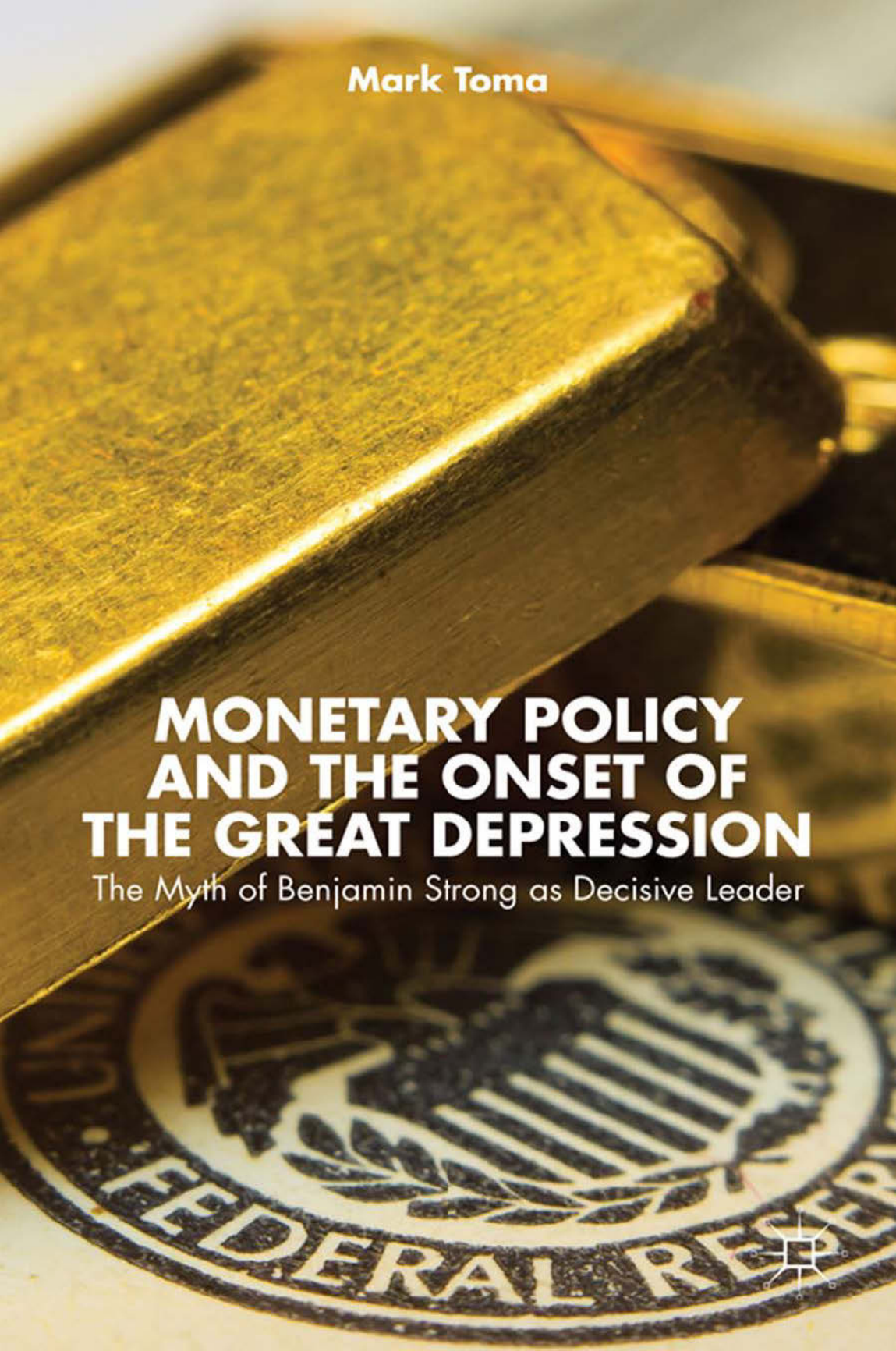
Mark Toma
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The Myth of Benjamin Strong as Decisive Leader
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Monetary Policy and the Onset of the Great Depression

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The Myth of Benjamin Strong as Decisive Leader

Mark Toma

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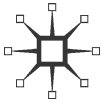

MONETARY POLICY AND THE ONSET OF THE GREAT DEPRESSION

Softcover reprint of the hardcover 1st edition 2013 978-1-137-37254-3

First published in 2013 by
PALGRAVE MACMILLAN®
in the United States—a division of St. Martin's Press LLC,
175 Fifth Avenue, New York, NY 10010.

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ISBN 978-1-349-47615-2 ISBN 978-1-137-37162-1 (eBook)
DOI 10.1057/9781137371621

Library of Congress Cataloging-in-Publication Data is available from the Library of Congress.

A catalogue record of the book is available from the British Library.

Design by Newgen Knowledge Works (P) Ltd., Chennai, India.

First edition: December 2013

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To Mattie and Genia

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Preface

This is not the book I intended. That book was to be all about trust—or rather mistrust—as the factor responsible for the Great Depression. The seminal event occurred during the first week of February 1929. On a Saturday morning, February 2nd at 11:35 a.m., six members of the Federal Reserve Board, accompanied by two assistant secretaries, met to discuss a letter drafted by one of its members, Adolf Miller, and addressed to each of the 12 Federal Reserve banks. Reading the minutes of that meeting, one cannot help but sense the tension that must have gripped the parties in attendance. The minutes open innocently enough by recording the reading and approval of minutes from the last meeting. Then, the minutes reveal the agenda for the current meeting:

> The Governor stated that special order of business for this meeting would be that fixed for consideration yesterday, namely, the proposed letter to the chairmen of the Boards of Directors of all Federal reserve banks on the subject of the proper use of the credit facilities of the Federal Reserve System (FRASER, Federal Reserve Bank of St. Louis, Minutes of the Board of Governors of the Federal Reserve System: February 2, 1929, 1).

The context of the proposed letter was the board's concern that in recent years Reserve banks had been lending money to member banks that in turn used the money to make speculative loans to their customers, loans that had contributed to an unsustainable run-up in stock prices in the second half of the decade. After summarizing its concerns, and indicating that such lending was contrary to the spirit of the Federal Reserve Act, the letter gets to the heart of the board's intentions:

> The Board has no disposition to assume authority to interfere with the loan practices of member banks so long as they do not involve the Federal reserve banks. It has, however, a grave responsibility whenever there is evidence that member banks are maintaining speculative security loans with the aid of Federal reserve credit (FRASER, Federal Reserve Bank of St. Louis, Minutes of the Board of Governors of the Federal Reserve System: February 2, 1929, 3).

"Grave responsibility"…one is unaccustomed to encountering a regulatory body so intent on impressing the regulated firms (in this case, the Reserve

banks) with the seriousness with which it is taking its oversight responsibilities. The letter continues,

> When such is the case the Federal reserve bank becomes either a contributing or a sustaining factor in the current volume of speculative security credit. This is not in harmony with the intent of the Federal Reserve Act nor is it conducive to the wholesome operation of the banking and credit system of the country.
>
> You are desired to bring this letter to the attention of the directors of your bank in order that they may be advised of the attitude of the Federal Reserve Board with respect to this situation and the problem confronting the administration of Federal Reserve Banks. The Board would like to have from them an expression as to (a) how they keep themselves fully informed of the use made of borrowings by their member banks, (b) what methods they employ to protect their institution against the improper use of its credit facilities by member banks, and (c) how effective these methods have been.
>
> The Board realizes that the problem of protecting the credit situation from strain because of excessive absorption of credit in speculative security loans is attended with difficulties. It also realizes that there are elements in the situation which are not readily amenable to recognized methods of banking control. The Board nevertheless believes that, however difficult, the problem can be more completely met and that the existing situation admits of improvement.
>
> The Federal Reserve Board awaits the reply of your directors to this letter and bespeaks their prompt attention in order that it may have their reply at an early date (FRASER, Federal Reserve Bank of St. Louis, Minutes of the Board of Governors of the Federal Reserve System: February 2, 1929, 3).

Board members knew fully well the likely effect of this missive on the mindset of those about to receive it: the 12 chairs of the Reserve bank boards of directors. From the opening days of the Federal Reserve System, the two sides, the Federal Reserve Board and the Federal Reserve banks, had been involved in a power struggle. Though the Reserve banks had won many of those battles involving open market operations, the board still had the upper hand with respect to its ability to influence discount loan operations; that is, Reserve bank loans to member banks. For the most part, however, the board exercised its power via a right explicitly granted by the Federal Reserve Act: to approve discount rate changes initiated by the individual Reserve banks. But what was proposed in this letter was a different matter altogether. Now the board was interjecting itself into the discount loan process much further down line, in the loan practices of those member banks that received discount loans from Reserve banks. The Reserve banks would quite naturally interpret the message along the lines the board seems to have intended, as a "grave" warning to be cautious in extending loans to member banks. The ambiguous criteria offered for ascertaining the type of loan that would receive the board's scrutiny, a "speculative" security loan, added to the gravity of the warning.

Sensing that by sending this letter, the board was about to elevate the power struggle to a new level, one of the board members, Charles S. Hamlin,

> moved that the above letter be amended by adding at the end of the next to last paragraph thereof the words, "without resort to drastic methods." (FRASER, Federal Reserve Bank of St. Louis, Minutes of the Board of Governors of the Federal Reserve System: February 2, 1929, 3).

Hamlin was seeking to soften the blow by in effect saying, yes there is a problem that "admits of improvement," but no big deal, no drastic methods are required. Most of the committee, however, did not share Hamlin's foreboding sense of concern about the effect the letter would have on the mindset of Reserve bank decision makers.

Mr. Hamlin's motion was put by the chair and lost, the members voting as follows:

> Mr. Hamlin "aye"
>
> Mr. Cunningham "aye"
>
> Governor Young "no"
>
> Mr. Platt "no"
>
> Mr. Miller "no"
>
> Mr. James "no"
>
> (FRASER, Federal Reserve Bank of St. Louis, Minutes of the Board of Governors of the Federal Reserve System: February 2, 1929, 3).

The letter would go out "as is" leaving open the possibility that Reserve banks might interpret its main message as, *We at the Board are fully prepared to "resort to drastic methods" to squelch what we deem to be inappropriate loans.*

Before leaving the topic, and moving on to matters of a housekeeping nature, the minutes indicate a debate on a seemingly procedural matter that, in fact, would have lasting repercussions on the future fragility and stability of the financial system.

> A discussion then ensued with respect to the possible publication of the letter, either in the Federal Reserve Bulletin or as a press statement. During the discussion it was voted to rescind the resolution adopted at the meeting on January 24th, that the letter be treated as a confidential document, and the Secretary was authorized to handle and transmit the letter in the usual manner (FRASER, Federal Reserve Bank of St. Louis, Minutes of the Board of Governors of the Federal Reserve System: February 2, 1929, 4).

The intention of the board, prior to this meeting, had been to treat the letter "as a confidential document." If that had been the case, then the monetary history of 1929, or perhaps, even of 1929–33, might well have turned out

different. Yes, the heads of Reserve banks would come to understand that the board was prepared to take "drastic actions" to preclude the possibility that funds extended through the discount window would end up fueling speculative activity in the stock market. But member banks, the broader financial community, and the general public would not necessarily share that understanding.

But that was not the road taken. Instead, "the Secretary was authorized to handle and transmit the letter in the usual manner." And what did the "usual manner" entail? First, and foremost, it meant a press release. While the board was to make the release on the 7th, the rumor mill was in full swing prior to that date. The headlines and bylines from the *New York Times* on the 7th and 8th are most telling. From the 7th:

> FINANCIAL MARKETS: Stocks Break on Report of Forthcoming Reserve Board Declaration (*New York Times,* February 7, 1929).

From the 8th the bylines were many (Louis T. McFadden was chair of House Committee on Banking and Currency):

> TREASURY DENIES BLOW AT MARKET: Officials Explain It Was Hoped Speculation Had Run Course and Would Subside. RESERVE BOARD ASSAILED McFadden Questions Its Right to Interfere—"Leak" of News Is Rumored in Washington. McFadden Assails Course. Rumors of "Leak" of News. Danger Abroad Seen. Various Viewpoints Stressed. Bankers Here Puzzled. Board's Statement Studied (*New York Times,* February 8, 1929).

Sure, you may be thinking, the headlines were metaphorically screaming. But are screaming headlines really such a big deal? What is the practical import of this episode as it applies to the onset of the Great Depression? In answer, I ask you to engage in a thought experiment that turns out not to be entirely imaginary. Suppose that I inform you that in the early years of the twentieth century Congress passes legislation that (1) authorizes a government lender of last resort in the form of a central bank and (2) outlaws all private lenders of last resort. For the next decade or so, the central bank carries out its lender of last resort responsibilities in a reliable fashion. It extends lines of credit with the stipulation that the credit lines can only be exercised when banks that are solvent find themselves in need of liquidity on an emergency basis. The central bank proves a reliable last resort lender; the discount window is always open to solvent banks wanting cash on short notice. Indeed, the central bank is such a reliable lender of last resort that banks feel comfortable in substituting the emergency credit line for ordinary reserves held in their vaults as cash. Banks use the freed-up reserves to make loans at market rates of interest. The result is a period of unprecedented financial prosperity and stability.

One day the central bank makes an unexpected announcement: banks have been too liberal in their lending policies, lending to borrowers who have

ill-conceived investment plans. Accordingly, the central bank intends to shut down the discount window for an unspecified period of time. Moreover, the central bank will not allow any private lenders of last resort to step in to fill the void.

The effect of this surprise announcement is to overnight wipe out the most important component, the central bank-extended credit line, of a member bank's safety cushion, which instantly, and quite dramatically, increases the (liquidity) cost of running a bank. Absent the availability of emergency lines of credit, banks eventually respond by holding a substantial amount of liquid assets, for example, noninterest earning reserves. The substitution of liquid assets for the missing credit line, however, is not seamless; the two are not perfect substitutes and banks find that their safety cushion does not rebound to prior levels. A reduced safety cushion makes the entire banking system more fragile, such that a negative financial shock that ordinarily would be handled by the financial system with relative ease—the central bank steps in and extends emergency liquidity—now has the potential of triggering a financial crisis.

Return to reality. Something like this sequence of events did occur in the early twentieth century. The Federal Reserve Act of 1913 did authorize the 12 individual Reserve banks to serve as lenders of last resort to the banking system. Legally, the Fed was the only institution, public or private, that had the power to create dollars out of thin air and lend them to banks. Lacking the money creation trick, private institutions could not compete with the Fed as lenders of last resort, leaving the Fed with an effective monopoly over emergency credit.

The financial system ran smoothly throughout the decade of the 1920s. While there were no negative shocks of great magnitude, when member banks did call upon their Reserve banks to deliver promised lines of emergency credit, those Reserve banks followed through. Indeed, the decade of the 1920s was so lacking in financial drama, that Milton Friedman and Anna Schwartz famously titled a chapter in their *A Monetary History of the United States* (1971), "The High Tide of the Reserve System, 1921–29." Recessions were mild and banks kept reserves to a minimum, extending loans to borrowers who, did indeed, frequently use the proceeds to invest in the stock market.

