A Discussion of Central Bank Operations and Interest Rate Policy

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Abstract

With floating exchange rate policies, central banks target policy interest rates- prices- rather than any monetary aggregate. The narrative favoured by central banks and academics is that of the central bank adjusting the quantity of reserves supplied in order to keep market rates in line with their target rate. This implies that, in the US case, for example, the Fed varies the quantity of reserves in order to achieve its interest rate target. However, we argue in favour of a reversed causality *vis-à-vis* orthodox analysis and contend that rather than adjusting the supply of reserves to meet its policy rate, as the monopoly issuer of reserves in a floating exchange rate regime, the central bank, in practice, acts as the price-setter for the level of reserves demanded by the banking system.

Keywords: Central Banking, Interest Rate Determination

Introduction

With floating exchange rate policies, central banks (such as the Federal Reserve and the Bank of England) target policy interest rates- prices- rather than any of their various monetary aggregates, often casually referred to as 'the money supply'. The narrative favoured by central banks and academics, however, is that of the central bank (CB) adjusting the quantity of reserves supplied in order to keep market rates in line with their target rate, implying that the fed funds rate varies continuously with the quantity of reserves, allowing the CB to achieve its interest rate target. What we first show is that the required quantity of reserves is demand driven by the banking system, and that reserves added beyond that point are of no macroeconomic consequence. We then work through examples where the general narrative is that price is a function of quantity provided by the CB, when in fact quantity is determined by the demands of the banking system, with the CB setting the price for whatever quantity is demanded. This is followed by a brief discussion of interest rate policy in general, and concluding remarks.

Central Banking

In banking systems consisting of more than one bank, a state controlled CB functions to transfer funds denominated in the state's currency between member banks. The CB can be thought of the operator of a spreadsheet which includes a transactions account for each member bank, generally called a 'reserve account' that records balances generally called 'reserves'. The CB also keeps accounts for the Treasury and for foreign CBs. The CB marks balances in the various accounts up and down- credits and debits- on instructions from those entities with accounts. Furthermore, the state sets the operating procedures for the CB and the banking system, including regulations regarding overdrafts (negative balances), which are accounted for as loans from the CB. The CB itself neither has, nor does not have, funds. Rather, it acts as the 'scorekeeper' for the members, crediting and debiting their accounts as per their instructions, and accounting for what it does with debits and credits in the CB accounts, using a process generally referred to as double entry accounting. CB's are, in general,

public sector entities. They are created, regulated, and supervised by the state to serve public purpose, with all profits credited to the state.

The state's CB is the only source of reserves for that currency. Reserve balances are created when the CB credits member reserve accounts. And as a monopolist (single supplier) of reserves to the banking system, the CB is necessarily the 'price setter' for two rates. The first is called the own rate, which is how that item exchanges for itself. For a currency the own rate is called the interest rate. Credit balances in CB accounts do not earn interest unless the CB acts to pay interest on those balances, rendering the payment of interest a political decision, as evidenced by well publicized meetings of CBs where the officers select their policy rates. In that sense, the 'natural rate of interest'- the policy rate in the event that the CB does not elect to pay interest on reserve balances or otherwise support a higher rate of interest- is 0%, with a higher rate possible only if supported by state intervention through its agent, the CB. In practice, policy rates above 0% are supported by the CB paying interest on reserves, or by the CB maintaining additional accounts, called securities accounts, on behalf of the Treasury. Such accounts are more commonly known as Treasury bills, notes, and bonds. Securities accounts are interest-bearing alternatives to reserve accounts and function to support a term structure of rates above 0%.

The rate of interest the CB sets is called the 'policy rate' which is meant to function directly as the marginal cost of funds for its member banks, providing a benchmark for the rates banks charge on loans to their clients which include a risk premium based on perceived creditworthiness.

When the Treasury instructs the CB to spend via crediting a member bank's account, the quantity of reserves in the banking system increases. Although banks can alter the distribution of bank reserves by inter-bank transactions, they are unable to control the overall quantity of reserves. Therefore when the government net spends ('deficit spends') the fed funds rate will, in the absence of CB intervention, fall to (or remain at) 0%. This explains why, in Japan for example, public debt that has exceeded 200% of

GDP has not resulted in an increase in the level of the interest rate paid by the state. In fact, rates have remained near 0% for several decades, as directed by the CB.

