CHAPTER 5

Understanding the Basics from a Contemporary Perspective

What does the Fed think about how the economy functions and how the institution itself makes, conducts, and discusses its monetary policy? This chapter elucidates the general principles of the Fed's views. Thus, it affords useful background for the detailed chapters that follow on the Bernanke era, which of course can't avoid these issues. Federal Reserve personnel and conventional macroeconomists predominately see eye to eye, though both suffer lacunas.

Analyzing the Economy from the Ground Up

Our first task is to understand basic economic processes. Before updating the Fed's understanding of the economy in Chairman Bernanke's reign, for comparison we'll first summarize the view of key economic processes as of the middle of the first decade of the new millennium. By indirectly adjusting its assets and liabilities, the central bank is able to set the interest rate in the market for overnight loans of reserves between banks, the nominal federal funds rate. The Fed carries out this process in some reaction to inflation and output or unemployment relative to implicit targets. Simultaneously, market participants form expectations of where the Fed will be setting the funds rate over time. To do so, those participants must forecast likely divergences of inflation and output or unemployment from the Fed's implicit targets.

From that expected path for the funds rate, the expectations theory of the interest-rate term structure explains the value of other market interest rates, even with maturities as lengthy as the longest bond rate, which has a maturity of 30 years. (Of course, the value of an additional term premium can vary over time.) The nominal bond rate less expected inflation over the life of the bond equals the real bond rate. That real bond rate then needs to be compared with the "natural" real bond rate (in other words, the real bond rate that would induce an amount spending just equal to potential output—the level of its long-run equilibrium or aggregate supply). That relationship, along with expectations and lags, is what generates actual real spending (aggregate demand) relative to potential output. Aggregate demand is for final goods

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and services, that is, the output that can be immediately consumed or invested in building new plant and equipment. In the short run, aggregate demand can be satisfied either by newly produced output or by inventories out of old production. But over time, demand must be the same as new output. Output relative to its potential implies an unemployment rate relative to its natural rate, or its sustainable long-run value. Price inflation is determined by output relative to its potential or, equivalently, unemployment relative to its natural rate, along with expected inflation as well as the relative prices of food, energy, and imported goods.

Now we can fill in some of the details. Financial market participants project the Fed's nominal funds-rate settings over time by forecasting the way the FOMC is likely to react to the participants' projected values of inflation and output or unemployment relative to their own estimates of the Fed's goals. These expectations of the future course of funds rates are the critical factors behind the level of medium- and long-term nominal interest rates, since the expectations theory of the term structure of nominal rates is the accepted view of how the market determines those interest rates. After all, investors will buy or sell financial assets to alter their yields until the return on holding all possible alternatives over the same time span are equalized. For example, the yield a 10-year note will have to become identical to the expected returns on holding two 5-year notes in succession, or on ten 1-year bills in succession, and so on down the maturity spectrum until ten years' worth of expected overnight interest rates is reached. (The term premium will have an effect as well.)

This is not at all to say that these expectations will be proven correct, or even that they are always rational given all the available information. In fact, as a predictor of future short-term rates on the assumption of rational expectations, the forecasting record of long rates is, using Alan Blinder's word, "terrible."[1] It says only that investors place their bets based on their convictions about the future, whether those convictions are right or wrong, and that investors will bid away easy profit opportunities through the process of arbitrage. And through this process, the central bank's setting of today's funds rate can influence, though not control, longer-term rates, including nominal bond rates.

Real interest rates, which adjust nominal or market rates for expectations of inflation, are readily figured out, as in the following example: When market participants' expectation of inflation over ten years, for example, is subtracted from the nominal rate on a 10-year note, the result is the 10-year real note rate. The central bank can influence real bill, note, and bond rates through its setting of the nominal funds rate, because the inertia of inflation and inflation expectations implies that it also has the ability to set the real funds rate. And the real interest rate at any maturity must equal the (weighted) average of all the overnight real rates that market participants anticipate will prevail over that time span.

The next link in this summary chain describes just how monetary policy's influence on real long rates affects spending, measured after accounting for changes in average prices, that is, real spending, as well as output, employment, and unemployment. At each point in time, some value for the real long-term rate will generate just an amount of real spending equal to potential output, that is, the economy's productive capacity. That rate is called the "natural" real interest rate, the name given to it in the early twentieth century by Knut Wicksell, a Swedish economist who lived from 1851 to 1926. But, as Wicksell also noted, if the actual interest rate in financial

markets is persistently below or above that rate, then real spending will consistently exceed or fall short of potential output. He further pointed out that as a result the level of prices (though we would say its rate of change or inflation) will tend to rise or fall in a "cumulative process." The natural real long rate will of course vary appreciably over time for numerous reasons, and it is much easier to conceptualize in theory than to estimate in practice.

Real spending can be divided into its components: consumption, investment, government, and exports minus imports. A brief summary of their determinants can be enumerated. Consumption is a function of households' perceptions of their long-run average (or permanent) after-tax income. Investment, including inventory accumulation, while depending unpredictably on people's "animal spirits," to use Keynes's apt term, also does tend to move inversely with borrowing costs as captured by the real rates of interest. Government spending falls with a rise in real income, while the amount of taxes that affects consumption increases with real income; both obviously also are importantly affected by political decisions. Exports vary directly with real incomes abroad as well as inversely on the exchange value of the dollar adjusted for domestic and international prices, that is, the real exchange rate, which in turn tends to rise with real long-term interest rates domestically relative to those abroad. Imports respond positively both to the real exchange rate and domestic real income.

Working mostly through channels involving investment and exports minus imports, the main determinant of the gap between overall real spending and potential output at any point in time can be boiled down to an inverse relationship with the difference between the actual real long-term interest rate and its natural rate, other things equal. Obviously, the numerous "other things," including real short- and intermediate-term interest rates, are factors whose variation will alter the value of the natural real long-term interest rate, which is very hard to estimate.[2]

The production of output along its expanding potential implies the maintenance of sustainable employment, given the economy's labor force, and of normal labor productivity—that is, output per employed worker. The value for productivity depends on the amount of capital and the technology (or knowledge) embodied in the plant and equipment with which laborers can work.

