term, and $\alpha_2 t$ represents trend component. Actually, in this regression model analyzed parameter is $\gamma$ (if it is equal to zero). If this parameter is zero for time series $Y_t$, then it can be concluded that this time series has unit root and that is nonstationary. At the beginning of cointegration analysis, it is necessary to deal with a problem of optimal lag length since multivariate cointegration analysis is very sensitive to optimal lag length selection. After optimal lag length selection, cointegration test will be conducted. This test will be obtained through Johansen procedure which tests the presence and number of cointegration vectors. Foundation of Johansen procedure in VAR model is defined by n variables and the lag lengths k, and it can be shown as follows (Bahovec and Erjavec 2009):

$$Z_t = A_1 Z_{t-1} + A_2 Z_{t-2} + \ldots + A_k Z_{t-k} + e_t \tag{2}$$

where $Z_t$ denotes $2 \times 1$ vector of variables, $e_t$ is vector of normal and independently distributed error terms. The presence of r cointegration vectors between elements of vector Z implies that $\Pi$ (matrix of parameters $2 \times 2$) is range $r$ ($0<r<2$). Actually, in order to detect the number of cointegration vectors Johansen has developed two tests: Trace test and Max test. Therefore, model specified on that way could be represented as follows (Bahovec and Erjavec 2009):

$$\Delta Y_t = \lambda \Delta X_t + \pi\left(Y_{t-1} - \widehat{\alpha} - \widehat{\beta} X_{t-1}\right) + a_t = \lambda\, \Delta X_t + \pi \widehat{\varepsilon}_{t-1} + a_t \tag{3}$$

where $a_t (t = 1, \ldots, n)$ denotes process of innovation, $\lambda \Delta X_t$ represents information about the short-run dynamics, $\pi\, \widehat{\varepsilon}_{t-1}$ is information about the long-run dynamics, and $\widehat{\varepsilon}_{t-1}$ is error term correction. Speed of adjustment to equilibrium is measured by $\pi$. This parameter should have negative sign, and it should be significant in order to be concluded that model is good. The value of this parameter that is less than one means that system is stable and that there is a long-term relationship between cointegrated variables.

The above-explained methodology was applied on data from selected Balkan countries in order to check cointegration and create models for each country. If we assume that

these three countries are representatives of entire Western Balkan, then it is justified to conduct cointegration analysis on group level of these countries. Namely, cointegration analysis of panel data from these three countries was obtained. In order to test existence of unit root Levin–Lin–Chu test (LLC) was used. This test assumes common unit root process so that autoregressive coefficients are homogenous across cross-sections.

In order to test cointegration Pedroni test, developed by Pedroni (2001), was employed. Cointegration procedure begins with estimation of the residual from the assumed long-run regression of the following form:

$$x_{i,t} = \alpha_i + \rho_i t + \beta_u Z_{u,t} + \ldots + \beta_{mi} Z_{mi,t} + \mu_{i,t} \quad (4)$$

where it is assumed that Z and x are integrated of order one. $\alpha_i$ represents intercept and $\beta_{1i}$, $\beta_{2i}$,..., $\beta_{mi}$ represent slope coefficients. Intercept and slope coefficients vary across units of panel.

## 5 Results

At first, the above-explained methodological approach was applied on data from Croatia, Bosnia and Herzegovina, and Serbia separately. In that sense, research results will be presented for each country, then comparison will be obtained. As it was already mentioned, the first step in cointegration analysis by implementation of Engle-Granger two-step method is testing the existence of a unit root regression model residuals. Thus, the following table represents Augmented Dickey-Fuller unit root test results for each of the observed countries (Table 1).

As it can be seen from the above table, results are suggesting that variables for all observed countries aren't stationary at levels, but they are stationary at first difference. Therefore, it can be concluded that there is present stable long-run causality. In order to determine optimal lag length of residuals, usual criteria were used. Those criteria include: log likelihood function, likelihood ratio, Final Prediction Error, Akaike's Information Criterion, Hannan–Quinn Information Criterion, and Schwarz's Bayesian Criterion. According to those criteria, optimal lag length for all observed countries is two.

Before conducting the Vector Error Correction Model, some of essential assumptions of this model were tested. Though Breusch-Godfrey LM test serial correlation were tested, further heteroscedasticity was tested by ARCH-LM test and normality was tested by Jarque-Bera test. Results indicate that residuals are normally distributed, absence of heteroscedasticity problem as well as absence of serial correlation between residuals. Cointegration relationship between observed variables was analyzed by applying Johansen cointegration test. Trace test and Max test indicate the presence of one cointegration vector between variables in each observed country. Therefore, it can be concluded that there is a long-run causation between analyzed variables in those countries. These results prove the existence of causation between non-performing loans and macroeconomic factors (Table 2).

**Table 1** ADF unit root test results

| Country | | ADF statistical value | Confidence level | | |
|---|---|---|---|---|---|
| | | | *0.01* | *0.05* | *0.10* |
| B&H | NPL | (−) 2.279906 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.NPL | (−) 3.392343 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| | GDP | (−) 2.287651 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.GDP | (−) 3.803366 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| | Infl | (−) 2.229985 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.Infl | (−) 3.873569 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| | Unempl | (−) 1.457604 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.Unempl | (−) 3.389244 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| Croatia | NPL | (−) 1.110368 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.NPL | (−) 2.844188 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| | GDP | (−) 2.174411 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.GDP | (−) 3.384327 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| | Infl | (−) 1.411360 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.Infl | (−) 4.431378 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| | Unempl | (−) 2.452381 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.Unempl | (−) 3.742116 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| Serbia | NPL | (−) 3.200963 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.NPL | (−) 4.348190 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| | GDP | (−) 2.388375 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.GDP | (−) 4.371270 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| | Infl | (−) 1.821521 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.Infl | (−) 5.249709 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |
| | Unempl | (−) 1.726364 | (−) 4.420595 | (−) 3.259808 | (−) 2.771129 |
| | D.Unempl | (−) 3.993662 | (−) 4.582648 | (−) 3.320969 | (−) 2.801384 |

As it can be seen from the above table, Trace test indicates the presence of one cointegration vector in all analyzed countries with confidence level of 0.05. Max test, also, indicates the presence of one cointegration vector with same confidence level. After conducting all necessary tests, Vector Error Correction Model for each country was conducted. Results of this model applied to Bosnia and Herzegovina data indicates that coefficient of residual is significant at confidence level 0.05 with speed of adjustment to equilibrium 38.48%. Therefore, in short-run non-performing loans in Bosnia and Herzegovina's banking sector adapts to 38.48% deviation in previous years from the equilibrium level, with change in macroeconomic factors. This indicates that it is a stable system with good speed of adjustment to equilibrium level. Also, it can be concluded that this is a good model since it explains 57.83% changes in non-performing loans. All this points to a significant causation of these variables in Bosnia and Herzegovina, and that it is essential to ensure healthy macroeconomic environment in order to prevent occurrence and growth of non-performing loans. Results of this model applied to Croatia's data indicate that coefficient of residual is significant at confidence level 0.05 with speed of adjustment to equilibrium 38.03%. Therefore, in short-run non-performing loans

**Table 2** Johansen cointegration test

| Country | r[a] | Statistical value of Trace test[b] | Confidence level 0.05 |
|---|---|---|---|
| B&H | 0 | 39.2308 | 35.19 |
| | 1 | 17.4348* | 20.26 |
| | r | Statistical value of Max test[c] | Confidence level 0.05 |
| | 0 | 23.9245 | 22.30 |
| | 1 | 11.5655 | 15.89 |
| Croatia | r | Statistical value of Trace test | Confidence level 0.05 |
| | 0 | 33.075 | 25.47 |
| | 1 | 14.02 | 12.78 |
| | r | Statistical value of Max test | Confidence level 0.05 |
| | 0 | 23.87 | 11.46 |
| | 1 | 10.22 | 5.84 |
| Serbia | r | Statistical value of Trace test | Confidence level 0.05 |
| | 0 | 23.29 | 14.47 |
| | 1 | 10.68 | 3.84 |
| | r | Statistical value of Max test | Confidence level 0.05 |
| | 0 | 22.72 | 14.26 |
| | 1 | 9.86 | 3.81 |

[a]Number of cointegration vectors assumed by null hypothesis
[b]Testing null hypothesis that number of cointegration vectors is less or equal to r
[c]Testing null hypothesis that number of cointegration vectors is equal to r, and alternative hypothesis that number of cointegration vectors is equal to r+1

in Croatia's banking sector adapts to 38.03% deviation in previous years from the equilibrium level, with change in macroeconomic factors. This indicates that it is a stable system with good speed of adjustment to equilibrium level. Also, it can be concluded that this is a good model since it explains 66.62% changes in non-performing loans. Therefore, these results indicate significant causation between these variables in Croatia as this is the case in Bosnia and Herzegovina. Results of this model applied to Serbia's data indicate that coefficient of residual is significant at confidence level 0.05 with speed of adjustment to equilibrium 48.86%. Therefore, in short-run non-performing loans in Serbia's banking sector adapts to 48.86% deviation in previous years from the equilibrium level, with change in macroeconomic factors. This indicates that it is a stable system with good speed of adjustment to equilibrium level. Also, it can be concluded that this is a good model since it explains 58.63% changes in non-performing loans. Thus, it can be concluded that non-performing loans of all analyzed countries are affected by macroeconomic factors and that is important to ensure better macroeconomic conditions in order to rise standard of population and, followed by that, improve a loan quality. This is very important since non-performing loans can cause a lot of problems in financial stability. The following table represents summary results of Vector Error Correction Model (Table 3).

The above table compares results between analyzed countries. As it can be seen, results imply that Serbia's banking sector financial stability fastly adjusts to equilibrium by the changes in macroeconomic factors. These results are encouraging,

**Table 3** Vector error correction model

| | Bosnia and Herzegovina | | Croatia | | Serbia | |
|---|---|---|---|---|---|---|
| Country | Coefficient | p | Coefficient | p | Coefficient | p |
| Constant | 1.9972 | 0.0267 | 1.9915 | 0.0189 | 2.2647 | 0.0074 |
| $D.NPL_{-1}$ | 0.3083 | 0.0472 | 0.2672 | 0.0065 | 0.3960 | 0.0047 |
| D.GDP | −0.0509 | 0.0310 | −0.0314 | 0.0312 | −0.0611 | 0.0332 |
| $D.GDP_{t-1}$ | −0.0478 | 0.0025 | −0.0239 | 0.0134 | −0.0586 | 0.0075 |
| D.Infl | 0.2539 | 0.0483 | 0.1919 | 0.0078 | 0.3067 | 0.0062 |
| $D.Infl_{t-1}$ | 0.2358 | 0.0039 | 0.1566 | 0.0002 | 0.2864 | 0.0004 |
| D.Unempl | 0.3212 | 0.0402 | 0.1157 | 0.0473 | 0.2130 | 0.0418 |
| $D.Unempl_{t-1}$ | 0.3052 | 0.0054 | 0.1029 | 0.0075 | 0.1956 | 0.0085 |
| Residual | −0.3848 | 0.0033 | −0.3803 | 0.0000 | −0.4886 | 0.0002 |
| $R^2$ | 0.5783 | | 0.6662 | | 0.5863 | |
| Adjusted $R^2$ | 0.5582 | | 0.6383 | | 0.5588 | |

especially for Serbia which has the highest level of non-performing loans. Serbia's authorities can, through the improvement into macroeconomic conditions, decrease non-performing loans. To be concluded, all these countries have adequate coefficient of adjustment to equilibrium and adequate $R^2$ what means that those are good models which confirm hypothesis about connection between macroeconomic factors and non-performing loans.

The following step in this research was cointegration analysis of panel data. As it was mentioned above, we assume that Bosnia and Herzegovina, Croatia, and Serbia are representatives of Western Balkan, so this analysis was employed in order to get conclusions for entire Western Balkan. First step in this analysis is testing for stationarity. For that purpose, LLC panel unit root test was conducted (Table 4).

The results of LLC panel unit root test with intercept and intercept and trend reveal that all variables included into this panel are non-stationary at level, but they are stationary at first difference. This means that non-performing loans, real GDP growth rate, inflation, and unemployment are integrated of order one. Integration of order one enables application of panel cointegration techniques in order to examine the long-run relationship between analyzed variables. Results of Pedroni panel cointegration test are presented in Table 5.

Pedroni panel cointegration test results present strong evidence that in this panel all variables are cointegrated over the period 2005–2015. Also, KAO cointegration test results with p-value 0.0149 indicates on the presence of cointegration between variables included in this model. After conducting all necessary tests, Vector Error Correction Model for this panel was conducted. The following table presents Vector Error Correction Model results for observed panel data (Table 6).

Results of this model indicates that coefficient of residual is significant at confidence level 0.05 with speed of adjustment to equilibrium 23.82%. Therefore, in short-run non-performing loans in Western Balkan countries adapts to 23.82% deviation in previous years from the equilibrium level, with change in macroeconomic factors. This indicates that it is a stable system with good speed of

**Table 4** LLC panel unit root test results

| | At level | | | | At first Difference | | | |
|---|---|---|---|---|---|---|---|---|
| Variables | $Statistics_i$ | p-value | $Statistics_t$ | p-value | $Statistics_i$ | p-value | $Statistics_t$ | p-value |
| NPL | −2.02132 | 0.6120 | −2.87939 | 0.2672 | −6.93815 | 0.0000 | −13.5704 | 0.0000 |
| GDP | −3.14975 | 0.0531 | −2.82768 | 0.2672 | −8.48354 | 0.0000 | −8.48354 | 0.0000 |
| Infl | −1.83877 | 0.0626 | −5.43771 | 0.6577 | −7.98237 | 0.0000 | −4.66276 | 0.0000 |
| Unempl | −2.97250 | 0.4664 | −9.19635 | 0.1665 | −8.67467 | 0.0000 | −5.31570 | 0.0000 |

Note: $Statistics_i$ represents intercept and $Statistics_t$ represents intercept and trend

**Table 5** Pedroni panel cointegration test results

| | No trend | | Trend | |
|---|---|---|---|---|
| Models | Statistics | p-value | Statistics | p-value |
| Panel v-Statistics | −0.129302 | 0.5514 | 0.331370 | 0.3702 |
| Panel rho-Statistics | 0.613514 | 0.7302 | 1.61072 | 0.9464 |
| Panel pp-Statistics | −3.734875 | 0.0001 | −0.728916 | 0.2330 |
| Panel ADF-Statistics | −3.165023 | 0.0008 | −0.630981 | 0.2640 |
| Group rho-Statistics | 1.706785 | 0.9561 | 2.239611 | 0.9874 |
| Group PP-Statistics | −2.864777 | 0.0021 | −0.890727 | 0.0186 |
| Group ADF-Statistics | −2.546201 | 0.0052 | −0.528627 | 0.0298 |

Variables: NPL, GDP, Infl, Unempl

**Table 6** Vector error correction model results

| | Coefficient | p-value |
|---|---|---|
| Constant | 1.0896 | 0.0170 |
| $D.NPL_{t-1}$ | 0.4536 | 0.0359 |
| $D.GDP_{t-1}$ | −0.1768 | 0.0167 |
| $D.GDP_{t-2}$ | −0.1086 | 0.1028 |
| $D.Infl_{t-1}$ | 0.0387 | 0.0062 |
| $D.Infl_{t-2}$ | 0.0108 | 0.0095 |
| $D.Unempl_{t-1}$ | 0.4350 | 0.0448 |
| $D.Unempl_{t-2}$ | 0.1459 | 0.0583 |
| Residual | −0.2382 | 0.0003 |
| $R^2$ | 0.7595 | |
| Adjusted $R^2$ | 0.5627 | |

adjustment to equilibrium level. Also, it can be concluded that this is a good model since it explains 75.95% changes in non-performing loans. All this points to a significant causation of these variables in Western Balkan countries and that it is essential to ensure healthy macroeconomic environment in order to prevent occurrence and growth of non-performing loans.

## 6 Conclusion

Non-performing loans are the greatest problems, not only for Balkan countries but also for entire world. Recent financial crisis, caused by uncontrolled borrowing, emphasized the significance of loans and their quality management. Namely, because of existence of interdependencies between risks and synergy effect increasing exposure to one of risks can significantly increase impact of other risks. Therefore, non-performing loans can threaten banking sector financial stability. In order to test relation between non-performing loans and macroeconomic factors, this research has been conducted. For the purpose of analysis, data from three

Western Balkan countries (Croatia, Bosnia and Herzegovina, and Serbia) was used. These countries were selected since the similarity of financial sector computation and the fact that they are neighbor countries, so potential spillovers may occur.

Research results present the existence of significant and long-term integration non-performing loans and macroeconomic factors. Also, it was proven that for all analyzed countries non-performing loans relatively fast converge to long-term equilibrium as well as that those are good models since they explain a significant part of changes in non-performing loans. This means that macroeconomic factors such as real GDP growth rate, inflation, and unemployment influence non-performing loans in Western Balkan countries. Therefore, national authorities should, through various reforms and incentives, enable better macroeconomic environment which should cause decrease in non-performing loans ratio.

ADF test results for each of analyzed countries indicate that observed variables are non-stationary at levels, but they are stationary at first difference, as well as integrated of order one. Further, cointegration test through ADF unit root test for all analyzed countries has demonstrated the presence of cointegration between variables of those models. Also, Johansen cointegration test pointed on one cointegration vector. Results of all analyzed countries approve significance of macroeconomic factors impact. Coefficient of adjustment is significant for all analyzed countries, with relatively fast convergence to long-term equilibrium. Second part of analysis, which analyzes panel data, indicates on cointegration between non-performing loans and macroeconomic indicators. Namely, LLC panel unit root test results reveal that all variables included into this panel are non-stationary at level, but they are stationary at first difference, what means that they are integrated at I (1). Pedroni panel cointegration test results show that all variables included into this panel are cointegrated. Results of Vector Error Correction model applied to this panel approve significance of macroeconomic factors impact. Coefficient of adjustment is significant, with relatively fast convergence to long-term equilibrium.

This research has demonstrated cointegration between macroeconomic factors and non-performing loans in analyzed Balkan countries. It was shown that macroeconomic factors do have an influence on non-performing loans and that influence is significant. Therefore, results of this research imply necessity of improving macroeconomic conditions in those countries in order to make an impact and improve state of non-performing loans. Sure, this is not the only aspect of non-performing loans, and we shouldn't forget bank-specific factors that also influence non-performing loans. Thus, a joint effort of national authorities and bank managers is required to make things getting better. This cointegration should be, together with stress tests, focus of regulatory authorities from these countries. Also, these neighboring countries should work on strengthening cooperation since problems in one of these countries could potentially spillover to another.

