



# Toward a New Understanding of Monetary Policy

## Citation

Friedman, Benjamin M. 2013. Toward a New Understanding of Monetary Policy. *Macroeconomic Review* 12, no. 2: 81-87.

## Published Version

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July, 2013  
For: MAS Macroeconomic Review

**TOWARD A NEW MODEL OF MONETARY POLICY\***

Benjamin M. Friedman  
William Joseph Maier Professor of Political Economy  
Harvard University

The financial crisis that struck most of the world's advanced industrialized economies during 2007-9 has presented a major challenge for economists concerned with economic fluctuations, and especially for those interested in the workings of monetary policy. By many measures the crisis constituted the most significant macroeconomic event since World War II. Further, the origin of these events (as the label suggests) was squarely in the financial sector, and the policy actions that governments in many countries took in response, first during the crisis and then in the post-crisis recovery effort, importantly involved monetary policy. Yet the models of monetary policy now commonly in use, both for teaching students in the field and for supporting policymaking within central banks, are not only incapable of incorporating the most widely accepted accounts of how this episode occurred but incapable too of analyzing the actions that monetary policymakers took. The gap between the models and the world of monetary policymaking is now wider than at any time since the 1930s.

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\* This paper is based on my paper "The simple Analytics of Monetary Policy: A post-Crisis Approach," *Journal of Economic Education*, \_\_\_\_\_.

The analytical models that have become standard within macroeconomics over the last generation are not only incapable of explaining what happened during this unusually significant episode, but unsuited even to incorporating most of the now widely accepted accounts of it. Today's standard macro-models typically include no financial-sector variables other than a short-term interest rate and (perhaps) the quantity of "money," and no way for what happens in the financial arena to affect nonfinancial economic activity other than via "the" interest rate's role in inter-temporal consumer choice (and perhaps an influence of real money balances, also on consumption). The larger empirical models used by many central banks have more expanded detail, including treatments of investment, and they make explicit a variety of real and nominal rigidities; but still the basic mechanism is the same. Neither offer any way to understand why the failure of a firm like Lehman Brothers, in September 2008, would have had a meaningful effect on the economy, or why it mattered that governments in the United States and elsewhere acted vigorously to prevent other firms from failing. Nor do these models offer any explanation of why or how the unusual actions that central banks took – establishing special lending facilities for banks, purchasing targeted securities like commercial paper and residential mortgages, providing forward guidance on the policy interest rate – would have had any effect. According to the models, once the central bank's policy interest rate reached the practical lower bound of zero, monetary policy simply had no further role to play.

To their credit, macroeconomists and others have reacted to the crisis with a profusion of new research efforts exploring the workings of financial intermediation and asset holding, and investigating in particular the implications of a variety of "frictions" that intermediation inherently entails under conditions that obtain in any even moderately advanced economy. But there is no point of contact between most of this work and the standard workhorse models.

Anyone seeking to understand how one or another strand of this new research fits into the canonical macroeconomic framework therefore sees an unbridged chasm between two seemingly incompatible lines of thinking about what is clearly the same set of behavioral phenomena. And, in contrast to earlier eras in the development of macroeconomics, researchers seeking to establish the motivation for their work, among more than a narrow audience of fellow specialists, are able to appeal to what everyone has read in the newspapers but not to what the field holds out as the accepted conceptual overview.

The most obvious example of this divide is the behavior of central bank balance sheets, both during and in the aftermath of the crisis. Most of the advanced economies' central banks responded to the crisis by rapidly expanding their balance sheets, purchasing assets in the open market and correspondingly issuing liabilities. The Bank of England has increased its balance sheet five-fold since the beginning of 2007, the U.S. Federal Reserve System four-fold, and the European Central Bank and Sweden's Riksbank more than three-fold (although the Riksbank's assets are now back to only double what they were at the beginning of 2007), and the Bank of Canada two-fold.

Moreover, this radical departure in central bank asset holding was not just a matter of total quantity; the character of the assets these central banks held changed as well. Traditionally, most of the assets that central banks hold have been obligations of their own governments, and within those, mostly short-term obligations. But during and in the wake of the crisis most of the major central banks massively substituted loans to specific financial institutions and then privately-issued securities for their customary holdings. By mid 2010, residential mortgages represented nearly half of the Federal Reserve's entire portfolio; today, with the total balance sheet now at \$3.5 trillion, mortgages still constituted 35 percent of total assets.

