1 New instruments of monetary policy

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1 Introduction

The chapters in this volume are the outcome of a conference held in Cambridge in March 2010. The title of the conference was 'New instruments of monetary policy'. Its purpose was to bring together economists from academia, financial markets and central banks to discuss some of the challenges that arose from both the financial crisis itself and the response to that crisis. Many of the assumptions that underpin mainstream (core) macroeconomic models have been challenged as a result of the traumatic events of the past three years. In particular, it became clear that the modern, micro-founded, form of macroeconomic model failed to allow adequately for the financial sector.

This failure, in part, reflected the belief that one could safely separate issues concerned with financial stability from the conduct of macroeconomic policy: macroeconomic policy, and in particular monetary policy, should be devoted to the stabilisation of inflation and output, and the short-term nominal interest rate used as the instrument of policy. Although it is well known that such a policy will be problematic when nominal interest rates are close to the zero interest rate floor, in practice it seemed that policy was successful in keeping the economy away from this region. The long road to price stability in the UK led down a number of cul-de-sacs, from monetary targets, shadow exchange rate targets, explicit exchange rate targeting and inflation targeting – without and then with operational central bank independence – and seemed to have arrived at its destination.

However, the exceptional circumstances of the financial crisis – which first manifested itself as a liquidity crisis for financial intermediaries[1] – and the consequent need to loosen monetary policy as much as possible, meant

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[1] See Chapters 2 and 8 in this volume on this point.

that the zero interest rate floor became the over-riding constraint acting on monetary policy. It had been broadly expected that the economy would operate at the zero lower bound for around only 2 per cent of the time at 2 per cent inflation targets.[2] But the eventual binding of the lower bound constraint meant that *so-called* unconventional or *new* monetary policies had to be adopted. In 2004 Bernanke et al. set out three types of response to the zero interest rate floor. First, a communication strategy must be used to influence expectations as to what interest rates and price levels will be in the future. Second, there must be an expansion in the size of the central bank's balance sheet. Finally, there must be direct use of the composition of the central bank's balance sheet to change relative yields. These three principles essentially encapsulate how central banks around the world responded in different ways to the crisis.

1.1 Macroeconomics and the crisis

The financial crisis has pushed the perennial questions of money and banking back to the fore of macroeconomic analysis. Until recently, it was widely agreed (at least outside of Frankfurt) that although the stock of money had a role to play, in practice it could be ignored as long as we used short-term nominal interest rates as the instrument of policy because money and other credit markets would clear at the given policy rate. Allied to this view was the belief that shocks to financial markets should not especially matter for the conduct of monetary policy when you are using the short interest rate as the main instrument over and above any impact they will have on the forecast output gap.[3]

But it has become increasingly difficult not to agree with the proposition that financial regulation, fiscal policy and even the objectives of overseas policy makers may constrain the actions of monetary policy makers. Indeed, in his June 2010 Mansion House speech, the Governor of the Bank of England welcomed wholeheartedly the Chancellor's plan to recombine monetary and financial policy: 'The Bank (will) take on (responsibilities) in respect of micro prudential regulation and macro prudential control of the balance sheets of the financial system as a whole. I welcome those new responsibilities. Monetary stability and financial stability are two sides of the same coin. During the crisis the former was threatened by the failure to secure the latter.' Indeed, prior to the financial crisis a form of separation principle was in place, whereby

[2] Bean (2003), for example, makes this point. Naturally a higher inflation target changes the duration downwards.
[3] We will discuss Poole's (1970) analysis of this question in Section 2.

monetary policy concentrated on inflation and financial or credit policy was treated as essentially a matter of microeconomic regulation.

