The Journal of Economic Education

ISSN: 0022-0485 (Print) 2152-4068 (Online) Journal homepage: https://www.tandfonline.com/loi/vece20

Monetary Policy After August 2007

Mark Gertler

To cite this article: Mark Gertler (2013) Monetary Policy After August 2007, The Journal of Economic Education, 44:4, 329-338, DOI: 10.1080/00220485.2013.825110

To link to this article: https://doi.org/10.1080/00220485.2013.825110

THE JOURNAL OF ECONOMIC EDUCATION, *44*(4), 329–338, 2013

ISSN: 0022-0485 print/2152-4068 online
DOI: 10.1080/00220485.2013.825110

Routledge
Taylor & Francis Group

CONTENT ARTICLES IN ECONOMICS

Monetary Policy After August 2007

Mark Gertler

In this article, the author describes conceptually how to think about the dramatic changes in monetary policy since the sub-prime crisis of August 2007. He also discusses how to incorporate these changes and related economic concepts in the teaching of an undergraduate class in macroeconomics. A distinction is made between conventional and unconventional monetary policy, both conceptually and in practice, but most of the focus is on unconventional monetary policy and how it can be integrated within a standard macroeconomic framework. Some attention is also given to the relevance of the liquidity trap and forward guidance in monetary policy.

Keywords *Federal Reserve, liquidity trap, monetary policy, quantitative easing*

JEL codes *E53, E58*

Since the beginning of the sub-prime crisis in August 2007, monetary policy has changed dramatically. Some of the change reflects natural progression. For example, although it has become increasingly sophisticated under the Bernanke Fed, the practice of forward guidance (i.e., the use of communication to manage private-sector expectations of the future path of the policy) has its roots in the Greenspan Fed. Another example involves the Fed's recent adoption of a formal inflation target. Although the Greenspan Fed resisted adopting a formal target, the evidence suggests that it conducted policy with an implicit inflation target in the range of 2 percent.[1] Speeches by FOMC members at the time appeared to consistently ratify the notion of a 2-percent target. The move to a formal target thus reflects more a smooth continuation of policy than any kind of sharp break.

On the other hand, the dramatic changes in monetary policy have come as a response to the crisis. The first type of change involves the introduction of a wide variety of unconventional tools that by and large have never been used before, at least in the postwar era. The second type of change involves management of policy in a liquidity trap where the nominal interest rate has reached the zero lower bound, a phenomenon that has not occurred since the Great Depression. The implication is that the way the central bank normally combats a weak economy—reducing

Mark Gertler (e-mail: mark.gertler@nyu.edu) is the Henry and Lucy Moses Professor of Economics at New York University.

the short-term interest rate—is no longer an option. Managing expectations of the future path of short rates remains an option. But the issue remains of how best to accomplish this.

In this article, I first describe conceptually how to think about these dramatic changes in monetary policy and then how to go about incorporating these concepts in the undergraduate macroeconomics class. I spend most of the time on unconventional monetary policy, where I think the changes have been sharpest. But I also discuss the relevance of the liquidity trap.

In the following section, I discuss how to think about unconventional versus conventional policy from a conceptual standpoint and then go on to describe what happened in practice. In the subsequent section, I describe how to integrate unconventional monetary policy within a standard macroeconomic framework from a conceptual standpoint. In the section after that, I describe the implications of the zero lower bound on the nominal interest rate for monetary policy management.

BACKGROUND

I begin with some definitions: By conventional monetary policy, I refer to the central bank's practice of setting the short-term interest rate to affect the market structure of interest rates, and thereby the cost of borrowing. For most of the time since the 1960s until the beginning of the crisis, the Fed has practiced conventional policy. The use of this conventional tool has perhaps been clearest since the early 1990s when the Fed began setting targets for the federal funds rate.

By unconventional monetary policy, I have in mind the Fed taking actions to improve the efficiency of credit markets. Typically this will involve the central bank either lending directly or indirectly in private credit markets. It will also often (though not always) involve the Fed exposing its balance sheet to private-sector credit risk. For most of the postwar period up until the crisis, private-sector credit risk was something the Fed largely avoided, except for a relatively small amount of discount window lending to banks short of reserves. Matters changed completely during the crisis, as I discuss shortly.