Setting the Policy Rate with a Corridor System

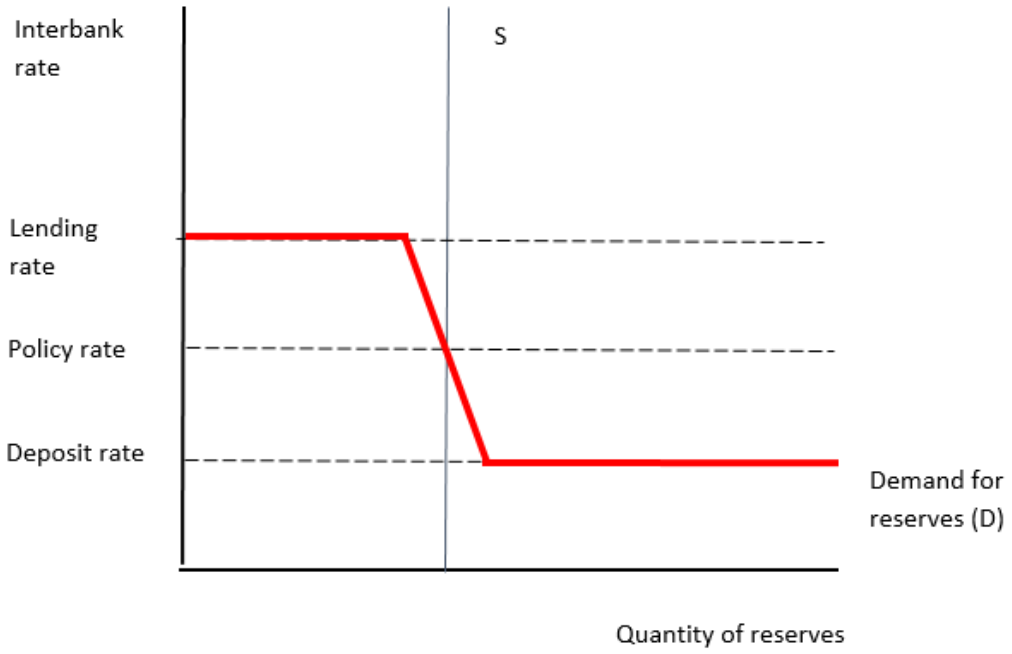
Numerous CBs have utilised the so-called 'corridor system' to establish their policy rate of interest. The standard model of the corridor system, as described by the Bank of England (2010), establishes an upper boundary called a 'ceiling' and a lower boundary called a 'floor', thereby ensuring that the policy rate of interest will be between the two limits. The model assumes profit maximizing banks from which the expected shape of an individual bank's demand for reserves can be derived, and, by implication, the demand curve for reserves as a whole. The bold red line in this standard model (figure 1) shows the demand curve for bank reserves in the interbank market. It is horizontal at the lending rate, on the assumption that profit-maximising banks will not borrow from each other at a rate that is higher than the rate charged by the CB. The downward sloping section reflects a particular conceptualization of bank behaviour; specifically the view that banks respond to a fall in the interest rate -or fall opportunity cost of holding reserves rather than lending them to other banks- by increasing their demand for reserves[1]. The final horizontal section reflects the fact that banks will not lend reserves to each other below the rate they can earn from the CB.

It is then theorized that, given the shape of the demand curve, the CB can adjust the aggregate amount of reserves (S) using open market operations and thus hit its target rate. The lending rate is the rate at which banks can borrow reserves from the central bank (discount window) and the deposit rate is the rate paid on reserves deposited at the central bank (referred to as 'standing facilities' by the Bank of England 2010: 295). The policy rate lies between the deposit rate and the lending rate and these the two administered rates define a ceiling and floor for the overnight rate, and limit the potential divergence of the overnight rate from the policy rate. Internationally, variation

[1] 'The higher the market rate of interest, the higher is the opportunity cost of holding reserves and hence the lower will be the demand. As rates fall, the opportunity costs fall and the demand for reserves increases. But in all cases, banks will only seek to hold (in aggregate) the levels consistent with their requirements'. (Mitchell, 2010)

exists in the exact implementation of corridor systems but the principle behind the policy remains the same.