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# Explaining CSR Performance with Contextual Factors: Focus on Development Banks

**Ana Kundid Novokmet and Andrijana Rogošić**

**Abstract** With a stronghold in the institutional theory of corporate social responsibility (CSR), a hypothesis is made on banks' CSR performance being positively driven with the contextual factors, i.e., countries' macroeconomic and institutional development and their banking sectors' development (briefly country development level). Development banks, rather than commercial banks, are at the center of the empirical evidence, mainly because they are perceived to be socially responsible institutions by their definition, as well as the best in class example for commercial banks' CSR practices in certain country. CSR performance is measured throughout CSR reporting quantity and reporting form following Global Reporting Initiative's (GRI) Sustainability Reporting Guidelines. By combining the aforementioned data and the World Bank's data for 22 European countries in 2013 out of which 15 are Balkan and Eastern European countries and the rest Western European countries, we find out that GDP per capita, research, and development expenditure over GDP, gross savings over GDP, and employment of total labor force are positively related to development banks' CSR performance, while banking sector variables (net interest margin and regulatory capital to risk-weighted assets) are negatively related to development banks' CSR. Countries' institutional development variables are also connected to development banks' CSR performance, but with rather slight differences between better and lower performing development banks with regard to CSR. Thus, more developed economic systems as well as less profitable banking systems, which have lower level of regulatory burden have higher performance of development banks' CSR when K-means clustering approach was adopted. An important caveat of the research is that there is a trade-off between cost of banking intermediation and development banks' CSR performance, while macroeconomic performance and CSR performance are in complementary relationship. Altogether, a conclusion is made that banks' CSR performance is rather modestly explained by the country development level in the previous empirical works and thus a more general approach when researching and creating public policies about the CSR phenomenon is required.

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## 1 Introduction

A large number of companies worldwide have produced damage to the environment as well as to society although, at the same time, they have contributed to economic and technological progress. "The issues such as pollution, waste, resource depletion, product quality and safety, labor conditions, human rights, and status of workers gained growing attention and concern" (Pistoni and Songini 2013: 4). The companies are encouraged and sometimes even obligated to take care of their impact on the environment and society. In this context, the notion of corporate social responsibility (CSR) emerged. During the last few decades, CSR is gaining significant importance in academic and business circles (Kemper and Martin 2010; Young and Marais 2012; Belu and Manescu 2013). The body of CSR literature witnesses that the relationship between business and society has altered. This change as well as motivation for it is often perceived from different aspects so many theories that explain CSR and CSR reporting have been developed.

The activities that fall in CSR domain should be followed up, recorded, and reported by sustainability accounting, which is the new field of accounting focused on all aspects of CSR. CSR reporting as an output of sustainability accounting is in the focus of this study. This chapter explores exogenous determinants of CSR disclosure of development banks that operate in 22 European countries. CSR disclosure is observed from the perspective of Global Reporting Initiative's (GRI) Sustainability Reporting Guidelines, which are one of the most prominent frameworks that enable organizations worldwide to measure and understand their most critical impacts on the environment, society, and the economy. GRI was founded in Boston, USA in 1997 as an international, independent organization that helps businesses, governments, and other organizations to understand and communicate the impact of business on critical sustainability issues. The great significance of GRI's impact on CSR promotion and implementation around the globe can be supported by the fact that 93% of the world's largest 250 corporations report on their sustainability performance and 82% of these uses GRI's Standards (GRI, official website).

One might ask why our attention is directed towards development banks. Firstly, reaching socioeconomic goals is the essential *raison d'être* of development banks. Namely, numerous individuals, firms, and industries suffer from the market failure in the provision of finance, usually due to insufficient interest, cautious behavior, and unwillingness of the mainstream banks to provide them credit and other financial services. Among other roles, development banks can provide funds and fill the gaps that exist on financial markets for certain population and projects as well as disseminate basic skills in finance and entrepreneurship. By doing so, they add to poverty reduction and spur the overall economic growth. Generally, development banks focus on "projects whose social benefits exceed their commercial ones," long-term projects, new technologies, and small and new borrowers with poor collateral (Thorne and du Toit 2009: 678). Although most of development banks were founded in order to restore economies of numerous countries hit and

destroyed by the World War II, their relevance persisted during the years and was renewed lately due to their countercyclical role in the financial crisis 2007/2008 and consequent credit crunch period (de Luna-Martínez and Vicente 2012). Secondly, by choosing development banks, which are usually (at some scale) state-owned financial institutions, rather than investigating commercial banks, we could omit bank-specific characteristics which are omnipresent in the empirical researches on determinants of banks' CSR performance, either as the main explanatory variables (e.g., Branco and Rodrigues 2006, 2008; Gutiérrez-Nieto et al. 2008; Wu and Shen 2013), or as controllable variables only. Thirdly, there is insufficient knowledge about the development banks phenomenon (de Luna-Martínez and Vicente 2012) and the factors that affect their performance (Thorne and du Toit 2009), so it is strongly recommended to deepen understanding about them especially throughout cross-country analysis (Culpeper 2012: 400–401). However, even development banks, whose task "is to address some of the weaknesses in the environment cannot succeed in a largely dysfunctional climate" and in order to be successful they need "a climate of macroeconomic stability without too many micro-economic distortions" as well as "political stability and a variety of complementary institutions" (Thorne and du Toit 2009: 689). Altogether, if country development level is crucial for the development banks' financial performance, then it is also expected to affect their CSR accomplishments. To our best knowledge, even commercial banks' CSR performance is rarely explained by its external drivers, likewise the country development level. More often, solely the ownership and spillover effects between CSR practices in country of origin and host countries are analyzed, but mostly for the non-financial sector.

The rest of the chapter is structured as follows: the next section reviews the survey of literature with respect to both theoretical and empirical background on the external drivers of the companies' CSR performance. The third section explains the methodological framework of our cross-country empirical research and reveals research findings, while the last section concludes the chapter.

## 2 Country Development Level as a Key Driver of Companies' CSR Performance

### *2.1 Theoretical Insight*

Although the notion of CSR has been globally accepted, the consensus on its definition is still not reached. Numerous attempts to get a clear and unbiased definition of CSR only indicate that it is a rather complex and continuously evolving concept. Besides CSR, some related concepts emerged like triple bottom line, sustainability, and corporate citizenship that have made it harder to concisely define it. Academic literature as well as corporate communication record increased vagueness when those terms are being used. The problem of overlapping

terminology and cross-connections between CSR, business ethics, and corporate governance was found in several studies (Rudolph 2005; Elkington 2006; Fassin and Van Rossem 2009). Fassin and Van Rossem (2009: 573) noticed that lack of clarity of semantics and terminology when corporate governance, business ethics, CSR, stakeholder management, and sustainability are concerned has led to confusion. Dahlsrud (2008: 6) emphasized that "due to globalization, the context in which business operates is changing at an increasingly rapid pace" so the "new stakeholders and different national legislations are putting new expectations on business and altering how the social, environmental and economic impacts should be optimally balanced in decision making."

This intriguing concept has inspired scholars worldwide resulting in abundance of CSR approaches and theories. CSR theories originated from different points of view on companies' motivation for CSR implementation, goals expected from CSR engagement, and circumstances for CSR adoption. The body of academic literature has emerged fairly because CSR is differently perceived. Some authors explain it as socially responsible behavior in the ethical sense while others rely on the idea of legal responsibility or liability. Sometimes, CSR is described through the main orientation: environmental, social, economic, stakeholder, and voluntariness dimension (often emphasizing some of them).

The history of the term and related theories is not so long but is quite rich. "In 1919, the concept of social responsibilities of a corporation was vaguely framed in moral and macro-social terms such that shareholders could not see how it served their interest or how it was related to the performance and management of the corporation" (Lee 2008: 54). Most academicians agreed that Howard Rothmann Bowen was the first to debate on social responsibility of business back in the 1953 (Carroll 1999; Garriga and Melé 2004; Lee 2008). Secchi (2007: 347) claimed that in the beginning there was a rather narrow definition of social responsibility—limited to philanthropy.

The most prominent CSR theories are stakeholder theory, legitimacy theory, and institutional theory, but many other perspectives on CSR occurred during the last three decades. Stakeholder theory affirms that those whose lives are touched by a corporation hold a right and obligation to participate in directing it. According to this theory, advocated by Freeman (1984), CSR is a company's response to the interests of its stakeholders. The awareness of firm's dependency on its internal stakeholders (employees) and external stakeholders (such as shareholders, customers, suppliers, government, community) led to an enhanced consideration of their needs and expectations with the ultimate objective: long-term balance between financial goals and stakeholders' approval.

Suchman (1995: 574) defined legitimacy as "a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs and definitions." According to legitimacy theory, companies will make a pragmatic strategic response to the public expectations in order to maintain some sort of social contract with society. In that sense, companies are motivated by the realization that compliance with societal expectations is necessary to safeguard some space for the

freedom of action of business in the pursuit of profit. Secchi (2007: 363) simply explained that the society, corporations, and the other economic organizations are supposed to share implicit, informal relations in order to define a moral community. The social contract theory has raised fundamental issue—the morality of economic activities. Social responsibility is derived from moral legitimacy the corporation achieves in society (Secchi 2007: 363).

Institutional theory of CSR (Campbell 2007) examines the conditions under which corporations are likely to behave in a socially responsible way. Campbell (2007: 948) noticed that the "basic economic factors, including the general financial condition of the firm, the health of the economy, and the level of competition that corporations face, are all likely to affect the degree to which corporations act in socially responsible ways." He explained that the relationships between economic conditions and socially responsible corporate behavior are mediated by several institutional factors: public and private regulation, the presence of nongovernmental and other independent organizations that monitor corporate behavior, institutionalized norms regarding appropriate corporate behavior, associative behavior among corporations themselves, and organized dialogues among corporations and their stakeholders.

Stakeholder theory, legitimacy theory, and institutional theory have dealt with both determinants of CSR and CSR reporting, "while positive accounting theory, decision usefulness studies and proprietary cost theory focused mainly on disclosure and its drivers" (Pistoni and Songini 2013: 16).

Since the approaches and theories that elucidate CSR have proliferated lately, several authors made an effort and systematized them. Garriga and Melé (2004) classified related theories and approaches into four groups:

- A group of instrumental theories—authors called it that way because they understand CSR as mere instruments to achieve profits. Those theories assumed that the corporation is an instrument for wealth creation and that this is its sole social responsibility. Only the economic aspect of the interactions between business and society is considered. So any supposed social activity is accepted if, and only if, it is consistent with wealth creation. The agency theory is the most popular among them.
- The second group unites political theories in which the social power of corporation is emphasized, specifically its relationship with society and its responsibility in the political arena associated with this power. This leads the corporation to accept social duties and rights or participate in certain social cooperation. Authors distinguished two major theories in this category: corporate constitutionalism and corporate citizenship.
- The group of integrative theories includes theories, which consider that business ought to integrate social demands. Usually, it is argued that business depends on society for its continuity and growth and even for the existence of business itself. Social demands are generally considered to be the way in which society interacts with business and gives it a certain legitimacy and prestige. As a consequence,

corporate management should take into account social demands and integrate them in such a way that the business operates in accordance with social values.
- The fourth group called ethical theories implies understanding the relationship between business and society that is embedded with ethical values. This leads to a vision of CSR from an ethical perspective and consequently firms ought to accept social responsibilities as an ethical obligation above any other consideration. Stakeholder normative theory and sustainable development approach are the key ideas in this category.

Secchi (2007) divided contemporary CSR theories into three categories: utilitarian, managerial, and relational theories. He used the role that theorists confer to the firm as a criterion for separating theories into homogeneous groups. The term "utilitarian" refers mainly to the traditional economic approach to the firm and within this framework. In this context, the firm's behavior is commonly studied as a profit maximizing function. From this well-known perspective, analyzing the firm's internal variables is not relevant; moreover, self-interest is also supposed to be the driving force of economic system. The enterprise is seen as part of a wider mechanism, the economic system. This stream of thought is fundamentally neoclassical in origin so is defined as utilitarian. Under that umbrella of theories, Secchi (2007) included theory of social costs, functionalists' approach as well as neo-functionalists. The second group of theories, called managerial theories, defines the firm as the center through which to evaluate external phenomena. According to the scholars that promote them, social responsibility should be, to some extent, integrated, measured, and controlled. This category includes corporate social performance models, theories on social accountability, auditing, and reporting, and social issues in international business. The third group is composed of relational theories, which originate from complex firm–society relationships. From this perspective, the firm loses its central role and starts being an interactive part of the economic system. This category is divided into four subgroups of theories: business and society, stakeholder approach, corporate citizenship, and theory of social contract.

Lee (2008) explored the evolutionary path of CSR theories and concluded that a recent theoretical initiative of linking institutionalism and social movement theory in organizational studies has already taken an important step towards theoretical development in this direction. He acknowledged (Lee 2008: 70) that "committed scientists and policy-makers are radically reshaping organizational choices" reminding that business and society relations in different countries can vary significantly according to varieties of capitalism theory. The varieties of capitalism theory are based on the assumption that every country has a distinct social structure, dominant issues, institutions, and interests, shaped by unique history and cultural tradition. Hall and Soskice (2001) argued that even at the face of rapid globalization of economy, different societies maintain distinctive economic systems that shape business–society relations.

Starting from institutional bases of CSR, Matten and Moon (2008) developed new CSR conceptual framework. They studied cross-country diversity (political,

financial, education and labor systems, organizational and market processes, and cultural specifics) in order to understand differences when CSR is concerned. Matten and Moon (2008) identified two distinct elements of CSR: explicit and implicit. Explicit CSR is characterized by corporate policies that assume and articulate responsibility for some societal interests. They normally consist of voluntary programs and strategies by corporations that combine social and business values and address issues perceived as being part of social responsibility of the company. Explicit CSR rests on corporate discretion, rather than reflecting either governmental authority or broader formal or informal institutions. Implicit CSR refers to corporations' role within the wider formal and informal institutions for society's interests and concerns. Implicit CSR normally consists of values, norms, and rules that result in (mandatory and customary) requirements for corporations to address stakeholder issues and that define proper obligations of corporate actors in collective rather than individual terms. In order to distinct explicit from implicit CSR, Matten and Moon (2008: 410) took several aspects into consideration. The first focus was the language which corporations use in addressing their relation to society; companies practicing explicit CSR use the language of CSR in communicating their policies and practices to their stakeholders, whereas those practicing implicit CSR normally do not describe their activities this way. The second focus was on the differences in intent. Implicit CSR is not conceived as a voluntary and deliberate corporate decision but, rather, as a reaction to, or reflection of, a corporation's institutional environment, whereas explicit CSR is the result of a deliberate, voluntary, and often strategic management decision. The predicting factors for the nature of CSR in a specific national context with respect to the nature of the institutional framework are summarized in Table 1.

CSR as an explicit element of corporate policies is common for liberal market economies where national institutions encourage individualism, incentivizing responsive actors, liberalism, network governance, and policies providing discretions, while the other type of CSR is widespread where national institutions support collectivism, incentivizing program-driven agency, solidarity, partnership governance, and policies providing obligations. Matten and Moon (2008: 411) concluded that explicit CSR is spreading globally consistent with neoinstitutional theory and

**Table 1** Explicit and implicit CSR compared

| Explicit CSR | Implicit CSR |
|---|---|
| • Describes corporate activities that assume responsibility for the interests of society<br>• Consists of voluntary corporate policies, programs, and strategies<br>• Incentives and opportunities are motivated by the perceived expectations of different stakeholders of the corporation | • Describes corporations' role within the wider formal and informal institutions for society's interests and concerns<br>• Consists of values, norms, and rules that result in (often codified and mandatory) requirements for corporations<br>• Motivated by the societal consensus on the legitimate expectations of the roles and contributions of all major groups in society, including corporations |

Source: Matten and Moon (2008: 410)

institutional legitimacy indicating that "regulative, normative and cognitive processes lead to increasingly standardized and rationalized practices in organizations across industries and national boundaries." Organizational practices are becoming institutionalized because they are regarded as legitimate. Homogenization of institutional environments across national boundaries especially when CSR implementation and reporting is concerned resulted in adoption of supranational guidelines like GRI, UN Global Compact, and ISO 26000 in large number of organizations worldwide.

Altogether, justification for this and further researches related to impact of country development (contextual variables) on the social reporting could be found yet in Tsang (1998: 624) who draws attention on the fact that "the stage of economic development is likely to be an important factor affecting corporate social reporting practices."

## *2.2 Empirical Insight*

Empirical examinations regarding the determinants of banks' CSR activities have usually strived to identify their CSR behavior as a consequence of their controllable or internal characteristics; bank size, market share and visibility, its financial performance and ownership, to mention a few of the most frequent explanatory variables (e.g., Branco and Rodrigues 2006, 2008; Gutiérrez-Nieto et al. 2008; Wu and Shen 2013). Recently, the human capital, organizational values, and corporate governance rather than other, previously mentioned organizational factors, became quite important point of reference when the CSR profile is endeavored to be explained. Thus, the leadership style (the affirmation of ethics in it) is studied as a driver of ethical behavior of employees in the Spanish banking and insurance industries (Ruiz-Palomino et al. 2013), while more developed internal corporate governance mechanisms were found to positively impact listed banks' CSR disclosures in the USA in the post-crisis period (Jizi et al. 2014). Furthermore, based on the sample of Sri Lanka's microcredit institutions, it is confirmed that customer and competitor orientation as well as inter-functional coordination add to more severe CSR involvement (Jebarajakirthy et al. 2015). Even religious piety of managers and employees (Chatjuthamard-Kitsabunnarat et al. 2014) and CEOs' luckiness or opportunistic behavior (Jiraporn and Chintrakarn 2013) are nowadays connected with the CSR involvement, using the data samples composed of various industries and corporations. Recently, it was demonstrated that CSR performance is positively impacted by the companies' age (Withisuphakorn and Jiraporn 2016). Nevertheless, despite growing body of literature about CSR determinants, and appearance of new variables in the empirical researches, surrounding, according to which banks and non-financial enterprises benchmark when decisions about the CSR are made, is still insufficiently documented.

Contextual factors could be of key importance for the development of CSR behavior at least because of three major reasons. First, the activism of civil society

organizations and generally the stakeholders' activism as well as customers' awareness and relevance they give to CSR issues might be a demand-side push for more responsible behavior of corporations and more ethical products and services delivery. On the other hand, corporations may develop their CSR practices in order to achieve comparative advantages over their competitors, for instance, higher cost-efficiency, better public reputation and clients' loyalty, lower regulatory oversight, improved risk management, attracting more sophisticated employees and finally higher profitability (Gyves and O'Higgins 2008: 209). Thus, certain level of competition and customers' expectations might spur CSR profiling. Neither the insufficient nor the excessive competition is beneficial to CSR. Namely, excessive competition increases the chances for irresponsible behavior with goal of market survival, while insufficient competition might end with inefficient corporate behavior and poor options on the demand-side (Quairel-Lanoizelée 2011). Finally, the state, to be more precise, its political ideology as well as functionality of its institutions surely affects both the demand and the supply-side of the CSR story. For instance, immature democracies with shattered ideological foundations and loss of identity of the major political parties, which are at the same time less developed and "investment-hungry" countries, usually have insufficient demand for social responsibility actions, due to being forced to wheedle to foreign-owned corporations in order to use them as an engine for job creation (Kundid and Rogošić 2011: 513–514). Thus, social responsibility strategies of corporations should be analyzed with regard to state support for such strategies (Archel et al. 2009), overall political surrounding (Detomasi 2008), country development level (Tsang 1998; Carrasco 2006), and stage of economic cycle, i.e., prosperity and crisis episodes (Giannarakis and Theotokas 2011). Altogether, country characteristics might be of crucial importance for the CSR adoption both by the corporations (the supply-side) and by stakeholders (the demand-side). In that sense, with a focus on developing economies, Visser (2008: 480–481) identifies ten mayor drives of CSR and classifies them into internal drivers (pressures from within the country) and external drivers (drivers with a global origin). Thus, the level of CSR in those economies might be led by these characteristics of the country (i.e., internal drivers): cultural tradition, political reform, socioeconomic priorities, and governance gaps. In addition, CSR may occur as a response to crisis, whether economic, social, environmental, health-related or industrial origin, as well as to be goaled for entering certain market. External drivers of CSR are: international standardization (e.g., adoption of CSR codes and standards), increasing number of incentives for socially responsible investments, stakeholder/civil society activism, and multinational corporations screening of the supply chains by the fair trade criteria.