From the imaginary vantage point of the first few years of the twenty-first century, the collapse of the separation principle would seem rather surprising. The new monetary policy consensus that emerged appeared to have solved many of the technical problems of monetary policy management. A representative view from this era, though written with circumspection, is that of Ben Bernanke (2004), who argued: 'Few disagree that monetary policy has played a large part in stabilizing inflation, and so the fact that output volatility has declined in parallel with inflation volatility, both in the United States and abroad, suggests that monetary policy may have helped moderate the variability of output as well . . . my view is that improvements in monetary policy, though certainly not the only factor, have probably been an important source of the Great Moderation.' He suggested several reasons for this: (i) low and stable inflation outcomes promoting a more stable economic structure; (ii) better monetary policy may have reduced the size and distribution from which measured shocks are drawn; and (iii) variable inflation expectations stop becoming an exogenous driver of macroeconomic instability. But the most important was arguably understanding the limitations of monetary policy. Bound by severe information constraints about the correct model and the current state of the economy, monetary policy concentrated on gauging the correct current level and prospective path for short-term interest rates in order to stabilise inflation and aggregate demand over the medium term. There was a general acceptance that a simple rule was likely to dominate a fully blown optimal rule, which was, in any case, always predicated on a particular model and subject to time inconsistency.

From an older perspective, the *Art of Central Banking* predated the *Science of Monetary Policy* and tended to define central banking not so much in terms of a narrow price stability but also in terms of objectives that might now be termed financial policy and involved policies to safeguard the continuing health of the financial system.[4] This art developed as a response to the multiplicity of roles 'grabbed' by a developing central bank but also fundamentally in response to crises. Bagehot (1873) famously outlined the principles of central banking in a crisis: (i) the central bank ought to lend freely at a high rate of interest to borrowers with good collateral; (ii) the value of the assets should be somewhere between panic and pre-panic prices; and (iii) institutions with poor collateral should be allowed to fail. The general understanding of these

[4] Compare the work of Hawtrey (1934) and Clarida et al. (2002).

principles has been associated with the avoidance of banking panics in England since the Overend and Gurney crisis of 1866, which was the previous example of a bank run in the UK until Northern Rock in 2007. The relevance of Bagehot's principles for the current crisis has recently been acknowledged by, among others, Mervyn King at the Bank of England (King, 2010) and Brian Madigan at the Federal Reserve Board (Madigan, 2009).

While short-term liquidity support, of varying kinds, was ultimately offered by all major central banks following the August 2007 freeze in interbank markets, another issue emerged shortly thereafter: how to deal with the zero lower bound on interest rates. In each case, the response has been to increase the size of the central bank balance sheet.[5] The basic idea here has borrowed from an older literature in which 'the size, composition and risk profile' (Borio and Disyatat, 2009, p. 5) is used to control financial conditions more generally. Because of imperfect substitutability across financial claims and a degree of market segmentation, a central bank that uses its balance sheet to alter the structure of private-sector balance sheets can influence financial prices (Tobin, 1958) and change the relative yields on assets (Brainard and Tobin, 1968). In this sense, balance sheet operations are really forms of extended open market operations with the objective of altering longer-term interest rates to an enduring extent.

1.2 Non-standard monetary policies

In this volume we outline some tentative views on non-standard policies from macroeconomists. We consider the theoretical case for bolstering the liquidity and capital holdings of financial intermediaries in line with the recently published Basel III recommendations.[6] A new generation of macroeconomic models suggests that financial frictions matter substantially in explaining business cycle fluctuations since they not only amplify the impact of a typical range of shocks but also can contribute directly to fluctuations. We also throw light on the implications of relaxing liquidity premia in a variety of newly developed macroeconomic models. Typically, the size of the central bank balance sheet has to be expanded considerably in order to offset the lower bound interest rate constraint. Chapters 5 and 7 from central

[5] This leads to the question of whether balance sheet operations and commercial bank reserve policies are independent of the short-term interest rate or simply complementary to the zero lower bound constraint.

[6] See the pages of the Bank for International Settlements (BIS) at www.bis.org/bcbs/basel3.htm.

bank-based economists show that the impact of balance sheet policies on both long-term bond prices and components of aggregate demand are far from insignificant, if carried out as part of a credible strategy to combat the zero bound. Finally, the UK's policy of quantitative easing is explained and some criticism of the current state of models is offered.

Let us start with a development of the criticism of baseline New Keynesian macroeconomics, that monetary policy with an explicit (or implicit) inflation target could not adequately capture information from money, asset prices and the accumulation of debt about medium-term macroeconomic disequilibria.

