

## 6. Federal Funds: Final Settlement

Stigum (p. 507) says “The primary job of the manager of a bank’s fed funds desk is to ensure (1) that the bank settles with the Fed and (2) that in doing so, it hold no more excess reserves than the amount, if any, that it can carry into the next week.” From the perspective of this course, the manager’s job can be understood as (1) satisfying the daily survival constraint and (2) satisfying the legal reserve requirement (special Wednesday afternoon settlement). For our purposes, the former is the more generally interesting task, especially today when all banks have massive excess reserves so that the legal reserve requirement does not bind.

### The Survival Constraint: Balancing Discipline and Elasticity

The survival constraint says that cash inflows must be at least as large as cash outflows. The precise institutional mechanism that embodies that constraint for banks is the requirement to end the day with a non-negative balance in their reserve account at the Fed. To appreciate the importance of this constraint at the end of the day, it is useful to appreciate the way that banks are **allowed to relax the survival constraint during the day**. Indeed that violation is essential for the smooth working of the payments system because it allows banks to be the “first mover”, to make payments before they receive payments. The institutional form that violation takes is the “daylight overdraft”.

If Bank A sends over Fedwire an order to pay \$10 to Bank B, but has insufficient funds to cover that payment, the Fed does not “bounce the check” but rather covers it temporarily. The effect is a temporary expansion of reserves in the system as a whole, thus:

Bank A		Fed		Bank B	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
	+overdraft	+due from A	Reserves +reserves B	Reserves +reserves	

This expansion of reserves is an expansion of credit on the balance sheet of the Fed, an expansion that at its maximum typically exceeds the size of the rather small required reserves.<sup>1</sup> Indeed, it is not stretching the truth much to say that these daylight temporary reserves, not the overnight required reserves, are the actual ultimate means of payment. The payment system is much closer to an ideal credit payment system than it is to an ideal money payment system.

The credit element in the payment system is not just on the (public) balance sheet of the Fed but also on the (private) balance sheet of CHIPS, the Clearinghouse Interbank Payments System. Every morning, member banks make payments to the Clearinghouse to open their

---

<sup>1</sup> Coleman, Stacy. “The Evolution of the Federal Reserve’s Intraday Credit Policies.” Federal Reserve Bulletin (February 2002): 67-84.

settlement accounts, but during the day they can and do run negative balances. The survival constraint kicks in at the end of the day, when they must bring their accounts back to zero, i.e. repay any daylight overdrafts. Here is the balance sheet relationship in the middle of the day:

Bank A		CHIPS		Bank B	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
		+collateral	+deposit		
	+due to CHIPS	+due from A	+due to B	+due from CHIPS	

Both the Fed and CHIPS are concerned to make sure that the daylight loans are paid back at the end of the day. To ensure this there are, in both institutions, controls over how much you can borrow (credit limits), and requirements to post collateral as guarantee. At the Fed there is the additional requirement to pay interest on your average daylight overdraft, but if you look at the details (Figure 12.6 p. 527) that requirement is not very onerous, and in fact the interest actually paid is quite small. Notably, interest is paid on the average daylight overdraft over the whole day, so peak overdrafts for an hour are diluted in the calculation. Also, banks are allowed to borrow a certain amount, proportional to their capital, without paying interest.

Once we appreciate the credit character of the payments system, it is clear that every dollar owed as an overdraft by one bank is an extra dollar in the reserve account of some other bank. To get the credit off the balance sheet of the Fed at the end of the day thus requires cancellation of both the negative accounts and the extra positive accounts. The simplest way to do that is for the banks with extra positive accounts to lend their extra to the banks with negative accounts, which then use the loan proceeds to pay off their overdraft. In fact, the bank with extra reserves should want to make the loan since reserves don't pay interest whereas the loan will. The Fed Funds market is where that interbank borrowing and lending takes place for domestic banks (see below). The equivalent interbank market for CHIPS is the Eurodollar market which we will talk about next week.

Suppose this doesn't work, that deficit banks are unable to find surplus banks to lend to them. If a bank is unable to pay back its overdraft at the clearinghouse, then all the members of the clearinghouse are jointly responsible for the loan. If a bank is unable to pay back its overdraft at the Fed, the Fed is willing to extend the loan overnight by lending at the discount window, at the penalty rate of 100 basis points over the Fed Funds target. (Bernanke has lowered the discount rate to 50 points over, but probably that is just temporary.) So banks generally prefer to borrow in the Fed Funds market. And they don't wait until the end of the day; they spend a lot of energy tracking their payment flows and trading in the Fed Funds market during the day.

## What Are Fed Funds?

The ultimate means of payment in the US banking system are deposits at the Fed. Call these deposits money. Fed Funds are (usually overnight) loans from one bank to another, payable in

deposits at the Fed. Call these loans credit. Until recently, the underlying deposits paid no interest, but the interbank loan does, and that interest rate is the Fed Funds rate.