Figure 1: Stylised demand for reserves in the corridor system

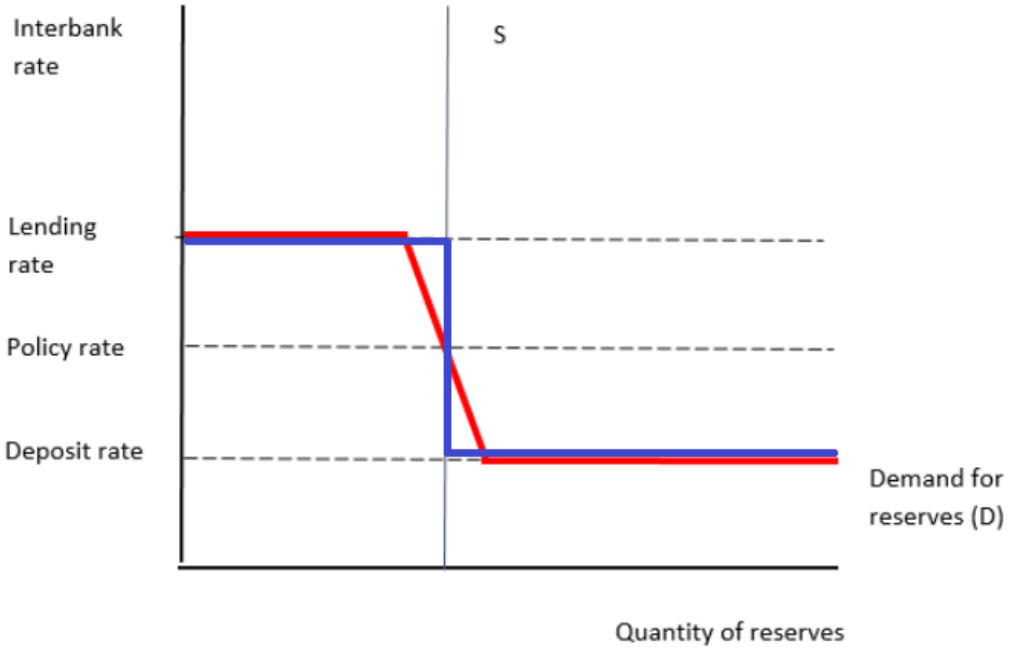


Source: Bank of England 2010

The CB uses open market operations to adjust the level of reserves in the system enabling it to hit its policy rate. The system relies on an orderly functioning interbank market which in turn facilitates an efficient distribution of reserves between banks.

While we agree with the functioning of the corridor model, our narrative differs from the standard account. First, we see the demand for reserves as being fixed at any given point in time, and as a function of something other than interest rates. This view is described by the blue line below:

Figure 2: An alternative conceptualization: Price not quantity



Second, we disagree with the standard model narrative which states that the CB controls rates and achieves its policy rate by altering the quantity of reserves, and instead we argue that close inspection reveals that interest rate policy remains best understood as a matter of setting rates and not quantities.

For example, if there is a shortage of reserves in the banking system, for any individual bank that shortage is accounted for as an overdraft loan (discount window loan) from the CB. That is, in the first instance, a bank's shortfall in its CB reserve account is accounted for as a loan from the CB. And if the CB sets the rate for these loans at the policy rate, there is no need for the further action (such as 'adding reserves' via repurchase agreements or outright purchases of Treasury Securities) suggested in the standard model. It is only when the CB adds what is called a 'penalty rate' to this type

of borrowing, or if a stigma[2] is associated with loans from the CB, that banks then attempt to borrow in the interbank market in order to replace higher priced loans from the CB with lower priced loans from other banks. As a point of logic, the bank would be willing to pay more than the policy rate, but less than the discount rate plus the amount by which it values any stigma. In the US case, for example, when the Fed observes the fed funds rate trading higher than its policy rate target, it then takes action to make reserves available *at a lower price* to bring the fed funds rate down to its policy rate.

In the case of a reserve excess, the CB can simply pay interest on reserves, which again is about setting the interest rate rather than the quantity of reserves. Alternatively, the CB can offer securities for sale, which support rates as determined by the interest rate which is implicit in the terms offered by the securities being sold[3].

Credit Risk

Banks' diminished credit assessments of other banks' solvency or ability to repay (such as occurred during the global financial crisis [GFC]) is evidenced by rising interest rates in the interbank market, as the increased perception of risk carries the higher price of compensation as expressed by the interest rate. In this case, the central bank can lower the fed funds rate to its target rate by lending needed reserves *at its policy rate* on demand, again setting rates and letting quantity adjust to demand.

During the GFC, the failure of Fed leadership to sufficiently understand that monetary operations and liquidity provision are a matter of setting price and letting quantity adjust to demand was initially evidenced when the fed funds rate exceeded the Fed's target rate, a point highlighted by Lavoie[4] (2010). The Fed's policy was to lend to its

[2] It may be that discount window borrowing might give the impression of financial weakness and so would be avoided if possible (see below).