2 Directions old and new

The long-run neutrality of money is a central plank of monetary policy making (Lucas, 1996). Although it is quite a simple matter to find long-run non-neutralities in many standard New Keynesian models, it is generally found that long-run non-neutralities should not be exploited as there is no clear enhancement in the welfare of the representative household.[7] Naturally, though, perturbations in the money market will lead to temporary changes in the market clearing level of (overnight or short-term) policy rates and, because of various forms of informational uncertainty or indeed structural rigidity, will lead to temporary deviations in the expected real rate from its natural level and thus act on aggregate demand. The key question, however, is the extent to which shocks emanating from the money market can be stabilised by an interest rate rule, or indeed whether an additional tool may be required.[8]

In a seminal analysis of this question, Poole (1970) took a standard IS–LM framework and analysed the impact on output variance from setting either interest rates or the money supply in the presence of stochastic shocks to either or both of spending or money market equations. When shocks to financial markets dominate relative to shocks in the real part of the economy, the natural assignment is then broadly to use interest rates rather than the stock of money as the main policy instrument. But Poole also showed that, in general, neither instrument would necessarily stabilise the economy better than the other as it depended on the relative magnitude of shocks in these sectors and the sensitivity of output to these respective shocks. An often overlooked implication of his analysis was that in general, some use of both instruments was likely to stabilise the output better than one instrument alone, a point to which we shall return,

[7] See Khan et al. (2003) on this point. [8] See Chadha et al. (2008) on this point.

but one that is perhaps echoed by the experience of policy makers worldwide as they have had to augment interest rate tools with the expansion of the central bank balance sheet.

The Bank for International Settlements, from a disinterested position – as it does not actually have to set monetary policy – regularly expressed concern about what we might call a 'worrying triplet'. This triplet comprises high internal and external debt levels, high asset prices and rapidly growing broad money aggregates. White (2006) added to worries about whether it was sensible to partition monetary and financial issues with a further concern: the horizon over which policy sought to stabilise was also part of the problem. 'Central banks have put too much emphasis on achieving near term price stability' (p. 2) at the expense of considering in detail what the implications may be for longer-run macroeconomic stability coming from the build-up in domestic and international 'imbalances'. Of course, central banks have explored the notion of flexible inflation targeting, whereby financial considerations may operate as an occasionally binding constraint which would, in principle, extend or contract the horizon over which inflation would be brought back to target (see Bean (2003) and Svensson (2009)).

Any direct discussion of a special role for financial intermediation leads to the reconsideration of the relevance of Bernanke and Blinder's 1988 model of credit and demand, a version of which we develop in Section 2.1 below. In comparison with the two-asset world of the LM curve where there is simply a choice between money and bonds, if credit is not a perfect substitute for bonds then the quantity of loans and the external finance premium matters. In other words, spending will be affected by interest rates in the broader credit (or loan) markets and so the allocation of funds across narrow and broad money by financial institutions will matter for the level of aggregate demand. In the next sub-section we develop a version of this model to help us understand QE. This important point was mostly neglected in the great dynamic stochastic general equilibrium (DSGE) revolution of monetary policy making that took place over the subsequent two decades, in which the Modigliani–Miller theorem held continual sway, as issues of real economy structure and monetary policy strategy took centre stage, with financial intermediation and monetary quantities having no special role to play over the short-term policy rate.

From the policy perspective the prosaic answer of the Bundesbank and, latterly, of the European central bank (ECB) is that money does indeed matter. And so it is broad money growth that is associated equiproportionally with growth in nominal expenditure and that timely and accurate analysis of monetary dynamics constitutes (arguably) the most important part of the central bank's information set. Indeed, Mervyn King, the

Governor of the Bank of England, in a paper written while he was Deputy Governor, argued that money is important because it is an imperfect substitute for a wide variety of assets and so a change in its quantity will induce some rebalancing of financial portfolios and therefore will have an impact on nominal demand, with both direct effects on real assets and indirect effects, as financial yields will change and so the yields from many financial assets may enter the broad money demand function (King, 2002). With some prescience he argued that money may matter simply because it relaxes transaction costs and promotes liquidity, a point taken up in several chapters in this volume (for example, see Chapter 4).