Why did these central banks undertake such massive expansions of their asset holdings? And what reason did they have for doing so primarily via loans to banks and then purchases of assets like commercial paper and mortgages? Why should an informed economist have expected these actions to affect either the financial markets or, more importantly, nonfinancial activity? By what metric would one judge whether these actions were effective? Students educated to view the macroeconomy and the role of monetary policy through the standard models have no way even to begin to pursue any of these very natural questions. And the researchers who have pursued them have little way to connect their work to the conceptual frameworks that the standard models offer.

Analogous questions arise from looking at these central banks' liabilities. Central banks' balance sheets, like those of other entities, balance. The huge increase in asset holdings with which they responded to the crisis therefore meant an equally huge increase in their outstanding liabilities. Students taught to view the macroeconomy through the lens of central bank (or "high powered") money supply would presumably have expected not just an increase of a few percentage points in these economies' rates of inflation but a hyperinflation, perhaps even reminiscent of what occurred in Germany and Russia after World War I or in Hungary after World War II. Indeed, more than a few economists predicted just such a consequence of these extraordinary central bank actions.

But no such increase in inflation – not even a few percentage points – has yet appeared, in any of these economies. To be sure, no one can preclude with certainty even that a hyperinflation, or something like it, may ensue some time somewhere. But even if inflation in these countries does pick up pace at some point, a response of some percentage points to this magnitude of increase in central bank liabilities, and only after a delay of more than half a

decade, is widely at variance with the core implications of standard models relating prices to central bank money. Given the huge magnitude of the expansion in central bank balance sheets, and in light of the weight that least-squares statistical methods attach to outlier observations, for at least the next generation no one will again be able to get economically sensible estimates, for any of the large high-income economies, from what were once standard regressions relating the price level (or its rate of change) to the quantity (or change) of central bank liabilities.

### **A Conceptual Framework**

The most familiar workhorse of monetary-policy macroeconomics today is the three-equation “new Keynesian” model consisting of an aggregate demand equation representing consumers’ forward-looking inter-temporal choice for a given interest rate, a “Phillips curve” representing the forward-looking behavior of price setters operating under some form of impediment to perfect price flexibility, and an equation representing the central bank’s setting of a short-term nominal interest rate in response to observed movements of prices or output or both. The problem with this model, for current purposes, is not so much that it is wrong but that it is incomplete. Once the central bank’s policy interest rate has reached the zero lower bound, the model implicitly portrays monetary policy as impotent to undertake any further economic stimulus. It leaves no room even to consider the kinds of additional measures that many central banks undertook during and in the aftermath of the 2007-9 crisis.

The remedy, therefore, is not to discard this otherwise useful framework but to expand it – while nonetheless preserving, in so far as possible, its analytical advantages in terms of parsimony and compactness. The model’s crucial lacuna, for purposes of representing the actions of central banks during this recent period and their effect on the nonfinancial economy, is the absence of any distinction between the interest rate that the central bank sets – in

conventional vocabulary, the “policy interest rate” – and the interest rates at which households and firms regularly borrow and lend, and that therefore matter for their spending decisions, either as direct costs (if they are borrowers/investors) or as opportunity costs (if they are lenders/savers). The simple framework suggested here fills that gap by adding a two-equation supply-demand apparatus explicitly representing lenders’ and borrowers’ behavior in the market for private-sector obligations.

Two elements of the standard “new Keynesian” model suffice with no change: Price setters set today’s prices in response to aggregate output of goods and services and to their expectations of future prices. And the central bank sets the policy interest rate in response to the difference between actual output and its target level of output (presumably the level that would deliver stable inflation) and to the difference between actual inflation and its target rate of inflation.

The third element of the standard model is necessary as well, although with an important change. Aggregate demand for goods and services depends on expected future output, as in the standard model, but also on the expected real interest rate derived from *the nominal interest rate relevant to private-sector spending decisions*. The important distinction is that the nominal interest rate that matters for these decisions is not the policy interest rate that the central bank sets but instead some private-sector rate that households and firms would pay on borrowing to finance spending in excess of current income, or that they would earn on unspent income or other accumulated assets.