[3] In practice, 'lag accounting' and reserve averaging regulations work to both destabilize and to stabilize interbank rates, a consideration of which is beyond the scope of this article (see Mosler 2012: 57-62)

[4] In Lavoie's analysis of the corridor system, the derivation of the demand curve for reserves is more sophisticated than the Bank of England's approach upon which Figure 1 and Figure 2 above are based. In particular, he includes a third horizontal

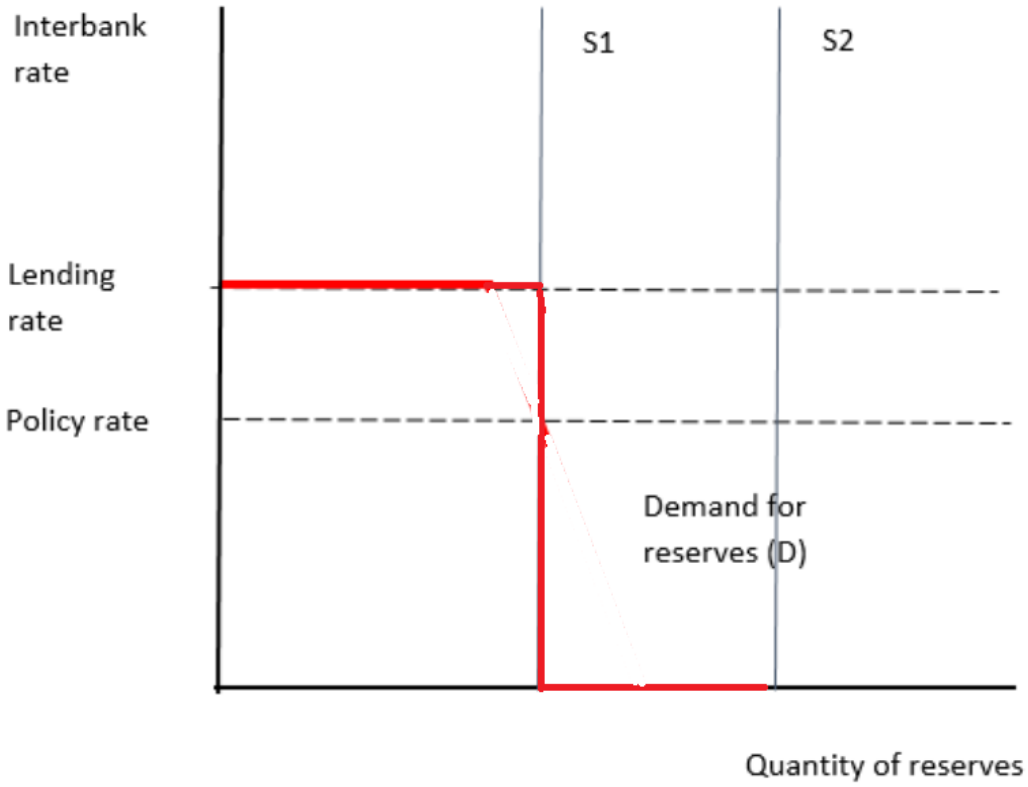
member banks only if they could provide US Treasury securities as collateral. This policy resulted in the fed funds rate rising above the Fed's target, as some banks needing reserves from the Fed did not have sufficient eligible collateral to access the required reserves (Mosler, 2016). In response to the observed rise of the fed funds rate above target, the Fed began adding to the list of eligible collateral
that allowed banks to borrow from the Fed *at lower rates*, which, when the list was finally sufficiently expanded, brought the fed funds rate down to the Fed's target. (Lavoie 2010: 5-7 and 23) Interestingly, in the week following the Lehman Brothers bankruptcy, after initially failing to provide sufficient reserves, the Fed overreacted, adding more reserves than were being demanded as evidenced by the fed funds rate falling below the Fed's target.

The impact of quantitative easing (QE)

In the aftermath of the crisis, CBs attempted to support increased bank lending to the private sector for the further purpose of supporting aggregate demand. The 'poster child' of these policy tools was quantitative easing (QE) in which the CB bought government bonds from banks and from other private sector financial institutions. While theorized channels from QE to aggregate demand have yet to be detected in practice, QE did have an effect on the rate setting process for the fed funds market as illustrated below. The extensive purchases of government bonds by the Fed increased the supply of reserves (shown by S2) which then exceeded the demand for reserves at all interest rates and, had no action been taken, would have resulted in the overnight rate falling to zero, as reserves did not earn interest at that time.