Economists, starting with Milton Friedman's presidential address to the American Economic Association in 1968 and Edmund Phelps's simultaneous research, also have pointed to the concept of the "natural rate of unemployment."[3] It's sometimes called the NAIRU, since inflation will be stable if unemployment holds at the "*n*on-*a*ccelerating *i*nflation *r*ate of *u*nemployment." However, the grammar in that phrase is so horrible, for several reasons, that I'll never use the phrase again. In principle, the natural rate is the equilibrium unemployment rate that results when all peoples' expectations about available jobs, wages, and prices prove correct on average. It's not zero because some structural, or long-lasting, unemployment exists and some equilibrium frictional unemployment results from an optimal amount of searching for the best job opportunity in an imperfectly knowable world. Nor is the natural rate of unemployment a constant bequeathed by God, since it changes with alterations in demographics and public policies relating to unemployment insurance or the minimum wage.

Potential output can be viewed as the real GDP that would be produced at the natural unemployment rate. And, as Greenspan recognized in the last half of the

1990s before anyone else on earth did, a pickup in the growth in labor productivity that boosts the expansion of potential output may well lower the effective natural rate of unemployment for a while. Despite their definitional clarity, the real-world counterparts of both the natural rate of unemployment and potential output, much like the natural rate of interest, are extremely hard to estimate in real time. Even after examining a variety of relevant data, estimates of these important concepts still can suffer from big mistakes. Also, the undoubted political pressure to exaggerate the economy's capacity doesn't contribute to objective estimates. Even in retrospect, assessing what their true values have been is no mean feat. The Council of Economic Advisers, the Congressional Budget Office, and the International Monetary Fund as well as the Federal Open Market Committee (but only implicitly for the *level* of potential output) still attempt to come up with their own estimates.

At the risk of getting bogged down in numerology, let's review the bidding over time, ending with where it stands today. For the decade of the 1960s, the natural rate of unemployment apparently trended up from 5-3/4 to 6 percent. For the first quarter century after 1970, the natural rate in retrospect appeared to have varied within an elevated 6 to 6-1/2 percent range. Then it seems to have gradually retreated to the 4-3/4 to 5-1/4 percent area in the later years of the old millennium and into the new one.[4] The FOMC must have believed that it moved up noticeably after the financial turbulence and associated recession left higher actual unemployment rates in their wake; in late 2013 its central tendency for the longer-run equilibrium unemployment rate remained on the higher plateau of a 5.2 percent to 5.8 percent rate.[5] Estimates outside the Fed of the natural rate in the immediate aftermath of the Great Recession also were close to 5.5 percent, in part owing to the more limited mobility of homeowners whose house values turned out to be "underwater."[6]

The growth of potential output slowed along with the expansion of productivity (output per worker-hour) in the late 1960s and later still more in 1973, but accelerated again after the mid-1990s, while the labor force continued to trend up at a pretty stable 1 percent rate. From 1973 to 1995, potential output is estimated to have grown at around a 2-1/2 percent per year pace, associated with an advance in labor productivity in the nonfarm business sector at an average annual rate of 1-1/2 percent. Then potential output accelerated to a 3-1/2 percent annual rate for the next five years, as labor productivity grew more rapidly, reaching 2-1/2 percent. From 2000 to 2005, potential output probably just about kept to that 3-1/2 percent upward pace, as annual trend growth in the labor force arguably ebbed by 1/4 percentage point to 3/4 percent but that of labor productivity likely rose by another 1/4 percentage point to 2-3/4 percent.

Looking beyond that experience, worker productivity surged by 5-1/2 percent in 2009 when the Great Recession pushed hiring off a cliff, as discussed at the end of Chapter 7. But productivity growth averaged only around 1-1/4 percent over the next four years. At the same time, the economic weakness induced an unusual cyclical departure of discouraged workers from the labor force, which Chapter 9 will examine. Assuming that a variety of headwinds, not least of which are unwise governmental policies in general, keep economic vitality from returning, an appreciable long-lasting slowdown seems in store. The optimistic FOMC, whose central tendency for longer-run growth in real GDP was as high as 2.4–2.8 percent as late as April 2011, further revised down its December 2013 central tendency to a 2.2–2.4

percent annual pace.[7] Even that reduced pace remained higher than those of the other official organizations mentioned above.[8]

Such an estimate is sure to change appreciably, as previous revisions have been substantial. For example, the estimated output gap experienced sizable upward revisions in the 1970s and 1980s, which continued through 1994.[9] The inverse relationship between percentage movements in output around the growing trend of its potential and percentage point changes in unemployment around its natural rate is of considerable importance. In recent decades, output has risen twice as far above the level of its potential as unemployment has fallen below its full-employment rate. This relationship is called Okun's Law. It was originally discovered by Arthur M. Okun when the ratio was a little more than half again as large at 3.2. He was a member of President Kennedy's Council of Economic Advisers, and in the late 1960s also was its chairman.

Next we need to understand how the Fed thinks inflation and unemployment relate to each other and how the economy determines the inflation rate. US experience has revealed a temporary tradeoff between them, as a deliberate effort by restrictive policy to lower inflation induced some temporary unemployment above its natural rate during the time that the public's wage and price expectations were adapting. The short-run tradeoff fully disappeared, though, once enough time passed for the public and businesses to no longer be surprised on average by economic developments—that is, when their expectations about wages and prices came to be fully realized.