Distinguishing between these two interest rates means abandoning the assumption, which has been commonplace in standard macroeconomic theory ever since the inception of the field, that all non-money assets are perfect substitutes. Most central banks normally conduct monetary

policy by setting an overnight interest rate, or if not overnight then for some other very short maturity: in the United States the federal funds rate (usually overnight transactions), in Europe the “EONIA” Euro overnight interest average, and in Japan the uncollateralized call loan rate (also mostly one-day loans). By contrast, the obligations that either households or firms issue to finance their spending, and likewise the instruments in which households invest their savings, are typically of much longer maturity, often measured in years rather than days. Further, while the interest rates that central banks set for purposes of monetary policy are mostly for obligations that are implicitly guaranteed – often claims on banks’ holdings of reserves at the central bank itself – private-sector obligations are potentially subject to default. On grounds of both maturity and default risk, therefore, the obligations respectively underlying the policy interest rate and the constellation of private-sector rates are not perfect substitutes when investors are risk averse. Moreover, the difference, or spread, between the two interest rates can vary over time even if investors’ risk aversion is constant.

It therefore remains to determine the private interest rate, given the policy interest rate set by the central bank. Two further relationships, representing supply and demand *in the market for private securities*, suffice for this purpose: Households and firms borrow in relation to how much they expect to spend (borrowing *more* when they expect to spend more) and, importantly, to how much it costs them (borrowing *less* when the expected real interest rate – the nominal interest rate on the securities they issue minus the inflation they expect over the securities’ life – is higher). Correspondingly, private investors, who likewise include households and firms within the economy but perhaps also financial intermediaries as well as foreign investors, lend to households and firms in relation to *their* expectations of the borrowers’ future income levels (lending more as they expect borrowers to earn more and therefore be more creditworthy) and,



importantly, to the difference between the return they expect on private securities compared to returns on alternative investments (buying *more* private securities when that difference is greater). Further, for at least some private investors – for example, banks – a plausible alternative investment is in assets that yield the policy interest rate. Hence the policy interest rate that the central bank is setting today matters, but so does the policy interest rate that investors expect the central bank to set over the remaining life of the private securities.

The volume of private securities issued by households and firms must equal the volume of these securities bought. In the absence of purchases by the central bank, this would mean the volume bought by private-sector investors. But when the central bank also buys privately issued securities – as many central banks have done in response to the recent crisis – then market clearing instead requires that the volume of these securities issued by private borrowers equal the volume bought by private investors *plus* the volume bought by the central bank.

### **Two Examples from Recent Central Bank Policy Actions**

Figures 1 and 2 illustrate the workings of this expanded model’s portrayal of an adverse shock to financial intermediation, as occurred during the recent crisis, followed by policy actions of the kind taken by many central banks. The downward-sloping line labeled IS in the right-hand panel of each figure shows the relationship between spending on goods and services and the *private-sector* interest rate, conditional on given expectations of future output and inflation. The downward-sloping line in the *left*-hand panel of each figure, labeled  $c^S$ , depicts households’ and firms’ supply of private securities, as a function of the interest rate on these securities, also for given expectations of future output and inflation. The solid upward-sloping line in the left-hand panel, labeled  $c^D + c^{CB}$ , correspondingly depicts private investors’ demand for these securities, as a function of the interest rate they bear, for given expectations of future incomes, a

given value of the policy interest rate set by the central bank today and given expectations of the policy interest rate in the future, *plus* a given level of purchases of these securities by the central bank. Both Figure 1 and Figure 2 arbitrarily portray the initial supply-demand equilibrium in the asset market in the left-hand panel, labeled point A, at the private-sector interest rate level that, when transposed to the right-hand panel, intersects with the IS line at the full-employment value, labeled  $y^*$ .

The story told in each figure begins from the kind of adverse shock that figured prominently in triggering the recent financial crisis: a decline in house prices, or realized loan losses that deplete lenders' capital, or even simply investors' concern that the economy may be heading into a slow period in which private-sector borrowers' creditworthiness will be under stress. Any or all of these events reduces private investors' demand for private-sector securities and therefore, all else equal, shifts the demand curve backward to the respective *broken* lines in the left-hand panels of Figures 1 and 2. The result in each case is a higher market-clearing private-sector interest rate, and therefore a reduced value of income, at the respective points labeled B. Under normal circumstances, when movements of the policy interest rate are not limited by the zero lower bound, the central bank presumably would choose to reduce its policy interest rate. Doing so would shift the demand for private-sector securities so as to reduce the private interest rate as well, and thereby restore output to its original level. For purposes of thinking about the 2007-9 crisis, however, the policy interest rate had reached the zero lower bound and so further cuts were not an available option.