Usually, disparities which are assumed to exist between countries, in the CSR affirmation, are investigated throughout the foreign ownership variable. Thus, CSR behavior of multinational corporations is compared across various economies in which they operate. For instance, Min Han (2015) explored consumers' expectations towards foreign multinationals in the automobile industry in Korea and found out that a higher level of CSR is demanded from foreign-owned corporations than domestic ones. In addition, perceptions towards the CSR content which should be

more emphasized in practice vary according to cultural values which are present in one country (Schmidt and Cracau 2015). Despite higher expectations (from the consumers' point of view) from foreign-owners in host countries, few researches demonstrated that CSR commitment of multinational corporations is more developed in their countries of origin in comparison to CSR practices of their subsidiaries abroad (Surroca et al. 2013; Zhao et al. 2014). Regarding the banking sector, the similar phenomenon occurred (e.g., Kundid and Rogošić 2011) as internationally active banks were found to be more dedicated and more transparent about CSR in more developed economies, due to higher ecological and social awareness in those countries as well as better protection and fight for human rights. However, comparison of CSR behavior of internationally present banks across countries of different stages of development and examining the scale of expected spillover effect is beyond the scope of this chapter. We rather focus on pure cross-country analysis of contextual drivers of development banks' CSR performance.

Similarly, Gallén and Peraita (2015) explored the relationship between GDP and GRI index in OECD countries and found that in their sample differences in CSR engagement are quite low. Next, Young and Marais (2012) made comparison of CSR reporting practices between Australia and France witnessing the influence of institutional background. Legislative drivers make French organizations keener to CSR reporting than Australian. They found that French companies reported more than Australian on labor and environmental issues as well as on business behavior which the authors explained by French social tradition and the importance of coercive and normative institutions in France. Both Australian and French companies report more on CSR in risky industries in order to respond to stronger institutional pressures to maintain their legitimacy. Finally, based on the sample of about 360 firms which are in the top 500 European firms in the period 2007–2010, de Villiers and Marques (2016) confirmed that higher CSR disclosure, where GRI guidelines are used to establish the disclosure standard, occurs among companies in more democratic and more press freedom countries which have better investor protection, higher government effectiveness as well as higher quality regulations, but are less dedicated to environmental policies. However, listed researches either refer to corporations, no matter of the industry in which they operate (Young and Marais 2012; Gallén and Peraita 2015), or purposely exclude banks (de Villiers and Marques 2016). Therefore, our attention is directed solely to development banks' CSR and country characteristics in which they operate. We would by no means claim that this is a fully comprehensive list of studies, but we believe that the cited studies are among the most relevant. Altogether, the following hypothesis is established:

H-1: (Development) banks' CSR performance is positively driven with the country development level expressed via higher macroeconomic performance and better institutional development, as well as more efficient banking intermediation.

## 3 Empirical Evidence

The empirical research of disparities in banks' CSR performance, which are assumed to be driven by the heterogeneity in the country development level, is conducted on the secondary data collected for a sample of 22 European countries in the year 2013. The following economies are encompassed with the analysis: Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Finland, France, Germany, Hungary, Latvia, Former Yugoslav Republic of Macedonia, Netherlands, Norway, Poland, Romania, Russian Federation, Serbia, Slovak Republic, Slovenia, Spain, Sweden, Turkey, and Ukraine. The year 2013 was taken into consideration due to the latest data availability for the largest number of countries. Explaining the criteria for the spatial component of the sample is more complex. In order to investigate bank's CSR performance as a consequence of certain country's development level (contextual variables), bank-specific variables which are normally identified as key determinants for its CSR performance (see, e.g., Branco and Rodrigues 2006, 2008; Gutiérrez-Nieto et al. 2008; Wu and Shen 2013), for instance, bank size and market share, its visibility, financial performance, and ownership had to be somehow excluded from the analysis. Therefore, attention is paid to development, rather than commercial banks. Moreover, the development banking is inherently related to socially responsible banking and could be perceived as a benchmark for other banks' CSR practices in certain country. In order to detect development banks in the European economies, we searched official websites of several associations whose members, among other financial institutions, are development banks. Associations which we took into consideration were the International Development Finance Club, the European Long-Term Investors Association, the European Association of Public Banks, Banking Association for Central and Eastern Europe, the World Federation of Development Financing Institutions, the Berne Union/Prague Club, and the Network of European Financial Institutions for Small and Medium Sized Enterprises. Altogether, a list of about 45 development banks Europe-wide was made.[1] Our next goal was to calculate the level of social responsibility reporting of these banks.

Sustainability accounting helps organizations to set goals, measure performance, and manage change that leads to improvements of their socially responsible operations. Very often organizations use GRI Sustainability Reporting Guidelines on their path since they are globally and widely implemented. GRI guidelines have been academically explored (Hedberg and von Malmborg 2003; Milne and Gray 2013) and used as a basis for CSR performance measurement (Skouloudis et al. 2010; Giannarakis and Theotokas 2011; Young and Marais 2012; Gallén and Peraita 2015; de Villiers and Marques 2016). Since GRI framework has been used for various empirical investigations of CSR performance, GRI 3.1 guidelines

[1]For Serbia, we took into consideration Export Credit and Insurance Agency of the Republic of Serbia, while for countries which had more than one development bank, we applied the age and transparency criteria, choosing older and more transparent development banks.

were used in our research. We also investigated Financial Services Sector Supplement as development banks are financial institutions. We are aware that there might be a considerable difference between CSR "reporting" and CSR "doing" but due to unavailability of monetary indicators related to CSR activities, we use CSR reporting level as a second-best solution for CSR activism. Thus, social responsibility disclosure index (GRI_COUNT) was computed following the GRI 3.1 Sustainability Reporting Guidelines and its Supplement on Financial Services Sector. After eliminating all the development banks without official website, as well as those without annual reports and standalone social responsibility reports available in English language (for the year 2013), disclosure index was calculated for 25 development banks in 25 European countries. Furthermore, three development banks that disclosed only few items from the GRI guidelines, i.e., less than ten activities were considered to be outliers and were also excluded from the further analysis. Finally, the data for 22 development banks and the same number of their home countries were suitable for the empirical research.

With reference to the institutional theory of CSR and our assumption that (development) banks' CSR performance is dependable upon the country development level, social responsibility disclosure index is set out as dependent variable, while country development indicators which were taken from the World Bank's databases, to be more precise, the World Development Indicators Database and the Global Financial Development Database, were treated as explanatory variables. According to the data availability (for the year 2013), the following indicators were used to depict the country development level:

- GDPperC—GDP per capita, PPP (current international USD)
- SAVING_GDP—gross savings (% of GDP)
- RD_GDP—research and development expenditure (% of GDP)
- UNEMPLOYED—unemployment, total (% of total labor force) (national estimate)
- PRIV_CRED_REG—private credit bureau coverage (% of adults)
- PUB_CRED_REG—public credit registry coverage (% of adults)
- LEGAL_RIGHTS—strength of legal rights index (0 = weak to 12 = strong)
- START_BUSINESS—time required to start a business (days)
- NIM—banking sector net interest margin (%)
- CA—banking sector regulatory capital to risk-weighted assets (%)

GDPperC, SAVING_GDP, RD_GDP, and UNEMPLOYED serve to describe country's macroeconomic environment. Since the first condition of CSR "doing" is "having," an assumption is made that more developed economies, i.e., economies with a higher GDP per capita and higher employment as well as higher savings and investments, especially in research and development will have better CSR performance.

PRIV_CRED_REG, PUB_CRED_REG, LEGAL_RIGHTS, and START_BUSINESS are approximations of the country's institutional development.[2] Countries with better functionality of institutions, i.e., more information available via public credit registry, higher strength of legal rights and lower number of days required to start a business are expected to be more dedicated to social responsibility issues.

NIM and CA stand for the banking sector development. On the sector-level data, net interest margin presents the cost of banking intermediation (e.g., Naceur and Kandil 2009) and indicates the level of competition in the banking sector. Higher the competition and lower the cost of banking intermediation, more developed banking sector should be. In such circumstances, commercial banks will either have fewer resources to be socially responsible or quite the contrary they will endeavor to achieve comparative advantage over competitors and increase their performance by being more socially responsible. On the other hand, in more developed banking sectors development banks are expected to be more socially responsible in order to justify their existence and compensate potential negative externalities from the commercial banks excessive competition such as insufficient financial inclusion and poor CSR in banking intermediation. Furthermore, CA is one of the most expensive regulatory measures in the banking sector. Thus, more restrictions towards the financial leverage usage mean more expensive business of banking (e.g., King 2010) and decreased opportunities for socially responsible banking. Finally, macroeconomic conditions as well as institutional environment surely impact the banking sector performance (see, e.g., Fang et al. 2014), and thus its ability to act in socially responsible manner. A conclusion is made on the interplays between macroeconomic, institutional and banking sector variables, and their consequent impact on (development) banks' CSR.

With the aim of detecting the relation of these indicators with development banks' CSR performance cluster analysis is performed. A cluster analysis enables to group development banks' CSR disclosure level based on their countries' characteristics. To be more precise, the K-means clustering technique was adopted with goal of identifying the cluster membership for each development bank/country. Nevertheless, due to a small size sample of only 22 observations, all clustering variables cannot be used at once. For instance, Mooi and Sarstedt (2011: 263) recommend having at least $2^m$ number of observations, where "m" is the number of clustering variables, in order to satisfy the condition of having reasonable relationship between objects and clustering variables. In our case, the maximum number of clustering variables is 4. This is why a separate cluster analysis for each group of clustering variables was carried out. All calculations were made in statistical package SPSS Statistics 23. In all cases, Pearson correlation (appendix, Table 9)

[2]Private credit bureau coverage and public credit registry coverage report the number of individuals or firms listed by either the private credit bureau or public credit registry with current information on repayment history, unpaid debts, or credit outstanding. Strength of legal rights index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders.

**Table 2** Final cluster centers for macroeconomic clustering variables

| | Cluster 1 | Cluster 2 |
|---|---|---|
| GDPperC | 20637,73982 | 46439,36906 |
| SAVING_GDP | 19,80977 | 26,89422 |
| RD_GDP | 0,97662 | 2,55496 |
| UNEMPLOYED | 14,19374 | 6,91666 |

Source: Authors' calculation

**Table 3** ANOVA for macroeconomic clustering variables

| | Cluster | | Error | | | |
|---|---|---|---|---|---|---|
| | Mean square | df | Mean square | df | F | Sig. |
| GDPperC | 2904977767,647 | 1 | 63365256,111 | 20 | 45,845 | 0,000 |
| SAVING_GDP | 219,008 | 1 | 35,819 | 20 | 6,114 | 0,023 |
| RD_GDP | 10,871 | 1 | 0,383 | 20 | 28,366 | 0,000 |
| UNEMPLOYED | 231,080 | 1 | 47,453 | 20 | 4,870 | 0,039 |

Source: Authors' calculation

was lower than critical value for the cluster analysis, i.e., 0.9 as suggested by Mooi and Sarstedt (2011: 263). Thus, there is no collinearity problem between clustering variables.

Tables 2 and 3 contain results when macroeconomic variables are used for clustering. Clearly, all variables are statistically significant (Table 3). Thus, countries with lower unemployment, higher GDP per capita, higher saving capacity, and at the same time higher investments in research and development have higher social responsibility disclosure index (GRI_COUNT) of development bank as the mean value of disclosure index in the first cluster is 44,813 and in the second cluster it is 109,5. Cluster 1 encompasses 16 countries, while the following six countries have membership in cluster 2: Finland, France, Germany, Netherlands, Norway, and Sweden. According to Table 4, difference in mean values of GRI_COUNT for clusters is statistically significant.

K-means clustering results for institutional development variables are disclosed in Tables 5 and 6. Private credit bureau coverage and public credit registry coverage are statistically significant at 1% level, while the strength of legal rights and time required to start a business are significant, but at 10% level (Table 6). In addition, small and statistically insignificant difference appears between the mean values of GRI_COUNT in the first cluster (62,933) and the second cluster (61,429). Still, a conclusion can be made that countries with higher private credit bureau coverage and lower public credit registry coverage have more developed social responsibility praxis (Table 5). Obviously, there is a trade-off between availability of information on credit indebtedness via public and private registries, but altogether irrespective of the information source, higher information availability reduces the adverse selection problem, what is a good basis for asset quality increase, lowering volatility of bank profitability, and consequent development of other sustainability activities (regardless of the bank type). Out of 22 countries, 15 are associated in cluster

**Table 4** Independent samples test when macroeconomic variables define clusters

| | Levene's Test for Equality of Variances | | t-test for equality of means | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 95% Confidence interval of the difference | |
| GRI_COUNT | F | Sig. | t | df | Sig. (2-tailed) | Mean difference | Std. Error difference | Lower | Upper |
| Equal variances assumed | 1,918 | 0,181 | −3,406 | 20 | 0,003 | −64,6875 | 18,9911 | −104,3022 | −25,0728 |
| Equal variances not assumed | | | −2,929 | 7,071 | 0,022 | −64,6875 | 22,0845 | −116,8035 | −12,5715 |

Source: Authors' calculation

**Table 5** Final cluster centers for institutional development clustering variables

| | Cluster 1 | Cluster 2 |
|---|---|---|
| PRIV_CRED_REG | 81,9 | 9,8 |
| PUB_CRED_REG | 5,7 | 38,5 |
| LEGAL_RIGHTS | 5,4 | 7,0 |
| START_BUSINESS | 11,5 | 23,3 |

Source: Authors' calculation

**Table 6** ANOVA for institutional development clustering variables

| | Cluster | | Error | | | |
|---|---|---|---|---|---|---|
| | Mean square | df | Mean square | df | F | Sig. |
| PRIV_CRED_REG | 24835,507 | 1 | 257,126 | 20 | 96,589 | 0,000 |
| PUB_CRED_REG | 5110,864 | 1 | 327,702 | 20 | 15,596 | 0,001 |
| LEGAL_RIGHTS | 12,218 | 1 | 3,480 | 20 | 3,511 | 0,076 |
| START_BUSINESS | 659,950 | 1 | 157,919 | 20 | 4,179 | 0,054 |

Source: Authors' calculation

**Table 7** Final cluster centers for banking sector clustering variables

| | Cluster 1 | Cluster 2 |
|---|---|---|
| NIM | 3,72251 | 2,42569 |
| CA | 18,672 | 15,04107 |

Source: Authors' calculation

**Table 8** ANOVA for banking sector clustering variables

| | Cluster | | Error | | | |
|---|---|---|---|---|---|---|
| | Mean square | df | Mean square | df | F | Sig. |
| NIM | 8,562 | 1 | 1,282 | 20 | 6,677 | 0,018 |
| CA | 67,117 | 1 | 2,151 | 20 | 31,197 | 0,000 |

Source: Authors' calculation

1, while cluster 2 is composed of 7 countries: Bosnia and Herzegovina, Bulgaria, Finland, France, Latvia, Spain, and Ukraine.

At last, clustering results for banking sector variables are revealed (Tables 7 and 8). Out of 22 countries, 8 countries are clustered in the first cluster whose mean value of disclosure index is 50,625 and thus lower that the mean value of GRI_COUNT in the second cluster (69,214). More precisely, Bosnia and Herzegovina, Croatia, Germany, Hungary, Latvia, Former Yugoslav Republic of Macedonia, Serbia, and Ukraine form cluster 1. It is transparent (Table 7) that banking sectors of those countries have higher net interest margin and capital adequacy ratio. Thus, less profitable and less restrictive banking sectors have higher

development bank's CSR performance when approximated with GRI_COUNT. Table 8 confirms statistical significance of these variables. However, the difference between mean values of GRI_COUNT in two clusters is statistically insignificant.

Besides these results, we find interesting that out of 22 countries, development banks in only 8 countries disclosed their social responsibility actions in standalone social responsibility reports. This form of reporting was adopted by development banks in Croatia, Finland, France, Germany, Netherlands, Spain, Sweden, and Turkey.

## 4 Conclusion

Lately, public attention is directed towards corporations, financial or non-financial ones, to behave in a more socially responsible way. Moreover, an impression is obtained that procurement of the public interest seems to be partly outsourced from the government, policymakers, and regulators to the corporate sector. As a result of the financial crisis, this is particularly true for the banking industry, i.e., a widespread expectance that banks should be more socially responsible emerged. Nevertheless, theoretical background on the determinants of CSR teaches us on variety of motives and drivers of CSR activism besides crisis occurrence. The literature containing empirical evaluation of theories related to internal or microeconomic factors of CSR has mushroomed until recently. Nowadays, relevance of institutional aspects for CSR performance as well as the issues about cyclical and pro-cyclical behavior of economic agents are rather important points of reference. Therefore, in the chapter we hypothesize that country development level and banks' CSR practices are in complementary and not substitute relationship, even in case of development banks. Based on 22 European countries and their development banks' social responsibility disclosures following GRI guidelines, we confirmed our assumption. Thus, higher CSR performance occurs in countries with prosperous macroeconomic surrounding and more efficient banking intermediation as well as more informed and less regulatory restrained banking sector. Altogether, expectations and judgement of the social responsibility by both commercial and development banks should be considered with country development level on mind, as the burden of being socially responsible is not dependable only upon organizations' actions.

We believe that findings presented add to the knowledge on development banks' CSR performance as well as to the literature on external drivers of banks' CSR. It is especially relevant for the European countries, which tend to converge to each other regarding economic, financial, and disclosure criteria. Nevertheless, the sample could be extended beyond these 22 countries in some future researches, more convincing statistical methods than cluster analysis used as well as development bank's internal variables supplemented to the contextual variables in the empirical evidence, while the disclosure content will be a subject of a subsequent article.