As long as inflation persistently exceeded the Fed's long-run objective, people were forced to learn about the likely future trend of inflation from recent experience. With inflation expectations adjusting only to people's impression of the movement in previous inflation, the creation of a shortfall of output from its potential, and an associated overage of unemployment compared with its natural rate, was required to lower the inflation rate. In fact, the evidence, as captured by the Board's old quarterly model, suggested that over much of the post-war period about two percentage points of unemployment above the natural rate for a year (or a percentage point of extra unemployment for two years) was needed for each percentage point that the rate of inflation was to be reduced. Okun's law could convert that unemployment gap into a shortfall of output from its potential. If output dropped to around 4 percent below its potential for a year (or a shortfall of 2 percent for two years), then the inflation rate in response would have declined by around a percentage point on the average. These rules of thumb held best for the core inflation rate, which excludes food and energy prices. Over shorter periods, those prices, along with import prices, are subject to variations that can displace the total measure of inflation from its long-run trend. But because those shorter-run variations tend to be reversed over time, the trend of overall inflation was best predicted by the actual behavior of core inflation.

At least these rules held pretty well until the middle of the 1990s. After that time, as the Fed finally managed to keep consumer inflation down on a sustained basis, the average inflation rate for personal consumption expenditures excluding food and energy began to hover just below 2 percent, equaling the Fed's implicit objective at the time. With the gradual emergence of a stable long-run average for the core inflation rate, the public evidently caught up in recognizing the FOMC's unstated goal. Once it became apparent that the central bank actually was willing to do what was necessary to maintain inflation on the average over time at its low goal, the evidence

suggests that inflation expectations became better anchored to that objective.[10] The Fed's consumer inflation goal apparently joined lagged inflation in determining the publics' shorter-term expected inflation, so the role of lagged inflation diminished in importance. But lagged inflation continued to be a part of shorter-term expected inflation possibly because some contracts were subject to indexation, or maybe because inflation could return only gradually to the Fed's target, or perhaps because a fraction of the public still had adaptive expectations based on past experience, or even because the public may have put some odds on the Fed's altering its implicit goal in response to an observed divergence.

After the mid-1990s, even when the Fed has maneuvered the output and unemployment gaps into disappearing fully, core inflation, rather than staying at its previous value as in earlier years, in the short run has tended to revert on its own part of the way, and in the long run all the way, toward the Fed's unstated numeric goal.[11] Thus, the new era of anchored inflation expectations has tended to make the Fed better able to keep inflation contained while aiming to hit gradually the economy's potential output and natural rate of unemployment.[12]

However, the influence of the state of the economy—as captured by the prevailing gap of output compared with its potential or unemployment relative to the natural rate—on the rate of inflation and hence the stance of policy also has evolved since the mid-1990s and has worked in the opposite direction. Of course, such a gap still independently influences the actual level of inflation, but the strength of the effect evidently has declined in the two most recent decades; that is, more of a gap has been needed to have the same effect on inflation.

Therefore, following a given deviation of inflation from the Fed's objective, in the last two decades the two offsetting effects have about canceled each other out in affecting how far the Fed has had to move its policy stance to induce the gap in output or unemployment needed to get inflation to return as quickly as before to its unannounced goal. (Not that potential output and the natural rate can be estimated infallibly.) On the one hand, because the public has become more confident that the Fed will attain its inflation goal over time, its policy stance has needed to move by less. On the other hand, the lessened effect of the induced output or unemployment gap on inflation has meant a larger policy adjustment. Just how the two effects balance out in affecting the thrust of policy and the real economy is unclear to date.

Now consider whether nominal longer-term market rates tend to rise comparably with an increase in inflation expectations. I doubt it. What I think is true is that, according to the expectations hypothesis of the term structure of interest rates as outlined previously, nominal long-term interest rates equal expected short rates over the life of the instrument, apart from the term premium. Then subtracting expected inflation for the same term to maturity gives the actual real interest rate for that maturity, which can vary over time. As noted above, the difference, particularly at the long end of the term structure of interest rates, between the actual real rate and the natural real interest rate, along with expectations and lags, gives real spending relative to potential output. Okun's Law then says what the unemployment rate will be compared with the natural rate of unemployment. Those output and unemployment gaps, along with lags and inflation expectations, generate wage and price inflation. Those relationships, when projected forward and combined with the Fed's reaction function—which may well include FOMC forecasts—are what yield the path of

future short rates expected in financial markets. Notice that a rise in inflation expectations tends to be associated with an increase in nominal interest rates, but the connection is not necessarily one-for-one. Instead, real long rates may decline some too. The mechanism works through the Fed's reaction function that creates the elevation in the expected path of future short rates, and thus the typical rise in current long rates. The more astute at forecasting are both the Fed and financial market participants, the closer will be the connection to one-for-one.[13]

The account we've just completed briefly describes how nominal and real interest rates, output, and prices are all determined together. Notice that this process all takes place without having to mention the money stock. In fact, when the Fed determines the federal funds rate (or its close relatives borrowed reserves or excess reserves minus borrowed reserves) without much reaction to monetary developments, money only enters the causal picture after all is said and done, as a residual. Despite Milton Friedman's dogmatic monetarism and Paul Volcker's practical monetarism, money growth in that case actually is not a causal factor in the inflationary process. Since mainstream economists now view the money stock as wholly demand determined when the Fed sets the short rate in this way, a single relationship describing money demand can be used iteratively to explain the money stock. The stock of narrow money just represents the public's desired holdings of transactions balances, which depends on how fast those balances turn over to facilitate the purchases of output at current prices. That turnover in turn depends on institutional factors and on the opportunity cost of money. The foregone opportunity of holding money rather than the best alternative financial asset is taken to be a short-term nominal interest rate, say, the funds rate, less the average offering rate, or own rate of return, on money. In order to keep the funds rate at the value of its operating target, the central bank has to ensure that it provides just the amount of reserves to ensure that banks will supply the requisite amount of money. That is the amount that that the money demand relationship indicates will generate the targeted funds rate given money's own return and the levels of output and prices in the economy.

