

Chapter 17

TOOLS OF MONETARY CONTROL

We saw in Chapter xx that the supply of money can be accounted for as the product of the *bank expansion multiplier* k times the *Monetary Base* B . In this chapter we will investigate how the Fed can control the monetary base through its Open Market Operations, and how this process is complicated by such considerations as Loans, Treasury deposits, and International Reserve transactions.

Then we will take a preliminary look at the fundamental dichotomy facing the Fed or any other Central Bank, between *money stock control* and *interest rate control*. We will also examine the function of reserve requirements as a tool of monetary control.

As noted in Chapter 16 on The Federal Reserve System, the Fed's balance sheet underwent a major change and expansion during the mortgage finance crisis of 2008. Our analysis will accordingly contrast the operations of the "Traditional Fed" before 2008 to those of the "Bernanke Fed" during and after 2008.

The Base Equation

Recall that the monetary base consists of currency in circulation plus the reserves of banks and other depository institutions. Currency is composed primarily of Federal Reserve Notes, which are liabilities of the Federal Reserve System. Cash reserves are made up of vault cash, which is the remainder of the total currency outstanding, plus depository institutions' reserve deposits with the Fed. These reserve deposits are also liabilities of the Fed. In fact, Federal Reserve Notes and reserve deposits together constitute over-90% of the traditional liabilities of the Federal Reserve System.

Because of the balance sheet identity that equates assets with liabilities plus net worth, there is a close relationship between the Federal Reserve System's assets and its liabilities, and therefore between its assets and the monetary base. With a few important qualifications, the base can actually be viewed as arising from the Fed's acquisition of assets. Furthermore, changes in the monetary base can generally be explained in terms of changes in the Fed's assets. This relationship is called the *base equation*.

In order to quantify these interactions, let us assign the following symbols to the principal items on the Fed's balance sheet, which we examined in Table 3A and 3B of Chapter 16. In order to include the Fed's new advances to questionable credit risks like Bear Stearns, AIG, Freddie Mac, and Fannie Mae, as well as risky private debt such as subprime Mortgage Backed Securities and moderately risky P-2 Commercial Paper, we classify these new items as "Junk" (J).

S = Securities

L = Net Loans

I = International Reserves

J = Junk Assets

C_F = Federal Reserve Currency (F.R. Notes)

D_R = Reserve Deposits

D_O = Other Deposits

NW = Net worth (capital)

In terms of these symbols, the Fed's consolidated balance sheet (neglecting miscellaneous assets and liabilities) looks like this:

Assets	Liabilities, NW
S	C_F
L	D_R
I	D_O
J	NW

The balance sheet identity,

$$\text{Assets} = \text{Liabilities} + \text{Net Worth},$$

can now be written as

$$S + L + I + J = C_F + D_R + D_D + NW,$$

or equivalently,

$$C_F + D_R = S + L + I + J - D_O - NW. \quad (1)$$

Equation (1) almost gives us the monetary base. It does not quite give us the base yet, however, because not quite all of the U.S. currency in circulation is really issued by the Fed. The Fed does issue essentially all the paper money in circulation, but coins are traditionally issued by the U.S. Treasury Department instead. This practice goes back to our early monetary history,

when gold and/or silver coins minted by the Treasury were the monetary standard. The original Federal Reserve Notes were mere substitutes for this standard money, but today these roles are reversed: Now Federal Reserve Notes are the monetary standard, and the Treasury merely provides small change according to the limited demand for small denominations.

Total currency in existence therefore consists of Fed Currency (dollar bills) created by the Fed, which we will represent by C_F , plus the currency (coin) created by the Treasury or **Treasury Currency**, which we will represent by C_T . Not all of this currency is actually in circulation, since banks hold some of it in their vaults where it counts as part of their reserves. But either way it is part of the monetary base, so we may express the base B as

$$\begin{aligned} B &= C_F + C_T + D_R \\ &= (C_F + D_R) + C_T \end{aligned}$$

Now the term in parentheses above is just the left-hand side of equation (1). Replacing it with the right-hand side of equation (1) gives us the **Monetary Base Equation**, or **Base Equation** for short:

$$B = S + L + I + J + C_T - D_0 - NW$$

(2)

The five positive terms in this expression for B, namely Securities, Loans, International Reserves, Junk, and Treasury Currency, are sometimes referred to as **Sources** of base money, while the two negative terms, Other Deposits and Net Worth, are factors that **absorb** base money.