# Appendix

**Table 9** Pearson correlation for clustering variables ($N = 22$)

| | GDPperC | SAVING_GDP | RD_GDP | UNEMPLOYED | PRIV_CRED_REG | PUB_CRED_REG | LEGAL_RIGHTS | START_BUSINESS | NIM | CA |
|---|---|---|---|---|---|---|---|---|---|---|
| GDPperC | 1 | | | | | | | | | |
| SAVING_GDP | 0,745[a] | 1 | | | | | | | | |
| RD_GDP | 0,714[a] | 0,387 | 1 | | | | | | | |
| UNEMPLOYED | −0,519[b] | −0,334 | −0,481[b] | 1 | | | | | | |
| PRIV_CRED_REG | 0,303 | 0,367 | 0,258 | −0,210 | 1 | | | | | |
| PUB_CRED_REG | −0,288 | −0,131 | −0,373 | 0,440[b] | −0,737[a] | 1 | | | | |
| LEGAL_RIGHTS | −0,352 | −0,161 | −0,376 | 0,060 | −0,469[b] | 0,296 | 1 | | | |
| START_BUSINESS | −0,332 | −0,464[b] | −0,275 | 0,423[b] | −0,371 | 0,190 | 0,296 | 1 | | |
| NIM | −0,634[a] | −0,531[b] | −0,470[b] | 0,297 | 0,036 | −0,120 | 0,092 | 0,170 | 1 | |
| CA | −0,413 | −0,392 | −0,395 | 0,266 | 0,039 | −0,012 | 0,272 | 0,138 | 0,304 | 1 |

[a]Correlation is significant at the 0.01 level (2-tailed)
[b]Correlation is significant at the 0.05 level (2-tailed)
Source: Authors' calculation

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# Interdependence Between Indicators Used for Identifying Impending Bankruptcy and Selected Indicators

**Anna Siekelova, Ivana Podhorska, and Katarina Valaskova**

**Abstract** Account receivables are a sum of money owed to a company by its debtors. Receivables are recorded by a company's accountants and reported on the balance sheet, and they include all debts owed to the company, even if the debts are not currently due. They are a part of current assets. Company's receivables may occur from a variety of titles. Each of these forms affects the financial situation in a different way. The majority of receivables has the nature of trade credit. Offering trade credit is a strategic tool in the hands of the company but many payments in commercial transactions not only between businesses but also between businesses and public authorities are much later than were agreed. Therefore, we can conclude that the offering trade credit is largely linked to credit risks. Term credit risk has assessed the risk associated with the fact that the customer fails to pay its obligations properly and on time or at all. Every year thousands of businesses go bankrupt just because of late payments not only in Europe but also in the world. In this chapter, we will focus on the relationship between the absolute amount of trade receivables and the ratio of equity to liabilities represented as indicators used for identifying impending bankruptcy and the relationship between the days sales outstanding and the mentioned ratio.

## 1 Introduction

In extreme cases, receivables make up for 50% of current assets in the company (Cisko and Kliestik 2013). The majority of receivables has the nature of trade credit. A risk that the debtor does not pay properly and on time is connected with the provision of trade credit, resulting in the company (Kollar and Bartosova 2014). On the other hand, if the company decides not to provide trade credits at all it loses competitive advantage and most likely has fewer customers than company that provides trade credit to their customers (Binda and Rychlewski 2010). This

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situation is mainly determined by the fact that economic operators in the market have cash at different times. (Grublova 2010)

## 2 Receivables as Part of the Current Assets

Accounts receivable is defined as a sum of money owed to a company by its debtors (Harumova 2002). From basic to applied theory is the first level, which defines a receivable or credit policy of the company, the theory of corporate finance. At this level, it is already examining in detail not only the actual capital structure and debt affect to the value of company and the bankruptcy of indebted company, but also the process of receivables management and collection, along with the credit policy of the company.

Economic perception of receivables consists in providing trade credit. Trade credit is provided to the customer as a sign of trust and fair trade relations (Kral and Janoskova 2014). The problem of unpaid debts is increasingly common. We need to know the amount of additional revenue that the company must obtain from the customer if the receivable is not paid. We can use the following formula.

$$A_r = O_i \times (100 \div P_{\%})$$

where

$A_r$ additional revenues
$O_i$ the amount of outstanding invoices
$P_{\%}$ the usual profit margin (%)

Outstanding invoices constitute not only margin loss. We can mention the following example to illustrate the situation. Customer does not pay the invoice in the amount of 2000€. Profit margin is typically 10%. In this case, a company loss a margin (200€), but also the value of all costs incurred in the production of goods. The actual loss is 2000€.

If an enterprise wants to compensate for this loss by gaining margin from selling additional goods, an enterprise has to sell goods that cost 20,000€. Only in this case a company can gain a margin of 2000€ (10% from 20,000€).

### *2.1 The Impact of Receivables on Selected Financial Indicators*

Although there is still a view that the receivables are rather influenced by external conditions of the economy, in particular, the behavior of customers and the company therefore has limited options for their management; it is necessary to pay

attention to their optimization (Valach 2003). Offering trade credit should not be automatic but should reflect primarily the outcome of the creditworthiness of potential business partners. Enterprises should seek to optimize the level of receivables due to the risk and liquidity (Block and Hirt 1989). In this process of receivables, management plays a very important role. Receivables management can be understood as purposeful activity of enterprises seeking the optimal controlling its debts (Adamko et al. 2014).

Receivables have an important role in the company. They have an impact on many financial indicators. (Daniel 2013) Table 1 shows the impact of receivables on the selected financial indicators.

**Table 1** The impact of receivables on financial indicators

| Financial operation | The reason of financial operation | The impact on capital | Real change in cash | Changing the operating free CF | Changing the working capital |
|---|---|---|---|---|---|
| Decrease in receivables | Payment of invoices | Capital bound in assets are released | increase | increase | decrease |
| Increase in receivables | Providing new trade credit | Capital is bounded in receivable | decrease | decrease | increase |
| Creation of provision for receivables | The assumption that the claim will not be paid | Status of receivables in the balance sheet remains unchanged, however, indirectly reduced; it appears as releasing of capital. | – | increase | decrease |
| Release of provision for receivables | The assumption does not insist | Status of receivables in the balance sheet remains unchanged, however, indirectly increased; it appears as bounding of capital. | – | decrease | increase |
| Write-off of receivables | Certainty that the receivable will never be paid | Status of receivables in the balance sheet has decreased, but the real money was not received. | – | increase | decrease |
| Encashment written-off receivables | Unexpected payment of written-off receivable | Receivables situation has not changed, however, in the account of money increase | increase | – | – |

## 2.2 The Impact of Receivables on Selected Financial Indicators

At present, the provision of trade credit to customers is common. Providing preferential payment terms has become a competitive advantage for companies. Any decision on providing trade credit is also a decision on taking additional credit risk. (Frajtova-Michalikova et al. 2015; Kliestik et al. 2015) For the company, it is necessary to compare the credit risk with achieving additional utility in case if it decides to provide trade credit. Figure 1 shows the impact of financial risk to the total utility.

Current utility associated with the provision of trade credit in relation to the financial structure of assets is located at "P". In case if a company decides to provide additional trade credit to its customer and a customer pays properly and on time, profit and also utility will increase ($x_2$; $U_g$). Otherwise, there is a loss of material costs ($x_1$), which is accompanied by a reduction of the utility ($U_1$). Based on the above picture, it can be seen that the material costs are higher than expected profit; thus, the decrease of the utility if failure to pay is higher than the increase of the utility in the case of payment. Company should decide to provide or reject trade credit based on the expecting increase of utility and profit in respect of the cost.

Trade credit is a strategic tool in the hands of the company. Its provision can be a competitive advantage for a company but on the other hand, it may lead to bankruptcy. The selection of the customer to whom a company provides trade credit is one of the most important parts of effective management of receivables. It is determined by assessing customer's creditworthiness as prerequisites of smooth repayment of trade credit in the future. In case the customer fails to pay the trade credit properly and on time, it will cause significant problems to the company. To a large extent, it is threatening the ability of the company to repay its own liabilities to suppliers. The results of a survey conducted by Intrum Justitia

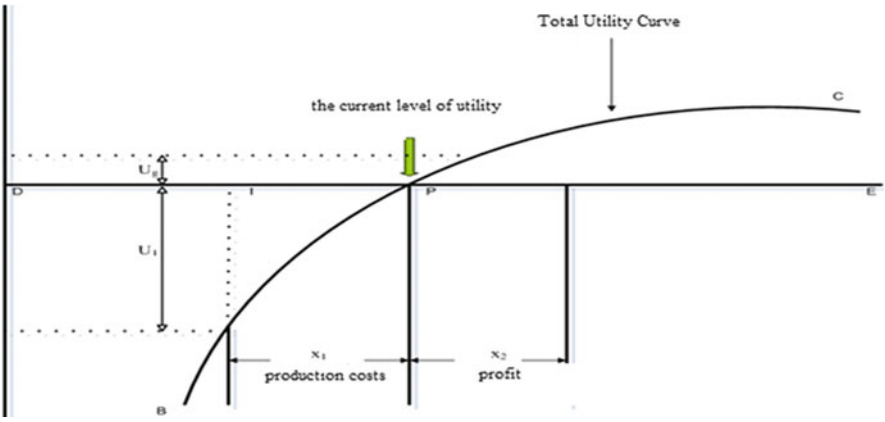


**Fig. 1** The impact of financial risk to the total utility

dealing with receivables management annually inform about the payment discipline of European businesses. Approximately 10,000 financial or executive directors and financial experts from more than 9800 companies operating within Europe respond to questions such as maturity of claim, bad debts, or the consequences of late payments, a total of 21 different variables. More than half the countries that were involved in the survey reported increased credit risk, while only one third of these countries have critical risk profile. The European Payment Report also reveals that respondents of the survey see 3.1% of their yearly revenues being written off, putting many European companies at strain. As much as 40% receivables that their customers are not able to pay on time or at all are hindering growth and one third (31%) see late payments as a threat to their long-term survival (Intrum Justitia 2015). These are of course worrying facts.

Bad debt loss increased to 3.10% in 2014. Converted to actual money, 360 billion euro is annually lost. This is the highest recorded amount since 2008. Some countries are far better than others. Bad debt loss increased also in Slovakia to 4%. Approximately 88% of the enterprises as the main reason for late payment provides for financial problems of borrowers. Other mentioned reasons also included the intentional non-payment of debts properly and in time, administrative inefficiency, and disputes with customers. Many of those surveyed still remain very pessimistic about the future development of payment discipline in European companies. Companies are increasingly facing the impact of crisis on sales, liquidity, and their ability to grow and in finding resources to invest in the future. European payment risk index indicates the credit risk of the debtors in selected countries. There is a risk index explanation of the payment risk index values.

| | |
|---|---|
| 100 | No Payment Risk, Cash on Delivery, Pre-payment, No Credit |
| 101–129 | Low payment risk, stay alert to keep this profile; |
| 130–139 | Low risk profile, intervention necessary, take action now; |
| 140–149 | Medium risk profile, action needs to be taken; |
| 150–159 | Medium to high risk profile, take immediate actions to lower the risk; |
| 160–169 | High risk profile, immediate actions are necessary; |
| More than 170 | Emergency risk profile (Intrum Justitia 2014). |

Table 2 shows payment risk index of selected countries.

Compared to last year the inclusion of countries into individual risk profile is nearly identical. Scandinavian countries have the best results. Low risk of bad debts is affected not only by the effective legislation in force in these countries, but also by respecting the unwritten rules of business. As we can see, Slovak Republic has achieved a high risk profile. And 65% of Slovak respondents said that due to late payment lost part of their income, 63% of them due to late payments are experiencing liquidity problems and up to 59% of companies had decreased or totally restricted further development. Almost half of the respondents think that the situation in the future will be better (Intrum Justitia 2014). Generally it can be assumed that the person to whom payment is late will pay his own debt late.

**Table 2** Payment risk index 2014

| Country | Payment risk index 2014 |
|---|---|
| Norway, Sweden, Finland | 101–129 |
| Iceland, Denmark, Switzerland | 130–139 |
| Germany, Austria | 140–149 |
| Estonia, Belgium, Netherlands, France | 150–159 |
| Ireland, UK, Latvia, Lithuania, Poland, Slovakia, Italy | 160–169 |
| Portugal, Spain, Czech republic, Hungary, Croatia, Slovenia, Bosnia and Herzegovina, Serbia, Romania, Bulgaria, Greece | More than 170 |

## 3 Data and Methodology

The amendment to Act no. 513/1991 Coll. Commercial Code defines the conditions under which the company is threatened by bankruptcy. The company is threatened by bankruptcy if its ratio of equity to liabilities is less than 8–100. Under the transitional provisions, the ratio of 8–100 will be used up by 2018. Until then, rules are less stringent. In 2016, to assess imminent bankruptcy the ratio of 4–100 should be used and in 2017, we can use the ratio of 6–100. As stated above, carelessly providing trade credits may cause major financial problems in meeting company's own commitments and eventually even to bankruptcy. In this chapter, we will focus on the relationship between the absolute amount of trade receivables and the ratio of equity to liabilities and the relationship between the days sales outstanding and the mentioned ratio.

In the first step, we selected a sample of 9821 Slovak companies. We focused only on companies with private domestic ownership structure. Next, we calculated the selected indicators in 2015. The formulas for calculating the individual indicators that were used are in Table 3.

Before focusing on the relationship between the indicators, we had to identify outliers, which we had excluded from testing. Grubbs' test was used for the identification of outliers (Kliestik et al. 2015). This test detects outliers from normal distributions. The tested data are the minimum and maximum values. The result is a probability that indicates that the data belongs to the core population. Grubbs' test is defined for the hypothesis:

$H_0$: There are no outliers in the data set.
$H_a$: There is at least one outlier in the data set.

The hypotheses were tested at the significance level $\alpha = 0.05$. Grubbs' test results for each variable are as follows (Tables 4, 5, and 6).

As the computed p-value is lower than the significance level alpha, we should reject the null hypothesis and accept the alternative hypothesis. The risk to reject the null hypothesis while it is true is lower than 0.01%. Values displayed in bold were outliers and after identification they were excluding from testing. After

**Table 3** Formulas for calculating the individual indicators

| Indicator | Formula |
|---|---|
| Days Sales Outstanding | $\frac{Trade\ Receivables}{Revenues\ from\ Sales\ of\ Goods, Products, and\ Services} * 365$ |
| Trade Receivables | *The Total Amount of Trade Receivables from Balance Sheet* |
| Indicator for Identifying Impending Bankruptcy | $\frac{Equity}{Liabilities}$ |

**Table 4** Grubbs' test results of trade receivables

| | |
|---|---|
| G (Observed value) | 49,989 |
| G (Critical value) | 4557 |
| p-value (Two-tailed) | <0.0001 |
| alpha | 0.05 |

**Table 5** Grubbs' test results of days sales outstanding

| | |
|---|---|
| G (Observed value) | 68,678 |
| G (Critical value) | 4559 |
| p-value (Two-tailed) | <0.0001 |
| alpha | 0.05 |

**Table 6** Grubbs' test results of indicator for identifying impending bankruptcy

| | |
|---|---|
| G (Observed value) | 12,754 |
| G (Critical value) | 4557 |
| p-value (Two-tailed) | <0.0001 |
| alpha | 0.05 |

excluding outlier (9067 enterprises remained), we dealt with the relationship between selected indicators using Pearson correlation coefficient. Pearson correlation measures the linear dependence (correlation) between two variables X and Y. It has a value between +1 and −1 inclusive, where 1 is total positive linear correlation, 0 is no linear correlation, and −1 is total negative linear correlation (Misankova and Kral 2015). Pearson correlation coefficient was calculated using the following formula:

$$r = \frac{\text{cov}\ (x, y)}{s_x \times s_y}$$

where

$$s_x = \sqrt{\overline{x^2} - \bar{x}^2}$$

$$s_y = \sqrt{\overline{y^2} - \bar{y}^2}$$

$$\operatorname{cov}(x,y) = \frac{1}{n}\sum_{i=1}^{n}\left(x_i - \bar{x}\right) \times \left(y_i - \bar{y}\right) = \overline{xy} - \bar{x} \times \bar{y}$$

In practice, we can distinguish:
$0< \mid r \mid \leq 0.3$ weak correlation
$0.3\leq \mid r \mid \leq 0.8$ mild (medium) correlation
$0.8< \mid r \mid \leq 1$ strong correlation

If the correlation coefficient is close to zero, it is appropriate to verify whether it is coincidence due to random chance, or indeed there is a linear relationship. Just to verify this fact is used significance test of correlation coefficient. Finally, we set the value of the coefficient of determination, which represents the proportion of common variance, thus how much percentage change in one variable affects change of another variable.

## 4 Results

Results are as follows (Tables 7, 8, and 9):

**Table 7** Pearson correlation coefficient

| Variables | Indicator for identifying impending Bankruptcy | Trade receivables |
|---|---|---|
| Indicator for Identifying Impending Bankruptcy | 1 | **−0.054** |
| Trade Receivables | **−0.054** | 1 |

**Table 8** Coefficient of determination

| Variables | Indicator for identifying impending Bankruptcy | Trade receivables |
|---|---|---|
| Indicator for Identifying Impending Bankruptcy | 1 | **0.003** |
| Trade Receivables | **0.003** | 1 |

**Table 9** Pearson correlation coefficient

| Variables | Indicator for identifying impending Bankruptcy | Days sales outstanding |
|---|---|---|
| Indicator for Identifying Impending Bankruptcy | 1 | **−0.014** |
| Days Sales Outstanding | **−0.014** | 1 |

## 5 Conclusion

Trade credits represent trade receivables. Provision of trade credits significantly affects the financial position of the company, which may negatively affect in particular if the customer fails to pay its liabilities on time and properly. Information about the impending bankruptcy is represented by the ratio of the equity and liabilities. In our contribution, we verify the impact of trade receivables, days sales outstanding, and this indicator on a sample of Slovak companies. Based on the results, we can conclude that:

We have found the existence of weak negative correlation between the absolute amount of trade receivables and indicator for identifying impending bankruptcy, if the amount of trade receivables reduced by 1% ratio between equity and liability increases by 0.003%. In examining the correlation between days sales outstanding and indicator for identifying impending bankruptcy the result of Pearson correlation coefficient was only −0.014. Then, significance test of correlation coefficient showed that between these indicators there is no correlation.

Despite the low correlations between these indicators, the amount of trade receivables and days sales outstanding have a major impact on the financial stability of the company. Therefore, we recommend enterprises to thoroughly consider providing trade credit and this decision derived from valuation of the client's ability to pay trade credit in the future.

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# Credit Risk and Bank Profitability: Case of Croatia

**Sandra Pepur and Marija Tripović**

**Abstract** Banks are exposed to a wide range of different risks and credit risk is considered one of the most important and most influential ones in terms of affecting bank performance. In order to investigate credit risk—profitability relationship, in addition to other bank-specific variables, the model also encompasses industry-specific and macroeconomic variables that might have an influence on bank profitability. A dynamic panel data analysis is applied to the data set of commercial banks that operated in Croatia in the period from 2003 to 2013. The aim of this chapter is to contribute to the understanding of the profitability determinants in the context of developing countries such as Croatia and to give additional insight into the main factors that may influence bank success, which is of unquestionable importance for both policy makers and bank management.

## 1 Introduction

Banks play an important role in the economy of every country because they foster economic development through the financial services they provide, namely their intermediation role.

Efficient and profitable banking sector is a pre-condition for a country's economic growth, its stability and sustainability. Similar to other emerging market banking sectors, Croatian banking sector has experienced the effects of globalization and has undergone different changes related to (de)regulation, liberalisation, foreign bank participation and consolidation (Pervan et al. 2012, p. 366). The mentioned have consequently led to an increased competition among banks, a wider range of services that banks offer to their clients and a growing risk exposure of bank performance.

This chapter is based on the research conducted as a part of student Marija Tripović's master thesis, written under the supervision of Sandra Pepur.