The founders of the Fed meant for unconventional policies to be used in crisis periods and not in normal times. To justify interventions in the recent crisis, the Fed appears to refer to section 13.3 of the Federal Reserve Act, which states that "in unusual and exigent circumstances" the Federal Reserve may lend directly to private borrowers to the extent it judges the loans to be adequately secured (Federal Reserve 2013). Though admittedly vague, the statement is interpreted to mean that during a crisis, the Fed is able to fulfill its responsibilities as a lender-of-last-resort. In particular, it can lend freely in private markets against "good" collateral. What constitutes good collateral is left vague by both necessity and design. Basically, the Fed has to use its expertise to make the call.

It is worth adding that Section 13.3 does not appear in the Federal Reserve Act by accident. The main motive for setting up the Fed in 1913 was to have a national financial institution that could act as a lender of last resort to help stave off banking panics.

The Fed began to introduce its new unconventional tools not long after the sub-prime crisis began. The motive for each new tool was to respond to a disruption in a particular credit market. A second consideration was the adjustment of the short-term interest rate to the zero lower bound by the end of 2008. Normally in a recession, the Fed combats the weakness in spending by reducing short rates. With this conventional tactic no longer available, the Fed must resort to

unconventional means to stimulate the economy. It is important to emphasize, however, that the financial crisis was central to the introduction of the new tools, which were mostly introduced prior to the point where short rates hit the zero lower bound.

The most visible tools, known in "Fedspeak," are large-scale asset purchases, or LSAPs. To the rest of the world these tools are referred to as quantitative easing, or QE. The notoriety is partly due to the fact that they largely account for the dramatic growth in the size of the Fed's balance sheet during 2007 to 2013. It is also partly due to the fact that these tools remain in operation, unlike a number of the liquidity programs that are now on the shelf.

There have been three main episodes of QE. The first and thus far the largest was initiated in December 2008, the peak of the crisis following the Lehmann Brothers collapse. Known as QE1, it involved the purchase mainly of agency mortgage-backed securities (AMBS) as an effort to reduce mortgage rates and spur mortgage lending. It also included purchases of agency debt and long-term government bonds as part of a general effort to reduce long-term interest rates. A complementary program introduced at the time was the commercial paper funding facility. Under this program, the Fed made loans to banks that in turn channeled the funds to commercial paper issuers. While this program did not involve direct purchases of assets, the Fed accepted the commercial paper as collateral from the banks, which is conceptually similar.

The second main wave of QE began in October 2010, in response to the floundering economic recovery. This program was roughly a third the size of QE1. Another important difference is that the purchases were exclusively of long-term government bonds. The goal again was to try to reduce long-term interest rates. QE2 was followed by Operation Twist, which involved the Fed shifting the composition of the asset side of its balance sheet to longer maturity securities. While QE involves increasing the size of its balance sheet by funding purchases by issuing reserves, Operation Twist left the size unchanged. In the latter case, the acquisition of long-term government bonds was financed by selling short-term government bonds.

Finally, QE3 was introduced in September 2012 as a further attempt to provide stimulus to a still stalled economy. This time the focus shifted back to the purchase of AMBS. In contrast to QE1 and QE2, however, the Fed did not announce ceilings for planned purchases. Rather it made an open-ended commitment of a small but steady monthly stream of purchases until labor market conditions improved.

It is instructive to analyze the behavior of the Federal Reserve's balance sheet over the crisis period. At the beginning of the crisis in August 2007, the balance sheet looked the way it normally does over the period: Assets consisted mainly of Treasury bills and liabilities mainly of currency, with a small amount of bank reserves. The overall size of the balance sheet was between eight and nine hundred billion. To do conventional monetary policy, the Fed would then buy and sell Treasury bills with the aim of adjusting the supply of bank reserves to target the federal funds rate (the market price of reserves).

As the crisis unfolded, the composition of the asset side of the balance sheet began to change, reflecting the introduction of various programs to improve the liquidity of interbank markets and other markets for short-term credit. For example, the Fed exchanged government securities for high-grade private securities to improve market liquidity. The liquidity crisis was impairing the collateral value of even the highest-grade private securities, hence the need for government securities to improve market liquidity. While the Fed's balance sheet rose on net, the increase was relatively modest up until fall of 2008.