One day calm was broken by the seminal event mentioned in the opening paragraphs of this preface. Henceforth, Reserve banks, the financial community, and the general public were on notice that the loan departments of Reserve banks and member banks would be scrutinized to insure that the proceeds from discount loans were not to be speculatively invested in the stock market. And the scrutiny would be undertaken by a bureaucratic agency, the Federal Reserve Board, located in Washington, DC, and relatively divorced from the day-to-day operations of the 12 Reserve banks.

In my mind, the February announcement represented the key event setting the stage for the onset of the Great Depression. The announcement was a trust-destroying event. It destroyed the trust that member banks had in

their Reserve banks. In particular, the announcement significantly reduced the probability that Reserve banks would serve as reliable lenders of last resort. Banks responded in rational fashion, cutting back on loans and building up liquid assets. The build-up, however, did not fully compensate for the loss of confidence in Reserve banks.

Throughout the spring and summer of 1929 the financial system was probed and tested. Most notably, in March, several banks in New York City found themselves short of cash and approached the New York Fed for emergency loans. The New York Reserve bank was willing, but the board was not. Fearing sanctions, the New York Reserve bank submitted to the board's wishes and did not extend emergency loans. In this environment of scarce liquidity, short-term interest rates sky-rocketed. Eventually, a large private bank, against the wishes of the Federal Reserve Board, did step in and provide emergency credit and interest rates for the moment fell to normal levels. Confidence in the Fed, as lender of last resort, reached a low point, however.

In the test of October 1929 the financial system did not escape unscathed. New York City banks again found themselves short of cash. Fearing sanctions from the board, neither Reserve banks nor private banks were quick to step in as last resort lenders. Banks scrambled to acquire cash, causing bond prices to fall, which triggered margin calls resulting in a massive sell-off on the stock market—a stock market crash.

While the crash did not necessarily represent the onset of the Great Depression, I do argue that it, along with liquidity events in spring and summer of 1929, was an early warning signal that something was drastically wrong with the financial system. It was a clear-cut signal, in other words, that the system suffered from a serious trust/credibility problem not easily solved. Banks and the general public continued to lack confidence in the Fed. Despite attempts to build-up liquidity, the safety cushion behind bank deposits remained dangerously low after the crash due to the expectation that credit lines would not be there to tap when needed. The economy was like a powder keg just waiting to be lit by an upcoming negative shock. To make a long story short, the inevitable did occur and an ordinary downturn was made "great."

I hope I have said enough to get you intrigued. But here is the problem I confronted in turning the trust theme into a book. As I prepared drafts of chapters, particularly as they pertained to the course of events in 1929, it became quite apparent that I would need to do battle with those who hold other views about the cause(s) of the onset of the Great Depression. Most notably, I would need to address and respond to what has come to be the received wisdom in the economics profession, that a major factor, arguably the key factor, responsible for the onset of the Great Depression was Federal Reserve mismanagement of the money supply in a gold standard setting. The most popular version of this view nowadays is that the onset of the Great Depression was triggered by a tight monetary policy in the closing years of the 1920s. Further, the Federal Reserve's stubborn refusal to abandon the

gold standard in the transition to the new decade led to continued tightness and represented the key factor responsible for the severity and length of the downturn.

To make things clear, my interpretation, the trust thesis, too points the finger at Fed mismanagement. But it would be misleading to classify mistrust as a monetary—that is, a nominal—problem. Instead, mistrust can be better classified as a regulatory policy that represents a negative real shock to the economy. In my storyline, mistrust acts more like a tax on the banking system that raises the cost of banking. That real cost, rather than a money growth rate that is too low, or for that matter too high, is what makes the financial sector more fragile and hence more prone to crisis.

I was prepared to do battle with the received wisdom. Some of my previous research efforts had been directed to the decentralized nature of the early Federal Reserve System and how it had been set up in a way that, under normal circumstances, guarded against the possibility that too much or too little money would be produced. My intention was to devote an early chapter or two explaining why, as normally construed, monetary policy was not a major factor contributing to the onset of the Great Depression. But one chapter became two, became three, became . . . Wait a minute, I was starting to churn out a monograph if not the beginnings of a full-blown book. And even more significantly, as I began to develop my position, it became increasingly clear that the consensus view of the operation of the early Fed was not on sound footing: there was a fundamental flaw in the received wisdom. Reserve banks in the 1920s did not have the power to mismanage the money supply, even if that had been their misguided intention. At some point, I decided that explaining the problem with the consensus view—what was it about the institutional structure of the Fed in the 1920s that all but guaranteed that the right amount of money would be produced—was of such significance that it warranted more than a few chapters. This book, *Monetary Policy and the Onset of the Great Depression: The Myth of Benjamin Strong as Decisive Leader* is the by-product. The intended book waits in the wings.

Chapter 1

Monetary Policy as Scapegoat

1. Introduction

The Federal Reserve of the 1920s did not mismanage money. Indeed, the Fed could not have mismanaged money even if so motivated. I am fully aware that this claim flies in the face of monetary theories of the onset of the Great Depression that have been famously advanced at various times in the past. On the Austrian side, Friedrich Hayek and, particularly, Murray Rothbard have attributed the onset to excessive money growth during the early and mid-1920s. On the Monetarist side, Milton Friedman, Anna Schwartz, and, particularly, James Hamilton have pointed to undue monetary restriction during the last two years of the 1920s. More recently, the Monetarists have been joined by the "Golden Fetterers": the thesis that the proximate cause of the onset of the Great Depression was a too tight monetary policy attributed at a fundamental level to a stubborn refusal by nation-states to abandon the gold standard in a timely fashion—they were "fettered" by gold.[1] While differing in the details, all camps share the thesis that money *matters*. That is, the rate at which the money supply grows, as established by central banks, determines the rate at which the price level grows in the long run and influences the rate at which real income grows, or does not grow, in the short run.

My intent in this book is to explain and document a flaw in the theories underlying both the "too much" and "too little" sides of the debate. To state things colloquially, monetary policy in the 1920s has been made a scapegoat. In the United States, Reserve banks and the gold standard setting within which they were situated have been falsely accused. The Federal Reserve of the 1920s produced exactly the right amount of money.

To what do we owe this happy outcome? More than luck was involved, though there may have been a fair amount of that too. The answer can be traced back to the blueprint of the Federal Reserve System, the Federal

Reserve Act, though in its original manifestation, the act was something less than an optimal blueprint. Indeed, before WWI, strict interpretation of a currency-backing clause (Federal Reserve Act, Section 16) effectively placed a strait-jacket on the Federal Reserve banks (Fishe 1991), preventing them from achieving what the preamble of the act called upon them to do: "to furnish an elastic currency." But as the system evolved, a more liberal interpretation of the act freed Reserve banks from the strait-jacket. In the aftermath of WWI, the system was up and running, arguably, in the way the founders intended, producing neither too little nor too much money.

2. WHY MONEY WAS JUST RIGHT

What features of the Federal Reserve Act rendered monetary policy "just right" in the 1920s? To lay bare those features requires an investigation of both sides, supply and demand, of the 1920s money market. While a full-blown investigation awaits the next chapter, the outline can be presented here. The Federal Reserve Act authorized the issue of a new type of currency, the Federal Reserve note, backed by a legally binding constraint requiring the Fed to redeem those dollars on demand for gold. Actually, the act authorized 12 different currencies, each issued by one of the 12 newly created Reserve banks, each with an inscription identifying the issuing Reserve bank and each backed by the requirement that the bank of issue redeem its dollars for gold. The effect was to make the dollar of each of the Reserve banks at least as good as gold in the sense that the purchasing power of the dollar would be greater than or equal to the purchasing power of gold. Conversely, the gold price of output would be greater than or equal to the dollar price of output (the price level), leading to the powerful conclusion that there was nothing the individual Reserve banks could do to push the price level above the level established by the gold anchor. If Reserve banks tried to do so by printing and distributing new notes, the public would simply refuse to hold them. In particular, if the dollar price of output climbs above the gold price of output, then the purchasing power of the dollar falls below the purchasing power of gold, and the public would have an incentive to redeem their dollars for the more valuable gold, either at the issuing Reserve bank, or its branch, or at the US Treasury in Washington, DC.

Note, however, that redemption alone, while precluding Reserve banks from decreasing the purchasing power of the dollar, potentially leaves the Fed with one margin of influence. By refusing to accommodate the demand for Reserve bank money, currency and reserves, the Reserve banks would be able to push the purchasing power of the dollar above the purchasing power of gold. Conceptually, the Fed has the power to make currency and reserves so scarce that the value of the dollar soars above the value of gold. The public and banks bang on the Reserve banks' doors for money, but the Reserve banks do not listen.

The conditions sufficient to render Reserve banks completely powerless to influence monetary aggregates are as follows:

1. The public must be able to redeem bank deposits into currency and currency into gold at relatively low cost.
2. Reserve banks must have an incentive to accommodate the public's demand for currency and member banks' demand for reserves.
3. An individual Reserve bank's demand for gold comprises an insignificant part of the total worldwide demand for gold.
4. The individual Reserve banks do not act collusively in choosing how much gold to hold.

Condition 1 makes Fed money *at least* as good as gold. Condition 2, in combination with 1, makes Fed money *exactly* as good as gold. Conditions 3 and 4 insure that Reserve bank decisions, with respect to how much gold to hold, have no effect on the purchasing power of gold and, therefore, no effect on the overall price level. To be sure, the price level may rise or fall over time, but only if forces outside the control of the Reserve banks cause the purchasing power of gold to fall or rise.

Given conditions 1–4, the Fed is able to control neither the total amount of its monetary liabilities nor how those liabilities are divided between currency and reserves. Instead, based on the prevailing price level, the public determines their real holdings of deposits and currency by choosing their nominal holdings. Then, banks choose how many (excess) reserves to hold behind those deposits. Seemingly, the accommodating Fed is left with nothing to do.

There is, however, one margin of choice. The Reserve banks must decide how to allocate their source of funds, currency and reserves, across possible assets: gold, government securities, and discount loans. The latter two are the Reserve banks' earning assets that constitute Federal Reserve credit. Since, as an accounting identity, total assets must equal total liabilities, and since in the current setting, total liabilities are determined by the general public and banks, the Reserve banks' asset allocation decisions (gold versus Fed credit) have no special monetary significance. A Reserve bank decision to increase Fed credit is a decision to decrease gold reserves with no effect on the monetary base (currency and reserves). But there is nothing significant about highlighting Fed credit in this setting. A Reserve bank decision to increase one component of Fed credit, say government security holdings, is a decision to decrease the sum of gold holdings and discount loans with no effect on the monetary base. Conceptually, there are innumerable ways that gold, government securities, and discount loans can be combined to back up the given level of the monetary base. The particular mix chosen by Reserve banks does not matter from a monetary economic perspective.

The irrelevancy of Fed credit is an important but, I would argue, almost universally denied conclusion. Indeed, it is not too much of an exaggeration

to claim that Friedman and Schwartz's masterpiece, *A Monetary History of the United States* (1971), can be read as a monument to the theme that Fed credit, and only Fed credit, matters. For this reason, further commentary seems justified. I suggest that the mistake made by Friedman and Schwartz, as well as other modern monetary economists analyzing the early Fed, was to (subconsciously?) apply a modern fiat money model to a gold standard setting. If an effective gold anchor is absent, then the public's nominal demands for currency and deposits are free floating. If the Fed decides to increase Fed credit, say by purchasing government securities, then the public deposits the new dollars in their pockets as currency or in their banks as reserves, the reserves serving as the base for a further increase in deposits. These new dollars are willingly held because the price level moves up hand-in-hand. There is no offsetting decrease in either of the other assets of the Fed, gold and discount loans, implying that the open market operation is associated with an increase in overall assets and liabilities of the Fed. Here, the chain of causation runs from open market operations to Fed credit to monetary base to the price level. Open market operations are important because they affect nominal values. Note, also, that open market operations are associated with a change in the gold ratio, the ratio between gold and the Fed's monetary liabilities, so that by purchasing government securities the Fed is choosing to reduce the gold ratio and expand the money supply. Is it any surprise, then, that Friedman and Schwartz devote a good part of their *Monetary History* to documenting movements in Fed credit and in the Fed's gold ratio?

My point is that nominal magnitudes were not free floating in the monetary environment of the 1920s. The supply and demand for gold determined the price level, the public determined real money holdings, and, given an accommodative Fed, nominal values were determined residually. Return to the open market operation example. A Fed decision to purchase government securities with newly created dollars temporarily increases the real amount of deposits and currency above the amount the public desires. Someone, somewhere in the economy will transform the excess into gold by, for example, withdrawing cash from their checking account, or from their pocket, and redeeming the cash for gold. The increase in Fed credit has been accompanied by a decrease in Fed gold, with the nominal value of the Fed's total assets and liabilities unaffected. Alternatively, the Fed may combine the open market purchase with a decrease in discount loans giving the same result: the Fed's total assets and liabilities are unaffected.

At this point the temptation is to conclude that the mix of Fed assets is indeterminate and that the move out of one and into another asset should be of no interest to a money/macro economist employed at a Reserve bank. To a Fed *manager*, however, the composition of Reserve bank assets would matter. In the 1920s each Reserve bank faced a bottom-line, each had to cover costs. This financing constraint ruled out some asset combinations. For instance, Reserve banks would be unable to back up their monetary liabilities with 100 percent gold, since no revenue would be generated to cover expenses. At the other extreme, refusing to hold any gold would also not be

a viable option. As discussed in detail in chapter 4, with zero gold reserves, the (liquidity) costs of abiding by the legal requirement to redeem currency into gold would tend to be prohibitively high. The upshot is that the gold reserve ratio is bounded by lower and upper limits. While not having broader macroeconomic implications, the ratio does have net revenue implications for the Reserve banks, and therefore will be of more than passing interest to Reserve bank managers.

3. Golden Fetters

But what about the golden fetters? Let's grant for the sake of argument that the Fed of the 1920s accommodated monetary demand, *given the general price level*. But changes in supply and demand conditions in the market for gold would result in a moving anchor for the price level. The particular concern in the golden fetters' camp is that increases in the worldwide demand for gold during the interwar period increased the purchasing power of gold resulting in worldwide deflation. Only those countries that abandoned the gold standard early-on were able to escape deflation's ravages on the real economy.

Several issues are raised by the golden fetters thesis. First, the possibility of a moving price anchor does not overturn the conclusion that the Fed of the 1920s was structured in a way that stripped the individual Reserve banks of any power to produce a monetary policy that was too tight or too easy. As price-takers, individual Reserve banks respond to an increase in the price of gold by economizing their gold holdings; that is, they substitute Fed credit for gold, thereby changing the composition of the monetary base. True, the nominal size of the Fed's balance sheet shrinks as the private sector, seeking to preserve real values, responds to the fall in prices by reducing its nominal demand for currency and reserves. But, as before, Reserve banks passively accommodate demand.