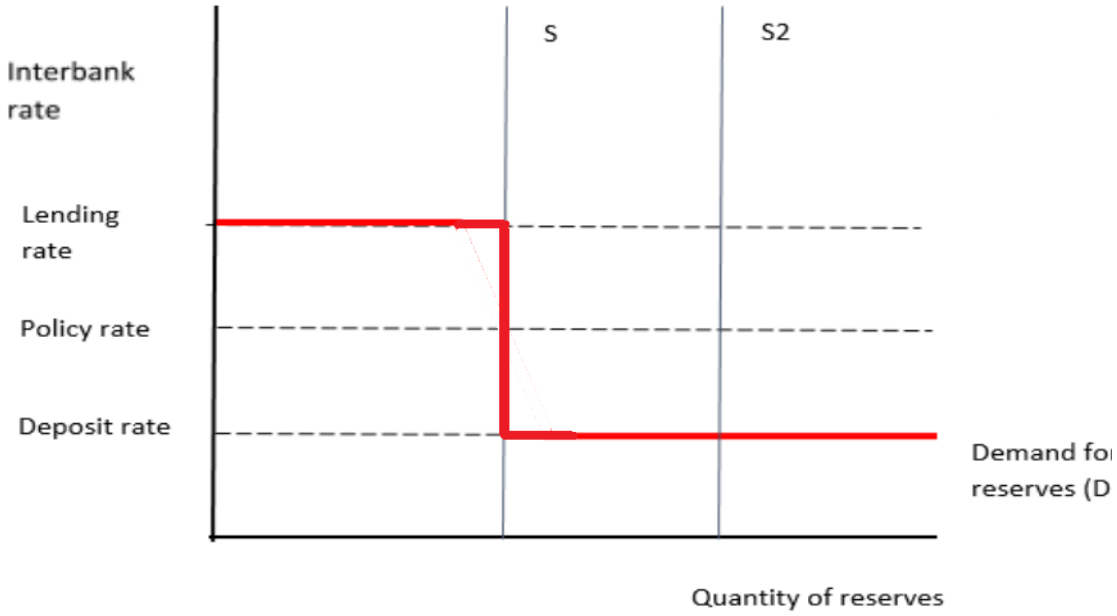
section at the target rate, which 'corresponds to the federal funds rate which is expected on the following days, before the end of the maintenance period' (Lavoie 2010: 4, 23).

Figure 3: The potential impact of QE on the Fed funds rate



In order to prevent this outcome, the Fed initiated payment of interest on both required and excess reserves. The Fed was thus able to 'regain control' of the fed funds rate by introducing a deposit rate on excess reserves equal to the policy rate, the so-called 'floor system' (Lavoie 2010: 7).

Figure 4: The operation of a ‘floor system’



The entire basis of QE was another demonstration of CBs failing to grasp the same fundamental- that central banking is about prices (interest rates) and not quantities. CBs engage in QE to add balances to reserve accounts as they removed equal balances from securities accounts, theorizing that increased reserve balances *per se* will somehow result in increased spending in the economy. The most recent narrative was called the ‘portfolio balance channel’ where Fed purchases of Treasury securities would cause investors to instead invest in ‘riskier assets’ which would thereby support investment spending. However, subsequent supporting data has failed to materialize, which should have been no surprise. Lending for investment has never been constrained by reserve availability, and if there was a desire to borrow for investment at a rate high enough for banks to make a sufficient return on equity, the banks would make those loans regardless of the quantity of Treasury securities outstanding.

A Closer Look at the Fed Funds Market

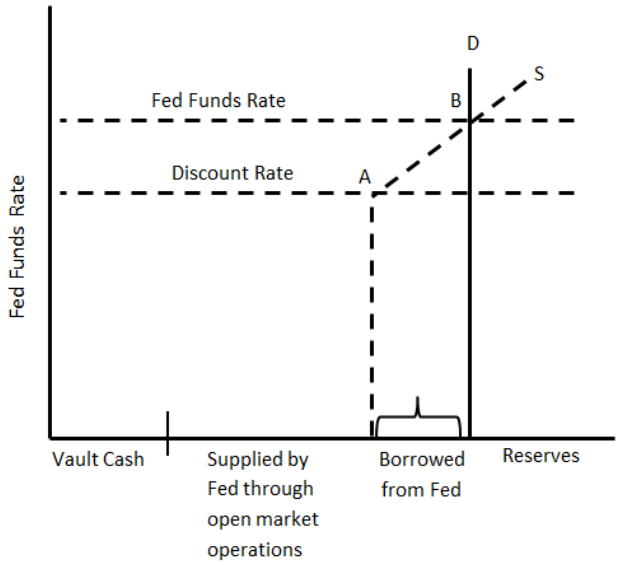
Mosler's (2012) further analysis of the operation of the fed funds market incorporates additional bank behavioral assumptions *vis-à-vis* the 'standard' corridor model, adding aspects of the inter-bank market which are absent from the 'sanitized' conceptualisations exemplified by the Bank of England (2010). Mosler's analysis of the fed funds market might be considered to be a 'real world' system-wide macro analysis of the banking system.