To see exactly what is going on consider the following transaction between Bank A (the borrower or buyer of money) and Bank B (the lender or seller of money). Compare the example of Stigum (Table 12.2, p. 495).

Bank A		The Fed		Bank B	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
+10 reserves			+10 Deposit A	-10 reserves	
	+10 Fed Funds		-10 Deposit B	+10 Fed Funds	

You can see how the transaction amounts to a loan between A and B, which means that the lender has to worry about whether the borrower will be able to repay.<sup>2</sup> After lending Fed Funds to Bank A, Bank B has gotten rid of his excess reserve position held at the Fed. After borrowing Fed Funds from Bank B, Bank A has gotten rid of his deficit reserve position at the Fed. Like daylight overdrafts, Fed Funds are a credit element that lends elasticity to the payment system. But Fed Funds are overnight credit not daylight credit, and interbank credit not Fed credit.

Stigum makes a point that some banks are natural sellers of funds and others are natural buyers. Put another way, the regular business of some banks causes their daily cash inflow to exceed their daily cash outflow, and for some other banks it is just the reverse. Concretely, it seems that the former are small banks in isolated areas that don't face much demand for loans, while the latter are large city banks that can lend out all their deposits plus more. So the Fed Funds market channels excess funds from the country banks to the city banks. Viewed in this way, we can think of the Fed Funds market as analogous to the older pattern of correspondent banking. This country-city flow was largely intra-regional in the past, and so it remains today. (The regional character of correspondent banking is reflected in the location of the 12 Federal Reserve Banks.)

It is important to emphasize that a Fed Funds transaction involves an immediate flow of reserves between the banks. There is no waiting for the end of the day, no netting of inflows and outflows, like at a clearinghouse. Thus, once A has bought the money, she can go out and sell it. Transactions like this happen throughout the day, and so the quantity of Fed Funds contracts increases throughout the day. They are all of course cancelled when they are repaid the next day, but by the end of the day outstanding Fed Funds credit can be several times as large as the outstanding deposits at the Fed. What is the point of that?

### Payment versus Funding

At a higher level in the system, money center banks trade Fed Funds among themselves as a way of managing intraday cash flow fluctuations. Just so, suppose that Citibank makes a mortgage loan to me to purchase a house from you. On the day of the closing, Citibank has to make a large payment to the seller's bank. In general, there is no reason to suppose that Citibank

---

<sup>2</sup> This is what Stigum's discussion about "line problems" is about. Banks have FF credit lines with one another in order to limit their exposure. Brokers need to "fine-tune" quotes because it matters who is selling and who is buying.

has adequate reserves at the moment, so to make the payment it has to raise them in the money market. The transaction then takes place as follows:

Citibank (my bank)		HSBC		Chase (your bank)	
Assets	Liabilities	Assets	Liabilities	Assets	Liabilities
+mortgage	+deposit (me)				
+reserves	+FF loan	-reserves +FF loan			
-reserves	-deposit (me)			+ reserves	+deposit (you)
		+reserves	+FF loan	-reserves +FF loan	

The first line shows the mortgage loan, which involves a swap of IOUs between me and my bank. (I don't show my own balance sheet, but you can imagine what it looks like.) The second line shows the immediate **funding** of the loan by buying money from HSBC in the Fed Funds market. The third line shows the **payment** that finalizes the transaction, which involves transfer of reserves from Citi to Chase, as well as debit of my account and credit of your account.

After all this is done, Citibank has a mortgage loan asset that is funded by overnight money. Clearly this is not ideal funding, and the bank has some more work to do, but we leave that aside for the moment to concentrate on the payment rather than the ultimate funding. Note also that Chase now has a large reserve position that pays no interest, so it also has some more work to do. Maybe it will sell in the Fed Funds market, maybe to HSBC? If so, then the ultimate source of funds that Citibank used to pay Chase is from Chase itself! I show this possibility on the fourth line. Note that HSBC is now back to zero in its reserve position at the Fed.

HSBC has in effect acted as an intermediary for interbank borrowing between Citi and Chase. In fact HSBC has acted as a **dealer** in the wholesale money market.

### Broker versus Dealer

Some of Fed Funds transactions are direct—the trader at Bank A calls the trader at Bank B—but a substantial number are brokered. Indeed, the real price discovery action (which is to say the determination of the “effective Funds rate”) happens at brokers and dealers, and the distinction between them will be critical later on in the course, so I introduce it now.

A **broker** just puts together potential buyers and sellers from his sheet, much in the way that real estate brokers do with their listing sheets and client listings. Brokers keep lists of the prices bid by potential buyers, and offered by potential sellers, and they look for matches. There is an extra twist in the Fed Funds market that comes from the fact that sellers are also financing the sale, so that bids need to be fine-tuned to take account of credit lines.