When the central bank sets the level of the funds rate with no reaction to money, the nominal money stock is determined simultaneously with the funds rate only in a temporal sense. Money somewhat surprisingly really doesn't matter in a causal sense for interest rates, output, or prices, as they already have been determined through another mechanism. Only afterward, if anyone is interested, do output and prices, along with the relevant opportunity cost, explain the nominal stock of money through the amount of nominal money demanded. Not that Milton Friedman, who sometimes wrote as if the Fed *did* exercise direct control over the nominal money stock and sometimes wrote as if it *could* do so more precisely after implementing certain regulatory reforms, such as contemporaneous reserve requirements, ever accepted this view.[14]

Neither did the public. And the aphorism of folk wisdom approximates the truth when it says that inflation reflects "too much money chasing too few goods." However, except for the three years when Paul Volcker's FOMCs aimed at controlling transactions money in the medium term via nonborrowed reserves, that statement is true only metaphorically. From a scientific perspective, most economists no longer accept its literal validity. Of course, inflation is responsive to monetary policy, since "inflation is always and everywhere a monetary phenomenon," in another aphorism,

this one coined by Milton Friedman. But the transmission mechanism always and everywhere operates through conditions and expectations in labor and product markets. And measures of the money stock always and everywhere are subject to innovation in payments practices in the marketplace. Judging by outward appearances, monetarists could never bring themselves to accept such an indirect linkage or grant the empirical importance of the latter observation in industrial countries. Accordingly, despite the strong influence of monetarists in the 1970s and 1980s, in recent decades their role has atrophied, partly because money is hard to measure but also because growth of the money stock has not been a causal factor in the inflationary process. Sometimes the truth can be counter-intuitive and violate "conventional wisdom."

Still, since the central bank is a crucial actor in affecting interest rates and thus aggregate demand, inflation clearly is a monetary policy—though not a monetarist—phenomenon. The central bank in reality makes policy decisions against the background of judgments about all the above relationships. The rising inflation of the 1960s and 1970s was indeed the fault of the Fed, a policy blunder of huge proportions, and eminently preventable.[15]

These are the economic mechanisms that circa the middle of the first decade of the new millennium would have well described the Fed's thinking about how the economy functioned. The Fed's influence could be captured by the overnight interest rate on federal funds, whose expected path influenced long-term interest rates, equity prices, the exchange value of the dollar, and asset and commodity prices in general. These channels were seen as being supplemented by the Fed's numerical inflation objective, which, along with the recent actual rate of inflation, affected the shorter-term inflation expectations in labor and product markets.

However, the Fed's perception of its own influence has evolved significantly further under Chairman Bernanke. The Fed's internal thought has come to see an unconventional policy of heavy asset purchases as having meaningful and lasting direct nontraditional impacts via a preferred-habitat channel on the term premium of nominal (and real) bond rates and other asset prices and thus strong indirect effects over time on the public's spending. The unconventional purchases of long-term securities issued by the Treasury and government-sponsored agencies or guaranteed by the latter entities blew up the size of the Fed's balance sheet. Moreover, because inflation expectations as perceived in financial markets clearly were augmented for a while by these policies, real bond rates would be damped further, stimulating spending by more.

In addition, informed by the rational expectations theory of academic economists, the idea took hold within the Fed that such actions themselves, including the unconventional policy of asset purchases, might even directly alter the inflation expectations that allegedly affect wages and prices.[16] In the traditional view, by contrast, to affect those inflation expectations, monetary policy had to work indirectly through the funds rate and then in turn on other financial and economic magnitudes, including observed inflation itself, or through the Fed's longer-run commitment to attain a desired inflation rate. The latter effect of course would be effectuated sooner if it were credibly announced by the central bank as opposed to remaining implicit and being subject to gradual learning by market participants in response to a series of realized outcomes.

Christina Romer, a professor at the University of California at Berkeley and former chairwoman of President Obama's Council of Economic Advisers, made an astute observation about the evolution of intellectual perceptions that can yield such revisionist judgments about the impact of large-scale asset purchases themselves. She asserted that the analysis of the economic "theorists" has increasingly supplanted in recent years the traditional influence on Fed thinking of the "empiricist" economists.[17] Unfortunately, this mode of thought, by replacing factual, if loose, historical relationships with academic conceits currently "in vogue," runs the risk of "wishful thinking," in John Taylor's apt phrase.[18] (Taylor is a Stanford economics professor and former top Treasury official under President George W. Bush.)[19] The concluding chapter traces the history of these and related developments.

Designing Policy from the Ground Up

Financial stability is an ever-present objective of the Fed's policy design. Indeed, as we have seen, the Fed was founded to prevent the reoccurrence of the financial panics of the past by maintaining an elastic currency and acting as a lender-of-last resort. This aspect of the Fed's role, of course, expanded enormously in the financial crisis of recent years. Moreover, we also have seen that the Congress established the government's responsibility for maintaining "maximum employment, production, and purchasing power" in the Employment Act of 1946. It further refined the Fed's objectives through the Federal Reserve Reform Act of 1977 that amended the Federal Reserve Act to mandate its current responsibility to "maintain long run growth in the monetary and credit aggregates commensurate with the economy's long run potential to increase production so as to promote effectively the goals of maximum employment, stable prices, and moderate long-term interest rates."

Given that the Fed's ultimate objectives are enunciated in the statute, the design phase must determine whether or not intermediate targets are interposed between the operating target and the objectives. Monetarists, who as noted were influential in the 1970s and 1980s, proposed money growth as an intermediate target. Money growth can be set in stone once and for all, as in Milton Friedman's k-percent rule.[20] Or it can be adjusted each quarter based on forecasts of spending and money holdings, as in William Poole's original analytical framework.[21]

Monetarism became increasingly influential in affecting policy design in the 1970s both through legislation and persuasion within the Fed. The capstone of the school's impact came with the reform in October 1979. However, we have seen the difficulties with unstable money demand that resulted from the incentives produced by the high interest rates that accompanied rapid inflation as well as the boost to the amount of money demanded that came from the subsequent decline in interest rates as inflation retreated. The Fed learned the hard way that it is more efficient for the monetary authority to use the intermediate variables at most for "information" about the currently unobservable behavior of the ultimate economic variables—inflation, real growth, and the unemployment rate.[22] With that approach, the Fed's operating target would be linked to ultimate, not intermediate, targets.