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Bank performance and the policies that it implements are to a large extent reflected on bank profitability. Profitability indicators mirror company's earning power and show the overall effect of liquidity, asset and debt management on the possibility of making profits (Vidučić 2011, p. 401). However, apart from bank features (size, credit quality, cost management, liquidity management, leverage, deposit and income structure, etc.), which are controllable by the bank management, profitability is affected by the environment in which the bank operates. These external factors are for the bank management uncontrollable and reflect economic and legal environment that could affect the operations of a financial institution (i.e. level of competition and concentration in the banking industry, legislative framework, general macroeconomic conditions in the country, etc.). In performing their functions of financial intermediaries, banks, among other risks they face, accept credit risk. Credit risk directly affects bank profitability because the largest part of accrued bank revenues is derived from the bank's lending activity, namely loans. Credit risk assumes that promised cash flows from loans and securities held by bank may not be paid in full (Saunders and Millon Cornett 2006, p. 168). Having in mind that bank profitability is a precondition for its stability and performance, the importance of assessing the influence of credit risk, among other factors, on bank profitability becomes evident. Poor credit risk management in the worst case can lead either to insolvency or to significant reductions in bank earnings and its net worth. The negative impact of credit risk on bank profitability is reflected in the fact that any counterpart's delay or failure to fulfil its obligations, bank records as bad loans, which, through profit and loss, leads to a reduction in bank profit. Due to an increasing level of non-performing loans, the Basel II Accord puts emphasis on credit risk management practices. Compliance with the Accord ensures effective management of credit risk exposure and the improvement in the quality of overall risk management system which ultimately leads to improvements in bank profitability and performance.

Figure 1 presents the ratio of non-performing loans (NLP) to total gross loans in Croatia from 2010 to 2015.

The statistics on the ratio of non-performing loans to total gross loans in Croatia, from 2010 to 2015, shows that the share of non-performing loans in the total amount of loans increased steadily since 2008. In 2014, a total of 16.7% total loans in Croatia were non-performing and by the end of 2015 that ratio grew to over 17%. In international comparison, with a non-performing loan ratio of over 15%, Croatia is among the worst positioned countries—between Bulgaria and Montenegro, and Hungary and Romania (Fig. 2). Such a position in the international comparison may be due to a number of factors: similar changes in economic activities that may be associated with common geographical factors (e.g. problems of major trading partners that are common to these countries), as well as institutional problems that are common to post-socialist economies (e.g. weak creditor protection) (CBA Analyses, No. 56, 2016, p. 4).

As credit risk is very important, many researches focus on revealing how credit risk, among other factors, affects bank profitability. The identification and analysis of the bank profitability determinants in the existing literature are performed either

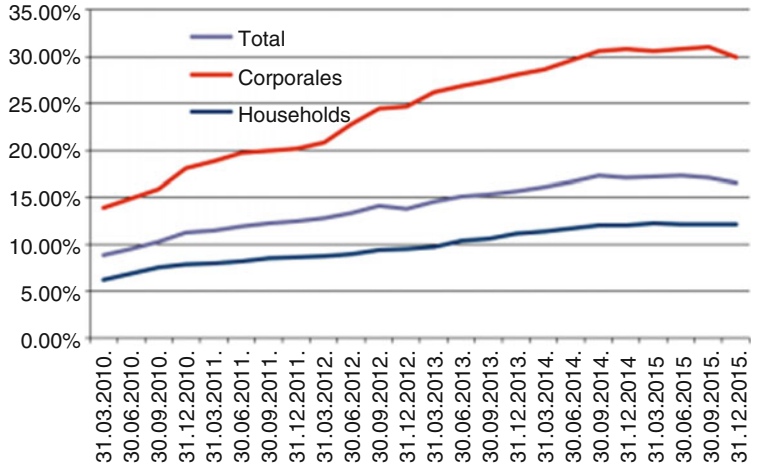


**Fig. 1** Non-performing loan ratio in Croatia in 2010–2015. Source: Croatian Bank Association Analyses, No. 56, 2016, p. 4 (http://www.hub.hr/sites/default/files/cba_analysis_56_npl_regulation.pdf)

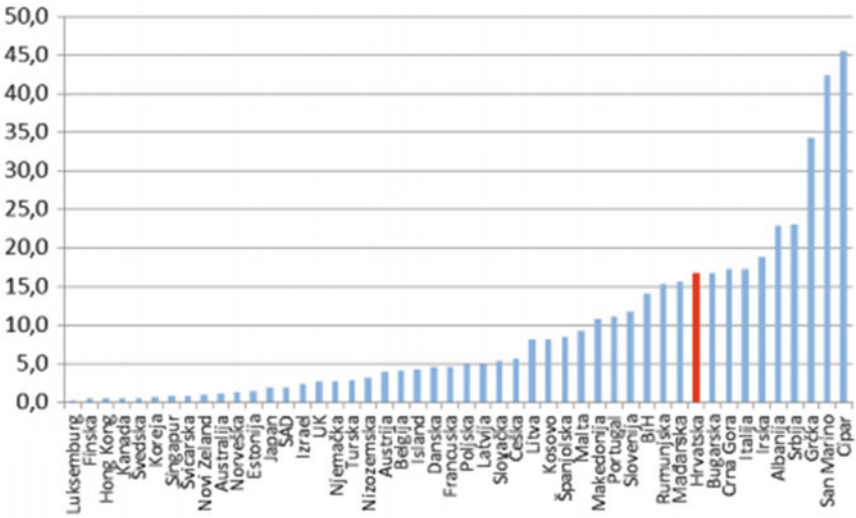


**Fig. 2** Non-performing loan ratio—international comparison (%). Source: Croatian Bank Association Analyses, No. 56, 2016, p. 5. (http://www.hub.hr/sites/default/files/cba_analysis_56_npl_regulation.pdf)

in the context of a single country (e.g. Athanasoglou et al. 2006; Sufian and Chong 2008; Kosmidou 2008; Pejić Bach et al. 2009; Ramlall 2009; Kundid et al. 2011; Ćurak et al. 2012; Pervan et al. 2012; Krivačić et al. 2012) or among several, usually developed, countries (e.g. Petria et al. 2015). However, in recent years, this topic has become the object of interest in the context of developing, e.g. South-

Eastern European countries (e.g. Athanasoglou et al. 2006; Košak and Čok 2008; Capraru and Ihnatov 2014). Most of the studies have concluded that internal or bank-specific factors explain a large portion of bank profitability. However, the results vary across countries since both datasets and environments differ (Athanasoglou et al. 2008). Therefore, the latest studies tend to consider the combination of both internal (bank-specific) and external (industry-specific and macroeconomic) factors.

Taking into the consideration all the above mentioned, the aim of this chapter is to investigate the credit risk-profitability relationship and to identify other influential factors and analyse the nature of their impact in determining bank profitability. The comprehensive analysis will encompass both internal and external factors and will be performed using dynamic panel model on the unbalanced panel data on banks operating in Croatia in the 11-year period from 2003 to 2013. In this way, the obtained results will be more complete and credible and will give an insight into the bank performance issue in the context of a developing country such as Croatia.

The chapter is organized as follows: Sect. 2 presents literature review on bank profitability determinants; Sect. 3 describes data, variables and the model; the empirical findings are presented in Sects. 4 and 5 summarises the conclusions and recommendations.

## 2 Determinants of Bank Profitability

Internal or bank-specific determinants relate to bank features such as its risk, size, capital and efficiency. These attributes are specific to each individual bank and are under the control of bank management.

The main drivers of bank profitability, mostly used in empirical investigations, and their potential influence on profitability are explained below. Bank risk exposure includes credit risk, liquidity risk and solvency risk. Credit risk is by far the most significant risk banks face and its accurate measurement and efficient management is extremely important. It exhibits the probability that the client who borrowed funds from the bank will fail to fulfil his/her obligations to the bank. If the debtor cannot pay the whole or a part of the amount of the principle and interest, this can have a negative effect on bank earnings and its overall performance. A commonly used indicator of credit risk is ratio of loan-loss provisions to total loans granted (e.g. Anthanasoglou et al. 2005, 2006; Košak and Čok 2008; Kundid et al. 2011; Ćurak et al. 2012, 2012; Petria et al. 2015; Capraru and Ihnatov 2014; etc.). Higher provisions indicate poorer asset quality, higher risk and higher probability of loans to become non-performing. Thus, it is expected that loan-loss provisions to loans negatively influence profitability. Some authors (e.g. Kundid et al. 2011), use total bank loans over total asset as an indicator of credit risk with a similar, negative effect on bank profitability. Namely, higher loans to asset ratio can also indicate a higher credit risk due to an increasing number of potentially default borrowers (unpaid loans) which can ultimately decrease bank profitability. However, the

positive influence is possible as well and it can be explained through risk-return hypothesis—higher loan to asset ratio implies higher credit risk exposure which needs to be compensated through higher returns and ultimately improved overall profitability. An increase in credit risk can gradually lead to liquidity and solvency problems. Liquidity risk reflects the possible inability of the bank to meet its obligations which can eventually lead to bank failure. The exposure to liquidity risk is usually measured as ratio of loans to deposits (e.g. Kosmidou et al. 2005; Ćurak et al. 2012; Capraru and Ihnatov 2014). In order to reduce liquidity problems, bank holds a higher amount of liquid assets (lower loan to deposit ratio) which can be easily converted to cash. However, liquid assets usually have lower rates of return. Therefore, higher liquidity, and consequently lower liquidity risk (lower loan to deposit ratio) would imply lower profitability (liquidity-profitability trade-off). A ratio of total bank loans over total assets can also be used as an indicator of bank liquidity (e.g. Kundid et al. 2011). Liquidity risk occurs with an increase in loans relative to total assets. On the other hand, granted loans earn interests and consequently increase profits. Thus, increase in the amount of granted loans leads to an increase in liquidity risk and to an increase in profitability (positive relationship). Solvency risk, usually measured with ratio of equity to total assets, is related to the capital strength of the bank. Higher capitalization (higher ratio and lower solvency risk) serves as a safety cushion and allows the bank to absorb shocks that it may experience. However, creditworthiness of better capitalized and safer banks encourages the confidence of depositors which lowers interests as funding costs and the need for external financing, thereby lowering interest expenses.

The effect of bank size on profitability is ambiguous. Larger banks are more able to exploit the advantage of economies of scale in transactions which can lead to cost advantages and greater operational efficiency and can ultimately result in higher profits (positive relationship). On the other hand, if a bank becomes too large, it can be affected by bureaucracy, inertia and difficulties in monitoring (negative relationship). Size is usually measured by the natural logarithm of total bank assets.

Cost efficiency is a result of improved cost management and can ultimately lead to higher profitability. A usual proxy for cost efficiency is the ratio of operational costs to assets (or income). Lower the cost to asset ratio, higher the profitability, thus, negative relationship is expected.

External factors are beyond the control of the bank management and are related to economic and legal environment that affects the operation of all financial institutions in the system. They include industry (market) factors, i.e. market concentration and/or competition, and macroeconomic factors, such as economic growth and inflation.

The relationship between market concentration and profitability is uncertain and is usually explained using two opposing hypotheses. Structure-Conduct-Performance suggests a positive concentration-profitability relationship. Namely, concentration on the market creates less favourable conditions to borrowers—lower interest rates on deposits and higher rates on loans which is in turn favourable for banks and consequently leads to their higher profits (positive effect of concentration on profitability). According to the other approach—Efficiency Structure

Hypothesis, a negative relationship is expected between bank concentration and its profitability and it is explicated via bank higher cost efficiency. Efficient Structure claims that the size matters for profitability because it is scale-dependent. A bank can earn higher profits because it is able to produce at lower costs in comparison to the competitors. Bank concentration variable is expressed by either concentration ratio ($CR_n$) or Herfindhal-Hirschman Index (HHI). $CR_n$ indicates the market share of *n* largest banks in total banks' assets or deposits. Higher the CR ratios or the HHI, higher the concentration.[1]

To account for the effects of macroeconomic factors on bank profitability, researches usually include economic activity (growth) and/or inflation. GDP measures total economic activity while GDP (per capita) growth shows its annual change. The GDP growth should increase bank activity and consequently increase its profitability. Namely, during positive economic conditions, the demand for bank products increases and the result of increased bank lending activities positively affect its profitability. Inflation affects both bank costs and revenues and thus can have either a positive and negative impact on profitability. A higher (anticipated) inflation rate increases interest rates on loans and thus increases bank profitability. However, higher interest rates on loans can adversely affect the ability of bank customers to repay their loan obligations leading to decline in bank profits. It is usually measured as percentage change in consumer price index.

The measures of bank performance most commonly used in empirical studies are return on asset (ROA), return on equity (ROE) and net interest margin (NIM). Each of these indicators has its (dis)advantages, however, ROA is considered to be the key ratio for evaluating bank performance (Anthanasoglou et al. 2005, p. 13) because as a comprehensive measure it shows the ability of bank management to generate profit from all available bank assets (ROA is calculated as the ratio of net income to bank asset) (For more details on bank performance measures, see Žager et al. 2008).

## 3 Data, Variables and Model

Data for all variables used in this research for the period from 2003 to 2013 are collected from two main sources. Data for bank specific and industry specific variables are extracted from bank's bulletin, and data on macroeconomic indicators are collected from the World Bank database available on the World Bank's website.

All data are reported at annual level. The sample consists of all banks that have been in operation in the observed eleven-year period. Table 1 presents variables used in the analysis, their calculation and expected sign according to theoretical explanations.

[1]For extensive discussion on industrial concentration and bank performance see i.e. Pervan et al. (2012).

**Table 1** Definition of variables and their calculation

| | Variable | Calculation |
|---|---|---|
| Dependent variable | Return on asset (ROA) | Net profit/total asset |
| Independent variables | | |
| Internal factors (Bank-specific) | Credit risk | Loan loss provisions/total loans |
| | Liquidity risk | Loans to total asset |
| | Operating costs | Operating costs to total assets |
| | Bank size | Log total asset |
| External factors | Concentration | CR 2 |
| | Economic growth | GDP per capita growth |

Bank specific variables included in the analysis are those related to credit risk, liquidity risk, operating cost management, and bank size. Industry-specific variable is concentration, and economic growth is macroeconomic determinant of bank profitability. The Pairwise correlations coefficients for all the above mentioned variables, which were included in the model, proved nonexistence of the multicollinearity problem in the proposed model.[2]

The dynamic nature of the observed economic relationships requires the estimation of the dynamic panel model which is characterised with the presence of lagged dependent variable among the regressors. The following dynamic model is applied:

$$ROA_{it} = \alpha + \eta ROA_{i,t-1} + \beta X'_{it} + u_{it} \quad (1)$$

where $ROA_{it}$ is the profitability of bank $i$ at time $t$, with $i = 1,\ldots, N$ and $t = 1,\ldots, T$. $\alpha$ is a constant term. $ROA_{i,t-1}$ is the lagged dependent variable. $X'_{it}$ is a set of explanatory variables. $\beta$ is the vector of coefficients to be estimated. $u_{it}$ are error terms that are assumed to be identically and independently distributed with mean 0 and variance $\sigma_u^2$.

Regarding estimation, generalised method of moments (GMM) panel estimator was used. It was developed for dynamic panel models by Arellano and Bond (1991) and Arellano and Bover (1995). The two-step Arelano and Bond GMM estimator was used.

In order to test the validity of the model, two types of tests were performed. The validity of the instruments was tested by the Sargan test. It is a test of the overidentifying restrictions with null hypothesis that there is no correlation between the instruments and the errors. Accepting the null hypothesis means that the chosen instruments are valid. The second group of test refers to tests of serial correlations in the differenced residuals—[first-order (m1) and second-order (m2) serial correlation]. The existence of the first-order serial correlation in the differenced residuals does not imply inconsistency of the estimations. Namely, the condition for

[2]Correlation matrix and descriptive statistics are available upon request.

consistency of coefficients estimations is that there is no second-order serial correlation in the differenced residuals.

## 4 Empirical Results

Table 2 presents the results of dynamic panel analysis of determinants of bank profitability. According to the Sargan test the chosen instruments are valid. The tests of serial correlation in differenced residuals show that there is no first-order or second-order serial correlation.

Several other bank-specific variables, usually found in other studies, were included in the model, but either produced inconsistent results or showed high correlation and therefore were excluded from the model. The set of macroeconomic variables was expanded to include GDP per capita, inflation and interest rates. However, the mentioned variables were found to be highly collinear with GDP growth, so they were omitted from the analysis.

The results of the analysis presented in Table 2 show a statistical significance of all independent variables except variables liquidity risk and GDP growth. Credit

**Table 2** Panel data estimation of bank profitability determinants

| Explanatory variables | Dependent variable: Return on assets (ROA) |
|---|---|
| | Coefficients (Standard errors)[a] |
| $ROA_{t-1}$ | 0.163*** (0.0214) |
| Credit risk | −0.454*** (0.0148) |
| Liquidity risk | 0.00603 (0.00735) |
| Operating costs management | −0.239*** (0.0549) |
| Bank size | 0.495*** (0.115) |
| Concentration | 0.0765** (0.0307) |
| GDP growth | 0.00595 (0.00530) |
| Constant | -9.751*** (2.849) |
| Sargan test (p-value) | 0.2392 |
| First-order correlation ($m_1$) | 0.2274 |
| (p-value) | |
| Second-order correlation ($m_2$) (p-value) | 0.1938 |

[a]***, ** and * indicate significance at the 1, 5 and 10 percent levels respectively
Source: Authors' calculations

risk variable proves a negative and statistically significant impact on bank profitability which is in accordance with elaborated expectations. This means that banks that have a larger amount of reservations compared with the total amount of loans experience lower profitability. In other words, bank profitability is reduced as a result of clients' loan repayment inability. This implies that the implementation of adequate policy of identification, measurement and managing credit risk as well as improvements in existing credit policy would to a certain extent reduce the credit risk because it would reduce the problem of moral hazard and negative selection. The variable *liquidity risk* proves to be statistically insignificant, although a positive coefficient sign of the ratio granted loans to total asset is in line with expectations. The results of the analysis show that operating costs negatively affect bank profitability. Thus, improvements in cost management would result in a better efficiency and ultimately profitability. The parameter of size variable is positive and statistically significant and it is in line with expectations as it indicates the presence of economies of scale in the banking sector in Croatia. The concentration in the banking industry has a positive effect on profitability implying that higher concentration leads to higher profits (as predicted by the SPC hypothesis). GDP growth variable shows expected (positive) sign but it is statistically insignificant. Statistically significant coefficient of bank profitability in the previous period confirms the dynamic nature of the panel model. The results of this research are consistent with findings of some of the aforementioned studies.

## 5 Conclusion

The chapter investigates the effect of credit risk and other potential determinants on profitability of banks in Croatia in the period from 2003 to 2013 applying dynamic panel data analysis.