Using money, or at least central bank liabilities, as an additional instrument of monetary policy fits well with the need to augment interest rate policy at the zero bound or indeed simply to deal directly with a malfunctioning financial system. Whether the use of central bank liabilities does indeed offset a shift in the supply curve for money and its counterparts too far to the left is one issue, but the development of new instruments fits very well into the game theoretic armoury available to central bankers. This is because complementary instruments may well augment the signalling impact of both the current level of interest rates and their expected path.[9] Note that one popular solution to the problem of controlling a forward-looking system of rational agents is to make it easier for those agents to forecast future policy and so condition their plans in line with the policy maker's objectives.[10] And so any strategy that is consistent with signalling a long period of low interest policy rates may help reduce real rates over a longer horizon and so raise price level expectations.

2.1 A framework for QE

If we leave to one side the signalling effect through a communications strategy, we can think about the (fiscal and) portfolio channels within the context of simple equilibria for money and spending equations in the economy. The discussion of a special role for financial intermediation leads us to reconsider the relevance of credit in determining demand. In comparison with the two-asset world of the LM curve where there is simply a choice between money and bonds, if credit is not a perfect substitute for bonds then the quantity of loans will matter for the

[9] Work by Gürkaynak et al. (2005) suggests that the empirical impact of monetary policy on asset prices reflects both the level of rates and the likely future path, or stance of policy.

[10] See Woodford (2003) on the timeless commitment technology of monetary policy makers.

determination of macroeconomic equilibrium. And so we can consider a simple model with money, bonds and loans:

$$L_t^d = y_t - \eta_1(\rho_t - i_t), \tag{1}$$

where loan demand, L_t^d, is a function of the interest rate on bonds, i_t, the interest rate on loans, ρ_t, and the level of transactions, y_t, and η_1 is an elasticity. The commercial bank balance sheet comprises: reserves, R_t, loans, L_t^s, and bonds, B_t, as assets, and deposits, D_t, as liabilities. Without any loss of generality, let us assume that reserves equal τD_t, a fraction, τ, of deposits, so that the bank balance sheet is as follows:

$$B_t + L_t^s + R_t = D_t \tag{2}$$

$$B_t + L_t^s = D_t(1 - \tau), \tag{3}$$

and loans supply has the following form:

$$L_t^s = \eta_2(\rho_t - i_t) + D_t(1 - \tau), \tag{4}$$

which is increasing in the premium of loans over bonds and deposits and decreasing in reserves. As before η_2 is an elasticity. Solving for clearing in the loans market:

$$\begin{aligned} y_t - \eta_1(\rho_t - i_t) &= \eta_2(\rho_t - i_t) + D_t(1 - \tau) \\ y_t &= (\eta_1 + \eta_2)(\rho_t - i_t) + D_t(1 - \tau) \end{aligned} \tag{5}$$

$$\rho_t = \frac{y_t - D_t(1 - \tau)}{(\eta_1 + \eta_2)} + i_t, \tag{6}$$

which tells us that the excess of interest rates on loans over bonds increases in output and reserves and decreases in deposits and the elasticity of loans demand and supply. Now let us consider the deposit market. Supply is given as follows:

$$D_t^s = \frac{1}{\tau} R_t,$$

and the demand for deposits is given by:

$$D_t^d = y_t - \eta_3 i_t, \tag{7}$$

which clears for:

$$y_t = \eta_3 i_t + \frac{1}{\tau} R_t \tag{8}$$

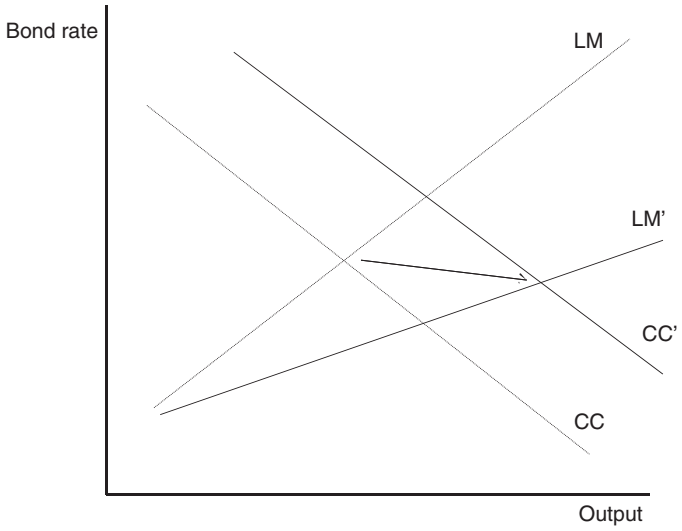

Figure 1.1 QE in a CC/LM framework

and gives the standard LM curve, but one in which increases in reserves push out the curve. The spending curve responds to both interest rates on bonds and to loans:

$$y_t = -\eta_4(i_t + \rho_t), \tag{9}$$

which can be rewritten as:

$$\begin{aligned} y_t &= -\eta_4 i_t - \eta_4\left(\frac{y_t - D_t(1-\tau)}{(\eta_1+\eta_2)} + i_t\right) \\ &= \frac{\eta_4}{\eta_1+\eta_2+\eta_4}\left[R_t\left(\frac{1}{\tau}-1\right) - 2(\eta_1+\eta_2)i_t\right] \end{aligned} \tag{10}$$

so the spending equation will be negative in bond rates and shifted out by increases in reserves. Following Bernanke and Blinder (1988), we term this the CC curve. Figure 1.1 shows the impact of a quantitative easing in this setup. The swap of bonds outstanding for reserves increases reserves and so pushes out the CC curve and the increase in reserves also acts to push out the LM curve. Although output will rise, the actual impact on bond rates will be ambiguous as it will depend on the impact of reserves on the money supply and the extent to which any easing in the external finance premium increases aggregate demand. If the former dominates the latter, interest rates will fall. If, however, spending effects dominate

then the latter would dominate. The early empirical results on the announcement effects of QE suggest that there has been more of a downward interest rate effect. It might very well be therefore that financial market participants have not transmitted the possible impact on spending down the asset price channel, but it is still early days and the lagged effects of QE may imply higher interest rates as the economy is expected to recover.

2.2 *There is little new under the sun*

The recent focus on quantitative easing has led to comparisons with events in the past. Initially it was assumed that QE was first used in Japan in 2001.[11] However, Anderson (2010) has drawn attention to events in the 1930s when in all but name quantitative easing was used.[12]

> During 1932, with congressional support, the Fed purchased approximately $1 billion in Treasury securities (half, however, was offset by a decrease in Treasury bills discounted at the Reserve Banks). At the end of 1932, short-term market rates hovered at 50 basis points or less. Quantitative easing continued during 1933–36. In early April 1933, Congress sought to prod the Fed into further action by passing legislation that (i) permitted the Fed to purchase up to $3 billion in securities directly from the Treasury (direct purchases were not typically permitted) and, if the Fed did not, (ii) also authorized President Roosevelt to issue up to $3 billion in currency. (Anderson, 2010, p. 1)

In the post-war period, there was also an attempt to use changes in the composition of the central bank's balance sheet in order to tilt the yield curve. 'Operation Twist' was a policy adopted by the Federal Reserve Board in February 1961. This represented a change in the policy that had been in place since 1953. The New York Fed, as the operating arm of the Federal Open Markets Committee (FOMC), was restricted to purchasing and selling short-term bills as part of its open market operations. The new policy allowed it to buy also long-term government bonds of up to ten years' duration. The intention of this policy was to try to stimulate domestic economic activity and at the same time to help improve the US balance of payments position which had been in deficit for many years. The hope was that the reduction in long-term interest rates as a result of the purchase of bonds would stimulate domestic demand, while higher short-term interest rates would attract foreign capital. The New York Fed as the implementer of the policy, was required to buy no more than $500 million before the next meeting of the FOMC. In total, some $8.8 billion of bonds and bills over one-year maturity were purchased. This is equivalent, at

[11] For a detailed dissection of QE in Japan, see Werner (2002).
[12] For a more detailed discussion, see Meltzer (2003).