The famous "Taylor rule" does just this, as it makes the operational target for the federal funds rate depend on key economic variables relative to their own targets as set by the Fed. The aforementioned John Taylor originated this guideline

for policymaking in 1993, and it since has become ubiquitous in monetary policy research.[23] He boiled down his advice into a simple formula relating the setting of the federal funds rate to a couple of broad economic measures that represent the primary objectives of monetary policy. He started out to uncover a relationship that would produce good results in simulations of large econometric models. But the rule that he came up with closely matched the funds rate settings in actual policymaking during recent decades when monetary policy was pretty successful in attaining its goals.[24]

As noted at the start of this subsection, since 1977 the Fed's long-run objectives have been "maximum employment, stable prices, and moderate long-term interest rates." The last goal follows immediately from price stability, which will squeeze the inflation premium out of market interest rates. As for the other two goals, both before and after the statutory change, the FOMC took seriously, though didn't always successfully pursue, *both* parts of this perceived *dual* mandate of stable prices *and* sustainable economic growth. My 2003 book discerns a pretty accurate statistical estimate of a Taylor-type function in the data for each era until then.[25] That estimate explains the funds rate that the Fed sets in reacting to key economic magnitudes. Though evolving over time in the particulars, such "reaction functions" have included as explanatory variables some version of outcomes in the economy's recent past, estimates of current conditions, or forecasts for the future of two values relative to their ultimate targets. The two values encompass inflation and either the level of or the growth rate of real economic activity or the level of or the change in the unemployment rate. In that sense, unlike inflation-targeting central banks (at least in theory if not in actuality), at the Fed one goal has not taken precedence over the other.

The ninth edition of The Federal Reserve System *Purposes and Functions* has added the Fed's imprimatur to the Taylor rule in the form of a description and critique. As noted, the formula shows how the Fed should respond systematically to

> the extent to which inflation may be departing from something approximating price stability and the extent to which output and employment may be departing from their maximal sustainable levels. For example, one version of the rule calls for the federal funds rate to be set to the rate thought to be consistent in the long run with the achievement of full employment and price stability plus a component based on the gap between current inflation and the inflation objective less a component based on the shortfall of actual output from the full-employment level. If inflation is picking up, the Taylor rule prescribes the amount by which the federal funds rate would need to be raised or, if output and employment are weakening, the amount by which it would need to be lowered.[26]

Although this guide has appeal, it too has shortcomings. The equilibrium level of the real short-term interest rate can vary over time in unpredictable ways. Taylor has adjusted its assumed value over time. The FOMC's thinking can be read only for a few years; by late 2013 its longer-run median funds rate projection of 4 percent combined with its 2 percent goal for consumer inflation implied a natural real funds rate of 2 percent. Moreover, the current rate of inflation and position of the economy in relation to full-employment output are not known exactly because of data lags and

difficulties in estimating the natural rate of unemployment and potential output, adding another layer of uncertainty about the appropriate setting of policy.[27]

Keynesian advice to the Fed in the 1960s and 1970s was not to tighten until the economy's (erroneously estimated) potential already had been reached. In this regard, I recall Donald Kohn, formally Board vice chairman but then serving in his earlier positions as director of the Division of Monetary Affairs as well as FOMC secretary, correctly pointing out that a very useful insight of the Taylor rule during economic recoveries is that the real funds rate already should be rising as the output gap is closing.

In specifying just how much the central bank should move its operating target for the funds rate in response to various misses, Taylor made his original recommendations in 1993. He suggested that the central bank raise the funds rate by one and a half percentage points in response to each percentage point divergence of inflation from a 2 percent objective. Importantly, since this reaction makes the nominal, or market, federal funds rate move up by more than the increase in inflation, the real, or inflation-adjusted, funds rate also will rise in response to an increase in the rate of inflation. For example, if inflation rises by a percentage point, the *real* funds rate will increase by one-half a percentage point.

Such a policy reaction is crucial for keeping inflation from getting out of hand. Indeed, a coefficient value for the Fed's reaction to the inflation gap very close to 1.5 is estimated statistically in my 2003 book in *all* the intervals after 1968 to that date.[28] That value is multiplied by four-quarter inflation projected out three quarters in the Burns-Miller era, realized as an outcome for the previous quarter in the Volcker era, and both estimated in the contemporaneous quarter and projected out three quarters during most of the Greenspan era.

Chairman Bernanke recently reiterated the common opposing view in the economics profession that the Fed under Burns and Miller responded far less forcefully to inflation.[29] But, as Athanasios Orphanides originally pointed out, that was the case only for realized inflation, which typically came in well above projected inflation rates in the 1970s owing to a vast underestimate of the natural rate of unemployment.[30]

Taylor also recommended that the Fed raise the nominal funds rate by half a percentage point for each percent by which output exceeds its potential. It's easy to figure out the implied reaction to unemployment compared with its natural rate from Okun's law by doubling the negative of that amount, since in percentage terms the unemployment rate in recent decades has drifted half as far from its natural rate as output has strayed in the opposite direction from its potential. To be consistent with Taylor's original suggestion, other things equal, the central bank would move the funds rate up by the same percentage point amount that the unemployment rate falls below its full-employment rate. More recently, Taylor mentioned an alternative that doubles the funds-rate reaction to movements in output, making the percent point increase in the funds rate just equal to the percent by which output exceeds its potential.[31] This doubling implies a rise in the funds rate that is about twice the size of the decline in the unemployment rate below its full-employment rate. Indeed, a value close to −2.0 was estimated by Athanasios Orphanides for the Burns and Miller era as well as in my 2003 book for most of the Greenspan era.[32]

The concepts of full employment or the economy's potential output are impossible to estimate accurately as well as being controversial, to say the least. Understandably,

the Fed until recently has not been very explicit about the ambiguous and shifting real-side goals that it has implicitly adopted. Perhaps to avoid appearing to put undue weight on its other goal, it also had refrained from quantifying its inflation objective. Instead, both Chairmen Volcker and Greenspan interpreted price stability as a subjective concept. According to Chairman Volcker,