The results support the importance of credit risk management in creation and improvement of bank profitability. Banks should ensure sound credit risk policies and increase the efficiency of credit analysis and debtor selection as well as their monitoring once the credit has been approved. Additionally, improved cost management, which results in reduction of operating costs, can increase bank efficiency and contribute to an increase in bank profitability. Besides the above mentioned internal factors, bank profitability is positively affected by industrial concentration. However, the macroeconomic variable of economic activity growth shows no statistical significance. This influence needs to be investigated in more details, broadening the set of potentially influential internal as well as external factors. Namely, further research should take into consideration other credit risk measures as well as other profitability indicators. Additionally, an inclusion of other variables that more deeply disclose macroeconomic conditions and/or institutional environment could contribute to more complete picture of bank profitability in Croatia.

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# New Role of Mutual Insurers on the Insurance Market

**Marietta Janowicz-Lomott and Adam Śliwiński**

**Abstract** A phenomenon in the insurance industry is that both mutual and stock firms dominate the market. Mutual and stock companies differ fundamentally. In a mutual organization, consumers are also owners. They provide capital and bear the risk. And because of that the mutual form is free of the conflict of interest between the owner and the consumer. In stock organizations, the owners and the consumers are distinct. The owners supply capital and receive the residual value; the risk is shared between the owners and consumers.

For many years in the literature, we try to find out the causes of coexistence of mutual and commercial insurers. The issue has been pointed out in the theory of enterprises (mainly the theory of agency) or the theory of finance (in connection with the effectiveness or availability of capital).

At the same time, in the last several years, we could observe a change in the concept of financial institutions' operations. They no longer play a subordinate role to the real economy, and they have become a generator of profits for investors. A clear result of such action was the financial crisis 2007–2008. However, it seems that this trend is not stopped in the insurance sector. Such action involves a loss of confidence in financial institutions by customers.

In the chapter, the authors analyse whether and how the paradigm shift operation of insurance affects the mutual insurance companies. The authors verify the hypothesis that the formula of reciprocity allows mutual insurers not only easier to survive crises of confidence in financial institutions, but even improve their market position.

To achieve the objective of the chapter, the authors analyse literature and the situation of mutual insurers in the European insurance market (with special emphasis on the countries of Central and Southern Europe).

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## 1 Introduction

Financial crisis of 2007 seems to be one of the major effects of the change of financial paradigm where finances started to be perceived as the sector generating extra profits. This crisis affected the whole financial sector, including insurance companies (for more, see Janowicz-Lomott and Lyskawa 2011). In the recent years, financial institutions as well as products and services offered by them have become extremely complicated and complex. By some of the authors, the complexity and luck of understanding of financial products was one of the main factors of the crisis (Gigerenzer 2014). Also, the role of global corporations, including financial ones, has been systematically growing.[1] As a result, financial institutions have weaker relations with their clients, yet at the same time they are becoming incredibly profitable. The effectiveness of their activity before the American crisis was immense [measured at least with the Return on Equity (ROE)]—in case of banks, the effectiveness of equity exceeded even the ROE for companies listed in FORTUNE 500. Nonetheless, it needs to be stressed that such financial results of the banking sector before the crisis result mainly from the increase in mergers and acquisitions (M&A), securitization, trading in the security or derivative sales rather than from banking activities in the strict sense (Steindell 2011). The decrease directly connected with the financial crisis of 2007–2008 was hampered in 2009 and since then slow increase in the profitability of financial institutions in the USA has been observed (Fig. 1).

In many European countries in the period of crisis, the profitability of equity involved in the insurance market also visibly decreased, it was even negative in, for instance, life insurances in Belgium, Italy, Portugal or non-life in Belgium, Italy, Portugal, and Slovakia (Table 1). However, alike in the case of the USA, it quickly started to have upward trend:

- in life insurances in none of the analysed countries in 2013 it was negative, in 9 (out of 20) it exceeded 10%, only in three cases it was below 5%.
- in non-life insurances in two countries ROE remained negative in 2013, nonetheless, in 10 it exceeded 10%, including Poland,[2] Finland and Slovakia where the ratio reached almost 30%.

Therefore, it may be concluded that so far only short-term curbing of profitability trend among financial institutions has been observed and currently they are

[1]Consequently, financial institutions that were created were "*too big to fail*". In the face of crisis, they are subsidized with the money of tax payers in order not to evoke panic on the market and avoid the so-called *contagion effect*. As a result, public money has been "the prize" for completely irresponsible policy of, for instance, AIG board of directors whose 80% of shares was taken over by the US government for 85 billion USD in 2008 and 30 billion USD in 2009, or in the banking sector, just to name Bank of America, Goldman Sachs, Citygroup or JP Morgan Chase.

[2]For more, see (Sliwinski et al. 2013).

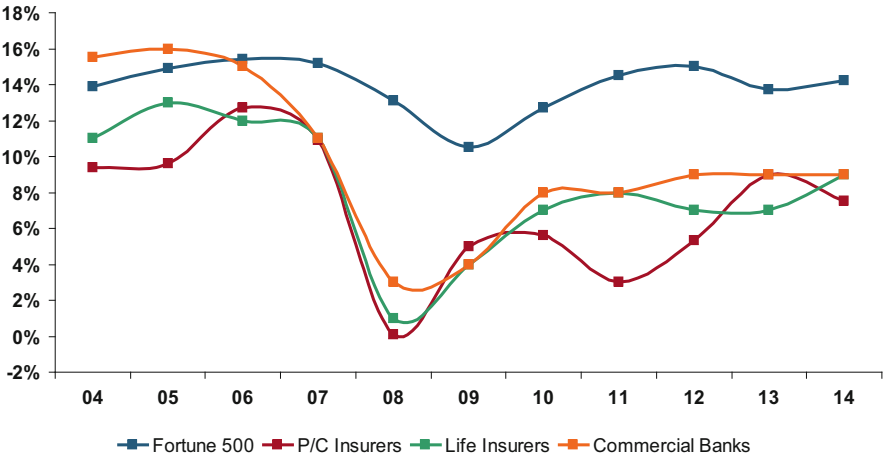


**Fig. 1** Return on equity by financial services sector vs. Fortune 500, 2004–2014. Source: (Hartwig 2016)

slowly getting back on track with regard to expected high profitability. However, it may be stated that earlier activity of financial institutions and the crisis of 2007 have negatively verified three basic ideas which form the basis of modern economy:[3]

1. Economic rationalism as a result of which all economic decisions are based on rational premises—measures of effects regarding financial decisions. Moral or ethical aspect of behaviour is completely ignored and the basic aim of such activity is increased profit or company value (including financial company!).
2. Market reliability—in 2007 the "invisible hand" of the market failed. It turned out that the market is not self-regulatory. Also, lack of effective control over the financial market and its members became clearly visible.
3. The credibility of accounting and rating information was seriously undermined as a result of incorrect evaluations of rating agencies. Financial engineering used in order to "polish" financial information allowed to mislead the investors and the whole market.

We cannot clearly state that we are already dealing with the crisis of trust to financial institutions. Nonetheless, the effect of this situation is visible in the insurance sector among its members whose behaviours and expectations are changing (see Table 2).

Undermining key ideas and the aforementioned behaviour changes paradoxically have become a chance for insurance mutuality which originated from group solidarity and which aimed not at obtaining high financial results, but at cheap and reliable insurance protection.

[3]For more, see (Robbs 2009).

**Table 1** Profitability of Return on Equity (ROE) of insurance companies in selected European countries in 2008–2013

| | | Life | | | | | | Non-life | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
| 1 | Belgium | −29.3 | 10.9 | 5.9 | 3.4 | 10.6 | 8.0 | −8.1 | 5.4 | 7.6 | 5.7 | 6.2 | 4.0 |
| 2 | Czech Republic | 6.8 | – | – | 14.0 | 9.9 | 11.3 | 0.9 | – | – | −8.4 | −2.7 | −7.8 |
| 3 | Denmark | – | – | – | 3.0 | 9.6 | 3.2 | – | – | – | 6.7 | 15.0 | 11.5 |
| 4 | Estonia | – | – | 28.7 | 9.8 | 17.0 | 4.9 | – | – | 14.6 | 13.8 | 16.7 | 4.8 |
| 5 | Finland | – | – | 21.2 | −2.7 | 21.8 | 13.5 | – | – | 17.6 | 10.2 | 24.7 | 27.5 |
| 6 | France | 16.7 | 8 | 6.4 | 2.5 | 5.5 | 5.3 | 17.8 | 10.5 | 7.0 | 7.1 | 3.6 | 7.4 |
| 7 | Germany | 7.6 | 9.8 | 9.8 | 9.7 | 9.6 | 6.1 | 3.9 | 4.5 | 3.8 | 3.8 | 3.9 | 4.3 |
| 8 | Greece | – | – | 7 | −6.0 | −14.5 | 7.1 | – | – | 12.5 | 10.1 | 18.8 | 18.4 |
| 9 | Hungary | – | – | −13 | −0.8 | −8.1 | 6.6 | – | – | −5.6 | −32.9 | −6.3 | −13.5 |
| 10 | Iceland | – | – | 25.3 | 21.4 | 18.2 | 18.8 | – | – | 9.7 | 12.3 | 20.4 | 10.4 |
| 11 | Ireland | −0.9 | −7.3 | −6.1 | −8.2 | 10.5 | 14.5 | 6.1 | 18.5 | 8.7 | 10.0 | 16.1 | 9.2 |
| 12 | Italy | −17.3 | 6.4 | −2.6 | −16.5 | 25.1 | 9.9 | −7.0 | −2.0 | −8.3 | −0.6 | 6.2 | 7.0 |
| 13 | Luxembourg | 3.8 | 6.6 | 7.5 | 3.7 | 7.3 | 8.9 | 10.6 | 11.1 | 14.5 | 22.7 | 23.2 | 8.5 |
| 14 | Netherlands | – | 9.9 | – | – | – | 2.6 | – | – | – | – | – | 11.7 |
| 15 | Norway | – | – | – | – | 10.9 | 7.0 | – | – | – | – | 36.1 | 16.1 |
| 16 | Poland | 22.6 | 31.8 | 27.2 | 22.5 | 21.6 | 20.4 | 14.7 | 9.3 | 18.8 | 18.0 | 16.8 | 29.1 |
| 17 | Portugal | −8.4 | 13.2 | 16.2 | −7.8 | 17.6 | 30.6 | −0.9 | 3.9 | 2.0 | 3.0 | −0.1 | 0.5 |
| 18 | Slovak Republic | 6.5 | 0.1 | 7.7 | 6.1 | −3.8 | 9.4 | −5.9 | −0.5 | −31.5 | −43.5 | 19.3 | 27.0 |
| 19 | Spain | – | – | – | – | 24.6 | 13.9 | – | – | – | – | 11.2 | 11.3 |
| 20 | Switzerland | – | 14.6 | 13.1 | 20.7 | 8.0 | 10.5 | – | 16.4 | 20.2 | 16.2 | 16.9 | 22.6 |
| 21 | United Kingdom | – | – | – | 7.0 | 3.2 | 12.9 | – | – | – | −2.1 | 5.4 | 9.6 |

Source: Own elaborate based on (OECD 2014, 2013, 2011)

**Table 2** Trends in insurance market

| Trends in customer behaviour | Trends in the operation of financial institutions |
|---|---|
| More customers seeking a partner they can trust<br>More interest in sustainable business, safer financial institutions<br>Launch of ethical investment and actions<br>More and safer capital | Lower investment returns<br>More fraud in claims<br>More focus on price<br>Trends toward basic cover in insurance<br>Call for more capital<br>Trend toward consolidation<br>Increased regulation and supervision and consumer protection |

Conservatism in actions, which makes insurance mutuality stand out on the insurance market, constitutes its important aspect and, at the same time, a chance for this form of activity (Janowicz-Lomott 2010).

## 2 Mutual Insurances: Basic Rules of Functioning

Insurance market is characterized by the co-functioning of two types of insurance organizations. In contemporary insurances almost 30% of the premium goes to insurance companies whose activity is based on the idea of mutuality. The residual part of the premium is collected by the organizations (insurance companies) whose activity is based on commercial rules.

The idea of mutual insurances is derived from the very essence of insurance and dates back to antiquity. It stems from group solidarity and is realized by a local government body whose activity is based on self-help and altruism. Members of such organization aim at mutual insurance against negative effects of fortuitous events, and it is visible in their mutual readiness to compensate for the losses. Their goal, therefore, is providing cheap and reliable insurance protection.

Concluding, the most essential aspects of mutual insurances include:

- not-for-profit aim of activity
- more complex satisfaction of needs regarding insurance protection with respect to the scope of services, their quality, and price
- free membership and autonomous management
- self-governance

Scientific legacy on organization and functioning of bodies whose activity is based on mutuality can be categorized in two basic trends:

1. explanation of the reasons behind the coexistence of both concepts regarding insurance activity on the global insurance market
2. indication of characteristics which cause higher efficiency of one of the concepts

| | | | |
|---|---|---|---|
| commercial insurer | managers | owners | clients |
| mutual insurer | managers | owners = clients | |

**Fig. 2** Relations between the owner, client, and manager in various forms of insurance activity. Source: (Mayers and Smith Jr. 2000)

In order to explain the phenomenon of the coexistence of two completely separate concepts regarding conducting insurance activity, in the subject matter literature authors often point to the role of agency theory. This theory on company functioning is considered to be a part of modern enterprise theory which is classified as the so-called new institutional economics[4] (for more, see Williamson 1985b).

In insurance companies, the relations of agencies may concern four groups of stakeholders—owners, managers, policyholders, and employees (Noga 2009). In considerations regarding competitive edge (or its absence) in the relation between mutual and commercial insurer, groups of stakeholders are usually narrowed to three types (Janowicz-Lomott 2007b):

- owners who supply equity and in exchange are entitled to profit share of the insurance company
- managers who decide on organization, functioning, and financing of the insurance company
- clients who purchase service offered by the insurance company

Depending on the concept of conducting insurance activity, mutual relations between particular stakeholders may vary and, consequently, agency relations also are different (Fig. 2).

The essence of agency theory is based on the assumption that actions and goals of particular stakeholder groups (in theory primarily called agent and principal) are in conflict (at least partially) and verification of agent actions is difficult or costly to the principal. At this point, it is worth stressing different attitude to risk of both groups (contract parties may prefer other behaviours due to different risk attitude), incomplete contracts, and information asymmetry regarding both sides of agency relations. Another key condition is the occurrence of costs connected with entering into and execution of contract (principal–agent). One may distinguish three categories of agency costs (Jensen and Meckling 1976):

[4]New institutional economics concerns two trends associated with enterprise functioning—monopoly and efficiency. In the trend of efficiency, one can distinguish concepts of property rights, agencies, and transaction costs. For more, see (Gorynia 1999a). Also, it needs to be mentioned that in the subject matter literature there is no unanimity as for this division and in the works of some authors (Gabrie 1994) these theories tend to be merged [for more, see (Gorynia 1999b)].

- costs incurred by principal—in order to control agent and motivate them to act in accordance with the principal's interest
- costs incurred by agent—in order to gain principal's trust
- alternative (residual) costs—denoting loss of usefulness by principal as a result of different interests of agent and principal

Agency costs are, therefore, costs connected with reducing and solving conflicts which occur between stakeholder groups surcharged by the value of service (production) capacity lost as a result of inability to eliminate these conflicts from enterprise functioning (Birkmaier and Laster 1999). As per agency theory, institutions which are able to manage agency costs effectively, i.e. minimize them, gain competitive edge on the market (Fama and Jensen 1983).

In insurance companies, the basic agency conflict concerns owner–client relation. In the case of the first group, their key priority is maximization of company market value whereas for clients of key importance is minimization of premium and risk of unpaid claims. As for mutual insurance company, risk is shared within policyholders and policyholders provide the capital and own residual gains of losses. In stock insurance company, stockholders supply capital and claim the residual value of company.

Therefore, when insurance risk is high, the client chooses commercial insurance over the mutual one. In the subject matter literature, this is called policyholder incentive to free ride or to expropriate stockholder capital (Laux and Muermann 2010). Mutual insurance companies are subjects which engage in low risk activities since mutual insurances are more likely be found in business lines with lower underwriting risk (Smith and Stutzer 1990).

They are not forced (by owners) to produce good financial results at all costs contrary to commercial insurers where the investor expects high profitability or increasing company value which (in short or long term) will guarantee satisfactory return on equity invested in the company. As a result, stockholders put pressure on increasing investment risk—choice of more risky assets (connected with insurer investments) (Lamm-Tenant and Starks 1993). Priority of mutual is the interest of their members, not investors, which can be seen in greater predisposition to engage in activities ethical to its members as well as the whole community. In effect, all actions aimed at improving asset quality through financial engineering or creative accountings are not in the nature of mutual insurers.

In literature, one may come across views (verified historically) that periods of financial crisis and disasters are times of activity for mutual insurances and simultaneous equity withdrawal from stock companies (Laux and Muermann 2010). Doherty and Dionne (1993) while analysing mutuality in the 1980s pointed to the fact that when there are undiversifiable risks and the resultant external capital is costly, consumers will choose to bear risk themselves. This also explains the presence of mutual insurances in specialized business lines with high or unpredictable burden of losses (agriculture, medical errors, etc.). On the other hand, the research shows (Mayers and Smith 2005) that when risk is more predictable and external capital is more accessible, the stock firm is preferred.

As a result of incurred losses, investors reduce considerably their investment activity, which makes room for social activity and mutual insurances take over the market.

All the aforementioned subject matter literature considerations and trends on insurance market lead to another thesis which is worth considering: is this situation a real opportunity for mutual institutions to play a new role on the market and will it be taken?

## 3 The Position of Mutual Insurers on the Global Insurance Market

As per the theory, mutual insurances can fully perform the role of traditionally perceived insurer and, at the same time, they have the opportunity to take on the stabilizing role with respect to new policy of insurers. Is that the reality?

The analysis of the mutual insurers' situation is based on data from reports of ICMIF. ICMIF's definition of "mutual" (also "cooperative" which operates also on mutual principles) in this reports includes organizations whose legal status may not be classified as mutual in their national law, but whose structure and values reflect the mutual/cooperative form, i.e. companies which are owned by, governed by, and operated in the interests of their member policyholders (fraternal benefit societies, friendly societies, reciprocals, protection and indemnity (P&I) clubs, community organizations and foundations). For groups of companies, whether their operations are national or multinational, figures for the whole group, including subsidiaries (even when subsidiaries are organized as joint-stock companies) have been included. Where possible, business written outside the group's home country has been deducted from the national figures in the mutual market share data and added into the country where the business has been written.

In 2014, mutual insurers collected about 27% of the global premium, with 24.3% in life and 30.4% in non-life insurances. Also, 2014 was the first time since 2007 when a slight drop of mutual market share was observed (Fig. 3).

In 2007–2014, premium collected by mutual insurers increased (Fig. 4)—the dynamics has visibly decreased in the recent period (are echoes of financial crisis gone then?). In total in 2007–2014, the increase of premium on the whole market reached about 16% whereas in the same period the dynamics of mutual insurance reached almost 30%.