Bank reserves are entries on the Fed's books that can be entered only by the Fed. When the U.S. banking system is left collectively short of reserves by the Fed's activities, the required reserves, in the first instance, are overdraft loans from the discount window. Window borrowing, however, is considered to be a sign of financial stress and weakness. Mosler's analysis recognizes that because of this stigma, the fed funds rate can exceed the lending or discount rate, even when banks do have sufficient collateral. As banks collectively bid up the fed funds rate, the spread between the fed funds rate and the discount rate widens to a point where banks decide that borrowing at the fed funds rate is so costly that the stigma associated with borrowing from the Fed is acceptable as an undesirable by-product of lower priced discount window borrowing. This is shown on the diagram below; as the market rate exceeds the discount rate (beyond point A) banks at some point borrow the needed reserves from the discount window. The Fed acts passively (setting price and not quantity) and supply adjusts to demand, eventually satisfying all demand (at market equilibrium shown by point B) -at a rate above the discount rate. Ultimately, however, the banks' reliance upon discount window borrowing is always under the control of the Fed; Fed provision of additional reserves via open market operations (also determining price; in this case, by using a 'stop' yield for Repo rates[5] allows banks to reduce their need to borrow from the discount window. Conversely, if the Fed provides fewer reserves than the banks wish to borrow using open market operations, the spread

[5] When central banks conduct repo auctions they ask the dealers to offer collateral in competition with each other, with the lowest yields awarded funding up to the highest yield the central bank decides to accept, which is called the 'stop'

between the fed funds rate and the discount rate will widen, requiring banks to rely more heavily on stigmatized discount window borrowing.

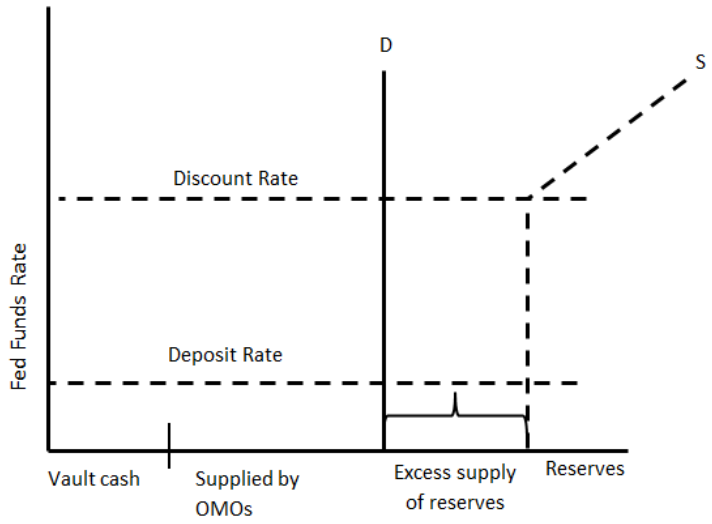
Figure 5: Supply and demand curves for reserves (System-wide shortage)



Source: Mosler, 2012: 55

The unprecedented increase in the level of bank reserves supplied by the Fed in the aftermath of the GFC generated, as matter of policy, a systemic excess supply of reserves. The excess supply (S) over demand (D) would have driven the fed funds rate to 0%, had not a ‘floor’ rate’ been introduced by the payment of interest on reserves held by banks at the Fed- shown by the deposit rate on the diagram.

Figure 6: Supply and demand curves for reserves (System-wide excess supply)



Source: Mosler, 2012: 56

We next point out the MMT perspective (Mosler 2012) of the debate between 'accommodationists' and 'structuralists' within Post-Keynesianism[6]. What MMT recognizes is that the argument is moot, as loans not only 'create' deposits[7], but at the same time 'create' associated reserve balances, all as a matter of accounting. This means there is no choice to be made by the CB with regard to adding or not adding reserves, as a reserve deficiency *is* a loan from the central bank, and in fact accounted for as such if overdrafts are not resolved by settlement day.