To illustrate, using “Traditional Fed” numbers for July 5, 2007 in Chapter 16, we have $S = \$790.5$ billion, $L = \$27.4$ billion, $I = \$51.5$ billion, $J = \$0$, $D_0 = \$36.9$ billion and $NW = \$34.1$ billion. The only number we need that does not appear on the Fed's balance sheet is Treasury currency C_T , which was $\$39.5$ billion. Therefore the monetary base (to within rounding error and considering that we have ignored the Fed's miscellaneous assets and liabilities) was

$$B = (790.5) + (27.4) + (51.5) + (0) + (39.5) - (36.9) - (34.1) = \$837.9 \text{ billion.}$$

The actual base for July 2007, averaged over the month, was $\$829.2$ billion.¹

Changes in the base sources and factors absorbing base will cause corresponding changes in the base as well. Using the Greek letter *delta* (Δ) to indicate "the change in" the variable it follows, (2) implies

$$\Delta B = \Delta S + \Delta L + \Delta I + \Delta J + \Delta C_T - \Delta D_0 - \Delta NW$$

(3)

¹ St. Louis Fed FRED data base series SBASENS.

To illustrate, between October of 2002 and October of 2003, the Fed's portfolio of Securities grew by \$50.9 billion. Its Loans fell by \$9.6 billion, while its holdings of International Reserves increased \$2.6 billion. Treasury currency increased by \$0.9 billion, while "Other Deposits" grew by \$1.31 billion, and the Fed's Net Worth accounts increased by \$0.4 billion. The net change in the base is therefore predicted to be

$$\begin{aligned}\Delta B &= (50.9) + (-9.6) + (+2.6) + (+0.9) - (+1.3) - (+0.4) \\ &= 50.9 - 9.6 + 2.6 + 0.9 - 1.3 - 0.4 \\ &= + \$43.1 \text{ billion.}\end{aligned}$$

The actual change, taking into account miscellaneous assets and liabilities and minor differences in timing that we have ignored, was + \$42.5 billion.

The only tricky thing to remember about equation (3) is that if either of the factors absorbing base money falls, minus a minus number becomes a plus, so its net effect is to *increase* the base.

Let us now take a closer look at the terms that make up the base equation.

ΔS : Open Market Operations

The Federal Reserve System's outright purchases and sales of U.S. government and Federal agency securities are known as **Open Market Operations**, since the Fed (through the Federal Reserve Bank of New York, which acts in the New York financial market as an agent for all 12 Federal Reserve Banks) makes these transactions in the "open market" rather than buying them directly from the Treasury or issuing agency.

As illustrated by the 2003-2004 figures cited above, open market operations were by far the most important year-to-year component of U.S. monetary base growth under the Traditional, pre-2008 Fed.

As the Fed buys securities, it ordinarily pays for them with a check drawn on itself. If the seller of the security is a bank or thrift, it deposits this check in its reserve account with the Fed, thereby directly increasing the total reserves in the system and the monetary base. If the seller is a private individual, he or she will probably deposit the check in a personal bank account. The bank will then present this check to the Fed for clearing. As with an ordinary check, the bank will get credit for the check in its reserve account with the Fed. But unlike an ordinary check, no other bank will have its account debited (i.e. reduced), so the monetary base will increase by the amount of the check rather than remaining constant as it does when ordinary checks are cleared. And finally, if a private seller actually presents such a check to a Federal Reserve Bank in exchange for currency, the number of Federal Reserve Notes in circulation will increase by exactly the amount of the Fed's securities purchase. In every case, the monetary base increases by an amount just equal to the Fed's open market purchase of securities.