Of course, this picture of powerless Reserve banks presumes that they are price-takers: they do not act jointly. If, instead, the Reserve banking system is better viewed as a unified system, then Reserve banks may have the power to affect demand conditions in the gold market and thereby the general price level. So, here a clear distinction emerges between my thesis of monetary policy as scapegoat and the golden fetters thesis. The scapegoat thesis sees intense rivalry among Reserve banks while the golden fetters thesis sees a unified Fed. As the challenger, the burden of proof rightly lies on my side. One of my goals in this book is to demonstrate that inter-Reserve bank competitive pressures rendered collusive, cooperative behavior among Reserve banks unlikely.

Finally, we get to the main golden fetters issue. Maybe Reserve banks were not powerful. Maybe Reserve banks did not comprise a unified system. Still, the scramble for gold in the 1920s caused a deflation that had a profoundly depressing effect on real economies worldwide. That is, the deflation had a depressing effect on those economies that stubbornly clung to the

gold standard. According to the golden fetters thesis, monetary policy is not a scapegoat. Choosing to cling, or not cling, to the gold standard is a policy decision, a monetary policy decision. The clingers found themselves rushing head-on into the Great Depression. The nonclingers were able to sidestep the brunt of the impact. Monetary policy in this sense was all-important.

Even here, my inclination is to cry-out, scapegoat. My concern is that the golden fetters' side too quickly constructs a causal-bridge from deflation to the real economy. Deflation means falling prices, not necessarily falling output. Depending on the context, some episodes of deflation are benign and some harmful.

The critical factor that decides the issue is whether deflationary pressures are unanticipated or anticipated. Sudden, surprise deflation, by upsetting the plans of economic agents, most likely does have significant, real negative consequences; gradual, expected deflation less so. With respect to the late 1920s, when the source of deflationary pressures was the return of nation-states to gold, deflationary pressures were more of the second type. Gold restoration started picking up steam in 1924: among core countries, the first to return was Germany (1924), then England (1925), and later France (1928). As each of the core countries rejoined, colonial noncore nations soon followed. There was nothing particularly surprising about the timing and sequence of core and noncore countries return to gold. Indeed, the timing and sequence of return was a subject of much discussion and analysis throughout the decade. On this basis, it seems a bit far-fetched to argue that ongoing deflation in the mid- and late-1920s caught the public by surprise. If we want to assign blame, we must search elsewhere. Golden fetters were not responsible for the onset of the Great Depression.

4. A Look Ahead

The agenda for the remainder of the book is ambitious: build and test a model of the early Federal Reserve System that is consistent with the thesis that the onset of the Great Depression cannot be attributed to an activist policy of monetary mismanagement commonly understood as either too much or too little money. The assumptions of the basic model are motivated by an examination in chapter 2 of the Federal Reserve Act of 1913, which established a blueprint for the early Fed. Unlike the National Banking Act, the Federal Reserve Act created a monetary environment whereby the suppliers of base money, the Reserve banks, had an incentive to accommodate demand. The defining features of that environment were competition and redemption. In particular, the 12 Reserve banks had the power to "print money" and buy government securities for their own accounts, which allowed them to compete among themselves to supply Fed money, reserves and currency, backed by gold. The Federal Reserve Act also established a process that, at least on paper, allowed the public to redeem currency for gold at a relatively low cost. Competition guarded against too little money and easy redemption against too much money.

Chapter 3 poses the question: Did the founders' vision materialize in practice? Once the Fed was up and running, would it operate as a decentralized, self-regulating system, with decision makers properly incentivized? The consensus answer seems to be a resounding, *no.* Monetary historians of both Monetarist and Austrian persuasions tend to agree that after WWI, the Reserve banks coalesced into a centralized, unitary system, with policy activism supplanting self-regulation. A common theme is that the Fed, under the leadership of Benjamin Strong, orchestrated a policy of month-to-month interest rate smoothing throughout the 1920s as well as a policy of monetary ease in 1924 and 1927.

Chapter 4 develops the basic model of competition among Federal Reserve banks that stands in contrast to more conventional models based on a discretionary, fine-tuning Fed. The key assumption of the competitive model is that the aggregate money supply and the overall price level are exogenous to the Federal Reserve System with the purchasing power of money determined by supply and demand conditions in the market for gold. An important implication is that Reserve banks can control the composition but not the size of their balance sheets. A decision, for instance, to buy government securities momentarily leaves people in the economy holding more dollars than desired at the prevailing price level and they respond by redeeming the excess for gold. The increase in Fed credit (the sum of government securities and discount loans) has been accompanied by a decrease in Fed gold, with the value of the Fed's total assets and its total monetary liabilities unaffected. Alternatively, the Fed may combine the open market purchase with a decrease in discount loans giving the same result: the Fed's total assets and liabilities are unaffected. This second example helps explain a stylized monetary fact of the early Fed years that has come to be known as the scissors effect, the tendency of changes in one component of Fed credit to be offset by changes in the other component. The scissors effect is a by-product of a competitive, self-regulated Federal Reserve but not a system headed by a discretionary central banker, who is only loosely bound by a gold anchor constraint.

Given that the conventional discretionary model fails to explain the scissors effect, chapter 5 turns attention to a less conventional discretionary model with historical roots in the 1920s, the Riefler-Burgess (RB) Doctrine. Like the competitive theory, the scissors effect is a defining feature of the RB Doctrine. But the two theories differ in the details of their storylines. Open market operations, as the initiating blade of the scissors, will move seasonally according to the RB Doctrine; discount loans, as the initiating blade, will move seasonally according to the competitive theory of Reserve banking.

Chapter 6 tests the scissors effect and related implications of the discretionary RB Doctrine versus the competitive Reserve bank theory. In general, the evidence is consistent with the competitive theory while at least some of the evidence is inconsistent with the RB Doctrine. A scissors effect does exist, but, contrary to the RB Doctrine, seasonality tests indicate that discount loans, not open market operations, are seasonal for the period, 1922–28.

Chapter 7 turns to an examination of the longer run tendencies and consequences of monetary policy, placing under the empirical microscope two conventional discretionary accounts, Austrian and Monetarist, of how Fed mismanagement of the money supply triggered the onset of the Great Depression. What is striking is that the two sides come to opposite conclusions about the nature of monetary policy in the 1920s, even though they examine the same set of data. Austrians claim that an overly loose monetary policy was responsible for the onset of the Great Depression while Monetarists claim that an overly tight monetary policy was responsible for the onset. I argue that both sides get it wrong; there is little in the monetary data to suggest undue ease or tightness for extended periods of time. The mistake both sides make is to selectively highlight those sub-periods and those components of Fed credit that best support their theories of the business cycle, ignoring the existence of a scissors effect.

While the scissors evidence is inconsistent with the two modern versions, Austrian and Monetarist, of a discretionary Fed, a modified discretionary model, where the Fed only sporadically exercises discretion, is able to sidestep the scissors-critique.[2] The modified version, outlined in chapter 8, admits that Benjamin Strong usually accepted the results of a self-regulated system. On special occasions, however, he aggressively pushed for monetary ease. More specifically, as discount loans tended to rise during the harvest seasons of 1924 and 1927, Strong did not passively accept the self-regulated scissors response; rather, he intervened and purchased government securities on behalf of the entire system, with an eye toward the reestablishment of the international gold standard. Preliminary evidence supports what I call the "*occasional* decisive leader theory": standard regression analysis, using readily available system-wide aggregate data, shows that the competitive theory under-predicts government security holdings during 1924 and 1927. This is exactly what the occasional decisive leader model would expect. Underprediction is reduced, however, when the competitive theory is amended to take into account increases in the relative price of gold associated with restoration of the gold standard. This finding along with supporting evidence from previous chapters elevates the competitive model back to the top of the empirical ladder.

Chapter 9 turns attention to data collected on an individual Reserve bank basis, in the hope that focusing on Reserve bank behavior at the micro level will shed more conclusive light on the question: Did Reserve banks *really* compete? Exploiting a data base that to my knowledge has not been used before, I find that, contrary to an assertion made by Friedman and Schwartz, open market operations conducted by the individual Reserve banks for their own accounts were not of insignificant amounts after 1923 and, surprisingly, evidence points to the increasing importance of these independent operations over the course of the decade. In addition, evidence for the scissors effect using individual Reserve bank data on open market operations and discount loans indicates significant inter-Reserve district rivalry among Reserve banks. The micro-level findings, when combined with the aggregate

findings from chapter 8, support the competitive, self-regulated model of the Federal Reserve over the discretionary, decisive leader model. The weight of the evidence suggests, "Yes, Reserve banks *really* did compete."

Chapter 10 offers concluding thoughts. The decade of the 1920s truly was, in words made famous by Milton Friedman and Anna Schwartz, the "high tide" of the Federal Reserve System. But that happy result was not due to wise policy by wise men. The hero in the 1920s storyline was not Benjamin Strong. Rather than a single hero there were heroes: the founders of the Federal Reserve System. They created a self-regulated, decentralized, automatic system that served the monetary economy well throughout the 1920s.

Chapter 2

Founding of the Federal Reserve System*

1. Designing a Monetary System

Mentally transport yourself to 1913. You have been charged with designing a new monetary system. Before jumping into the details of the task, you and your cofounders must answer the basic question that every institutional architect must answer: Do you create a top-down or a bottom-up system? More concretely, do you create a system whose policy is determined at the discretion of decision makers at the top of a hierarchy, ideally motivated to do what is best for the economy? Or do you do you establish certain rules of the game where decisions are made bottom-up by individuals pursuing their self-interest? For the discretionary solution, the challenge is to design the system so that good leaders end up at the top. For the self-regulating solution, the challenge is to design rules that confront self-interested individuals with incentives that induce them to take actions that promote the common good.

Once this issue has been settled, you can turn to the design details. Now you and your cofounders must confront a problem that every *monetary* architect must confront: How do you avoid two bad outcomes, too much or too little money? First, consider the overissue problem. If the money supplier issues more than the public demands, then the result is inflation. The money holder finds, through no fault of her own, that the purchasing power of her money balances dwindles over time. The classic solution, benefiting both sides, is for the issuer to commit to redeeming notes into a good, like gold, whose real value cannot be manipulated by the issuer and to make redemption easy. Then, money will be at least as good as gold, implying that the purchasing power of money cannot fall below the purchasing power of gold.

A second problem arises in the form of potential underissue: the money issuer may fail to accommodate demand, triggering a scramble for liquidity

that may result in some or all of the following: (1) a rise in the purchasing power of money relative to gold, (2) a rise in the rate of exchange between currency and its money substitute, demand deposits, (3) a rise in short-term interest rates. These price adjustments signal that currency has become scarcer, needlessly so if, under alternative institutional arrangements, the currency supplier would have been incentivized to accommodate.

Was the design problem confronted by the founders of the Federal Reserve one of overissue, underissue, or both? To answer, we must briefly explore the nature of the monetary system that existed before the Fed's founding. That system, the National Banking System, was established by the Lincoln administration to solve its own design problem—how to help the North win the Civil War. Solving the war financing problem, however, did have a downside, producing a version of the underissue problem or what came to be known as the problem of an inelastic currency. The creation of the Fed, some 50 years later, was meant to address this downside, a point driven home by the opening line of the Federal Reserve Act: "An Act To provide for the establishment of Federal reserve banks, *to furnish an elastic currency.*" (Italics added). Before recounting the story of how the founders of the Fed crafted a new system to furnish an elastic currency, the next section outlines the nature of the elasticity problem under the National Banking System.

2. THE NATIONAL BANKING SYSTEM

Overissue

Legislation giving rise to the National Banking System created two national currencies, US notes and national bank notes. The US notes (greenbacks) were issued by the Treasury and the national bank notes were issued by a new type of bank, nationally chartered banks, authorized to acquire the notes from the Treasury only after purchasing 2 percent US government bonds as collateral backing. After 1879, the US notes were backed by a gold reserve of 100 percent housed at the Treasury, essentially making these notes commodity money. The national bank notes could be redeemed into lawful money (gold or US notes) either at the national bank of issue or through redemption centers established by the Treasury. Each bank was required to contribute lawful money, into a redemption fund at the Treasury, equal to 5 percent of its outstanding notes. In the event that a national bank went bankrupt, the Treasury was obligated to immediately redeem its notes. For redemption purposes, the Treasury could use the redemption fund and the government bond collateral and was given first lien on all the assets of the bank and upon the personal liability of the stockholders (Friedman and Schwartz 1971, 21). After that, the Treasury would have to rely on the federal government's tax and borrowing capabilities.

Two considerations come into play in assessing whether these features of the National Banking System protected the currency holder from the overissue problem. First, was redemption certain? Second, was redemption low cost?

For holders of US notes, certainty of redemption was guaranteed by the 100 percent gold backing. For holders of national bank notes, certainty of redemption was a question of the magnitude of the federal government's taxing powers relative to its spending obligations, since the US government stood as the ultimate backer. If the present value of current and expected future *maximum* taxes was less than the present value of current and expected future spending, then the federal government had no excess tax powers that could be used, by selling bonds, to redeem notes into gold. Note holders would have good reason to doubt the federal government's ability to raise funds on short notice to redeem notes.

How would a late nineteenth- or early twentieth-century note holder view the net tax powers of the federal government? Spending obligations were modest, but taxing powers also were modest, since the federal government relied on taxes with narrow bases, mainly excise taxes and tariffs. Still, national notes were substantially backed: by reserves at the Treasury, by the government bond collateral, by the assets of the bank, and by the personal liability of bank stockholders. A reasonable conjecture, therefore, is that holders of national bank notes, while not perceiving redemption to be certain, would have perceived it as likely.

Was redemption also low cost? Here, too, the answer is a qualified *yes*. An individual wanting lawful money for a national bank note issued by a distant bank could, of course, travel to the bank for redemption. More conveniently, she could take the note to her bank, exchange it for one of her bank's notes, which she could then redeem for lawful money. If desired, her bank could send those notes to a Treasury redemption center and receive lawful money from the redemption fund. Significantly, the costs of note redemption, for example, the sorting of notes and the transportation costs, were not incurred by the sending bank; instead, they were assessed against the issuing bank (Champ, Freeman, and Weber 1999, 568). So except for possible delays in receiving credit for notes sent to the Treasury, redemption costs were low.

The bottom line is that, while not surefire, the National Banking System did represent a credible solution to the overissue problem. The cost of initiating redemption was relatively low. Once triggered, the likelihood that the notes would in fact be redeemed was relatively high.

Underissue

Underissue, the failure to promptly accommodate currency demand, would prove a bigger concern under the National Banking System. Chronic scarcity of money, say, a constant supply in the face of rising demand, was not the issue. The outcome in this case would be a persistent, equilibrating fall in the price level, with note-holders expecting and receiving a rising purchasing power. Rather, the problem was that supply did not promptly increase in response to temporary increases in demand.