> A workable definition of reasonable "price stability" would seem to me to be a situation in which expectations of generally rising (or falling) prices over a considerable period are not a pervasive influence on economic and financial behavior.[33]

Similarly, Chairman Greenspan's famous characterization follows:

> By price stability, I mean a situation in which households and businesses in making their saving and investment decisions can safely ignore the possibility of sustained, generalized price increases or decreases.[34]

He continued to use that formulation over the years:

> We will be at price stability when households and businesses need not factor expectations of changes in the average level of prices in their decisions.[35]

By contrast, Bernanke thought that, to help nail down the public's expectations, the range of the central bank's long-run objectives for the inflation rate usefully could be quantified and announced. Of course, he was aware that the range may not encompass literal price stability if the central bank wants its target to incorporate a cushion above precisely stable prices. In doing so the central bank may wish to help shield the economy from the threat of deflation, in light of the constraint that the zero lower bound on the nominal funds rate puts on the amount of stimulus that it can impart. Although the FOMC hadn't then formally adopted any explicit inflation target, it intimated in early 2009 that its objective for consumer price inflation was represented by its longer-run central tendency projection of 1.7 to 2 percent. In January 2012 the Fed finally publicly set an explicit goal for consumer inflation of 2 percent.

The financial meltdown, as we have already seen, induced the Fed to move well beyond the Taylor rule once it had pushed the funds rate virtually to zero, reaching its lower bound. The Fed greatly augmented its balance sheet via large-scale asset purchases, hoping to raise inflation expectations and to lower long-term real rates. But, as we shall see, it's not clear that quantitative easing had much lasting direct or indirect effect on financial conditions, output, or inflation expectations. Yet possible ineffectiveness didn't deter the Fed from introducing repeated rounds of that or related policies. The Fed also provided forward guidance to market participants by virtually pre-committing to keeping the funds rate low for a protracted period. Suggesting that the Fed would sustain an easier policy stance than consistent with past conditional practice and therefore expected in financial markets indeed right away would reduce the expected path for the nominal funds rate, which, other things equal, would lower current levels of real as well as nominal long rates. Spending would respond, and by strengthening the economic outlook, forward guidance thus

directly could increase inflation expectations and further lower current real long rates given the new levels of current nominal long rates.

Implementing Policy from the Ground Up

An important aspect of implementing policy is the choice of operating target, that is, the measure that the FOMC relies on in policy implementation by instructing the Trading Desk to aim at from day-to-day or from one reserve maintenance period to another. A good way to think about alternative operating targets concerns where they fall on a spectrum of "automaticity" of movements in the short-term interest rate, which indicates the degree to which financial market forces versus policy judgments are allowed to be reflected in movements of short rates in the money market. Going from most to least automaticity suggests, in decreasing order, how much market forces are allowed to show through, and, in increasing order, how much discretion over short rates the FOMC exercises in trying to stabilize the economy. With discretion, of course, comes direct responsibility, and thus—to the degree policy implementation is transparent so that the public is fully aware of this responsibility—praise or blame for the level of short rates. The relevant candidates to select from in the choice of an operating target were:

1. Total reserves or the monetary base—that is, total reserves plus currency.
2. Nonborrowed reserves or the nonborrowed base—that is, the total figure minus borrowed reserves.
3. Borrowed reserves or free reserves—that is, excess reserves minus borrowed reserves.
4. The federal funds rate—that is, the interest rate on overnight loans of reserves between banks.

The size of the Fed's balance sheet may be augmented to supplement the funds rate when that rate objective has been moved close to zero.

Monetarists preferred the monetary base, which as we have seen is sometimes called high-powered money. (The narrower concept of total reserves is a logical alternative, given that the demand for currency is uncertain and that reservable deposits are a multiple of required reserves, but monetarists never backed it.) In the 1970s, the base target would have been calibrated to have been consistent with the given short-run intermediate target for money, and it even could have been continuously adjusted for updated information on variations in the "multiplier," the ratio of money to the base.[36]

Strict control of the base would have given short-term interest rates the freedom to have moved enough to bring money back to its preset target pretty quickly following misses. The FOMC, whose discretion was not to be trusted according to monetarists, thus would have been circumvented. As time passed, the amount of money demanded would have become more and more inversely responsive to the short-term rate, so a given shift in the position of its demand curve relative to target would have allowed hitting the target over time with a smaller change in short rates. Yet, especially over brief periods, interest rates would have been extremely volatile in the real world as the rather interest-insensitive money demand varied, transmitting

this variability of an interest-insensitive demand to the base as well, even with contemporaneous reserve requirements based on current deposits. But monetarists at the time denied this fact.[37]

A point having to do with its short-run controllability as well as interest rate volatility also rendered it impractical. To have used the base as an operating target, the Trading Desk would have had to counter any non-targeted jump in, say, required reserves, total reserves, and the base with an offsetting reduction to nonborrowed reserves. But in the very short run that would just have induced banks to react by borrowing more reserves as an offset. The Trading Desk—in classic chasing-its-tail behavior—would have countered in turn with another decline in nonborrowed reserves, and so on. Even with some immediate reaction of the amount of money demanded to the resulting response of higher interest rates and with strictly contemporaneous accounting for reserve requirements, I doubt that short-run base control would even have been feasible, although monetarists never admitted this fact either. Accordingly, attempting close control of the base would have implied so much volatility in the funds rate that it would never have been adopted.

Nonborrowed reserves, by contrast, are closely controllable day-to-day by the Trading Desk without inducing inordinate interest rate volatility. Suppose the FOMC had instructed the Trading Desk to use nonborrowed reserves or the nonborrowed base as its operating target. Defensive open-market operations can pretty well offset movements in non-controlled factors that threaten to displace the supply of either nonborrowed measure from target. They would have had target paths consistent with the short-run money path—derived from the paths for total reserves or the base by subtracting initial borrowed reserves or initial borrowing plus projected currency. The amount of borrowed reserves in the 1970s and 1980s mainly depended on the funds rate less the known discount rate. Thus, the initial amount of borrowing assumed in constructing either of the nonborrowed paths would have needed to be consistent with the funds rate that was projected to have yielded the public's demand for the money target, given the nominal income forecast.