Open market operations are sometimes classified as either *Dynamic* or *Defensive*. **Dynamic Open Market Operations** are transactions which are intended to *cause a deliberate*

increase or decrease in the monetary base. **Defensive Open Market Operations** are those which are intended to *prevent* an *undesired change* in the base that would otherwise occur because of changes in the other components of the base equation. For example, if International Reserves increases by \$8 billion while Treasury Deposits (D_O) decline by \$2 billion and all other terms in the base equation are unchanged, the base would increase by $(+8) - (-2) = +\$10$ billion. An Open Market *sale* of \$10 billion ($\Delta S = -\10 billion) would then exactly cancel the effect of the first two changes, and leave the base unchanged.

ΔI : International Reserve Transactions (including Gold Flows)

Prior to 1968, international gold flows were an important component of the base equation. American citizens were prohibited by law from owning gold coin or bullion, but the United States government stood ready to buy or sell gold at \$35.00 an ounce in the international market. In the 1930s, the dollar was a fantastic buy on these terms, so foreigners turned in their gold for dollars which they could either keep, use to buy American goods, or invest in the US economy. Since international reserves (I) enter positively into the base equation, such a gold *inflow* would tend to increase the monetary base unless offset by defensive open market operations. In the early 1960s, inflation made the dollar no longer such a good buy at this gold price, and foreigners instead cashed their dollars in for gold. Such a gold *outflow* would tend to *reduce* the U.S. monetary base unless offset by defensive open market operations.

If the Fed does not want a gold (or other international reserve asset) inflow or outflow to affect the monetary base, it can offset ΔI by an equal and opposite ΔS . In the special case of international reserve asset flows, a Defensive Open Market operation is called **Sterilization**.

During the 1970s there was a limited program of gold sales at market prices. By themselves, these would tend to reduce the monetary base through a negative ΔI , and at the same time create a profit for the Treasury equal to the difference between the market price and the official price. Since the 1970s the Fed's monetary gold stock has been virtually static at \$11.0 billion (as evaluated at the official gold price of \$42.22/oz).

Although no attempt is any longer made to fix the value of the dollar relative to either gold or foreign currencies, the Fed does occasionally **intervene** in foreign exchange markets by buying or selling foreign currency denominated assets. Purchases will create a positive ΔI and increase the base, while sales will create a negative ΔI and reduce the base, unless "sterilized."

We will study gold and foreign exchange transactions in greater depth in Part VIII on International Monetary Relations.

ΔL : Net Loans

Although ΔS is the most important Traditional Fed determinate of year-to-year changes in the base, changes in net Loans, primarily structured as Repurchase Agreements, are far more important from day to day and week to week. By standing ready to lend or borrow billions of dollars at slightly above or below its target for the Federal Funds Rate, it can guarantee that the Funds Rate will be very near its target level, without actually entering the Fed Funds market itself.

Direct lending to banks through the Discount Window is included here in Net Loans, but was ordinarily inconsequential in comparison to Repo lending to Securities dealers under the Traditional Fed.

Under the post-2008 Bernanke Fed, Repo lending to dealers has dried up and been replaced by the numerous new facilities. Direct Discount Window lending is now up to a previously unheard of \$36 billion, but is dwarfed by the \$283 billion in Term Auction Credit lending to banks.

ΔJ : Junk Assets

Since mid-2008, risky Junk assets have become the Fed's largest single category of asset, and therefore have replaced US Treasury Securities as the primary source of Monetary Base.

ΔC_T : Treasury Currency

What would be the effect on the money supply of replacing One dollar bills with a One dollar coin? A rise obviously, since the new coins would be issued by the Treasury rather than by the Fed, and therefore be part of Treasury Currency. Unless the Fed conducted a defensive open market operation to offset the change in C_T , total Fed currency would remain unchanged, though only denominations of \$5 and up would be circulating.

But usually changes in Treasury currency make only a trivial contribution to the total change in the base.

ΔD_O : Other Deposits

The bulk of the "Other Deposits" component of the base are traditionally the General Account of the U.S. Treasury, against which the Treasury writes its paychecks, Social Security checks, and checks for other purchases.

If the Treasury kept all its spare change in this General Account, the monetary base would tend to experience large *reductions* on April 15 and other tax dates, since as the tax checks cleared, funds would be transferred from bank reserves, which act as part of the monetary base, to the Treasury's account with the Fed, which does not count as part of the base. Similarly, there would be large *increases* in the monetary base and money supply every time the Treasury met monthly payrolls or paid off maturing bonds, since these transactions would release base money to the banking system, and would have a multiple expansionary effect on the money supply.