[6] Pollin (1991: 367-8) contrasts the two approaches to money supply endogeneity- the accommodative and structural- and provides a clear distinction between the two. The accommodative perspective argues that no quantity constraints exist on banks with respect to reserves as the central bank must necessarily supply required reserves. Only a price constraint is relevant as the central bank acts as price setter. The structural perspective contends that attempts by the central bank to control the growth of non-borrowed reserves do exert quantity constraints on banks. Additional reserves-although they may not be fully adequate- can be generated within the system itself by liability management.

[7] For MMT, lending is best thought of as the bank purchasing the note from the borrower, and then crediting the borrower's account for the proceeds, thereby establishing funds that did not previously exist. This view is consistent with the general case where any bank purchases establish (create) incremental (new) bank deposits.

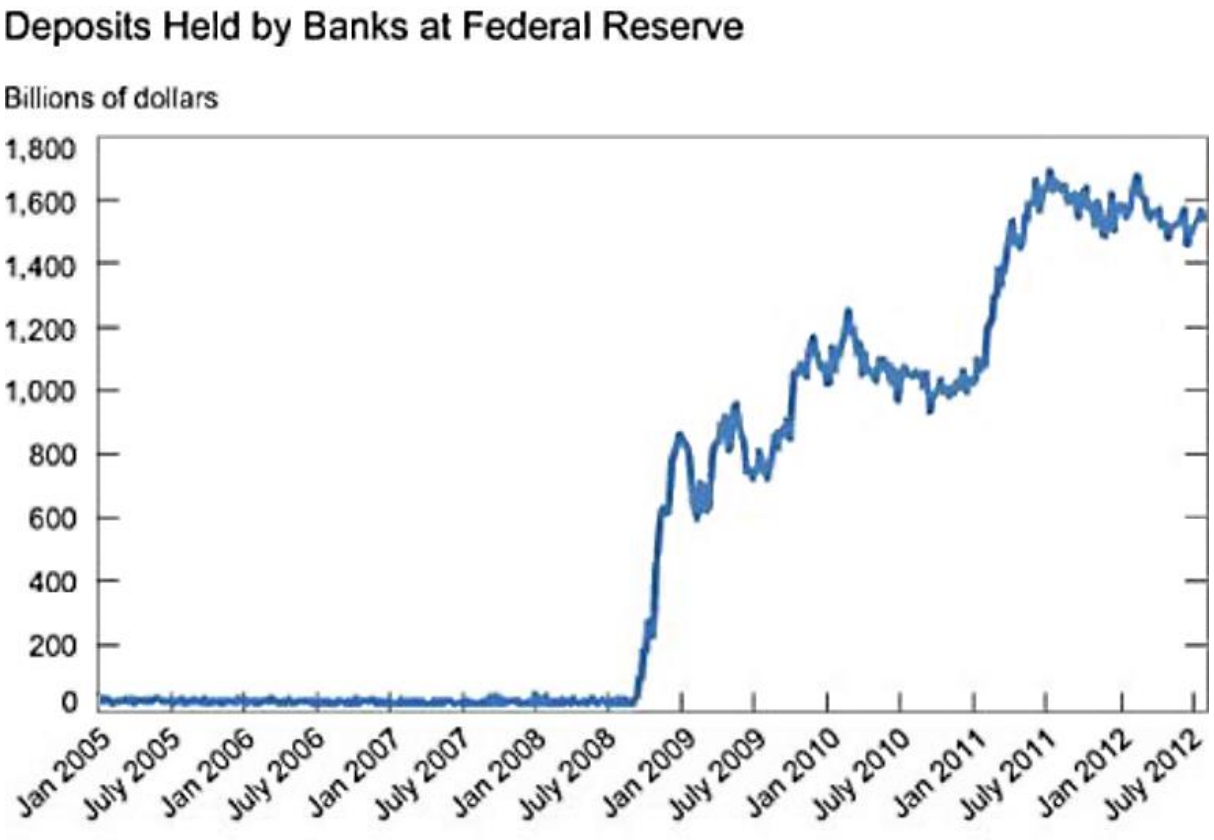
The long-term risk-free rate

The yield curve shows the risk-free interest rate for government debt of different maturities and acts as a benchmark for other debt. In the current situation in the UK and US, for example, the CB sets the overnight rate and allows 'market forces' to determine the long-term rate structure. The state, via its CB, could directly set the entire term structure of risk-free rates, also known as 'the yield curve' (the Bank of Japan is now doing this for its 10 year bonds, for example). Operationally, the CB stands by to purchase unlimited quantities of government debt at a price consistent with its interest rate ceiling target at each maturity level, and sell securities to support its lower boundary. (Mosler, 2012)

CBs also intervene selectively when they wish to influence, rather than peg, longer term interest rates. Quantitative easing (or 'Asset Purchases' using Bank of England terminology), was meant to increase demand for government bonds, raise bond prices and reduce bond yields. The policy was enacted in the expectation that these lower bond yields would boost investment and also increase demand for alternative assets such as equities.