What is most important to understand, though, is what would have happened automatically to borrowing and the funds rate in the event of a surprise miss of money from its target during the inter-meeting period. Holding nonborrowed reserves to its target path would have caused an induced movement in the funds rate that would have been in the right direction but would have been considerably muted relative to maintaining total reserves or the base on target. Eventually, despite some edging back of short rates, money would have come an appreciable part—though by no means all—of the way back to its target after a permanent demand curve shift due, say, to an unexpected variation in nominal income. But the movement in rates, especially at first, would have been cushioned a lot by the automatic change in borrowed reserves that would have caused total reserves and the base to miss their targets by the same amount in the same direction as the Trading Desk hewed to its nonborrowed reserves target. Over time, of course, borrowing also would have partly reversed its original induced movement, in line with the funds rate.

Alternatively, the FOMC could have instructed the Trading Desk to aim at a free reserves or borrowed reserves operating target. After all, during a maintenance period, excess reserves were highly predictable and, in the late 1960s through the mid-1980s and after mid-1998, required reserves were certain given that reserve

requirements were based on deposits measured with a substantial time lag, that is, lagged reserve requirements. The Fed thus could get to borrowed reserves through its control over nonborrowed reserves. And the Trading Desk's potential control over aggregate borrowing would have given it considerable influence over the funds rate because the wording of the borrowing regulation (Regulation A) in the 1970s and 1980s produced for each commercial bank a higher implicit incremental cost for each additional dollar of borrowing from the Fed. (The Board staff referred to this implicit marginal cost as the "frowns premium.")

As the Trading Desk forced *more* borrowing on the banking system, for example, by lowering nonborrowed reserves, the implicit incremental cost of borrowing from the System *would have risen*. Banks naturally would have turned to the funds market for funding. Their stronger bidding would have forced up the funds rate—all the way to the point where the marginal cost of all sources of funding again were equal. Since to reduce overall costs each commercial bank naturally would bring the added cost of all sources of funding into equality, including the interest cost of borrowing from other banks in the funds market, the Trading Desk would have been provided with an indirect handle over the rate at which funds would have traded. Simply by altering the overall amount of borrowing, the Trading Desk therefore could have fairly accurately predicted the associated change in the funds rate. Econometric evidence suggested that each time the amount of borrowed reserves rose by $100 million, the spread of the funds rate over the discount rate would have gone up by 25 basis points (plus or minus an error term). A close operational variant to aiming at borrowed reserves is using free reserves, again, excess reserves minus borrowed reserves, as FOMCs loosely did under Chairman Martin. Before excess reserves exploded in the financial crisis, banks' desired holdings of excess reserves also were predictable in advance.

Finally, the Trading Desk could have gained even closer control over the federal funds rate if the FOMC had instructed it to use that rate itself as an operating target. The Trading Desk simply could have relied on its day-to-day influence over nonborrowed reserves through open market transactions in government securities. It could have bought securities and injected reserves by paying for them when the funds rate edged above the targeted rate or drained reserves by selling securities when the rate slipped below it. Announcing the FOMC's intention for the funds rate additionally would have aided in establishing the desired trading in the funds market. The market's tendency to arbitrage by buying when the prevailing rate is below its near-term expectations—thereby bidding up the market rate—and selling when the prevailing rate is above those expectations—thereby lowering the observed rate—would help to bring the rate into conformity with its target.

The FOMC, though, occasionally felt constrained by the visibility of the overnight interest rate and resultant potential political pressure from simply relying on a federal funds rate operating target. Adopting free reserves or borrowed reserves as the primary operating target rather than the funds rate—as FOMCs has been forced to do when the Fed had to obscure its influence over short-term market rates—has deflected potential political pressure away from the FOMC. Thankfully, in our enlightened era the problem of political pressure will never arise again! (Please ignore the criticism from Democrats, Republicans, and Independents alike about exceptional Fed policies from 2008 through 2013.) Even so, the FOMC did use the funds

rate in implementation for virtually all of the decade of the 1970s under Chairman Burns and once again under Chairman Greenspan as the 1980s ended and thereafter through part of Chairman Bernanke's first term. Insufficient—and certainly no—judgmental adjustment over time of any of the alternative operating targets for free reserves, borrowed reserves, the funds rate certainly can result in undesirable movements in total reserves, the monetary base, money, and spending. But as the post-1982 eras of Volcker and nearly all of Greenspan demonstrated, enough counter-cyclical adjustment of any of these operating targets no doubt can prevent any necessary logical inconsistency between a focus on any of them and the conduct of sensible policy.

The move in January 2003 to a penalty rate for primary discount credit of a percentage point above the FOMC operating objective for the federal funds rate along with the immediate announcement of the operating target for the funds rate starting in February 2004 appeared to have locked the FOMC into a funds rate target once and for all. However, after the financial crisis caused a freezing up of credit extension in the late summer of 2008, as noted, the Fed not only lowered the funds rate as far as possible by year-end but also established novel and radical supplements to a funds rate target. The new implementation initiatives took the form of a greatly enlarged balance sheet. During the crisis the Fed first interposed itself as a financial intermediary to keep credit available in essential credit markets while undertaking huge volumes of foreign exchange swaps with other central banks. Thereafter, it adopted several episodes of quantitative easing, which became open-ended in September 2012.