In order to provide a clear answer to the thesis formulated above, the market situation requires a thorough analysis. Though financial crisis of 2007 had a global character, it affected most severely the financial sector in North America (USA). This market has in fact the highest dynamics of mutual insurance (of course apart from developing markets of South America and Africa) (Fig. 5). Only in Asia this dynamics was lower than for commercial insurance (yet it is worth mentioning that

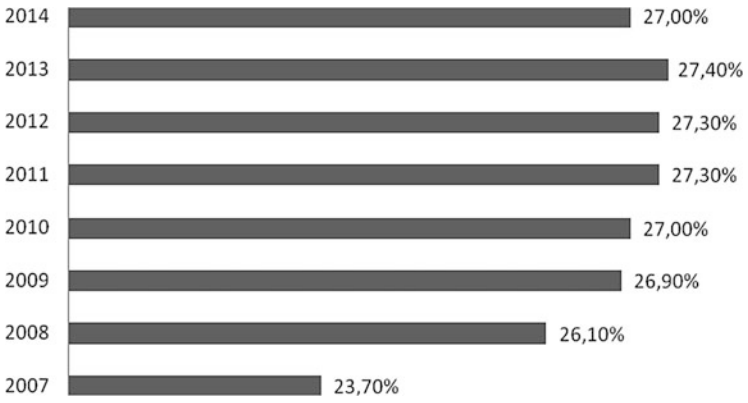


**Fig. 3** Global mutual market share. Source: Own elaborate based on ICMIF Reports

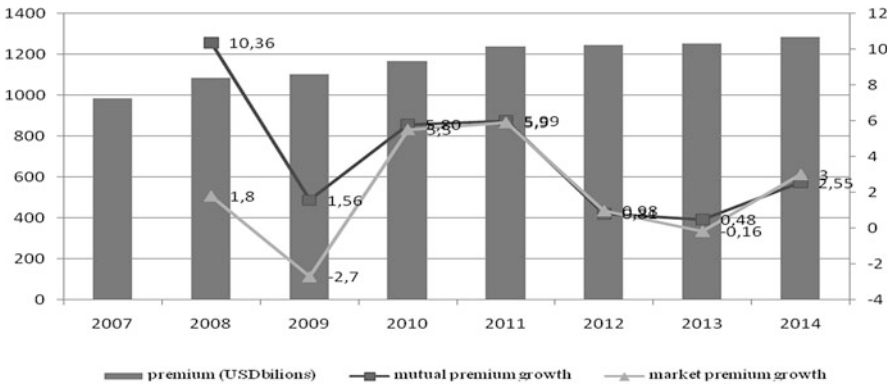


**Fig. 4** Global mutual premium and global premium growth (2007–2014). Source: Own elaborate based on ICMIF Reports

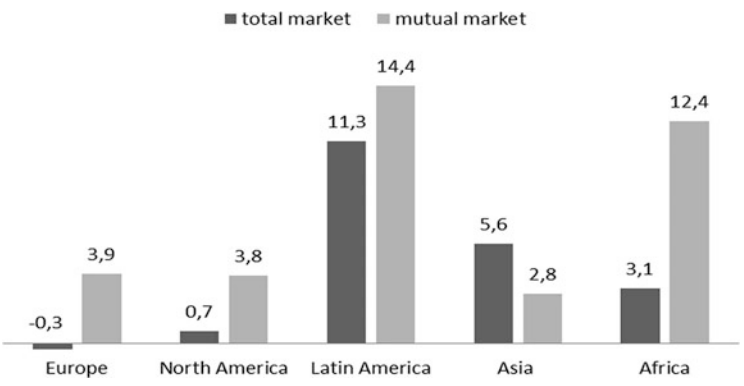


**Fig. 5** Regional market and mutual compound annual growth rates (CAGR) (2007–2014). Source: Own elaborate based on ICMIF Reports

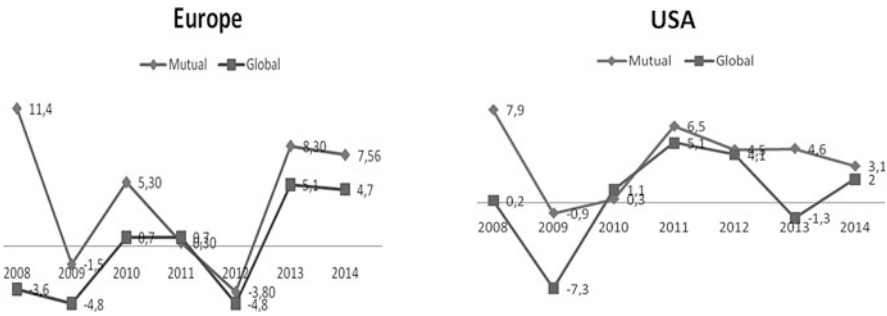


**Fig. 6** Global and mutual premium dynamics in Europe and the USA. Source: Own elaborate based on ICMIF Reports

the most dynamically developing Chinese market in this period lacks mutual insurance).

It is clearly visible that in 2008–2014 in Europe and the USA the tendency of increased mutual dynamics was preserved almost in all analysed periods (Fig. 6).

As investment activity of insurance companies generates key profits for insurers (Janowicz-Lomott 2011), it is worth analysing the investment structure of insurers in comparison to insurance companies operating in life and non-life sectors in these countries (Fig. 7). The analysis was conducted in those countries where mutual insurers have the highest assets.[5]

In the case of the USA, France, and Japan, the structure of mutual insurers was close to long-term (life) insurances, which confirms the thesis of "safer", long-term investments presented in the subject matter literature. Nonetheless, situation in such countries as the Netherlands, Germany, or the UK does not confirm it (in portfolios of mutual insurers one may observe a high share of stocks, bigger than in life or non-life sector).

## 4 The Role of Mutual Insurers in South and Southeast Europe

Mutual share in the market of selected South and Southeast Europe countries is strongly varied—from a dozen or so per cent in Greece or Croatia to several dozen in Hungary or Slovakia (Fig. 8).

[5]The USA was the largest mutual market in terms of invested assets in 2014 with almost USD 2 trillion in investments. Japan (USD 1.6 trillion) was the second largest, followed by the European markets of France (USD 856 billion), Germany (USD 838 billion), and Denmark (USD 292 billion). These five markets accounted for almost 80% of the global mutual sector's aggregate investments in 2014.

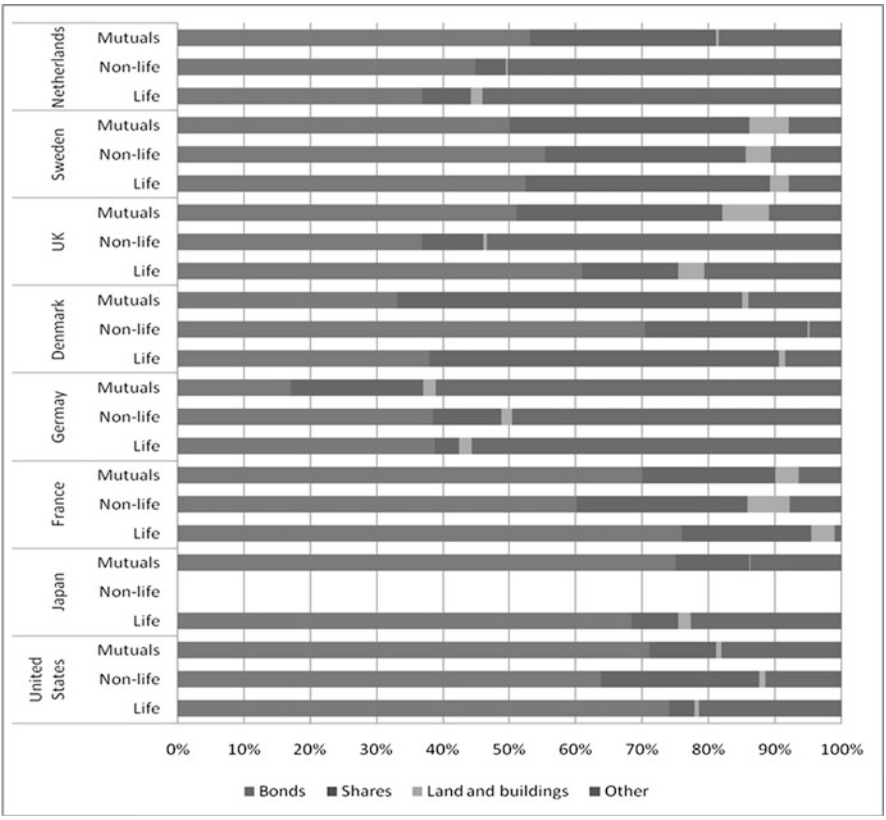


**Fig. 7** Investment structure of mutual insurers, life and non-life on selected insurance markets in 2013. Source: Own elaborate based on OECD and ICMIF Reports

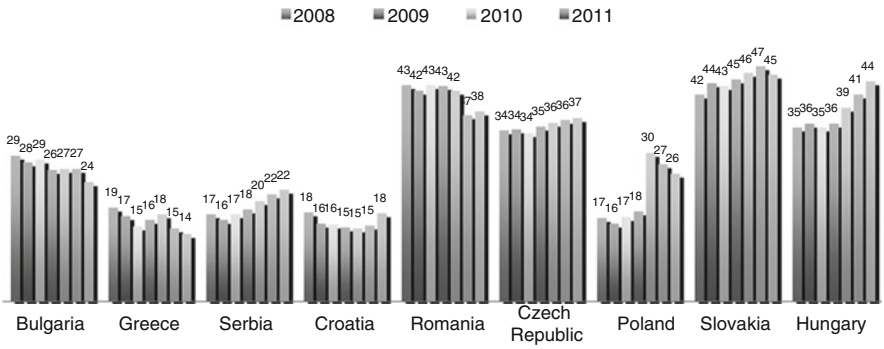


**Fig. 8** Mutual market share in selected South and Southeast Europe countries. Source: Own elaborate based on ICMIF Reports

Yet it is worth noting that the aforementioned method of research assumed by ICMIF determines observations regarding mutual insurances for Southeast and South Europe. With the exception of the Hungarian market, where there are also a number of local mutuals, the largest mutual sectors in these Eastern European markets were composed of subsidiaries of multinational mutual groups from Austria, Germany, and Spain. These were mostly the result of acquisitions of formerly state-owned companies following market privatization reforms.

As a result, mutual share in Slovakia in 2014 reached 45% even though there were no legal regulations allowing the creation of TUWs in this country (alike in Lithuania, Estonia, or Czech Republic)—the whole share concerns stock firms owned by mutual insurance companies. In Poland in 2014, the mutual share in the market (calculated with premium collected by TUWs only) was below 3%, but the statistics conducted by ICMIF included also stock firms owned by, for instance, HDI, Signal Iduna, Vienna Insurance Group.

While analysing the biggest European institutions based on the idea of mutuality, it is easy to observe that the majority of them owns subsidiary entities in Southeast or South Europe (Table 3).

In effect, it is difficult to observe any regularity associated with premium dynamics in mutual insurances and on insurance markets of Southeast or South Europe. In countries like Bulgaria, Greece, or Romania, the dynamics of mutual premium is negative in "post-crisis" period and this sector share in the insurance market decreased many times more sharply as compared with the whole insurance market. Nonetheless, it does not result from increased or decreased popularity of

**Table 3** The 16 largest mutual insurers in Europe in 2013

| Rank | Company | Country |
|---|---|---|
| 1 | Credit Agricole Assurances | France |
| 2 | Achmea | Netherlands |
| 3 | Unipol | Italy |
| 4 | Covea | France |
| 5 | R+V Versicherung | Germany |
| 6 | MAPFRE | Spain |
| 7 | HDI | Germany |
| 8 | Groupama | France |
| 9 | Debeka-Gruppe | Germany |
| 10 | AG2R La Mondiale | France |
| 11 | Vienna Insurance Group | Austria |
| 12 | CZ Groep | Netherlands |
| 13 | HUK-Coburg | Germany |
| 14 | MACIF | France |
| 15 | SIGNAL IDUNA | Germany |
| 16 | UNIQA | Austria |

Source: ICMIF Market InSights: Europe ICMIF 2013a, b http://www.icmif.org/market-insights-europe-2013

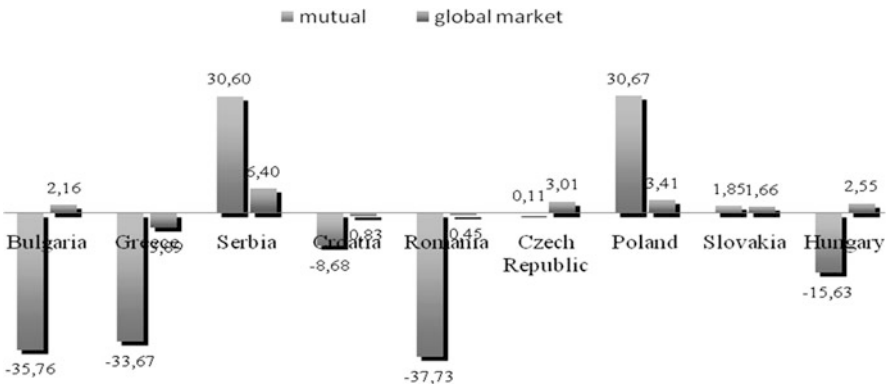


**Fig. 9** Global and mutual premium dynamics in selected South and Southeast Europe countries. Source: Own elaborate based on ICMIF Reports

mutual insurances since in this part of Europe entities perceived as mutual insurances by ICMIF are not perceived this way by insurers. It rather results from the policy of their owners. Therefore, it is not possible to assume any positive impact of mutual insurances on the insurance market in this part of Europe (Fig. 9).

## 5 Conclusion

Theoretical subject matter literature considerations allow to draw conclusions regarding the new role of mutual insurance on the insurance market. Mutual insurers, thanks to their common aim of providing complex and cheap insurance protection, could stabilize the insurance market.

Simultaneously, analysis of data from North America or Europe indicates visible curbing of mutual trend growth. Post-crisis actions aimed at greater control over financial markets did not produce the expected results regarding the insurers' return to traditional role. Excessive regulation led to even greater market concentration. Rigorous barriers to entry, high equity requirements, detailed control of offered products, limitations regarding portfolios of financial companies or, finally, limits on functioning diversification have counterproductive effect. It seems that financial institutions must have the real possibility of bankruptcy. Otherwise, the temptation of boards to run risky policy will never be eliminated. If we add to that rising costs of functioning[6] connected with introduction of new evaluation system of insurance company solvency—Solvency II, in Europe in 2016, insurance market concentration becomes obvious. This new system, Solvency II comprises a few dozen documents, a few thousands of pages and introduces many new rules. This amount

[6]Study conducted in the USA shows that there is 1.2 of employee dealing with financial supervision per one bank employee dealing with typical operations.

is unacceptable for small and medium-sized insurance enterprises who, though theoretically exempted from some regulations (proportional rule), still have to deal with such accumulation of regulations. Moreover, this system almost equalizes requirements for commercial and mutual insurance companies.

Such situation disturbs the functioning of small insurance companies (particularly of small mutuals) and in consequence leads to increased mergers and acquisitions (M&A) on this market. Strength of mutuality is clearly visible when these institutions have regional character and are connected with their client-member.

Instead of supervising and interfering, actions of supervisory bodies should focus on providing proper level of competition since the fewer entities on the market, the lesser is their diversification. This, in turn, affects the condition of the whole insurance market and curbing of the trend of traditional insurer role as the one who protects against the effects of fortuitous events may not work

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ICMIF Global mutual market share 2013b, ICMIF
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# Delistings from the Athens Stock Exchange: Recent Evolutions

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**Abstract** The aim of this chapter is to study the forces driving companies' exit from the Athens Stock Exchange (ASE). It also highlights the motives and the information on which this exit was considered as the most appropriate choice as well as the actions taken before, during and after the delisting process from the ASE. Moreover, the differences between voluntarily and not voluntarily delistings are highlighted and useful and valid conclusions from investors who are placed in diversified portfolios are indicated. The chapter attempts finally to give a brief overview of the current regulatory framework in Greece.

## 1 Introduction

Most major companies seek for listing in the stock market both in the developed and the developing economies. Basic criteria of free float to the public must be met for the listing of a company's shares in a stock market. Disposal of shares by the introduction of a company to the ASE, which acts as our market paradigm, is achieved either through an IPO, which gets the approval of the Securities and Exchange Commission and includes disposal of shares to institutional and private investors, or through a private placement and share capital increase. Each company listed on the ASE normally attaches great importance to the control, supervision and management of its wealth and business decisions relating to the share capital should promote the long-term interests of the company and the shareholders.

Capital markets are affected by the cycles of the economy, which conversely affects the stock market. The literature review indicates a large number of

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companies that declared a voluntary delisting, or were absorbed by other larger company, or were involuntarily shown the stock market exit (Aharony et al. 2011). This happens since each stock market has its legal framework, like any regulated market, in which the operating procedure and the way of introducing a company in the market are defined, while the same applies for the delisting of a company (Cholevas 1995). The aim of this chapter is to investigate in brief the legal and financial issues pertaining to the process of a company delisting from the ASE and analyze the reasons that lead a company to such a decision.

## 2 The ASE

The local stock market is a secondary market (Theodoropoulos 2001). Listing conditions to the ASE according to the Law include the following:

- The legal status of the company must comply with the laws.
- A specific amount of equity (at least one million euro and fifteen million euro for a small and large capitalization company, correspondingly).
- The duration of the company's life whereby published statements are required for at least three financial years.
- Tax audited results.

Respectively, for introduction of shares it is required:

- The company has legal ownership over those shares.
- Share must be freely transferable and there must not be a transfer problem in the statute. The company agreements with third parties must not prevent their negotiability, because of their contractual nature.
- With respect to the dispersion of the shares the company must be owned by more than one shareholder. Adequate dispersion is considered to be 25% of the shares belonging to different shareholders. The regulation requires 25% to belong to at least 2000 people, without anyone holding more than 2%. Exceptionally the company can be admitted in the exchange if the ASE finds that there may be further dispersed. Also, if it exceeds 5%, the ASE considers the company adequately dispersed. Finally, for the 25% the shareholdings of the company to other markets are calculated.
- All shares must be of the same type and grant equal rights. If the capital increases, then the new shares are freely transferable.

The admission steps to the ASE are the following:

- Assessment of the company's adequacy from the ASE and acceptance of the admission application.
- Organization of pre-marketing presentations by the Underwriter.
- Approval of the Prospectus by the Hellenic Capital Market Commission (HCMC) and administration Public Offering carry permit.

- Public Offer and raising capital.
- Approval for shares' listing by the ASE and filling of the dispersion criterion.
- Start of shares trading on the ASE.

The exclusion of a company from the ASE is a decision of the Securities and Exchange Commission or a decision of the company itself (Voulgari-Papageorgiou 2002). When it comes to a decision of the company, a decision by the General Assembly by 95% itself is required. A company may wish to withdraw from the ASE if:

- The stocks are gathered to the jurisdiction of one person.
- The objectives have not been achieved and it not worthwhile to remain in the exchange.
- The company wishes to avoid the costs associated with the stock exchange listing.

Companies' delistings can also be divided as follows:

- Hot delistings, when the company permanently leaves the ASE.
- Delistings from one and listings to another market.
- Change of category of trading (e.g. from high to low capitalization).
- Cold delistings, when there is a change in the company leading to the exit.

The delisting can be a punitive measure of the capital market committee as well, if it takes place, because of certain agreements affecting the operation of the market in general and investor protection needs (Kiohos 2001).