Many central banks therefore turned to large-scale purchases of private-sector securities. Figure 1 illustrates the effect of such purchases following an adverse shock (again, from an erosion of borrowers' creditworthiness, or a depletion of lenders' capital) to the demand for

private securities. Here the central bank's purchases are a straightforward addition to the total market demand for these securities, and so they shift the demand curve outward to the *dotted* line in the left-hand panel, thereby lowering the market-clearing private interest rate for given expectations and a given (presumably zero) policy interest rate. The corresponding result in the right-hand panel is an increase in output. Both intersections are labeled as point C. Figure 1 illustrates the presumably realistic case in which the central bank's purchases, however, are not sufficient to restore output to the initial full-employment level.

A second policy tool to which some central banks turned in the crisis, in the absence of the ability to cut the policy interest rate any further, was forward guidance. The Federal Reserve's Open Market Committee reduced its target for the federal funds rate to 0 – ¼ percent in December 2008. At the same time, it publicly stated that “the Committee anticipates that weak economic conditions are likely to warrant exceptionally low levels of the federal funds rate for some time.” Apart from a change in wording from “some time” to “an extended period,” the Committee repeated the same public statement after each meeting that it held through June 2011. In August 2011, it then switched to a more explicit statement that “the Committee currently anticipates that economic conditions ... are likely to warrant exceptionally low levels for the federal funds rate at least through mid-2013.” Thereafter, the Committee extended the specific horizon for this forward guidance several times, by late 2012 indicating the anticipation of low short-term interest rates “at least through mid-2015.” And in December 2012 the Committee shifted to a new form of statement explicitly conditioned on observed and forecast economic outcomes: “the Committee ... currently anticipates that this exceptionally low level for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6 ½ percent, inflation between one and two years ahead is projected to be no more than a half

percentage point above the Committee's 2-percent longer-run goal, and longer-term inflation expectations continue to be well anchored."

Figure 2 illustrates the working of this kind of forward guidance on the future policy interest rate. Reducing the policy rate that investors expect in the future shifts the demand curve for private-sector securities downward, again lowering the market-clearing private interest rate, as indicated by the *dotted* line in the left-hand panel of the figure, and correspondingly raising output in the right-hand panel, in each case to the point labeled C. (With the linear demand curve drawn here, the *downward* movement due to a lower expected future policy rate in Figure 2 is visually indistinguishable from the *outward* movement due to greater central bank purchases in Figure 1; but the movement in the demand curve due to forward guidance is vertical, not horizontal.) Here too the figure illustrates the case in which the effect of the central bank's forward guidance is not sufficient to restore income to the initial level – presumably because of the zero lower bound on the policy interest rate.

### **In Conclusion**

The practice of monetary policy, as carried out by the central banks of the advanced industrialized economies, has changed since the 2007-9 financial crisis. The analysis of monetary policy needs to change as well. Monetary policy is no longer merely a matter of the central bank's setting some short-term nominal interest rate. Once they had cut their policy interest rates to the effective lower bound, during and in the aftermath of the crisis, many central banks pursued further measures like targeted asset purchases and forward guidance on the policy rate itself, in both cases intended to reduce longer-term interest rates for private-sector borrowers and thereby stimulate nonfinancial economic activity. The analysis of monetary policy needs to

be able to accommodate these monetary policy actions too. It is no longer sufficient to represent the central bank as having a single policy tool at its disposal.

The point is a fundamental one, in two ways. First, for decades the common theoretical understanding has been that monetary policy has only one independent instrument at its disposal: it can set the quantity of its outstanding liabilities, or it can set their market price – that is, the interest rate at which they are exchanged – but it cannot independently set both. In modern times, with brief exceptions, most central banks have chosen to carry out monetary policy by setting the interest rate corresponding to banks' holdings of reserves held at the central bank. In their response to the 2007-9 crisis, most of the major central banks initially used the interest-rate instrument and then, once the policy interest rate had reached the lower bound, turned to the quantity instrument. Viewed from this perspective, in each phase of the response to the crisis the central bank was, as in the traditional understanding, still using only one monetary policy instrument at a time.