The source of the problem was that neither of the two parties directly involved in currency supply, the national banks that issued the notes to the

public and the Treasury that printed and delivered the notes to the national banks, had strong incentives to accommodate demand. The incentive problem faced by national banks stemmed from the requirement that they first acquire a specific bond, 2 percent US government bonds, before acquiring new notes. The requirement "funnelled the banks' buying power into a single bond market and raised prices there to prohibitive levels" (Horwitz 1990, 640), a problem made more severe by the fact that, after around 1880, the government used persistent budget surpluses to retire debt, thus reducing supply. Any unexpected relaxation of the collateral requirement or any easing of supply conditions in the market for 2 percent government bonds might impose potentially significant capital losses on banks. In addition, by making the entire banking system more fragile, the collateral requirement reduced depositor and note-holder confidence, increasing the likelihood that a relatively modest economic downturn would trigger numerous requests for note redemption, thus raising the overall costs of running the banking system. All told, the collateral requirement implied that accommodating the public's demand for currency was not always a profitable activity for national banks.

The incentive problem faced by the Treasury arguably was even more severe. Unlike private banks, the Treasury was a nonprofit bureau that financed itself from a government budget. While the out-of-pocket expense of printing and delivering the notes was covered by the national bank requesting the notes, the Treasury still faced ancillary costs stemming primarily from the mandate that it verify and approve the government bond collateral backing new notes. Verification and approval costs would be particularly high during periods when the Treasury was called upon to respond quickly to numerous requests, requiring banks "to wait thirty days or more after depositing bonds before actually getting hold of new notes" (Horwitz 1990, 641). The problem of underissue, in the form of upward inelasticity of note issue, was real.

3. MONETARY REFORMS: DISCRETION OR SELF-REGULATION?

Currency inelasticity posed a particularly severe problem during an *active* season, the fall harvest season in the agriculturally based economy of the nineteenth century, when the public sought to withdraw currency. As has been documented by numerous sources (e.g., Sprague 1910), a series of bank crises, accompanied by currency premiums and short-term interest rate spikes, did occur during the late 1800s and early 1900s. Both contemporary and modern economists generally agree that these crises were a major motivation for monetary reform. But what would be the nature of this solution? Would the National Banking System be replaced by a top-down system, headed by decision makers exercising discretion, or by a bottom-up, self-regulating system?

One way of viewing the controversy is whether the Fed was to function as a modern central bank or as little more than a national clearinghouse,

operating on automatic pilot. The policy debate was sparked by the central bank-type open market operations in the early 1900s undertaken by Treasury secretary Leslie Shaw during fall seasons of financial strain (Timberlake 1993, 248–50). The Democratic Party tended to endorse Shaw's operations and wanted to institutionalize them in the form of a central bank with the tax powers of the federal government underwriting any losses incurred. The Republican Party favored a more decentralized, federalist structure that would automatically produce currency elasticity. The key innovative feature was a collection of competing government clearinghouses that would face a bottom-line and function alongside the already existing private clearinghouse system (Gorton 1985).

We all know the winning side, right? The Democratic Party swept the mid-term elections in 1910 and their candidate Woodrow Wilson won the presidency in 1912. Then, on behalf of the Wilson administration, Senator Carter Glass helped defeat a Republican bill, earlier offered by Senator Nelson Aldrich, and won passage of a Democratic bill, establishing a modern central bank in the form of the Federal Reserve System. Indeed, that passage of the Federal Reserve Act represented victory for Democrats and for discretion seems ingrained into the modern mindset.

The case for this modern consensus weakens considerably, however, with a more careful examination of the Fed's historical roots. For one thing, Elmus Wicker (2005) persuasively argues that Glass's plan adhered closely in its details to the one previously offered by Aldrich. Even more to the point, Richard Timberlake concludes that in creating the Fed, the founders rejected the discretionary central bank model, intending instead to create a system that would be largely self-regulating.

> Creation of the Federal Reserve banks was in part a reaction to the Treasury policies that Shaw had developed. Equally important was the anticipation that the new system would promote form-seasonal elasticity in the money supply . . . not through the discretion of a government official, but on the initiative of commercial bankers themselves through a supercommerical (Federal Reserve) bank. The emphasis shifted from discretionary policy by a government agency to automatic and self-regulatory policy in the market. Indeed, the early Federal Reserve System, operating on a real-bills principle and on the doctrine of maintaining its discount rate above market rates of interest, was to be a self-regulating appendage to a more fundamental self-regulating system—the operational gold standard (Timberlake 1993, 249–50).

Timberlake's characterization of the new system as a "self-regulating appendage to a more fundamental self-regulating system—the operational gold standard" is especially apt. The gold standard was the foundation of the system. But as emphasized in the introduction, an effective gold standard guarantees only that the price level will not rise above a certain ceiling level. To get an anchor, not just a ceiling, requires, in Timberlake's words, an appendage to the gold standard; an appendage that gives the Fed no choice

but to passively supply the amount of money demanded at a price level over which it has no control.

To be sure, one need not be wedded to the particular appendage that Timberlake suggests, a real bills principle with penalty discount rates, to appreciate that some such device is needed to make the system truly self-regulating. Indeed, the next section argues that the decisive add-on to the gold standard was competition. The founders' intent was to replace an inflexible bureaucratic currency-issuing system, the National Banking System, with a more flexible, competitive currency-issuing system, the Federal Reserve System, where Reserve banks would act as clearinghouses in a market-like setting. If operated as planned, the new Fed would have little choice but to elastically supply currency at a price level that was determined in a market, the market for gold. The gold anchor would guard against Fed overissue and competition against Fed underissue of currency.

4. THE FEDERAL RESERVE SYSTEM

Overissue

Perhaps the most significant features of the Federal Reserve Act were the creation of a new type of currency, the Federal Reserve note, to be supplied by a new type of financial institution, the Federal Reserve bank. In particular, the act created 12 Reserve banks, each operating inside a distinct geographic boundary and each offering two monetary liabilities, deposits of member banks and Federal Reserve notes, with the notes of each Reserve bank bearing "upon their faces a distinctive letter and serial number" (Section 16). The Reserve banks were nominally owned by member banks, which were required to purchase stock in their district Reserve bank. Stock ownership, however, did not convey ordinary voting rights, nor could member banks sell their stock or buy stock held by others (Sections 2 and 5). In the absence of stockholder control, the power to make decisions on behalf of a Reserve bank was divided among the president of the Reserve bank (the governor), the board of directors of the Reserve bank, and the Federal Reserve Board, which was a central administrative body consisting of the US secretary of Treasury, the US comptroller, and five members appointed by the president of the United States.

In establishing a new currency, the founders of the Federal Reserve were aware that *certainty in redemption* was a key to overcoming the problem of overissue. Section 16 of the Federal Reserve Act states that Federal Reserve notes "shall be redeemed in gold on demand at the Treasury Department of the United States . . . or in gold or lawful money at any Federal reserve bank." Section 16 also requires that each Reserve bank hold (1) gold in a redemption fund at the Treasury equal to 5 percent of its outstanding notes, (2) gold or lawful money equal to 40 percent of outstanding notes, as well as 35 percent of member bank deposits, with the 5 percent redemption fund at the Treasury counted as part of the 40 percent reserve against notes.

In addition, Reserve banks were required to supplement gold reserves with collateral in the form of bills and notes (commercial paper) accepted for discount. In the event a Reserve bank declared bankruptcy, the note-holder had first lien against all assets of the Reserve bank. If those proved insufficient, then, as a last resort, the tax powers of the federal government ("notes shall be obligations of the United States," Section 16) stood behind the Federal Reserve notes.

How do these features stack-up against corresponding features of the National Banking System? National bank notes were backed by (1) lawful money required to be held by a national bank in a redemption fund at the Treasury, (2) government bond collateral, (3) assets of a national bank and the personal liability of its stockholders, and, as a last resort, (4) the tax powers of the federal government. Federal Reserve notes were backed by (1) gold or lawful money required to be held by a Reserve bank, including its redemption fund at the Treasury (2) commercial paper collateral, (3) assets of a Reserve bank, and, as a last resort, (4) the tax powers of the federal government.

While conditions (1) through (3) offer no clear-cut winner, the advantage seems to go to the Federal Reserve with respect to the ultimate backstop, federal tax powers, condition (4). The 16th Amendment to the US Constitution, authorizing a federal income tax, was ratified in February 1913, just as congressional debate on the new monetary system was intensifying. At first the income tax was to apply only to the richest 2 percent of the population. But a forward-looking taxpayer would have solid grounds for forecasting that the tax base at some future date would be broadened. With enhanced powers to tax, government was in a position to make a commitment to the note-holding public that was more credible than at any time in the past: *If all else fails, the federal government stands ready to use its ability to borrow on the basis of future income tax collections to redeem your notes into gold*. On this basis, holders of Federal Reserve notes would have perceived the probability of redemption to be as high as or higher than the probability perceived by the pre-1913 holders of national bank notes.

Did the Federal Reserve System also do a better job of satisfying the second overissue condition, that redemption cost is low? Here, the tables are turned. The individual holder of a national bank note simply visited the nearest national bank for redemption. Over-the-counter redemption for the holder of a Federal Reserve note required a visit to the Treasury, any Reserve bank, or any Reserve bank branch, none of which were necessarily nearby. Alternatively, the individual could send the Federal Reserve note to one of the above locations. Since express costs were assessed against the issuing Reserve bank, out-of-pocket costs would be low. Still, the note-holder would have to prepare the notes for mailing and wait for delivery of lawful money. Under the presumption that over-the-counter redemption at a nearby location is preferred to all other redemption options, note-holders would have perceived redemption to be less costly under the National Banking System.

One special provision of the Federal Reserve Act, however, may have allowed the general public to off-load the entire cost of redemption.

> Whenever Federal reserve notes issued through one Federal reserve bank shall be received by another Federal reserve bank they shall be promptly returned for credit or redemption to the Federal reserve bank through which they were originally issued. No Federal reserve bank shall pay out notes issued through another under penalty of a tax of ten per centum upon the face value of notes so paid out (Section 16).

Here, a mechanism for routine *indirect* redemption is established. First, an individual visits her bank to deposit cash in her checking account. The bank may choose to hold the notes in anticipation of future withdrawals or send the notes to its Reserve bank in exchange for an increase in deposits. Assuming the Reserve bank was not the original issuer, Section 16 directs it to forward the notes to the issuing Reserve bank "for credit or redemption." While not a foregone conclusion, (individuals may seldom deposit cash, commercial banks may choose to hold deposited notes as vault cash, Reserve banks forwarding notes may ask for credit), the Federal Reserve Act provided for the possibility of routine indirect redemption.

Where do things stand with respect to the problem of overissue under the Federal Reserve System? The note-holder knows that if certain steps are taken, redemption is all but inevitable due to the deep pockets of the federal government. Still, a question lingers: Can redemption be triggered without substantial costs? For direct redemption, the answer is a qualified, *yes.* Note-holders are compensated for out-of-pocket costs of sending notes for redemption; the only costs incurred are in the form of inconvenience and waiting time. Moreover, note-holders may be able to avoid even these costs, if indirect redemption, as provided for in the Federal Reserve Act, is effective. Commenting on the clause in the Federal Reserve Act authorizing indirect redemption, H. Parker Willis and William H. Steiner, contemporary authorities on the operation of the early Fed, concluded, "Redemption is thus fully provided for" (Willis and Steiner 1926, 136).[1]

Underissue

The problem of underissue in the form of upward-inelasticity of currency was the downfall of the National Banking System. Would inelasticity also prove the Achilles' heel of the Federal Reserve System? Viewed from one perspective, it would be a little shocking if the founders of the Fed dropped the ball on this issue. After all, the nation had just witnessed a long debate on how best to solve the elasticity problem. The big questions were (1) was elasticity to be achieved by establishing a discretionary central bank or by setting up a self-regulating system, and (2) was the chosen solution effective?

The debate at the turn of the century focused on the first question. Ultimately, Congress rejected both a monopoly central bank and a

thorough-going decentralized system of legally unrestricted private banks. Instead of pure discretion or pure self-regulation, Congress created a system of 12 nonprofit Reserve banks, each offering reserves to member banks in its district and each offering currency, unencumbered by a government bond collateral requirement, funneled through the banks to the general public. Did this hybrid system incentivize Reserve banks to accommodate the public's demand for currency? Were other government agencies involved, whose behavior might serve as bottlenecks to timely currency supply?

With respect to incentivized Reserve banks, two stumbling blocks stood in the way: Reserve banks as nonprofit firms and as regional monopolists. Consider first the nonprofit stumbling block. Reserve banks have an incentive to accommodate increased demands for currency only if so doing provides them with net benefits; more concretely, only if accommodation generates a flow of residual revenue that can be directly, or indirectly, consumed by the Reserve bank decision makers. The Federal Reserve Act seemed to answer this question once and for all in a section titled, Division of Earnings:

> After all necessary expenses of a Federal reserve bank have been paid or provided for, the stockholders shall be entitled to receive an annual dividend of six per centum on the paid-in capital stock, which dividend shall be cumulative. After the foresaid dividend claims have been fully met, all the net earnings shall be paid to the United States as a franchise tax, except that one-half of such net earnings shall be paid into a surplus fund until it shall amount to forty per centum of the paid-in capital stock of such bank (Section 7).

So the sequence of revenue disposition was (1) necessary expenses, (2) dividend payments to stockholders (member banks), (3) surplus fund, and, finally, (4) transfers to the United States (Treasury) in the form of a so-called franchise tax.

Where do Reserve bank decision makers fit into the sequence? The apparent answer is that they do not. To be sure, the first draw on revenue goes to finance necessary expenses, with management compensation subsumed under necessary expenses. But once enough asset-backed currency has been issued to cover necessary expenses, along with dividend payments and the stipulated build-up of the surplus fund, the United States, not the Reserve banks, is in line to profit. Because there are no profits to be won, and *taken home*, the management team would not be advocates for accommodation: they would not care that the Treasury may receive a larger transfer payment. In a word, they would be simply *disinterested*.

Or would they? While the disinterested characterization may be consistent with a literal reading of the Federal Reserve Act—that Reserve banks transfer all revenues after paying necessary expenses, dividends, and adding to the surplus fund—it is inconsistent with the economic literature on nonprofit firms. The problem here is the word, "necessary," preceding the word, "expenses." A world of scarcity is a world of tradeoffs where, strictly speaking, nothing is an absolute necessity. In practice, decision makers at each

Reserve bank may see the clause, necessary expenses, but they will behave as if it reads simply, expenses. Or, in the language of the economist, decision makers will engage in expense preference behavior, spending net revenues on goods that can be consumed in-house. Nonprofit Reserve banks will have an incentive to supply currency to the public and reserves to banks so as to maximize this discretionary spending, with transfers of revenue to the government equaling zero in equilibrium.

Formally, replacing disinterested Reserve banks with discretionary spending maximizing Reserve banks solves the elasticity problem. Confronted by an economy-wide increase in currency demand, each Reserve bank finds that it can increase excess earnings, and hence discretionary spending, by accommodating demand in its region. Note, however, that the incentives are not as strong as with full-fledged, for-profit, competitive Reserve banks. For one thing, nonprofit managers must consume net earnings as in-kind perks of office. Second, by carving the United States into 12 regions, the Federal Reserve Act seemed to give each Reserve bank monopoly power. Under competition, if an individual firm is not alert to an economy-wide increase in demand, a competing firm stands ready to fill the void. But in a regional monopoly system, with impregnable boundaries, no Reserve bank stands in waiting; demand in that region would go unsatisfied. Accordingly, a system of regional nonprofit monopolies only *weakly* incentivizes accommodation.