The ASE's trading system is used for the clearance of a company. The closing price is determined by the method of the weighted average of the 30% of last trades. Optionally, the company can determine the liquidity of its stock and to appoint a market maker. The market maker must be present in all markets with buy and sell orders, achieving satisfactory supply and demand to interested investors (Malindretou and Malindretos 2000). If there is a specific negotiations evaluation model, then this must be calculated (Mitsiopoulos 2001). Finally, when it comes to sectoral division of companies, the ICB model of FTSE/DowJones is applied.

A company may be delisted from the ASE following the decisions of the HCMC if it breaks the rules. Also, a company may apply for a voluntarily delisting to the HCMC and the ASE on its own. Most delisting cases result from non-compliance with financial standards, such as minimum net of income and minimum number of shares. Moreover, apart from non-compliance with numerical standards there are other factors that affect and lead to delisting from the ASE, such as:

- Failure to comply with good accounting practices, which refers to the non-publication of financial statements at the given timeframe.
- The establishment and perpetuation of conflict of interests.
- The inability to meet current debt obligations.
- The unusually low selling price.
- The negotiated volume.

## 3 Literature Review for Delistings from Stock Markets

According to Chaplinsky and Ramchandt (2006) in a paper referring to US stock markets, the most common form of voluntarily delisting from the stock market is companies that have a low turnover rate. The number of delisted companies for the years 2002 and 2003 was 150. A study in 140 delisted companies and 72 voluntary delistings was conducted in order to explain the reasons of delistings. The research resulted that the voluntarily delisting companies had low turnover.

Ongoing literature explains why companies benefit from the cross-listing (Witmer 2005). Minority shareholders may not know all actions of the administration and thus, they cannot see whether management acts for the interests of shareholders. To solve this problem, the management should be conducted with better scrutiny under the BoD that will be objective in their assessments. The management is committed to monitoring by the Securities and Exchange Commission, the auditors, the analysts, the U.S. stock markets, the institutional shareholders, the rating agencies and the boards.

Doidge et al. (2009) concluded that companies with higher control rights in relation to the rights of cash flows is less likely to be found at the delisting from the stock market. Sanger and Peterson (1990) refer to corporate bankruptcies leading to delistings and show through arguments that this tendency has been exaggerated to a range of issues, such as:

- The regulatory regime of the U.S.A. weakens foreign investors.
- It is difficult for the Securities and Exchange Commission to enforce the rules with foreign publishers.
- The corporate scandals of the 1980s were responsible.

Pagano et al. (2001) found that it is more likely that a country from the same cultural group to cross-list. They state that geographical proximity is an important determinant of the decision of multiple listing. The cultural proximity, is approached by such language or colonial background, and positively influences the destination choice list.

Globalization and technological advances have led to a steady change in the structure of the international equity markets. Companies operating globally are able to align their activities with corresponding international shareholder base by listing their shares on several exchanges simultaneously (Pfister and von Wyss 2010).

## 4 Methodology and Results

In this chapter we investigate companies' delisting from the ASE during the period 2000–2014. According to the ASE over these years approximately 200 companies were delisted or withdrawn from the ASE and 146 companies were listed at the same period. We list the reasons that led the companies to take this decision. Also,

there are delistings cases that were solely a decision of the HCMC as some company did not meet the necessary criteria to remain active on the ASE.

In our chapter, we indicate the reasons of delisting and we relate those to the economic situation of Greece. The key elements of our research are the following:

- We indicate the basic financial info of the ASE, in order to give a comprehensive picture of the state of the market during the delistings period.
- Percentage changes of the ASE every year.
- The business nature of the causes that led to deletions or withdrawals.

In Fig. 1 the closing Price Index of the ASE is given for the last years.

From data derived by the ASE, we observe that the majority of companies that have delisted were absorbed by another company already listed in ASE. Many companies were absorbed by non-listed companies, as well. The rest of the companies were facing financial problems and their delisting was the decision of the main shareholder. The recession and the collapse of the corporate earnings boosted the decision of delisting and resignation of companies from the ASE, since the cost of staying was growing and their liquidity was decreasing.

The companies' withdrawals from the ASE are mainly due to the economic problems that occur in companies due to the economic crisis. We analyze the companies' withdrawals starting from 2000, a period of economic prosperity, but yet, a difficult year for the ASE with a significant decrease. The General Stock Price Index closed at 3389 points, an overall annual decline by 38.8% (see Fig. 2). 2000 has been a difficult year for most stock markets worldwide.

Acquisitions of subsidiaries by multinationals in Greece and increased maintenance costs of a company on the ASE in connection with the collapse of prices has

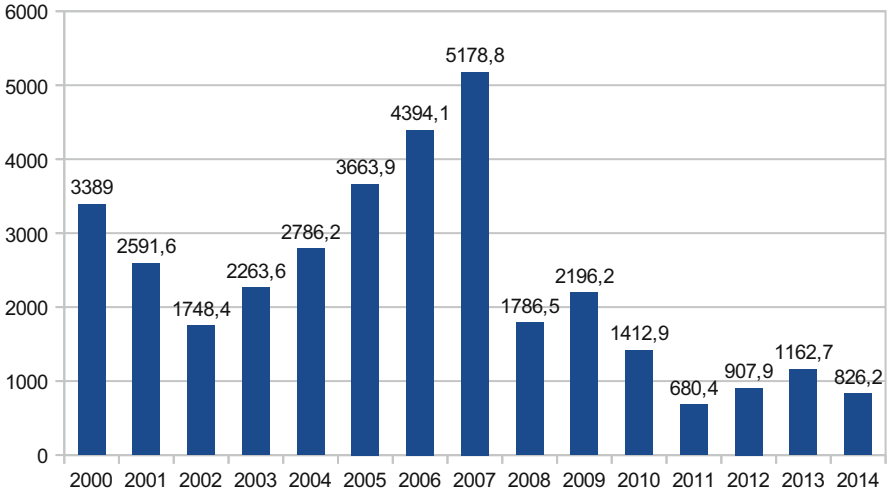


**Fig. 1** Price Index of the ASE in the years 2000–2014 (closing prices). Source: Annual reports HCMC: http://www.hcmc.gr/el/annualreports

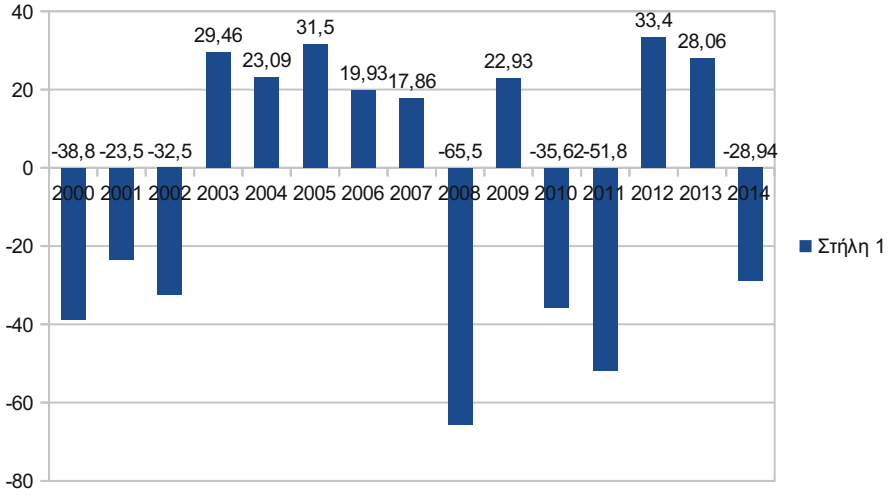


**Fig. 2** Annual percentage changes of the ASE general price index for the period 2000–2014 (Percentage %). Source: Annual Reports HCMC: http://www.hcmc.gr/el/annualreports

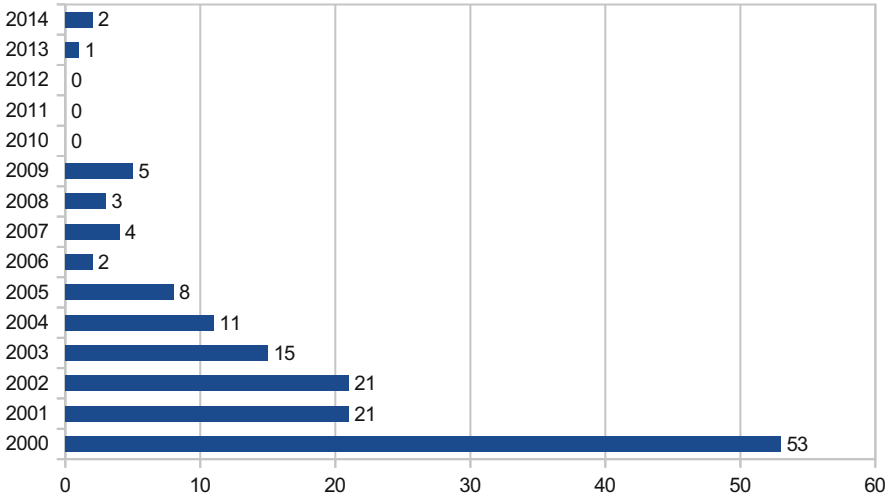


**Fig. 3** Number of new listings per year. Source: Annual Reports HCMC: http://www.hcmc.gr/el/annualreport

led since 2000 to a total number of delistings of around 200 companies. The large number of withdrawals was coupled with a reduction in public offers and corporate acquisitions. Listed companies withdrew from the ASE due to insuperable financial problems they were facing. Until the year 2000, 113 companies had listed in the ASE in very limited time (23 in 1998, 37 in 1999 and 53 in 2000, see Fig. 3). It was then that the huge demand for shares from small investors led underwriters to create a list of companies that might be involved in an Initial Public Offering. Most of

those companies it appears in retrospect did not fulfill the criteria for listing. The average market value in 1999 reached 135.25 billion euro, corresponding to approximately 130% of GDP. The following year, the ASE followed an adverse process according to the previous one. The Greek capital market led to correction in stock prices, fluctuation and decrease in trading activity. The General Price Index closed for the year 2001 at 2591.6 points, a decrease of 23.5% compared with the closing index in the previous year. In 2002, no major difference occurred even though it was a more difficult year than 2001. The General Index of ASE closed at 1748.4 points to an overall annual decrease of 32.5%. The downward trend was not very high, fluctuated due to the influence of Greek and international factors, with the mains one being the corporate governance scandals worldwide and especially in the USA. The improvement of the financial conditions and awareness of the importance of adopting modern corporate practices of government played an important role in contributing startups shareholders and corporate bonds on the exchange.

During 2003, the Greek economy maintained its growth momentum, despite the lower growth of the European economy. It was a year characterized by turning the international importance of corporate behavior of senior executives and board members of joint-stock were traded. The ASE's General Price Index closed at 2263.6 points presenting a total annual increase of 29.5% compared with the close of the index at the end of the previous year. The number of listed companies at the end of 2001 had reached the number of 342. Since 2003, 170 companies have withdrawn or delisted. During this period, the average stock market capitalization reached 152.51 billion euro due to new listings on the ASE.

2004 was the year that endorsed the adoption of competitive Corporate Governance practices. International developments affected the course of the Greek capital market, which was characterized by rising stock prices and trading activity on stock markets, derivatives and corporate bonds of the ASE (Angelopoulos 2001). The General Index of ASE closed at 2786.2 points, with an annual increase of 23.1%.

According to the annual reports of the capital market in 2005, there was a rise in stock prices, as the previous year. The Greek capital market has followed the international trends, confirming the significant correlation with international markets. General stock Price Index closed at 3663.9 points noting again an increase of 31.5%.

In 2006, the increase in stock prices continued in the Greek capital market. The relationship between changes in stock indices of Greek and international markets had increased showing that the Greek capital market followed the international developments. In 2006, there was also a slight increase in the average volatility of prices. The General Index of Athens Stock Exchange closed at 4394.13 points marking an annual increase of 19.9%. This increase was identified as one of the best stock returns that have occurred in the countries of the euro zone.

The upward trend continued in the following year of 2007 in the Greek capital market. The ASE General Price Index closed at 5178.83 points and recorded an annual increase of 17.9% compared with an increase of 19.9% in 2006. In 2008 there was a large decrease in the stock prices both in the international and Greek

capital markets. After five consecutive years of growth for the ASE's General Index, in the year 2008, one of the worst returns was recorded and the ASE was characterized by an increase in the average price volatility. In 2008, the General Price Index closed at 1786.51 points marking a decrease of 65.5% compared with an increase of 17.9%, in 2007. In 2008, 41 companies delisted from the ASE. n 2009 the ASE closed with a General Index of 2196.16 points by performing an annual increase of 22.9% against a drop by 65.5% in the previous year. In 2010, the General Index of ASE recorded an annual fall of 35.62% compared with an increase by 22.9% in 2009, closing the last meeting of the year at 1413.94 points.

The acquisitions made in 2010 by listed companies decreased compared to 2009, as reported by official corporate announcements in the Daily Official List of the ASE and press releases posted on the ASE online. Specifically, 26 listed firms repurchased shares, while in 2009, 25 listed companies had acquired 30 companies of which one was listed and the remaining unlisted.

2011 was a difficult year for the Greek economy and society, characterized by fiscal consolidation efforts that aimed at the stabilization and recovery of the economy and the impact of the ongoing recession and the European and International programs of stability across Greek crisis was evident in the Greek capital market. These developments affected the course of European capital markets to an extent and of course the Greek capital market. In 2011, the General Index of ASE closed at 680.42 points and dropped by 51.88% coupled with a significant decrease in the volume of transactions. In 2012, the General Price Index of ASE closed at 907.9 points with an increase of 33.4% and significant volatility throughout the year.

In Table 1 the delisting reasons are outlined while Fig. 4 graphically represents the derived reasons that drive delistings.

At the beginning of the year there were downward trends due to the negative impact of political and economic factors such as:

- The evolution of the debt crisis in the eurozone.
- The deterioration of financial figures of banks from participating in government bond exchange program (PSI).
- The deterioration of the economic growth rate of the country and investment prospects.
- The two consecutive elections.
- The Greek economic crisis led in 2009–2012 the General Price Index to low levels, similar to those of 30 years ago, to 450 units, when it initially started

**Table 1** Number of delistings per category of delisting

| Reasons for delisting | No per category |
|---|---|
| Mergers | 99 |
| Financial difficulties | 85 |
| Squeeze out | 31 |
| Buyout from non listed firm | 11 |
| Low annual revenues | 1 |

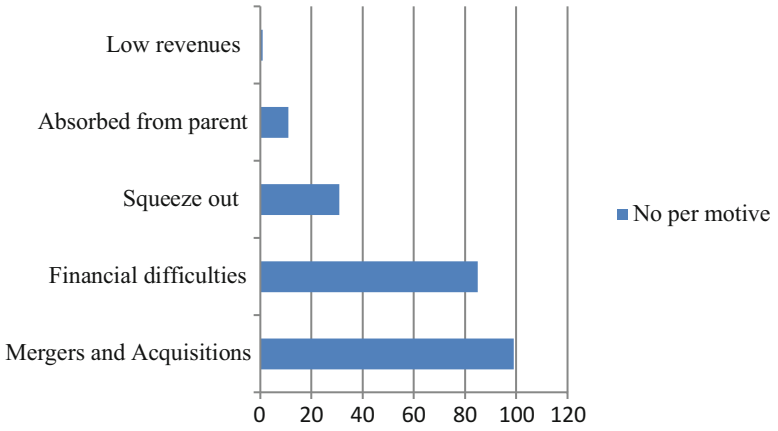


**Fig. 4** Representation of delistings motives

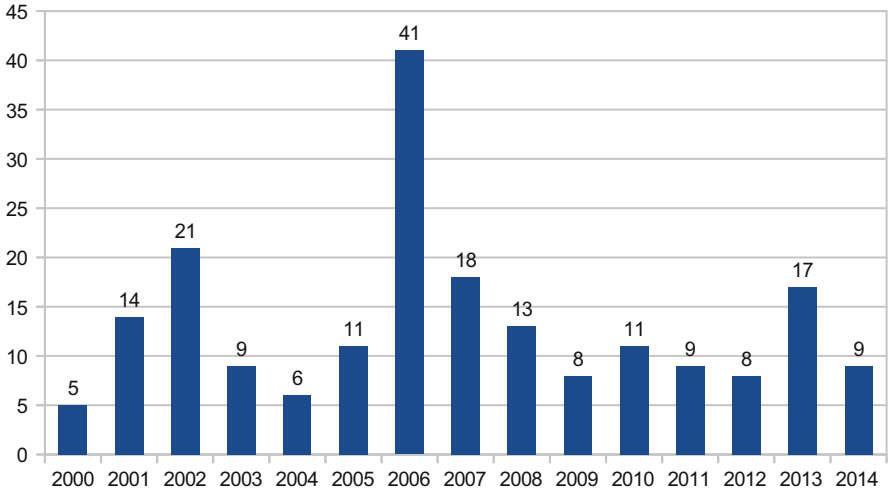


**Fig. 5** Number of delisting companies for the period 2000–2014. Source: Annual Reports SEC: http://www.hcmc.gr/el/annualreport

rising. Although the values in the stock markets are certainly changing when there is no significant attraction of new companies or without other listed companies that have currently limited critical mass to attract international funds, they bring the ASE to a difficult situation.

In 2011, 9 listed companies and in 2010, 11 companies were delisted (see Fig. 5). During 2009, in which the crisis started in Greece, four listed companies had delisted as a result of a tender offer. In the coming years, in 2013, the General Index of ASE closed at 1162.68 points marking an annual increase of 28.06% and in 2014 the General Price Index closed at 826.18 points.

The year of 2014 was important for the ASE, because the largest technological and institutional upgrading of the last decade was completed, with the association of stock and derivatives markets and upgrading environmental clearance. The management of the Hellenic Exchanges (HELEX) seeks to attract new companies to the market, since from 2010 until 2012 there was no new listing and in 2013 there was just one new listing company, while the delistings in 2012 were 7 and in 2013 were 14. In 2014 there were 9 delisting. Currently the target of HELEX is to improve the role of the corporate bond market, in order for the listed companies to be able to raise capital by supporting their investment programs.

## 5 Conclusions

In this chapter, necessary notions for a company to be listed and delisted in the ASE were introduced. We reported the stages and the certificates required in the case of a new listing on the ASE. We analyzed the reasons that can lead to a delisting of companies from the ASE and the reasons for a voluntarily withdrawal from the ASE given the surge towards the exit over the last 15 years.

We presented also the companies that were driven to delisting from the ASE during the years 2000–2014. The majorities of companies withdrew or were delisted, because they reached bankruptcy first. A small percentage of companies were delisted after a merger or acquisition with other more economically powerful company, while very few continued their activities after they delisted from the ASE in the case of involuntary delistings.

In an effort to improve the role of the ASE and the market's prospects we concluded that on the past and along with the mistakes that have taken place, an important reason for companies' delisting from the ASE was the lack of control of listed companies. The lack of control led in many case to a delisting of a listed company from the ASE because of weak corporate governance and audit mechanisms. The total number of delistings is not for this reason the result of the economic crisis, but a significant portion is due to poor information quality from the companies to the greater public. These reasons amongst others have led to the lack of confidence of Greek investors to the capital market.

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