After the Lehmann collapse, however, all hell broke loose. The central bank dramatically increased the size of its balance sheet. In the very near term, much of the increase was due to the increase in short-term lending to financial institutions, a large component of which was due to the initiation of the commercial paper funding facility, described earlier. (The other major component included dollar loans to foreign central banks.) Over time, however, the LSAPs initiated under QE1 provided the main source of the upward drift. Most of the purchases involved non-Treasury securities, mainly AMBS.

By late 2010, there was a sharp increase in government bond holdings due to QE2. By the time QE3 was initiated in late September 2012, the balance sheet was more than three and a half times its pre-crisis size, growing from roughly 800 billion to nearly 3 trillion.

How did the Fed finance the sharp expansion of its balance sheet? Following the Lehmann collapse, it initially borrowed short-term government bonds from the Treasury to issue to the private sector. At roughly the same time, it gained the power to pay a variable interest rate on bank reserves. It eventually switched to using this kind of liability to fund its asset acquisitions. Note, however, that interest-bearing reserves are essentially overnight government debt. Just like Treasury Bills, for example, they pay a market-determined interest rate and have the full backing of the United States government. The only difference is that the maturity is a day as opposed to three months.

The point of all this is that an unconventional tool like QE essentially should be thought of as central bank intermediation. Like an investment bank, the Fed acquires assets which on average have a maturity longer than the liabilities used to fund these assets. The main difference is that the liabilities the Fed issues are essentially riskless as compared to an uninsured private intermediary. Thus, in a financial crisis the Fed can obtain at a time when private financial intermediaries are likely to find it very difficult. Under this interpretation, QE reflects central bank intermediation stepping in to offset the disruption of private intermediation.

Indeed, the assets the Fed acquired during QE1 and related programs had been held by investment banks that were rapidly shrinking at the time. The evidence suggests further that these programs were largely successful in improving credit flows. The response of the commercial paper market to the introduction of the funding facility is a prime example. The money market meltdown following the Lehmann Brothers collapse led to sharp disruption of the commercial paper market: New issues fell significantly and rates on commercial paper relative to similar maturity safe assets rose dramatically. The introduction of the funding facility quickly restored lending activity in the commercial paper market. The net effect was a reduction in credit spreads back to the vicinities of pre-Lehmann levels. Effectively, the program helped avoid a catastrophic breakdown of the commercial paper market.

There was a similar response of rates on AMBS to the Fed's intervention in this market. In December 2008, the Fed announced its plan to begin mortgage purchases in the spring of the following year. Immediately upon this announcement, the spread between AMBS and then-year government bonds fell roughly 50 basis points. Once the program was initiated, the spread fell another 50 basis points. Further, the combined effect of purchases of AMBS, agency debt, and long-term government bonds pushed long-term government bond rates down in the vicinity of 50 to 100 basis points. This implies that the overall mortgage rate fell between 150 to 200 basis points, a sizeable drop. One can reasonably argue that the drop in various long-term rates helped stabilize the economy by substantially reducing credit costs.

While most observers agree that QE1 was very effective, there is debate over the impact of QE2, which was smaller in scale and restricted to purchases of long-term government bonds. The formal evidence suggests that long-term rates dropped approximately 15 basis points, although this drop is difficult to see from simply inspecting plots of the data. (See Williams [2011] for an analysis of the evidence.)

MODELING CONVENTIONAL VERSUS UNCONVENTIONAL MONETARY POLICY

Let R^k be the rate of return to capital and R be the risk-free saving rate. Then under perfect capital markets, portfolio arbitrage implies that to a first approximation the two rates of return are equalized.

$$R^k = R \tag{1}$$

Note that this restriction typically holds in standard intermediate macro models. It also holds implicitly in standard "DSGE" models used in central banks for forecasting and policy evaluation.

The transmission mechanism for conventional monetary policy then works as follows. The central bank adjusts the nominal interest rate, which in the short run translates into an adjustment in the real rate R due to the presence of nominal price and/or wage rigidities. The change in R then generates a one-for-one change in R^k. Interest-sensitive spending then moves inversely with the change in the required return to capital.