Communicating Policy from the Ground Up

In modern times, making the Federal Reserve's procedures as understandable as possible has proven to be advantageous, as increasingly became the case under Chairmen Greenspan and Bernanke. Transparency has rendered the Fed's current policy posture obvious and its future policy stance more predictable. Given the important role of expectations in financial markets, such predictability potentially makes its policy implementation more effective. If the Fed communicates its procedures as well as its goals clearly, its future actions, even if conditioned on particular economic developments, in principle would be more accurately reflected in financial-asset prices and yields. That way the Fed in theory would find it easier to attain its objectives. Indeed, if the Fed in fact usually could predict its future tactics with some precision, then it would find publicly communicating hints about the future settings of the funds rate to be in its interest in helping market participants establish appropriate prices and yields of financial assets.

There are times, for example, when such an "open-mouth" policy may be viewed as essential. If falling prices are a genuine threat, as seemed to the FOMC to be the case in mid-2003, the Fed may need to indicate that it intends to keep the funds rate low for quite a while to further lower bond rates. Or at the beginning of a severe financial meltdown when extreme policy ease would help to avoid any possibility of depression, a signal of a low funds rate objective may be a crucial policy initiative. Making public such a predilection to stay quite accommodative for a considerable period of time will contribute to pushing down nominal and real bond rates relative to where

they would be otherwise. This pattern would foster higher stock and housing prices, added spending and output, and lower unemployment.

Still, markets could interpret any such communication about the Fed's future policy stance as a commitment, whether that inference is intended or not. And such a posture could prove to be undesirable in certain situations, as when the economic outlook is crucially uncertain and circumstances can change unexpectedly. On those occasions, a surprising swing in policy may become necessary, which can bring into question the Fed's analysis and policy decision underlying a quasi-commitment. Especially when financial asset prices fall appreciably, investors always look around for scapegoats. And the Fed is a readily available candidate. A change in economic conditions that affects the outlook enough to alter the Fed's tune in the face of its "promised" policy stance, naturally gives rise to calls of "inconsistency" and "incompetence." The lesson of being vague in public communication about future contingencies so as to avoid such charges is one that successful politicians have to learn quickly, because it is impossible to cover all the possible hypothetical circumstances that may well have to be taken into account while at the same time maintaining the simplicity of message that can be comprehended.

A related lesson can be drawn from the FOMC's mistakes in several months following both May 1999 and January 2006 in Chairman Bernanke's first chairmanship: When immanent policy firming is not a foregone conclusion, but depends on uncertain economic developments, hinting in the immediate announcement after its meetings at its own inclination to tighten policy can cause trouble in the form of a demonstrable edginess in financial markets. Bernanke addressed this issue at a Joint Economic Committee hearing on March 28, 2007, in response to a question from Jim Saxton (Republican, New Jersey). He said that the FOMC, except in unusual circumstances, should limit itself to specifying its sense of the risks to upcoming outcomes for inflation and economic expansion relative to its objectives of price stability and maximum sustainable economic growth, and leave it to financial markets to set asset prices that incorporate their expectations about the future stance of policy. Thus, he suggested, the FOMC henceforth normally would refrain from issuing an immediate statement containing any semblance of a "tightening bias" regarding the setting of the funds rate in the near future.

The Fed later seemed to realize that, although market skittishness would persist in the case when it still wants to make its quasi-commitment to tightening explicitly contingent on arriving data, the problem could be ameliorated through forward guidance combined with economic thresholds as distinguished from triggers. This approach can add policy flexibility even given the perception of an absolute conditional commitment. But in adjusting their estimate of the likely date of action, markets still may overact somewhat to new data.

Even too much clarity about a central bank's ultimate objectives can circumscribe the tactical flexibility that is so necessary to success. For example, if the range of acceptable core consumer inflation has a hard edge, then any sustained reading above it, for example, even if it is soon destined to disappear on its own, can induce unwarranted market expectations of a course of policy tightening. If the Fed then fails to live up to those expectations, it will be called "soft on inflation." A dovish reputation can be very hard to live down. Before Bernanke the Fed was somewhat ambiguous about its inflation objective. Also, even if the Fed's words are crystal clear, market

misunderstandings of its meaning are inevitable. Yet attempts to correct those initial misperceptions can engender new misunderstandings. And gabbiness by many Fed officials with different perspectives only enhances the grounds for charges of inconsistency. Because investors view the Fed's words through the prism of investment profitability, too much talking by the central bank can be hazardous. Although investors may well have evaluated available profit opportunities objectively, reflecting George Stigler's principle that the *survivors* in competitive markets must have been behaving as if their effective decisions had been made rationally, their judgment about the Fed's words often has been distorted.

Simple repetitive language has the best hope of being understood by busy investors. Robert Rubin and Laurence Summers, successive Secretaries of the Treasury under President Clinton, took this lesson to heart: "A strong dollar is very much in the best interest of the United States" could just as well have been emblazoned on a card for them to have passed out instead of having to reiterate the same mantra over and over again.[38] David Wessel wrote,

> It isn't clear (to me, anyhow) why the Treasury secretary's words matter so much to currency markets but they do . . . Robert Rubin showed how to use rhetoric to steer the dollar away from the cliff while avoiding adding noise to the market. "I had to be consistent and highly disciplined in not only what I said, but precisely how I said it," Mr. Rubin wrote in his memoirs. "Affecting exchange rates unintentionally would make me look undisciplined and unsophisticated. My credibility . . . could be especially critical if at some subsequent time we had a weak dollar and faced the possibility of a dollar crisis."[39]

William Poole, then president of the St. Louis Fed, summarized this perspective:

> [T]he policy statement needs to be put together from a relatively few standard elements. The way I have put this point is that the English language is incredibly rich, often with multiple meanings for a given word. The various meanings can be looked up in a good dictionary. However, there is no dictionary in which we can look up the meaning of a paragraph. In the past, market participants have sometimes come to somewhat different interpretations of FOMC policy statements. This fact indicates to me that the Committee has not communicated with as much clarity as desirable. I do not pretend that the goal is easy to reach but believe that progress will require greater standardization over time in the structure of the statement and in the options from which the statement is put together.[40]

That completes our background lesson. Now it is on to Part II, which examines in detail monetary policy during the eventful chairmanship of Ben Bernanke.