The extensive purchase of securities led to a significant expansion of CB balance sheets and an explosion of bank reserves. This point was noted by Keister and McAndrews (2009: 2) and is illustrated by the Federal Reserve Statistical Release H 4.1 (below)

Figure 7: The impact of bond purchases on reserves



Source: Federal Reserve Statistical Release H.4.1

A 'standard' upward sloping yield curve reflects an expectation of rising interest rates on the part of bond dealers[8]. Investor expectations of bond prices and yields in the future are continuously reflected in the yield curve adjusting to indifference levels. This includes preferences for for cash, short-term securities, or longer term securities. Furthermore, as we have noted, any such effect results from an active choice on the part of the state or its CB to cede power to financial markets in determining the spectrum of long-term interest rates as the term structure of rates merely expresses anticipated central bank interest rate changes.

[8]Potential buyers of bonds will consider possible future CB interest rate settings (along with default risk should that be a consideration) and, in general, prices will reflect those expectations.

Interest Rate Selection

Central Bankers believe raising rates works to reduce inflationary pressures by reducing aggregate demand, and lowering rates works to support aggregate demand and increase inflationary pressures. The primary channel for this effect is private sector lending, where higher rates discourage lending and lower rates support lending. We directly challenge this assumption (Mosler and Silipo 2016), first from close examination of the interest income channels.

In the private sector, casually stated, for every dollar borrowed, there is a dollar saved. Therefore a shift in rates can only shift income between borrowers and savers, as total interest income and expense remains unchanged. CBs agree with this, and then further assume that the propensities to consume out of interest income differ between borrowers and savers, such that when rates rise, for example, borrowers cut back on their deficit spending to a greater than savers increase their spending. Likewise, as rates fall, they believe that borrowers increase their deficit spending more than savers cut back on their spending. And therefore, central bankers conclude, higher rates are contractionary and lower rates expansionary.

However, while we agree with the propensity estimates of the central bankers, we further recognize that the state is a net payer of interest to the economy, higher rates are adding interest income to the economy and lower rates are removing interest income from the economy (Mosler and Silipo 2016). And with debt to GDP ratios often approximating 100% of GDP, the interest added or subtracted by this channel is likely to dwarf the effect of the differing propensities between private sector borrowers and savers. And in that case, higher rates are in fact an expansionary force rather than the contractionary force assumed by central bankers. That is, global central bankers have it backwards- they are easing when they believe they are tightening, and tightening when they believe they are easing. And experiences of Japan, the eurozone, and the US do not contradict this hypothesis, where decades of 0 and near 0 rates have not triggered aggregate demand or inflation from private sector credit expansions, and, to the contrary seem to be supporting low inflation and low demand.

Conclusion

Events of the past decade have highlighted the importance for policy makers, investors, academics, and voters of developing a richer understanding of the operation of the monetary system in general and the determination of interest rates in particular. We welcome the acceptance on the part of many economists, including those outside Post-Keynesianism, of the endogenous nature of the money supply[9]. Central bankers have also acknowledged the operational necessity of targeting interest rates rather than money supply growth[10]. However, we would argue that the process of deepening understanding is not yet complete and further requires the recognition that, as the monopoly issuer of reserves in a floating exchange rate regime, supply is demand determined with CBs controlling price. That is, CB action under a floating exchange rate regime is best understood as that of a price-setter of the reserves demanded. We argue in favour of a *reversed causality vis-à-vis* orthodox analysis which would have applicability in a fixed exchange rate regime, which is in fact reserve constrained by design. (A full analysis of fixed exchange rate dynamics, however, is beyond the scope of this article[11]) We also contend that its role as monopoly supplier also gives the CB the ability to control the full spectrum of long term risk-free rates and that the extent of market influence on the determination of the shape of the yield curve is always, ultimately, under the control of the CB.

[9] See Wray 1998; 2007

[10] See McLeay, Radia and Thomas 2014a; 2014b

[11] For a discussion of the monetary policy constraints which accompany the adoption of a fixed exchange rate see Mosler 1998 and Forstater and Mosler 2005.

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