In order to reduce, though not eliminate, the impact of Treasury cash operations on the money supply, the Treasury keeps most of its temporary balances in **Tax and Loan Accounts** with ordinary commercial banks rather than in its General Account with the Fed. As checks payable to the Treasury are deposited in commercial banks, the Treasury simply leaves the funds on deposit with the commercial bank (or a qualifying correspondent bank) rather than moving them immediately into its General Account with the Fed.

Then, just before the Treasury has a predictable expenditure due, such as a payroll, it transfers the requisite funds from its Tax and Loan Accounts to its General Account. The result

is a swing in the base until its checks clear, but one which is much shorter in duration than would otherwise have occurred.

Tax and loan accounts are not counted as part of the M1 money supply, so there are still fluctuations in M as these accounts go up and down. However, since these accounts are merely tying up "low powered" M1 money, instead of "high-powered" base money, there is only a one-for-one effect on M rather than the multiple effect that would occur if the Treasury held all its temporary cash balances on deposit with the Fed instead.

Since 2008, the Treasury has accumulated some \$272 billion in deposits with the Fed, making this base equation item much more important than it was under the Traditional Fed. The Treasury and Fed could restore this item to its traditional value of a few billion without changing the base, simply by using this balance to retire an equal quantity of the US Treasury Securities held by the Fed. This would reduce the Fed's "S" to about \$400 billion, almost half what it was in 2007 (see Table 3A in chapter 16).

In other words, the Fed has effectively replace about half of the Treasury securities it held in 2007 with Junk loans to AIG, Bear Stearns, the subprime mortgage market, and the P-2 Commercial paper market, effectively a "defensive open market operation" to keep the huge increase in J since 2007 from having as big an effect on the base as it otherwise would.

The cost to taxpayers is that now the Treasury must actually pay interest to the public on this portion of the public debt, instead of just paying it to the Fed and then getting it back again as Fed profits. In return, the Fed may be earning a net return on its new risky Junk assets, but only if these investments don't "head south."

If the Treasury were instead to spend these funds, say with new capital advances to bank holding companies under the TARP program, D_O would fall and the base would increase by a comparable amount.

ΔNW : The Fed's Net Worth

The final component of the base equation is the change in the Fed's net worth. This could rise as the Fed accumulates undistributed profits, or as commercial banks join the Federal Reserve System, buying "stock" in the Fed as a condition of membership. It can fall as statutory dividends are distributed to member banks or as profits in excess of statutory dividends are distributed to the Treasury.

If the Fed were to write off any losses on its new Junk Assets, NW and J would decline simultaneously, and there would be no net effect on the Base.

If realized losses on Junk Assets were to exceed the Fed's Net Worth, the Fed would simply become insolvent, and (now negative) NW would become a Base Source item, rather than a Base Drain item as traditionally.

Money Supply Targeting versus Interest Rate Targeting.

We have seen how, if it wishes, the Fed can use open market operations to control the level and rate of growth of the monetary base. To the extent the currency/deposit ratio and therefore the bank expansion multiplier is predictable, it can also control the level and rate of growth of the money stock.

However, if it chooses a target level for next year's monetary base and/or money stock, it must buy a certain volume of securities through its open market operations without regard to its effect on interest rates. Interest rates will be determined by the demand and supply for credit, together with inflationary expectations, and will be outside the control of the Fed. *If the Fed targets a monetary aggregate such as B or M1, it therefore gives up control over market interest rates.*

On the other hand, the Fed's open market operations can have a huge effect on market interest rates. Partly this is a *direct effect* through the prices of the securities the Fed is buying or selling. Buying a particular issue will tend to drive its price up and therefore its yield to maturity down, through the inverse relationship between bond prices and bond yields discussed in Chapter xx. And partly this is an *indirect effect* through the market for bank reserves: An open market purchase of securities creates new monetary base and therefore excess bank reserves at the original level of bank loans. In the first instance, banks will try to lend each other these excess reserves through the Federal Funds market, driving the Fed Funds rate down. Then, as the Fed Funds rate becomes unattractive relative to loans, banks will lend the excess reserves to their customers, thereby driving down loan interest rates.