But the ongoing discussion of monetary policy in the post-crisis recovery has made clear that, under arrangements now in place in most of the high-income economies – specifically, with the central bank able to pay interest on banks' reserve balances – monetary policymakers need not deploy only one of these instruments at a time. The central bank's ability to choose what quantity of assets to purchase (with consequent increase in its liabilities), as many central banks did during and following the crisis, is not merely an artifact of the policy interest rate's being at the lower bound. Paying interest on reserves effectively established a floor to short-term market interest rates. Importantly, it does so without the central bank's needing to carry out conventional open market operations; indeed, it can even do so while the central bank is changing the quantity of its assets and liabilities in the opposite direction to what would

correspond, under the traditional theory, to whatever change in the policy interest rate it is implementing at the same time. Given today's institutions, therefore, the central bank can choose *both* the quantity of its outstanding liabilities *and* their market price (that is, the interest rate at which they trade). Monetary policy has not one independent instrument but two.

The second way in which the monetary policy response to the 2007-9 crisis has represented a fundamental departure is that the movement of central banks' *liabilities* has been, in most cases, merely the passive (and, for macroeconomic purposes, mostly irrelevant) counterpart of the changes central banks have made in their asset holdings. Policymakers' decisions, and whatever economic effects have ensued, have been a matter of the asset side of central banks' balance sheets, not their liabilities.

Numerous researchers have been actively engaged in seeking to understand, and where possible to quantify, the working of monetary policy within this new and very different theoretical framework. The necessarily simplified conceptual framework that macroeconomists teach to students of the subject – and to which they turn in their own short-hand intuitive thinking – should incorporate this changed monetary policy landscape as well. The simple framework set forth here provides a way of doing so.

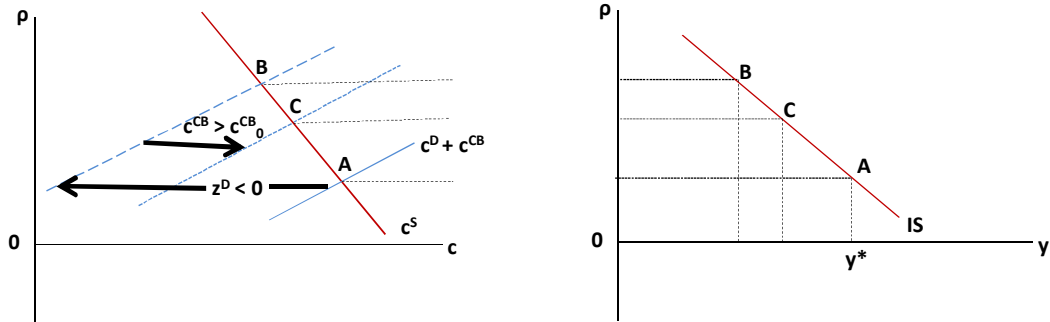


Figure 1: Effect of a Central Bank Asset Purchase

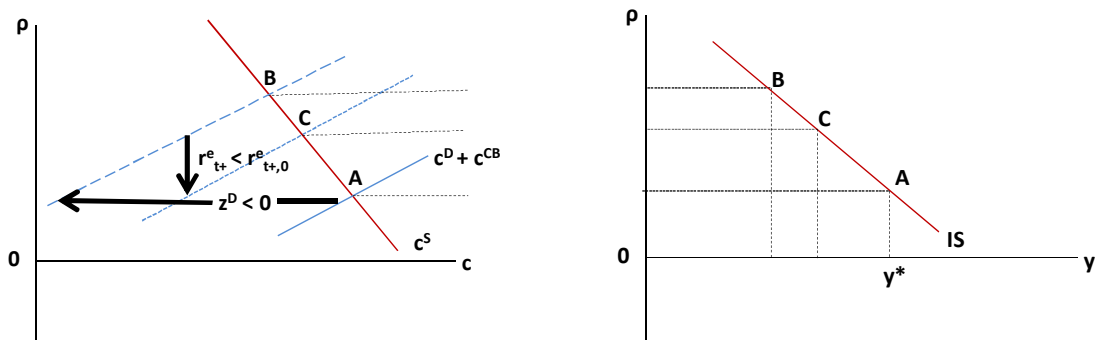


Figure 2: Effect of Forward Guidance on the Policy Interest Rate