However, a more careful reading of the Federal Reserve Act suggests that the characterization of Reserve banks as regional monopolists is misleading. To be sure, the act did not allow a member bank in one region to borrow reserves from a Reserve bank in another region: *direct* competition through the discount window was illegal. But a true regional monopoly requires that all interconnections between regions be severed. If a member bank in one region is able to form a correspondent relationship with a member bank in another region—a bank is able to borrow from a bank in another region—then, via this bank-to-bank link, a Reserve bank in one region would be able to lend to banks in other regions.

Prior to the Fed, large national banks in urban centers frequently did form correspondent relationships with smaller banks inside and outside their region. In drafting the Federal Reserve Act, the founders made an explicit decision to retain the essential features of the correspondent system. Interregional borrowing and lending among banks could, and did, take place (Toma 1997, 29–30). In this sense, the Federal Reserve Act provided an avenue through which Reserve banks could *indirectly* compete in supplying reserve balances to out-of-district member banks as well as currency to the out-of-district general public.

Before concluding that the Federal Reserve System represented an effective solution to the currency elasticity problem, there is one more base to cover. Are there outside parties that may serve as a bottleneck to accommodation? We know from our discussion of the National Banking System that the Treasury was one such party with little incentive to insure the timely delivery of notes to national banks. The founders of the Federal Reserve System

did not make the same mistake: note delivery would be brought within the Federal Reserve System proper. In particular, a board-appointed Federal Reserve agent would be assigned to each Reserve bank and charged with the responsibilities of validating commercial paper for collateral-backing and of transporting the notes from the Treasury to the Reserve bank. Significantly, the act stipulated that the agent's salary would be paid by his Federal Reserve bank, thus aligning the agent's interest with the Reserve bank's interest in the speedy delivery of Federal Reserve notes. The Federal Reserve agent, as an incentivized link between the Treasury and Reserve banks, represented a key ingredient in a decentralized, self-regulating Federal Reserve System.

The Federal Reserve Board represented perhaps an even more potent threat to currency elasticity. The board enjoyed significant supervisory powers, the most important of which were to set discount rates and to define which bills would be eligible for rediscount (Federal Reserve Act, Sections 13 and 14). So empowered, the board had the ability to shut down the flow of new currency through the discount window.

The Federal Reserve Act contained a loophole, however, which would allow Reserve banks to sidestep this potential bottleneck. The act authorized the individual Reserve banks "to buy and sell, at home or abroad, bonds and notes of the United States" (Section 14). The authorization did contain the qualifier, "such purchases to be made in accordance with rules and regulations prescribed by the Federal Reserve Board" (Section 14). But, the limited nature of the board's powers over open market operations, in contrast to its powers over discount loans, was recognized from the outset. Jane D'Arista in a passage introducing her much-neglected study prepared for a House Committee on Banking and Currency observes:

> A power struggle began almost immediately after the Reserve banks opened for business in November 1914, when the Federal Reserve Board pressured the Reserve banks for lower and more uniform discount rates and the Reserve bank governors resisted. The board won that round but lost the struggle. The Reserve banks won the struggle for power by dominating the system's open market operations (D'Arista 1994, 4).

Open market operations provided a potential mechanism by which Reserve banks could end-run any impediments to currency elasticity arising from the board's regulation of the discount window.

5. Conclusion

The design flaw of the system preceding the Fed, the National Banking System, was that it had no built-in mechanism that guaranteed upward elasticity of currency. The flaw stemmed from two attributes of the system: (1) the government bond collateral requirement and (2) bottlenecks in the process of delivering currency to the issuing banks. The challenge facing the founders of the Federal Reserve System was to remedy these defects—to

create a system that would incentivize all parties involved in the supply of currency. The founders met this challenge by creating a decentralized self-regulating system, or, in Richard Timberlake's characterization, they created a "self-regulating appendage to a more fundamental self-regulating system—the operational gold standard." The operational gold standard was a holdover from the National Banking System that guarded against overissue. The really novel feature of the new system was the self-regulating appendage—a network of nonprofit Reserve banks, each facing a bottom-line, but without the government bond collateral requirement. At least on paper, the Reserve banks would face market pressures to accommodate surges in the public's demand for currency. They would be incentivized, in other words, to solve the fundamental defect of the National Banking System. In this sense, competition can be seen as representing the founders' silver bullet, a bullet whose power is underappreciated to this very day.

Chapter 3

Beyond the Founders' Vision: Benjamin Strong as Decisive Leader or Figurehead?

1. Introduction

It is one thing to argue, as I did in chapter 2, that on paper the founders of the Federal Reserve solved the fundamental defect of the National Banking System, an inability to accommodate seasonal increases in the demand for currency, by creating a decentralized self-regulated network of competitive Reserve banks. The critical issue, though, requires that we move off the cushy armchair of thoughtful speculation and get our hands dirty with some practical considerations. We need to address the question: Did the founders' vision prove out once the Reserve banking system was up and running? The consensus answer seems to be a resounding, *no.* There were cracks in the founders' design plan that provided an opportunity for a decisive leader to emerge. Monetary historians tend to agree that after WWI, the Reserve banks coalesced into a centralized, unitary system, with policy activism supplanting self-regulation.

The two policy activism perspectives that have emerged most prominently in recent times come from the Monetarist and the Austrian camps. For Monetarists, policy activism was orchestrated by a well-intentioned technocratic decisive leader who nudged Reserve banks to purchase more government securities than what they would on their own. This is the story of Benjamin Strong in 1924 and 1927. With Strong's illness and death in 1928, policy activism died and the opposite tendency emerged—monetary contraction. The Austrian camp tends to take a more broad-brush approach: the Fed, under Strong's leadership, was always and everywhere a revenue-hungry Leviathan that pursued a policy of excessive money production in response to special interest pressures.

There is, of course, a third perspective: the founders' vision. The founders intended a system largely devoid of centralized leadership.[1] Put differently, the founders intended a system of many leaders, 12 Reserve bank heads, each of whom would be tightly constrained by competition and redemption. To the extent that a system-wide leader did emerge, say through the strength of his or her personality, that person would be a leader in name only, a mere figurehead. In particular, the open market operation authority granted the individual Reserve banks under the Federal Reserve Act would enable those banks to undercut any attempt by a decisive leader to orchestrate a monetary outcome that differed from the outcome forthcoming under self-regulation. In opposition to the Monetarist and Austrians, the third perspective declares the founders not guilty of sloppy design.

2. The Monetarist Activist as Technocratic Engineer

The primary spokespeople for the Monetarist camp are Milton Friedman and Anna Schwartz, who laid out the case for Fed activism in their book, *A Monetary History of the United States* (1971) and Allan Meltzer, who followed in their footsteps with his book, *A History of the Federal Reserve, Volume 1* (2003). In general, they view the decade of the 1920s as the period when the Federal Reserve System became a modern central bank, conducting open market operations with an eye toward how those operations would affect the overall economy, both domestically and internationally. Indeed, Friedman and Schwartz title their 1920s chapter, "The High Tide of the Reserve System, 1921–29," suggesting that not only did the Fed attempt to use open market operations as a policy instrument, but also that it was successful in achieving its policy goals. They argue that during the 1920s there

> was a conscious attempt, for perhaps the first time in monetary history, to use central-bank powers to promote internal economic stability as well as to preserve balance in international payments and to prevent and moderate strictly financial crises. In retrospect, we can see that this was a major step toward the assumption by government of explicit continuous responsibility for economic stability. As the decade wore on, the System took—and perhaps even more was given—credit for the generally stable conditions that prevailed, and high hopes were placed in the potency of monetary policy as then administered (Friedman and Schwartz 1971, 240).

Allan Meltzer echoes their praise, with a flourishing bow to the success of the 1920s policy activism: "In retrospect, we know that the years 1923 to 1929 were one of the best periods in the first eighty years of Federal Reserve experience" (Meltzer 2003, 261). The impact of Friedman, Schwartz, and Meltzer's work on the economics' profession is such that the Fed's emergence as an effective policy activist during the 1920s seems to have risen to the status of received wisdom.

The policy activist trio carved out two important exceptions—one well-known, the other less so—to the policy activist motif. The well-known exception commenced with the illness and death of Benjamin Strong, when the Fed pursued a policy of monetary contraction. The less-known exception, which is the current focus of interest, occurred during one brief period, 1922–23, before Strong assumed the mantle of leadership, when Reserve banks put aside any pretense of economic policy goals, turning their attention, instead, to the problem of earnings. The antecedent to the problem was the build-up of discount loans during WWI. While the build-up had a positive effect on the net earnings of Reserve banks, the postwar retirement of discount debt by member banks had a negative effect. In fact, for some of the Reserve banks, the decline in earnings threatened to put them in a position where they were unable to cover expenses—let alone pay dividends to member banks or transfer excess earnings to the Treasury in the form of a franchise tax—an outcome that, under the Federal Reserve Act, would require the offending Reserve banks to be dissolved.

As you might expect, the prospect of bankruptcy focused the minds of Reserve bank decision makers. Fortunately, for Reserve banks, the Federal Reserve Act provided a means of financial relief in the form of open market operations. Reserve banks could and did replace one earning asset, discount loans, with another earning asset, government securities.

> Between October 1921 and May 1922, the reserve banks added almost $400 million to their holdings of government securities as partial replacement for the $900 million reduction in discounts during the same period. Purchases were particularly heavy in February and March, when the reserve banks purchased $200 million, doubling their holdings (Meltzer 2003, 143).

The run-up of Reserve bank security holdings prompted an outcry outside of Fed circles. In particular, "The Treasury complained that uncoordinated market activity by the reserve banks interfered with debt management operations, and some commercial banks complained about competition from the reserve banks in the debt market" (Meltzer 2003, 143). While resenting what they perceived to be an invasion of their right to conduct open market operations, the governors of the 12 Reserve banks responded to these complaints by establishing in May 1922 the Committee of Governors on the Centralized Execution of Purchases and Sales of Government Securities, headed by Benjamin Strong, governor of the New York Reserve bank, and including governors from the Boston, Philadelphia, Chicago, and, eventually, Cleveland Reserve banks. The committee's role was to coordinate Reserve bank government security purchases and after its first meeting "the Committee began coordinated sales of securities in response to the Treasury's request to reduce holdings" (Meltzer 2003, 146).

The Treasury still was not satisfied in that the committee's "role was limited to recommendations and to execution of orders sent by the reserve banks. Responsibility for decisions remained with the individual banks and

their directors, who retained the right to purchase and sell at their discretion and to buy directly from member banks in their districts" (Meltzer 2003, 146). Treasury undersecretary Gilbert wrote to Strong in mid-September 1922 reiterating the Treasury's desire "that the reserve banks liquidate all their government securities... Further, he complained that even with the Committee on Centralized Purchases and Sales, reserve banks were purchasing independently to increase earnings" (Meltzer 2003, 146).

Gilbert continued to call for security sales when all 12 governors met in October 1922. In response to that request,

> the governors recommended no further purchases and modified their objectives. Henceforth they would conduct open market operations with less attention to earnings and dividends and more to the effects on the money market...
>
> The governors also took a major step away from the original plan for semiautonomous banks and toward a unified System. The Committee on Centralized Purchases and Sales now had responsibility for recommending to the reserve banks the advisability of purchases and sales. Decisions remained with the individual banks; they could refuse to participate, so centralization had not yet been realized (Meltzer 2003, 147–48).

Not only could Reserve banks "refuse to participate" in the central allotment, each could, and did, purchase government securities without obtaining prior consent from the committee (Meltzer 2003, 148). These independent open market operations proved the "fly in the ointment" from the Treasury's perspective. Acting at the Treasury's bequest, the board stepped in at this point and attempted what amounted to a takeover of the governor-created committee. In March 1923, the board passed a resolution that abolished the Committee on Central Purchases and Sales replacing it with the Open Market Investment Committee (OMIC), a board-appointed committee (with the same five members) under its general supervision. The resolution also "severely restricted the banks' right to buy government securities" (Meltzer 2003, 150). That stipulation led to "a stormy session with the Governors" (Burgess 1964, 221), resulting in an amended version of the resolution (April 1923) that left out the restriction. The individual Reserve banks retained the right they possessed previously, to purchase or sell government securities outside the committee structure.

In the face of this setback, the board issued a statement making clear its preferred open market policy, calling for open market operations to be "governed with primary regard to the accommodation of commerce and business, and to the effect of such purchases or sales on the general credit situation" (Meltzer 2003, 152). Toward this end, a Special System Investment Account was established in December 1923 at the New York Federal Reserve. The System Account was to be used for all open market operations of the OMIC, with purchases and sales pro-rated among the individual Reserve banks (Meltzer 2003, 201n101).

What was the significance of the newly created OMIC? Did the board achieve its purpose? Did Reserve banks now suppress their earning concerns, choosing instead to abide by the board's directive to weigh the effects of open market operations on "commerce and business" and "the general credit situation?" The Monetarist camp provides a clear-cut affirmative answer. Friedman and Schwartz point to the board's Annual Report of 1923 as a turning point in the intellectual evolution of the system away from earnings considerations toward broader macroeconomic policy objectives. The report

> was the first explicit recognition of the coordinate importance of open market operations and rediscounting for general credit policy . . . The report provides a rationalization for the open market committee, which had been tentatively organized in 1922, and reorganized in 1923, after purchases by individual Banks to obtain earnings had demonstrated both the general credit effects of such purchases and the need for coordination (Friedman and Schwartz 1971, 251).

Of at least symbolic significance, the next Annual Report (1924) "was the last one to refer to Reserve Bank credit as 'earning assets' of the System" (Friedman and Schwartz 1971, 252n15). To be sure, "Individual Banks still engaged in independent operations" but these were dismissed by Friedman and Schwartz as being "generally small in amount" (Friedman and Schwartz 1971, 251n15). After December 1923, most open market operations were coordinated through the OMIC's System Account, "under the general supervision of the Board" (Friedman and Schwartz 1971, 251n15).

Friedman and Schwartz close their chapter on "The High Tide of the Reserve System" with an ode to monetary policy coordination over the period 1924–29.

> On the monetary side, the most notable feature was the close connection in timing between the movements in economic activity and the explicit policy measures taken by the Federal Reserve System . . .
>
> The close synchronism produced much confidence within and without the System that the new monetary machinery offered a delicate yet effective means of smoothing economic fluctuations, and that its operators knew how to use it toward that end. That confidence was accompanied and in turn strengthened by refinement of the monetary tools available, greater understanding of their operation, and more explicit consideration of criteria for their use. The most important development was surely the rapid spread of understanding within the System of the effects of open market operations on the reserves of member banks and the resulting *voluntary coordination of the open market operations of the twelve Federal Reserve Banks through a System account conducted by an open market committee on behalf of all the Banks* (Friedman and Schwartz 1971, 296; italics added).