With imperfect capital markets, however, the return to capital may exceed the riskless rate:[2]

$$R^k \geq R \tag{2}$$

In this case, limitations on the ability to obtain credit may preclude borrowers from making what would otherwise be profitable investments. A financial crisis, accordingly, corresponds to an increase in the spread $R^k - R$. The rise in R^k relative to R in turn depresses interest-sensitive spending. In this way, the financial crisis spills over to real activity. In terms of the IS/LM apparatus, an increase in the spread would lead to a downward shift in the IS curve, reflecting the associated decline in investment.

Note that the spread may rise for one of two basic reasons, or both: First, credit constraints may have tightened on nonfinancial borrowers; second, they may have tightened on the financial intermediaries via which these borrowers obtained funds. In the current crisis, the latter phenomenon was particularly impotent, peaking at the time around the Lehmann collapse.

Unconventional policy in this scenario amounts to central bank intervention in credit flows to reduce the spread $R^k - R$. Indeed, good prediction of whether the Fed would introduce a new unconventional tool for a particular credit market was a sharp increase in the credit spread relevant to that market. Almost invariably, the introduction of the new tool would lead to a reduction in the spread.

As with conventional policy, the aim of unconventional policy is to stimulate the economy by reducing the cost of capital. The tools for doing so, however, involve some form of central bank intermediation, as opposed to adjusting the short rate. Note, though, that conventional policy can still be effective in this environment so long as the zero lower bound on the short rate is not binding. Holding constant the spread, a fall in the short rate reduces R^k.

I next characterize how the spread may be determined in private credit markets and then describe how unconventional policy can affect the spread. The particular unconventional policy I will model is QE.[3]

To keep things simple, I suppose that all borrowing is done to finance capital. Further financial intermediaries (i.e., "banks") intermediate funds between households and nonfinancial firms are omitted. Let S be the total stock of loans to finance capital, S^p the amount intermediated by banks, and S^{cb} the amount intermediated by the central bank. Then by definition

$$S = S^p + S^{cb} \tag{3}$$

Banks fund asset holdings by issuing short-term deposits, a portion of which are uninsured. The quantity of deposits a bank can issue, accordingly, will depend on the overall financial health of the bank, X. A common measure of a bank's financial health is its leverage ratio (i.e., the ratio of its total assets to equity). This ratio is an indicator of how well a bank can insulate its depositors from losses on its assets. Accordingly, theory suggests that the quantity of assets a bank can intermediate depends positively on its financial health. It also depends positively on the excess return on assets it can earn (i.e., the wedge between the borrowing and lending rate, given by the spread, $R^k - R$, as follows). The higher the expected spread a bank can earn, the more likely it will be able to meet its obligations to depositors, and hence the more deposits it is able to issue. Thus, one can write

$$S^p = \phi(X, R^k - R) \tag{4}$$

with $\phi_1 > 0$, $\phi_2 > 0$.

Central banks fund the residual between the total amount of securities and the amount that private banks intermediate. To obtain funds from depositors, they issue interest-bearing reserves (i.e., overnight government debt). In equilibrium,

$$S - S^{cb} = \phi(R^k - R, X) \tag{5}$$

The left side of (5) is the supply of securities that must be intermediated by private banks (i.e., the total net central bank holdings). The right side is the quantity that private banks are able to intermediate. Given bank health, the spread adjusts to equate demand and supply. Securities prices adjust to bring R^k and hence $R^k - R$ in line with the equilibrium.

One can now turn to some comparative statics. Suppose first there is a decline in bank health. Everything else equal, this reduces the quantity of assets banks can intermediate. As a result, the spread must increase to equate supply and demand. As noted earlier, the increase in the spread reduces investment demand. In terms of the IS/LM apparatus, a reduction in bank health shifts the IS curve down, reducing output, everything else equal.

Central bank asset purchases can work to mitigate the impact of the decline in bank health. An increase in S^{cb} reduces the quantity of securities that private banks need to fund. As a result, the spread decreases, which in turn stimulates investment demand. The policy accordingly generates an outward shift in the IS curve. This exercise also illustrates how unconventional monetary policy works by reducing credit spreads.

It is important to emphasize that unconventional monetary policy is effective to the extent there exists limits to arbitrage in private intermediation (i.e., $R^k > R$). In this instance, central bank intermediation can improve overall credit flows. Under perfect capital markets, however ($R^k =$

R), changes in S^g are neutral. Central bank intermediation simply displaces private intermediation with no impact on rates.