The Fed can, if it wishes, use its great leverage over market interest rates, and particularly over the fed funds rate, to set them to almost any level it desires, at least in the short run. If it does so, however, the market will determine the size of the Open Market Operations and/or Loans, and therefore the monetary base and money stock required to attain its interest rate target. *If the Fed uses its money creation powers to set interest rates, it therefore gives up control over B and M.*

The Fed therefore must make a fundamental decision as to whether to use its powers to target a monetary aggregate or interest rates. If it chooses one it must give up the other.

Prior to 1979, the Fed officially watched growth of the monetary aggregates, but at the same time attempted to smooth out changes in interest rates, with the result that excessive money growth caused inflation to rise to politically unacceptable levels. In October of 1979, Chairman Paul Volcker announced that the Fed would henceforth be targeting monetary growth without regard to interest rates. Interest rates soared to historically high levels, but money growth was kept under control and inflation did come down.

In 1982, however, Volcker reversed this policy and announced that the Fed would henceforth be following what was known as *borrowed reserve* targeting, a form of indirect interest rate targeting. In the later 1980s, the Fed moved to direct *Federal Funds Rate targeting*. In 1994 Chairman Alan Greenspan announced that this was in fact what the Fed was doing, and the Fed began to explicitly announce its Fed Funds targets.

If the Fed were to set a very low Fed Funds Rate target, such as the 1% in effect during much of 2003 and 2004, but conducted no Open Market Operations, Net Loans would grow rapidly to become a very large component of the Base. Longer term interest rates would decline somewhat, but only to the extent that the market expected the low short-term rates to persist. However, since the Fed prefers not to allow Net Loans to exceed \$50 billion or so, it periodically conducts a large Open Market Operation, known as a **Coupon Pass**, when Net Loans reach this level. This gluts the market with reserves, and induces many of the Net Loans to be repaid, at least temporarily, so that there is little if any immediate effect on the base. These Open Market Operations directly reduce the yields on the securities involved. In this manner, the Fed more directly passes its low Fed Funds Target into longer-term yields, without actually fixing the precise value of the longer-term interest rates. It is still true, however, that in order to meet its Fed Funds target, it must allow the market to determine the size of the Base.

In Chapter 21 we will study in greater detail the impact of the monetary and banking system on the level of interest rates and the long-run implications of interest rate targeting.

Reserve Requirements: An Unwieldy Tool

In theory the required reserve ratio against checkable deposits, the " r_r " of Chapter xx, can be used in conjunction with open market operations to control the money supply. In practice, however, it is a rather unwieldy tool that is seldom used for this purpose. A significant recent exception was the April 1992 reduction in the top reserve requirement on checkable deposits from 12% to 10%.

A fundamental problem with sole reliance on the reserve ratio to provide the monetary growth necessary to prevent deflation in a growing economy is that there is a limit to how far the money stock can be increased by this means. For example, Table 2 in Chapter xx shows that at a currency/deposit ratio (c) of .50, a 10% reserve ratio leads to a bank expansion multiplier k of 2.50. If reserve requirements were entirely eliminated, the highest level the multiplier could rise to with this c value is 3.00, a mere 20% increase. This is equivalent to only three years' of base growth at the rate experienced between October 2002 and October 2003 cited above. Once reserve requirements were eliminated altogether, the money supply could be further increased only by open market operations or by other means of increasing the base.

Conceivably, the reserve ratio could be raised and lowered again every year to meet seasonal fluctuations in the demand for money such as the one that appears to occur around Christmas time. Even for such a limited purpose, however, the Fed prefers to rely on open market operations.

As noted in Chapter 10, the statutory structure of U.S. reserve requirements implies that a movement of deposits from large banks to small banks will reduce the effective average required reserve ratio, thereby increasing the multiplier, and vice-versa. To the extent the Fed can predict these shifts, or measure them as they are taking place, it can offset their effect on the money stock through compensating open market operations. Because of reporting lags, however, the Fed may not know what the distribution of deposits is for a couple of weeks, by which time any induced change in M may already have occurred.