One noteworthy feature of the Monetarist story of the evolution of successful policy activism is the emergence of Benjamin Strong, head of the OMIC, as

heroic figure. With creation of the OMIC, Friedman, Schwartz, and Meltzer viewed Fed policy as orchestrated by Strong, who, through the strength of his personality, was able to persuade, cajole the rest of the Reserve bank governors to follow his lead. The years 1924 and 1927 best illustrate the theme of Benjamin Strong as decisive leader, willing and able to impose his own brand of policy activism on the OMIC. In both years Strong was motivated not only by domestic considerations, but also by a desire to restore and maintain the international gold standard. In 1924, the international issue was Great Britain's imminent return to the gold standard. In 1927, the issue was Great Britain's continued commitment to gold as well as the return to gold by several other countries. As Meltzer recounts, Strong took much heat for his leadership position:

> The New York reserve bank and its governor, Benjamin Strong, received much criticism at the time and subsequently for lowering interest rates in 1924 and 1927 partly to assist Britain. Although United States prices generally declined, New York's policy was considered inflationary by the financial press, the Federal Reserve Board, and leading members of Congress. Strong was charged with allowing credit expansion based on purchases of government securities. That the price level fell after 1925 did not mute this criticism (Meltzer 2003, 262).

Here, Meltzer conveys the force of Strong's personality enabling him to resist outside pressures—"by the financial press, the Federal Reserve Board, and leading members of Congress"—presumably with the intent to implement his technocratic vision of "good" monetary policy. Strong's biographer, Lester Chandler, goes so far as to suggest an altruistic foundation for Strong's policy position:

> There can be no doubt that the international situation was a major reason for the 1927 easy-money policy, that Strong was motivated by an altruistic concern for European countries, especially Britain, and that at least the timing of the policy was related to the conference with foreign central bankers in early July (Chandler 1958, 440).

To be sure, Chandler immediately qualifies the theme by noting that the international situation and altruistic purposes did not comprise the complete explanation for Strong's advocacy of open market operations. The major point stands, however. We can understand the Fed's policy during the last halves of 1924 and 1927 only by elevating Strong to the status of a decisive, well-intentioned, technocratic leader.

One implication of the decisive leader view is that policy activism tends to die when the decisive leader dies. And indeed this is an important Monetarist theme regarding the onset of the Great Depression. Strong's illness in 1928, and eventual death in October of that year, created a leadership vacuum, setting the stage for a period of monetary contraction preceding the Depression.

3. The Austrian Activist as Special Interest Agent

Though there may be some argument, in my mind, the leader of the Austrian camp of Depression-era policy activism is Murray Rothbard, with his monetary history book, *America's Great Depression* (1975). Rothbard and the rest of the Austrian camp side with the Monetarists in pointing to monetary policy as a key factor responsible for the onset of the Great Depression. But while the Monetarists argue that the Fed got monetary policy just right for most of the 1920s, with the Depression's onset caused by a sudden switch to tightness in 1928, the Austrians view the Fed's monetary policy as an inflationary disaster throughout the decade, with particularly excessive Fed credit expansion in the first half of the decade setting the stage for the onset of the Depression later in 1929.

Many of the details of Rothbard's descriptive account of the Fed's emergence as a policy activist mirror the Monetarist account. First, like Friedman, Schwartz, and Meltzer, Rothbard recognizes the importance of Reserve bank earnings for the conduct of monetary policy in 1922:

> "Open-market" purchases and sales of government securities only emerged as a crucial factor in Federal Reserve monetary control during the 1920's. The process began when the Federal Reserve tripled its stock of government securities from November, 1921 to June, 1922 . . . It did so, not to make money easier and inflate the money supply, these relationships being little understood at the time, but simply in order to add to Federal Reserve earnings (Rothbard 1975, 123).

Rothbard further indicates that this decentralized policy, whereby "the individual Reserve Banks at first bought the securities on their own initiative . . . was resented by the Treasury" (Rothbard 1975, 124), leading in June 1922 to the formation of "an Open-Market Committee to coordinate Reserve purchases and sales" (Rothbard 1975, 124), which, in April 1923 "was dissolved and a new Open-Market Investment Committee was appointed by the Federal Reserve Board" (Rothbard 1975, 124). Benjamin Strong became the leader of the OMIC and from that time forward, "the FRS's open market policy was virtually controlled by Governor Strong. One of Strong's first control devices was to establish a 'Special System Investment Account,' under which . . . Reserve purchases of government securities were made largely by the New York Bank, which then distributed them *pro rata* to those other Reserve Banks that wanted the securities" (Rothbard 1975, 124–25). Finally, like Friedman, Schwartz, and Meltzer, Rothbard points to the role played by Benjamin Strong in conducting open market operations with an eye toward the international scene during two years in particular, 1924 and 1927 (Rothbard 1975, 132–35).

But here several not too subtle differences emerge between the two storylines. First, note the contrast between chapter and section titles where the two sides give their overview of Fed policy during the 1920s. Friedman and Schwartz title their relevant chapter "The High Tide of the Reserve

System, 1921–29" and Rothbard titles his relevant section "The Inflationary Boom: 1921–1929." For Friedman and Schwartz, open market policy under Strong, particularly in 1924 and 1927, was appropriately expansionary, a "high tide." For Rothbard, policy was excessively expansionary, an "inflationary boom," that was a continuation of the inflationary policy of 1922. Rothbard's description of open market policy immediately after creation of the OMIC is particularly telling:

> As a result of Strong's new accession to power, the Federal Reserve resumed within two months a heavy purchase of governments, and the economy was well launched on its dangerous inflationary path. As Strong's admiring biographer puts it: "This time the Federal Reserve knew what it was doing, and its purchases were not for earnings but for broad policy purposes," [Chandler, 1958, p. 233] i.e., for inflation (Rothbard 1975, 124).

To make sure his point is not lost on the reader, two pages later Rothbard restates his theme, "Open-market purchase of government securities began as a means of adding to the earning assets of the Federal Reserve Banks, but was quickly continued as a means of promoting monetary expansion" (Rothbard 1975, 126).

Second, for the Monetarists, Benjamin Strong, head of the New York Reserve bank, served as a heroic decisive leader who stood up to outside pressures. For Rothbard, Strong served as an malevolent team player who aided and abetted an assortment of outside special interests that included farmers, investment bankers, Great Britain, and president elect (1924) Calvin Coolidge (Rothbard 1975, 128, 139). In addition, Secretary of Treasury George Mellon "was Strong's staunchest supporter in the Administration throughout the entire period" (Rothbard 1975, 143). One group that did not benefit from the inflationary policy was the general public. In contrast to a public-spirited Fed, led by a well-intentioned, technocratic leader, the Fed, in Rothbard's view, was more of a puppet whose strings were pulled by the adroit hands of Benjamin Strong, connected to the brain of an inflationary, special interest monster.

4. WHY WOULD THEY LISTEN?

The unanswered question is "Why would they listen?" That is, why would Reserve banks, which had the authority—not just initially, but throughout the 1920s—to conduct open market operations for their own accounts, voluntarily comply with the directions that come down from on high, that is, from the OMIC? The Monetarists have a quick and easy answer: Benjamin Strong, through the strength of his personality, was able to persuade individual Reserve banks to forgo independent operations and to share, on a pro-rata basis, in the purchases or sales made by the OMIC on behalf of the system. For me, at least, this is too much of a black-box answer that avoids the more basic economic issue. Namely, what is the payoff, the incentive, for

Reserve banks to follow Strong's lead? Strong's charm does not directly provide enhanced dollar profits or enhanced spending opportunities for Reserve bank decision makers. Sure, Freidman, Schwartz, and Meltzer could point to a lost opportunity to bask in the warmth of Strong's persona, or, if they refused to cooperate, the psychological pain Reserve banks would suffer when on the receiving end of his wrath. But it seems doubtful that charm or wrath would be sufficient to preclude independent, free-riding behavior if such behavior could indeed provide direct payoffs to Reserve banks.

The problem with the Monetarist approach is that it views decision makers inside the Fed as disinterested parties, recalling terminology from the last chapter, largely immune from economic incentives. Here, the analyst's temptation is to interject noneconomic, for example, historical or psychological, criteria to fill in the void. The Austrian view takes us a step closer to answering the "Why listen" question in an economically, incentive-laden way. For Rothbard, Strong is a constituent element of a larger government organization, the federal government. His decisions are influenced by numerous outside interests. As noted above, these parties include farmers, bankers, and presidents. While Monetarists tend to place Strong on a pedestal, largely immune to outside pressures, the Austrians have in mind more of a principal-agent framework where Strong is viewed as part of a team, as an agent serving special interests higher up the government hierarchy.

But the Austrian view does not take us all the way to an answer. Indeed, Rothbard fails to extend the principal-agent framework downward to relationships inside the Fed. He simply assumes that Strong, whose policy positions are shaped by upper-level interests, is able to impose those policies on Reserve banks. Again, we are back to the characterization of Reserve banks as disinterested parties, without an agenda of their own that may run counter to Strong's.[2]

My interest in the next section is to add some economic robustness to the Monetarist and Austrian policy activism perspectives by applying a principal-agent approach to understanding open market operations in the 1920s. The problem with the Monetarist perspective is that, in ignoring incentives, it fails to intellectually engage the economically minded observer, an audience most Monetarists would like to persuade. The problem with the Austrian approach is that, while not entirely discounting incentives, it does not lay bare those incentives at the level of Reserve bank decision making at the bottom of the ladder. Only by explicitly exploring the incentives confronted by individual decision makers inside and outside the Fed can we begin to understand why Reserve banks may or may not have chosen to comply with the OMIC in the 1920s.

5. A Principal-agent Interpretation of Benjamin Strong as Decisive Leader

Who are the parties that make-up the principal-agent network within which the Fed is embedded? Outside the Fed, the list includes the general

public—or various subgroups within the general population such as farmers and investment banks—the president, the Treasury, and Congress. Inside the Fed, the list includes the Federal Reserve Board, member banks, and individual Reserve banks. A highly stylized principal-agent flowchart would begin at the top with the public as principal to Congress and to the Executive branch, which are principals to the board which serves, at least nominally, as principal to the Reserve banks.

Several questions need addressing in developing the principal-agent hypothesis that decision makers at the Fed were policy activists in the 1920s:

- What are the interests of those at the top of the governmental hierarchy, Congress and the Executive branch?
- Are those upper-level interests properly aligned with those in the middle, in particular, members of the Federal Reserve Board?
- Are the board's interests properly aligned with those at the bottom, the individual Reserve banks?

Precise answers to these questions will be sensitive to the economic climate, moving from the early to the late 1920s.

Start with the early years, 1922 and 1923, when complaints of Reserve bank open market operations were first surfacing. At this time, who determined when, and how many, government securities would be purchased had yet to crystallize. At the bottom of the agency ladder, the individual Reserve banks wanted to acquire exclusive, unattenuated decision-making rights so that they could purchase securities to enhance earnings. The Treasury, serving as Executive branch spokesman, voiced displeasure over such purchases. To modern ears, the Treasury's complaints seem strange. As explained by one student of the period, Jane D'Arista, the Treasury's position

> stands out in sharp contrast to the role that, today, it is widely believed the Treasury would play in monetary policy were the Federal Reserve deprived of its independence and made subordinate to the Treasury and the president. The prevailing belief is that the Treasury (and presumably therefore the president) desires, above all, low interest rates. Thus inflationary expansion of money and credit would be certain to follow if monetary policy were formulated by the Treasury or others responsible to the president (D'Arista 1994, 105).

Why the discrepancy between the policy advocated by the Treasury in the early 1920s and the policy stance of its modern-day counterpart? The key here is incentives conditioned by the economic environment. The job of the Treasury is, first and foremost, to raise revenue for financing federal government outlays. During modern times, the federal government's budget typically has been in deficit, giving the Treasury an incentive to press the Fed to monetize the debt, thus relieving the Treasury from having to service the debt. To be sure, once the Fed acquires the government securities, the

Treasury is obligated to pay interest to the Fed on that debt. But today, the Reserve banks, at their initiative, return most of those interest payments to the Treasury.

In the 1920s the Treasury confronted a different budgetary environment. The period 1922–28 was one of federal government budget surpluses that the Treasury used to retire the substantial federal debt that had accumulated during WWI. Accordingly, the Treasury was an active participant in the government bond market, not as a seller of new debt, but as a buyer of old debt. The Treasury, therefore, was defending its turf in complaining about competing bids from individual Reserve banks.[3] In fact, the initial request by the Treasury in 1921, before establishment of the Committee for Centralized Purchases, was that Reserve banks liquidate their entire portfolio of government securities with the added stipulation that if Reserve banks insisted on purchasing bonds, they should purchase private securities (bankers' acceptances) not government securities. Later, when it became apparent that the first best outcome was not forthcoming, the Treasury demanded that any Reserve bank government security purchase be confined only to what was necessary to cover expenses, the presumption being that Reserve banks had been conducting open market operations to generate excess earnings. So the answer to the first-bulleted principal-agent question posed above is that, at least in the early years of the decade, the interests of those at the top of the government hierarchy seemed directed toward achieving a somewhat narrowly defined bureaucratic objective: lower the cost to the Treasury of managing the debt, which, in the context of the 1920s, meant restricting Reserve bank open market purchases.

From an incentive-based, principal-agent perspective, the second-bulleted question now becomes relevant: Are upper-level interests properly aligned with those in the middle, in particular, the board's? While D'Arista's account simply assumed that the Treasury represented the top, it seems worthwhile to explicitly identify the agency relationships between the board and, not only the Treasury, but also the president and Congress. With respect to the Congress-to-board linkage, the Federal Reserve Act makes the board, but not the Reserve banks, beholden to Congress for its funding (Toma and Toma 1986, chapter 13). Because Congress has the power to discipline the board by strategically influencing its funding, the board has an incentive to listen to Congress. The Treasury's potential influence on the board is more direct. Two Treasury officials, the secretary of Treasury and the comptroller of currency, serve as ex officio members on the seven-member board, with the secretary as board chair (Federal Reserve Act, Section 10). Finally, the president appoints the other five members of the board. Since the secretary of Treasury and comptroller serve in those capacities at the pleasure of the president, all seven members of the board have strong incentives to be in tune with presidential preferences. The tentative conclusion is that the Federal Reserve Act specifies strong linkages between board policy and the desires of the Executive branch as well as Congress.

Finally, we are down to the last bulleted question. Given that the Federal Reserve Board was strongly incentivized, does the act also incentivize the Reserve banks? That is, were there equally strong linkages between the board and Reserve banks, serving to effectively transmit Congressional and Executive branch desires into the appropriate open market operation policy, where appropriate is defined in the context of 1922 and 1923 as a policy of open market restraint? A first reading of the act points to affirmative answers. For one thing, the Federal Reserve Board can wield the power of appointment as a control instrument. The act calls for the board to appoint 3 of the 9 directors of each Reserve bank, and for the directors to appoint the Reserve bank president (governor), who serves as the CEO (Federal Reserve Act, Section 4). But this does not provide a strong argument for Reserve bank compliance, since a majority of directors are not appointed by the Federal Reserve Board—they are appointed by member banks.