The implication is that the effectiveness of central bank asset purchases is likely to be greater in securities markets where frictions are greater. This helps explain why purchases of AMBS seem to have a greater impact on rates than purchases of government bonds, for example (given the AMBS market is less liquid than the government bond market).

I emphasize that QE can be effective so long as the central bank is able to purchase securities experiencing liquidity problems as a opposed to solvency problems. In the former case, the central bank is reducing the cost of funding assets in markets where private liquidity has temporarily dried up. In the latter case, it is funding assets with a negative present value—something it would like to avoid. This suggests that the central bank, as best it can, should fund only high-grade securities (e.g., ABMS as opposed to junk bonds).

THE LIQUIDITY TRAP AND FORWARD GUIDANCE

In a liquidity trap, the nominal interest rate is at the zero lower bound. It is no longer an option for the central bank to stimulate the economy by reducing current short rates. In this situation, the kinds of unconventional policies described in the previous section are viable. Another alternative is for the central bank to manage expectations of the future path of the short-term interest rate. This latter policy in Fed parlance is known as "forward guidance."

To characterize how forward guidance works, I must add some detail to how monetary policy is transmitted to the real economy. I begin with Tobin's Q theory which suggests that investment I_t depends positive of the ratio of the market value of capital Q_t to its replacement cost, which I normalize at unity. Accordingly, one can write

$$I_t = h(Q_t);\ h' > 0 \tag{6}$$

Monetary policy is transmitted to investment via the impact of interest rates on the market price of capital. Let D_t be dividend payouts. Then the rate of return to capital R^k_{t+1} is given by

$$R^k_{t+1} = \frac{D_{t+1} + Q_{t+1}}{Q_t} \tag{7}$$

Manipulating this relation and solving forward iteratively for Q_t implies

$$Q_t = \sum\nolimits_{i=1} \frac{D_{t+1}}{\prod_{J=1}^{I} R^k_{t+j}} \tag{8}$$

Equation (8) states simply that the asset price equals the discounted stream of dividends, where the relevant period discount rate is the required return to capital R^k_{t+j}. Let us define p_{t+1} as the spread between the required return to capital and the riskless rate R_{t+1}. (As discussed in the previous section, one can think of this spread as arising from capital market frictions.) Accordingly,

$$R^k_{t+1} = p_{t+1} + R_{t+1} \tag{9}$$

Combining equations (8) and (9) yields a relation for Q_t as a function of current and expected future values of p_{t+1} and R_{t+1}.

$$Q_t = \sum_{i=1} \frac{D_{t+1}}{\prod_{j=1}^{i} p_{t+j} + R_{t+j}} \tag{10}$$

As inspection of equations (6) and (10) makes clear, the transmission of conventional monetary policy to investment spending depends not only on how the central bank sets the current short rate, but also on beliefs about how it will set the path of future rates. For example, if the central bank is able to credibly communicate that future short rates will fall, asset prices and investment will increase. Communication about future unconventional policy matters in a complementary way. As discussed in the previous section, unconventional policy affects the spread p_{t+1}. Beliefs about the future impact of unconventional polices affects expectations about the path of the cost of capital (via the impact of the path of the spread), which in turn affects asset prices and investment.

In a liquidity trap with the zero lower bound binding, forward guidance moves to center stage as a policy strategy. In this instance (and ignoring the distinction between nominal and real rates), the following equation holds with equality during the time the economy is in the liquidity trap and is relaxed in the periods it is out:

$$R_{t+j}^{k} \geq 0 \tag{11}$$

Suppose the economy is currently in a liquidity trap but is expected to be out T periods from now, that is,

$$R_{t+j}^{k} = 0,\ j \varepsilon [1, T] > 0,\ j > T \tag{12}$$

In this instance, the central bank can use forward guidance to manipulate market beliefs about the path of short rates for period $t + T$ and beyond. By doing so, it affects longer-term interest rates (which depend on the expected path of short rates) and the market price of capital, ultimately leading to an impact of investment. For an economy currently in recession and stuck in a liquidity trap, the central bank can promise to keep rates low beyond the time the economy leaves the liquidity trap. Promising future monetary accommodation provides stimulus today via the impact on longer-term rates and asset prices. Among the challenges in using forward guidance in this situation is balancing the need to commit to accommodation in the future to inject stimulus today against the possibility that when the future arises the promised stimulus is likely to be inflationary.