**Dealers**, by contrast, take positions themselves. Read the chapter carefully and you'll find a number of references to dealer activities. What do they do? They buy funds at a low price and sell them at a high price. This sometimes means bridging different segments of the market--

small versus large tiering, unsophisticated versus sophisticated, domestic versus offshore (Euro). And it sometimes means bridging across time--intraday positions, cross-day positions. From one point of view, dealers are doing arbitrage, picking up nickels on the street and so creating a single price. From another point of view, they are making markets, and that is one big difference from brokers. This latter dimension we'll be talking a lot about two weeks from now. For now, I just want to note that it is there and move on. For present purposes, the important point is that dealing activity expands the balance sheet of the dealer, while simple brokering does not, thus:

Bank A		FF Broker		Bank B	
+reserves	+FF loan			-reserves	
				+FF loan	

Bank A		FF Dealer		Bank B	
+reserves	+FF loan	+FF loan	+FF loan	-reserves	
				+FF loan	

## The Reserve Requirement

We have been focusing on the survival constraint and daily clearing, but what about this “reserve requirement” that Stigum talks about? Banks are required to hold a certain fraction of deposits in reserve (on average over the reserve maintenance period) and they can voluntarily pledge to hold more than that. (The banks holding more reserves than required are the money center banks, and they do it to facilitate the very large volume of transactions they are involved in.) Nowadays this constraint does not bind, but it is nonetheless of considerable historical interest.

Stigum makes a big point about the (monetarist-inspired) shift to contemporaneous reserve accounting from lagged reserve accounting in 1984, which made the central bank’s job more difficult. Lagged reserve accounting meant that banks had to accumulate reserves as a fraction of past deposits. Since the demand for reserves was therefore completely inelastic, the Fed essentially was forced to provide them, either through open market operations which made them available through the Fed Funds market, or through the discount window. Given the choices, it preferred the former. The problem with this, according to monetarist thinking, was that it made the supply of reserves endogenous. They wanted banks to adjust deposits to fixed reserves, rather than vice versa.

The monetarists lost out on that one. Today the Fed supplies whatever reserves are needed to hit the Fed Funds target. This involves the Fed in practically daily interventions in the market (see Fig 12.5, p. 524). For our purposes, the important thing about these daily interventions is that they are adjustments of the size of the Fed’s balance sheet. If the Fed is adding reserves, that means that the daylight expansion of credit on Fedwire doesn’t have to collapse back to zero at the end of day. The Fed is taking some of that credit onto its own balance sheet overnight, or longer.<sup>3</sup>

---

<sup>3</sup> D. L. Thornton has generated a debate about the “liquidity effect”(p. 507) which we can understand better using the balance sheet approach.

The Fed does these daily adds usually by lending to security dealers in the repo market. We will be talking about the repo market next time. For now, suffice it to say that repos are loans, so the reserve add can be pictured as follows:

Security Dealers		The Fed	
A	L	A	L
+reserves	+RP loan	+RP loan	+reserves

If the Security Dealer lends these extra reserves out, that amounts to an additional supply of credit in the Fed Funds market, which puts downward pressure on the Fed Funds rate.

The Wednesday afternoon settlement to which Stigum refers is about meeting this reserve requirement, not the regular daily settlement of payment balances. Note especially how the Fed intervenes to provide the reserves demanded at the targeted FF rate. As Sternlight says (p. 506) “If you want to hang your hat on something, hang it on the average effective funds rate over the settlement period.”

## Anecdote

When I was at the Board of Governors in summer 1986, there was much discussion about daylight overdrafts on Fedwire. Fedwire is a Real Time Gross Settlement system where a payment from bank A to bank B is immediately good funds that bank B can use to make a payment of its own. The problem is that banks were making more payments than they had reserves during the day, with the plan that they would be receiving more payments at the end of the day. So there was in effect an intraday expansion of reserves that was not under the control of the Fed. The Fed got concerned about the apparent credit element entering here, partly because it put them in the position of lending without control, partly also because they think of reserves as money and they want the credit element to happen somewhere else in the system.

They clamped down initially by establishing credit limits, tailored to individual bank needs. Then in 1994 they started charging interest on average daily overdrafts (now 36 basis points). This has not been that effective in reducing overdrafts, and not effective at all in reducing peak aggregate overdrafts (which come late in the day and are driven by security transactions). One thought is that maybe the price is not high enough? Maybe so, but be careful. The relevant alternative to overdrafts on Fedwire are overdrafts on other payments systems, which typically cost less, even zero. (Here again we hear echoes of the Strong Rule: use the amount of credit on the Fed balance sheet to monitor and control credit more generally.)

For example, CHIPS is an alternative payment system with an even stronger credit element because payments are not good funds until net settlement at the end of the day. One way to think about what happens is that banks do business on CHIPS, taking great care to keep track of their net position and to accumulate what FF they need to clear that position at the end of the day. Note that Oct 1, 1981 Fed required that CHIPS go to same-day settlement, which in effect tightened up on the credit element here as well. And there has been periodic tightening of the

collateral requirements for overdrafts on CHIPS. The idea has been to push the credit element out of the payments system into the repo market which we'll talk about next time.