Sections 11(f) and (h) of the Federal Reserve Act provide the board with more potent weapons. Section 11(f) authorizes and empowers the board

> to suspend or remove any officer or director of any Federal reserve bank, the cause of such removal to be forthwith communicated in writing by the Federal Reserve Board to the removed officer or director and to said bank.

and section 11(h) authorizes and empowers the board

> to suspend, for the violation of any of the provisions of this Act, the operations of any Federal reserve bank, to take possession thereof, administer the same during the period of suspension, and, when deemed advisable, to liquidate or reorganize such bank.

Note the unconditional nature of 11(f). The board can fire officers and directors of a Reserve bank for cause. The clause says nothing about justifying the removal, only that the cause be communicated in writing. Section 11(h) does require just cause. Action can be taken only "for the violation of any of the provisions of this Act." But while action is conditional, the specific actions indicated are rather draconian: "suspend," "take possession thereof," or "administer" the "operations of any Federal reserve bank" and "liquidate or reorganize such bank." So the Federal Reserve Board has the power to fire Reserve bank decision makers *for any reason* and put a Reserve bank completely out of business for violating *any* provision of the Federal Reserve Act. These are strong incentives that would seem to justify the conclusion that the Reserve banks were incentivized agents of the Federal Reserve Board.

Indeed, there is direct evidence that Reserve bank officials in the early 1920s weighed carefully the implications of sections 11(f) and 11(h). In the May 1922 Conference of Governors meeting, a number of governors voiced resentment to pressure placed on them by the Treasury to refrain from purchasing government securities. Here, we see for the first time, Benjamin Strong's leadership skills on display. In seeking to move the system toward a

more unified decision-making process, Strong urged a conciliatory approach, basing his appeal first on the legal formality that the Federal Reserve Act required the Reserve banks to serve as fiscal agent of the Treasury (Federal Reserve Act, Section 15). Strong's point was that by bidding against the Treasury for government securities, the Treasury could argue that the Reserve banks were failing to serve as its fiscal agent. He followed this legal point with an appeal to the raw self-interest of Reserve banks: "Should they refuse to accommodate the secretary, he could appeal to the president or to the Congress, and the matter might go to the extreme of 'removing some people from office'" (D'Arista 1994, 95). Strong's point is well-taken. The Treasury need not prove in any legal sense that Reserve bank operations were in violation of their fiscal agency obligations. Such proof would be icing on the cake. All that was required by section 11(f) for the firing of Reserve bank officials is that there be some reason—whatever the reason may be—and that it be communicated to the offending officials. What was left unsaid, but surely must have been in the back of the minds of officials, is that if failing to serve as fiscal agent was deemed a violation of the Federal Reserve Act, then the Reserve bank itself could be liquidated. To be sure, authority to fire and liquidate rested with the board, but, as argued above, the board was an incentivized agent of the Executive branch.

Clearly, "removing some people from office" was a last resort option that would be implemented only after other appeals by the secretary of Treasury had been exhausted. Still, the implied threat seemed not lost on the 11 other Reserve bank governors. In the May meeting they agreed to establish the Committee of Governors on the Centralized Execution of Purchases and Sales of Government Securities, later to be replaced by the OMIC, which had the authority to purchase or sell government securities on behalf of the entire system. But, in the aftermath of the OMIC's creation in April 1923, the key "Why listen" question was whether the Federal Reserve Board's power to remove officials from office would suffice to forestall open market purchases both by the OMIC and by the individual Reserve banks acting on their own.

The immediate answer seemed to be *yes*. Though Strong was forced by health concerns to take a leave of absence from policy deliberations, his warning that the board possessed the removal power must still have been ringing in the ears of other OMIC members. Meltzer reports the results from the OMIC's first meeting in April: "Acceding to the Treasury, the OMIC allowed $36 million of maturing securities to run off" (Meltzer 2003, 199). The "run off" continued so that by the end of November 1923 system-wide government security holdings were under $100 million compared to well over $300 million at the beginning of the year.

But the conclusion that Reserve banks were incentivized to comply in 1923 may very well be conditional on the nature of the policy directive at the time. The Treasury's policy goal could be translated into a simple instruction like "liquidate your portfolio" or "allow your portfolio to run off." Whether Reserve banks complied with this concrete instruction could

easily be assessed; that is, it was relatively low cost for Treasury officials themselves to meter the amount of government securities in the portfolio of each Reserve bank. Under these circumstances, if the Treasury huffed and puffed loud enough, with the incantation "liquidate your portfolios," then the Reserve banks, both collectively and individually, would know with little ambiguity what was expected of them. Moreover, given the ease of metering their government bond holdings, they would know that they would be held accountable for any open market operation outcome that was inconsistent with the specific instruction "liquidate your portfolios."

But what about over the longer haul, particularly in 1924 and 1927, when the Treasury, or other upper-level principal, seeks a policy result not readily translated into a simple, unambiguous, and easily metered mandate? In a principal-agent setting, how is a more nuanced policy objective, for example, conduct open market operations in a way that increases the likelihood that the international gold standard will be restored and sustained, to be conveyed to the relevant open market decision makers? How is it to be enforced? Repeated huffing and puffing seems inappropriate in these circumstances.

One solution is that the upper level can designate an intermediary, an insider at the Fed, whose policy preferences happen to be congruent with upper-level interests. The intermediary, as an insider, will be in a position to quickly notice deviate behavior by lower-level agents. Also, the intermediary will have an incentive to immediately report the deviate behavior, since that behavior is, by assumption, inconsistent with the insider's preferences.

And who might be that intermediary? Our discussion of the Monetarist and Austrian views suggests an obvious answer. Although there may be some debate by the Monetarists, arguably, Benjamin Strong's policy preferences were naturally aligned with most elements of upper-level government. Both he and a wide cross-section of federal government officialdom wanted easy money in 1924 and 1927.[4] So if he sensed that a Reserve bank was not cooperating with the OMIC—that its open market transactions were offsetting OMIC operations—he could threaten to inform the board (an agent of upper-level government) and it could deliver the shock of removing the offending Reserve bank official from office or even putting the Reserve bank out of business.

Finally, an amended principal-agent answer to the "Why listen" question casts Strong in a more prominent position in the top-down hierarchy. In keeping with the Monetarist storyline, Strong may have been more than just a conduit for upper-level interests. Through the strength of his personality, he may have served the role of lobbyist who attempted to shape the policy preferences of Congressional and Executive branch decision makers. The presumption is that the principal-agent linkages were not so tight as to preclude Strong from exerting some influence on the message that ultimately was transmitted from the Congressional/Executive level down to the Reserve bank level.

6. A Self-Regulation Interpretation of Benjamin Strong as Figurehead

Is that it? Must we buy into the characterization of Reserve banks as incentivized agents of upper-level government, with a decisive leader, Benjamin Strong, serving as the link between upper-level government interests and Reserve bank policy? A diametrically opposite answer to the "Why would they listen" question is suggested by the previous chapter on the Fed's founding. The founders directly confronted the question and metaphorically shouted "they didn't" or, more to the point, "we don't want them to . . . that's why we, the founders, gave each Reserve bank the power to conduct open market operations on its own and required each Reserve bank to self-finance from interest earnings on government securities and discount loans." Self-financing, under this interpretation, was the founders' way of removing the Reserve banks from the principal-agent hierarchy outlined in the previous section.

To appreciate the significance of self-financing—how it gives Reserve banks both the incentive and the opportunity to exercise independence from upper-level interests—compare it to alternative, more ordinary financing methods. The Federal Reserve Act could have subjected Reserve banks to something akin to a budgetary process, as it did the board, with the budget then used as a device to incentivize Reserve banks to be compliant agents of upper-level government. Alternatively, the Federal Reserve Act simply could have denied Reserve banks the right to conduct their own open market operations, with the board, as the upper level's agent, responsible for buying and selling government securities on behalf of the entire system and for distributing those securities among the individual Reserve banks. Nothing could stop Reserve banks from complaining about the size of the system portfolio and the distribution scheme, but the board would have no reason to listen. Under this conjectural history, there would be no margin along which Reserve banks could act in a way contrary to Congressional and Executive branch preferences.

Returning to historical reality, the founders of the Fed choose not to grant the board, or any one Reserve bank official, dominance over open market operations. They rejected ordinary budgetary methods for Reserve banks in favor of the novelty of self-financing. In addition, the founders chose to situate the locus of decision making at the individual Reserve bank level rather than at some higher level. In particular, the Federal Reserve Act explicitly granted each Reserve bank the right to conduct its own open market operations—an individual Reserve bank need not obtain prior consent from some so-called decisive leader, or from some other Reserve bank, or from the board, or from Congress, or from the Executive branch—with each Reserve bank held accountable for its own financial health in the sense that each was required to generate enough revenues to cover costs or else face the prospect of dissolution. And individual Reserve banks retained the

right to conduct open market operations even after creation of the OMIC. Self-financing provided the incentive and open market operations the means for engaging in noncompliant behavior.

More concretely, self-financing incentivizes Reserve banks to purchase government securities during seasonal or cyclical decreases in discount loans, even if, as in 1922, the Treasury denounces such purchases, and to resist calls for government purchases, even if, as in 1924 and 1927, a decisive leader endorses such purchases in the name of international monetary stability. In the first case, Reserve banks that failed to accommodate would lose the opportunity to acquire earning assets and, therefore, would lose the opportunity to enjoy a metaphorical free lunch in the form of enhanced spending opportunities that the extra revenue would permit. In the second, Reserve banks that caved-in to international policy concerns by purchasing government securities and reducing gold reserves would put themselves at risk of being unable to redeem their outstanding monetary liabilities, effectively raising expected operating costs above desired levels, again taking a free lunch off the table.

Lingering in the background, however, is the power to remove clause in the Federal Reserve Act. Might not the knowledge that the Federal Reserve Act equipped the board with the power to fire Reserve bank officials, directors and governors, provide a potent check to independent open market operations? Might not such knowledge, for instance, transform spending-motivated bureaucrats into compliant incentivized agents of upper-level interests willing to trade-off spending opportunities in favor of greater job security? Or, somewhat less directly, might not Benjamin Strong, as decisive leader, leak information to the board, or the Treasury, about noncooperating Reserve banks, information that might cause the board to exercise the removal clause?

7. CALLING ALL ECONOMISTS

Who has the last word? Were the Reserve banks of the 1920s policy activists, dancing to the tune of Benjamin Strong? Or were they tightly constrained seekers of enhanced spending opportunities within the context of an automatic, decentralized monetary system? Despite the consensus that has emerged on the policy activist side of the debate, my intent in this chapter has been to suggest that answers to these questions are not clear-cut.

So how do we proceed from here? The temptation is to continue with the approach that Monetarists and Austrians have pursued thus far; that is, to consult the historical narrative. Do we find overt signs of leadership? Score one for policy activism. Do we find overt signs of competition? Score one for self-regulation. The problem here is that the debate seems endless. A proponent of policy activism can always uncover one more anecdotal piece of evidence that seems to suggest the power of a Fed decision maker. A proponent of self-regulation can always uncover one more piece of anecdotal evidence that seems to suggest Reserve bank rivalry.

I propose that, rather than approaching the problem as would an historian, we, instead, act like economists. I really do not mean to be so parochial. I am not just calling economists but all of us who decide a debate by thinking through the implications of our position and then gathering the facts. More concretely, let us first develop formal models of Fed discretion and Fed self-regulation. Next, derive testable implications of each theory. Finally, put the implications under the empirical microscope: Which set of implications are more consistent with the factual record we have at hand? The next chapter turns to the modeling phase of this agenda.

Chapter 4

Modeling Discretion and Self-Regulation

1. Introduction

The last chapter catalogued the evolution of the Fed as discretionary policy activist, interpreted from the Monetarist and Austrian perspectives. Both camps emphasized the Fed's tendency to expand Fed credit, appropriately so, according to the Monetarists; excessively so, according to the Austrians.

An interesting way to recast the policy activist theme is in terms of an interest rate smoothing objective. Indeed, Friedman and Schwartz devote an entire section, "Seasonal Movements," in their "High Tide" chapter to documenting the Fed's attempt to smooth interest rates. Their analysis is insightful and worth quoting at length:

> Before the Federal Reserve System was established, there had been recurrent ease in the money market in the summer and tightness in the fall crop-moving season and in the Christmas season September through December. One aspect of the seasonal movement was a fluctuation in the ratio of deposits to currency, which produced recurrent ease and tightness in bank reserve positions and a sharp seasonal pattern in call money and other short-term interest rates. That seasonal movement was very much in the minds of the founders of the System and was an important source of their belief in the need for an "elastic" currency . . .
>
> The Federal Reserve System met the seasonal movements by expanding and contracting high-powered money sufficiently to provide for the changed ratio of deposits to currency and also to permit a seasonal movement in the total stock of money. It thereby largely eliminated the recurrent seasonal ease and tightness in bank reserve positions, and hence the seasonal movement in interest rates (Friedman and Schwartz 1971, 292, 294).

Friedman and Schwartz give their stamp of approval to the Fed's interest rate smoothing policy. Allowing changes in the deposit-currency ratio to tighten

bank reserve positions and induce seasonal movement in interest rates, as those changes did prior to the Fed's creation, "is simply an unintended and undesired consequence, which it seems eminently proper to eliminate as far as possible" (Friedman and Schwartz 1971, 294).

Finally, in a footnote pointing out the difficulties inherent in interest rate smoothing, Friedman and Schwartz indirectly pay homage to the theme of an activist Fed:

> In a system in which the monetary authorities effectively control the money stock, they must decide explicitly how much seasonal change to introduce—a decision depending on uncertain criteria. Should they determine the seasonal change so as to eliminate entirely any seasonal movement in interest rates? If so, which interest rates? Or should they determine the seasonal change to introduce into money by an observed seasonal movement in velocity? (Friedman and Schwartz 1971, 295n77).

Interest rate smoothing requires a rather alert, adroit monetary authority that is in control of the overall money stock.

Though devoting less ink to the topic, Murray Rothbard, of the Austrian camp, too acknowledges the activist theme of the Fed as interest rate smoother. Rothbard, however, puts a different spin on the topic. Sure the Fed was focused on dampening fluctuations in interest rates. But in keeping with his emphasis on an excessively expansionary policy, Rothbard downplays seasonal smoothing and instead sees the Fed as maintaining interest rates at inappropriately low levels across years. In commenting on the Fed's policy in the late 1920s, for instance, Rothbard indicates

> that the Federal Reserve Bank of New York effectively set the call rates for loans to the stock market . . . its policy being to furnish any funds necessary to enable the banks to lend readily to the market . . . The call rate, as we have noted, stayed very far below its pre-war levels and peaks (Rothbard 1975, 145).