In practice, the way the central bank is using forward guidance is by promising to delay raising interest rates until well after the recovery has taken hold. Initially, it announced a target date for when it expected that it would begin raising rates. It has since moved to stating explicit criteria for when rate increases could begin. In particular, the current criteria for raising rates are either the unemployment rate falling below 6.5 percent unemployment or the year ahead forecast of inflation going above 2.5 percent. Given the unemployment rate is currently more than a percentage point higher and the forecasted inflation rate roughly 75 basis points lower, the condition of the economy is well short of the criteria for raising rates and is expected to be this way for at least another year and half to two years or more. The implication for the market is that the Federal Reserve plans to be accommodative for a considerable period and for clearly beyond

the point where the recovery has taken hold. Of course by doing so, it is providing stimulus that is helping the economy.

Note also that forward guidance can involve the central bank signaling its intentions about unconventional policy as well as conventional policy. As is clear from equation (10), the asset price depends inversely on the current and expected future values of the spread p_{t+1}. As discussed in the previous section, unconventional monetary policy (e.g., LSAPs) can reduce the spread, thus stimulating asset prices and investment. However, it is not only current purchases that matter but also the expected future path. For this reason, the central bank's communication strategy involves signaling its future intentions about both conventional and unconventional monetary policy.

CONCLUDING REMARKS

Two distinctive features of monetary policy after the crisis are (1) the use of unconventional interventions in credit markets and (2) forward guidance about the path of future policy.

Unconventional monetary policy reflects central bank intermediation and not money creation per se. The various types of interventions (e.g., LSAPs) are effective in reducing credit costs if frictions exist in private intermediation. For this reason, unconventional interventions are most effective in a financial crisis, as was the case with QE1, and in less liquid securities markets such as mortgage-backed securities as opposed to government bonds.

Like conventional monetary policy, unconventional monetary policy works by reducing credit costs. Accordingly, the transmission of unconventional monetary policy to the real economy is very similar to the transmission mechanism for conventional policy. The two types of monetary policy should be thought of as alternative ways of reducing credit costs. Importantly, there is no "quantity theory of money" link between the amount of bank reserves outstanding and inflation. A large central bank balance sheet does not imply inflation pressures, especially if the economy is weak.

It is true that when interest rates begin to increase, the Federal Reserve's interest obligations may eventually exceed the earnings on its portfolio. However, most reasonable estimates suggest that the losses will not be large and will be small relative to the profits on its portfolio that the central bank has already earned (e.g., Hall and Reis [2013]). Here it is important to recognize that the central bank must not market. It can simply hold its assets until they mature. They can continue to fund the assets by paying market interest rates on reserves and possibly also by extending to maturity its liabilities from overnight reserves to short-term certificates of deposit.

Finally, economic activity depends not only on the current setting of conventional and unconventional policy instruments, but also on their expected future paths. Thus, careful communication about future policy is critical.

NOTES

1. See, for example, Clarida, Gali, and Gertler (2000).
2. See Bernanke and Gertler (1989) for a formal analysis of how capital market frictions induce a spread between borrowing and lending rates.
3. See Gertler and Karadi (2011) for a formal analysis of QE.

REFERENCES

Bernanke, B., and M. Gertler. 1989. Agency costs, net worth and business fluctuations. *American Economic Review* 79(1): 14–31.

Clarida, R., J. Gali, and M. Gertler. 2000. Monetary policy rules and macroeconomic stability: Evidence and some theory. *The Quarterly Journal of Economics* 115(1): 147–80.

Federal Reserve. 2013. Federal Reserve Act, Section 13.3. http://www.federalreserve.gov/aboutthefed/section13.htm (accessed April 21, 2013).

Gertler, M., and P. Karadi. 2011. A model of unconventional monetary policy. *Journal of Monetary Economics* 58(1): 17–34.

Hall, R. E., and R. Reis. 2013. Maintaining central bank solvency under new style central banking. Unpublished paper. New York: Columbia University, Department of Economics.

Williams, J. C. 2011. Unconventional monetary policy: Lessons learned from the past three years. Paper presented at the Swiss National Bank Research Conference, Zurich, Switzerland, September 26. http://www.frbsf.org/news/speeches/2011/john-williams-0923.html#_ftn1 (accessed April 21, 2013).