For Rothbard interest rate smoothing was part of a broader policy aimed at inflating the money supply to satisfy special interests.

The interest rate smoothing theme of both camps, however, seems at odds with an empirical relationship between Fed government security holdings and discount loans that emerged in the 1920s, whereby changes in one of these components of Fed credit tended to be offset by changes in the other. Indeed, Friedman and Schwartz make a big deal about this relationship, referring to it as the scissors effect. Commenting on the Fed's Tenth Annual Report for 1923,

> the discussion of Federal Reserve actions during the year provided the occasion for raising general issues about open market operations, their role in general policy, and their relation to discounting. The report emphasizes the need for relating open market operations to the general credit policy of the System and of coordinating the actions of the separate Banks. It demonstrates, on

> the basis of the experience during 1922 and 1923, the tendency of open market purchases to reduce the volume of discounting and open market sales to increase it—the so-called scissors effect (Friedman and Schwartz 1971, 251).

Friedman and Schwartz acknowledge that the scissors phenomenon was widely heralded in the early years of the Fed. In particular, two economists from that era, Winfield Riefler and Randolph Burgess, emphasized that the effect was not confined to 1922 and 1923 but persisted for the entire decade. They also documented the magnitude of the effect: open market operations "have usually been accompanied by almost corresponding decreases or increases in bills discounted and bankers' bills held" (Burgess 1946, 237–38).

What does not seem to be fully appreciated, at least by Friedman and Schwartz as well as by many modern monetary economists, is what the presence of a scissors effect implies about the ability of the early Federal Reserve to exercise discretionary monetary powers. In its simplest form, a $1 open market purchase associated with a $1 fall in discounts, implies that open market policy does not affect Fed credit. A scissors effect of this type would seem to render open market policy impotent, undermining the claims that the Fed was an adroit fine-tuner who, for instance, increased financial stability by smoothing seasonal movements in interest rates.

Given the importance of the scissors effect for understanding the nature of the early Fed's monetary powers, this chapter seeks a theoretical understanding of this effect within two competing models, one that views the Fed as a discretionary policy activist that deliberately attempts to smooth interest rates and one that views the Fed as a self-regulated system where interest rate smoothing is an unintended consequence of competition.[1] Both models assume that, due to gold standard constraints, the general price level is outside the control of the Fed. What distinguishes the two models is how they treat open market operations and their impact on the public's willingness to hold currency. For the discretionary model, open market operations are controlled by a unified body, the Fed. Moreover, the public is willing to accept and hold all currency created by those operations, implying that the public's demand for currency is untethered. For the self-regulated model, open market operations are not controlled by a unified body; instead, control is fragmented among the 12 Reserve banks. Moreover, open market operations do not create a demand for currency (supply does not create demand). The public determines its real demand for currency and, given the gold-determined price level, chooses how many nominal balances to hold independent of open market operations. The bottom line is that the monetary base (bank reserves plus the public's currency holdings) and Fed credit (Fed security holdings plus discount loans) are untethered in the discretionary model, so open market operations need not be associated with offsetting movements in discount loans; the monetary base and Fed credit are tethered in the self-regulated model, so open market operations tend to be associated with offsetting movements in discount loans.

2. DISCRETIONARY FED

Open Market Operations

Following the lead of Friedman and Schwartz, Jeffery Miron (1986), in an article titled "Financial Panics, the Seasonality of the Nominal Interest Rate, and the Founding of the Fed," models the early Fed as an autonomous, discretionary fine-tuner, which seeks to seasonally smooth interest rates thereby decreasing the likelihood of financial crises. Miron's model attributes the disappearance of seasonal movements in interest rates to well-timed, seasonal open market operations, sidestepping the scissors phenomenon by assuming away discount loans. The potency of open market operations stems from their impact on the credit market, where a key element of that storyline is the loan and reserve decisions of member banks.

The heart of Miron's model of Fed discretion is the liquidity cost of running a bank. As Miron explains:

> The banking system consists of a fixed number of identical banks, each of which is sufficiently small that it acts as a price taker. The representative bank holds two types of assets: reserves, R; loans, L. There is one type of liability: deposits, D. The bank accepts deposits infinitely elastically and pays out currency on demand. The only decision it faces is what proportion of its assets to hold as reserves and what proportion as loans. The larger the proportion of loans, the greater the costs to the bank of managing its portfolio.
>
> There are costs to the bank of holding a large proportion of its assets as loans because it can suffer unexpected deposit withdrawals. Under fractional reserve banking, a sufficiently large amount of withdrawals causes the bank to fail because some of its assets are tied up in loans and it takes time to convert these into cash. If the bank experiences withdrawals, therefore, it liquidates some of its loans to bolster its reserve position. This imposes costs since the bank accrues capital losses and/or incurs excess brokerage fees when it calls in loans unexpectedly (Miron 1986, 126).

Miron assumes the bank's liquidity costs: (1) rise as the amount of unexpected withdrawals, W – E(W), rises, where W is the amount of withdrawals that the bank experiences, and (2) decline as the ratio of planned reserves to expected deposits, R/D, rises. He assumes a specific form for the liquidity cost function:

$$LC_B = [(W \quad E(W))^2 / \ ][(R/D) - \ ]^2. \tag{4.1}$$

Miron is upfront in noting his formulation of liquidity costs entails simple, unrealistic assumptions.

> The cost function . . . assumes that unexpected withdrawals and unexpected deposits have the same effect on costs. It also assumes that the distribution of withdrawals is independent of the level of deposits. Both of these assumptions

are probably unrealistic, but they simplify the presentation of the results. The results do not depend on these two assumptions (Miron 1986, 126).

Equation (4.1) implies that if the bank holds substantial cash reserves, then it is in a favorable position if hit by unexpected withdrawals. In this case, liquidity is high, expected liquidity costs are low, and the probability of a financial crisis is low. Conversely, if cash reserves are low, then the bank is not well positioned to respond to unexpected withdrawals. In this case, the bank is illiquid, expected liquidity costs are high, and the banking system is relatively fragile.

Turning to the bank's decision problem, Miron assumes the bank's profit function is given by $\pi_B = iL_B - LC_B$, subject to a balance sheet constraint, $L_B + R = D$, where i is the nominal rate of interest.[2] The bank takes the interest rate as given and is risk-neutral, maximizing expected profit by choosing its planned reserves before experiencing any unanticipated withdrawals. Formally, the bank's problem is

$$\text{Max } E(\quad_B) \quad iL_B \quad (s^2/\quad)(R/D) - 1]^2, \tag{4.2}$$

subject to the balance sheet constraint,

$$R \quad L_B = D, \tag{4.3}$$

where $s^2 = E(W - E(W))^2$ is the variance of withdrawals. The solution is

$$R^d \quad D[\quad -(iD/s^2)]. \tag{4.4}$$

Equation (4.4) implies that higher deposits increase the demand for reserves and a higher interest rate decreases the demand for reserves.

Equilibrium in the private loan market is determined by loan supply by banks and loan demand by the nonbanking public. Loan supply is

$$L^s \quad L_B = D \quad R^d = iD^2/s^2. \tag{4.5}$$

Miron assumes loan demand is negatively related to the real interest rate and deposit demand is interest inelastic

$$L^d \quad P(Y \quad b(i \quad \pi^e)) \quad Y - bi, \tag{4.6}$$

$$D^d \quad P\delta = \delta, \tag{4.7}$$

where Y is a measure of the real demand for credit, $b > 0$ is a parameter, and, due to gold standard considerations, the price level, P (set equal to one for convenience), is constant and inflation expectations, π^e, are zero. An

important feature of the model is that real deposits, $D/P = \delta$, are demand-determined, as are nominal deposits given the fixed general price level, $P = 1$, and the willingness of banks to accept all deposits.

Setting $L^s = L^d$ and solving for the market clearing interest rate on private loans gives

$$Ys^2/\left(bs^2 + \quad ^2\right). \tag{4.8}$$

The interest rate rises with loan demand, Y, and falls with deposits, $D = \delta$. Substituting (4.8) into (4.4) and dividing by (4.7) gives the equilibrium reserve-deposit ratio

$$(R/D) \quad 1 - \left(iD/s^2\right) \quad 1 \quad \left[\delta Y/\left(bs^2 + \quad ^2\right)\right]. \tag{4.9}$$

Finally, substituting (4.9) into (4.1) gives the equilibrium costs of running the banking system

$$\left(LC_B\right) = \left(s^2/2\right)\left[\delta Y/\left(bs^2 + \quad ^2\right)\right]^2. \tag{4.10}$$

Before the founding of the Fed, there was no institutional mechanism that served as a source of currency elasticity. So a seasonal increase in the demand for loans, Y, or decrease in deposit demand, δ, would tend to increase the interest rate, decrease the reserve-deposit ratio, and increase the costs of running the banking system. As explained by Miron:

> Panics can be thought of as periods when the costs of running the banking system are especially high. Since the distribution of costs shifts upward with the seasonal increases in loan demand and the seasonal decreases in deposit demand, the probability that costs exceed any given level is higher in seasons when loan demand is high or deposit demand is low. Thus panics are more likely to occur in these seasons (1986, 128).

Miron provides evidence confirming the central implication of his model, "that the distribution of financial panics should have been seasonal, with periods of high frequency corresponding to periods of high interest rates" (Miron 1986, 132). In particular, he finds that the timing of peaks in the call money rate and in the loan-reserve ratio coincides with peaks in financial panics.

Miron next examines the cost of running the banking system with a Fed capable of intervening by conducting open market operations. He introduces Fed discretion by cryptically stating: "An open market purchase increases the supply of loans by an amount F" (Miron 1986, 128). Government security holdings are the only component of Fed credit and, more generally, Fed assets—presumably there are no discount loans or gold holdings. Because the Fed controls open market operations, Miron has no need to consider

the relationship between the Fed's government security purchases and the amount, F, added to the supply of private loans. The discretionary Fed desires some particular value for F and buys whatever magnitude of government securities necessary to generate that F.

In the next section I introduce discount loans into the model and at that point the connection between open market purchases and F will help determine the scissors effect. To anticipate that discussion, I now simply assert a one-for-one connection, which would indeed be the result if (1) the Fed buys government securities from the nonbanking public and (2) the nonbanking public, circumventing the banking system, loans the cash so acquired in the private loan market. The intuition is that the public treats government securities and private loans as close substitutes; therefore, when the Fed purchases a government security from the public, the public seeks to replace it with a close substitute asset, private loans. Accordingly, the nonbanking component of private loan supply equals S_{RB}.

The total supply of private loans consists of bank loans, L_B, and nonbank loans, L_{NB}:

$$L^{s}_{DIS} \quad L_B + L_{NB} \quad (D \quad R^{d}) \quad S_{RB} = (i \ ^2/s^2) \quad S_{RB}, \tag{4.11}$$

where the DIS-subscript indicates the solution with a discretionary Fed. Private loan supply arises inside the banking system from deposits net of reserves, $L_B = D - R$, and outside the banking system as a by-product of government securities the nonbanking public sells to the Fed, $L_{NB} = S_{RB}$. Setting (4.11) equal to (4.6) and solving for the equilibrium interest rate under discretion gives

$$_{DIS} \quad (Y \quad S_{RB})s^2/(bs^2 + \ ^2). \tag{4.12}$$

Fed open market purchases reduce i and sales increase i. So the solution to the financial panic problem is to instruct the Fed to pursue a policy that would seasonally smooth the interest rate and the reserve-deposit ratio. In particular, the discretionary Fed would increase S_{RB} to offset seasonal increases in Y or decreases in $D = \delta$. The policy prescription is a conventional one: increase Fed credit, which in this case consists solely of the Fed's government security holdings, to release upward pressure on interest rates.

Miron concludes by testing the implications of the discretionary model. First the implications: "The hypothesis that the Fed caused the decrease in both the frequency of financial panics and the size of the seasonal movements in nominal interest rates implies that the actions of the Fed should have been seasonal, with the peaks of accommodation coming at those times of the year that had previously tended to be ones of financial stress" (1986, 133). He finds confirming evidence in that seasonal peaks in Federal Reserve credit outstanding for 1922–28 coincide with seasonal peaks in interest rates and loan-reserve ratios before the founding of the Fed.

Open Market Operations with Discount Loans

A virtue of Miron's model is that, based on a minimal number of standard banking assumptions, it produces an intellectually appealing explanation of how short-term activist open market operations could have reduced the frequency of financial panics. One of those simplifying assumptions is that the Fed of the 1920s used only open market operations as a policy tool. While this assumption captures the modern monetary environment, in the 1920s discount loans were arguably as important as open market operations. Accordingly, this section amends Miron's model by allowing the Fed to extend discount loans to member banks—while still assuming that the Fed holds no gold. I refer to the amended model as the Miron-plus model of the Federal Reserve.

To derive the implications of the Miron-plus model, start with the decision problem of the member bank. The member bank maximizes expected profit by choosing borrowings from the Fed in addition to planned reserves:

$$\text{Max } E(\pi_B) \quad iL_B - (s^2/2)\left[(R/D) \quad 1\right]^2 - dL_{RB} - (a/2)(L_{RB})^2, \tag{4.13}$$

subject to the balance sheet constraint

$$R \quad L_B = D \quad L_{RB}. \tag{4.14}$$

A new feature of the decision problem is that the bank now may borrow from the Reserve bank at a preset discount rate, d, with the amount of the discount loan, L_{RB}, appearing on the liability side of the balance sheet. Besides a monetary cost, dL_{RB}, I assume the bank incurs a nonmonetary cost for visiting the discount window equal to $(a/2)(L_{RB})^2$, where $a > 0$. A nonmonetary cost of this type would arise if the Fed subjects the member bank to increased regulatory scrutiny as a consequence of visits to the discount window. The solutions are

$$(R^d)_{DIS^+} \quad \delta\left[1 - (i \quad s^2)\right], \tag{4.15}$$

$$(L_{RB}{}^d)_{DIS^+} \quad 0, \text{ for } d \quad i, \tag{4.16a}$$

$$(L_{RB}{}^d)_{DIS^+} \quad (i \quad d)/a, \text{ for } d < i, \tag{4.16b}$$

where the (+)-script indicates the discretionary Miron-plus solution.

The reserve demand function (4.15) in the Miron-plus model is the same as in Miron's basic model. To understand this equivalence, assume for the moment that the Fed has the option of withholding, or calling, a discount loan and the possibility that the Fed might do so is uncertain. Then, the

member bank would need to protect itself from this possibility by holding reserves not only behind deposits but also behind discount loans. Under these hypothetical circumstances, reserve demand would be higher (for a given interest rate) in the Miron-plus model. But with the member bank deciding whether, and how much, to borrow, no added protection is needed. Each dollar borrowed from the Reserve bank is funneled into a bank loan, with nothing added to reserves. Here, the reserve demand function is the same in the two versions of the model.

Equations (4.16a) and (4.16b) show that the demand for discount loans depends on the private loan rate, i, the discount rate, d, and the nonmonetary cost parameter, a. If the discount rate is at market levels or higher ($d \geq i$), as Miron implicitly assumed, loan demand is zero, but if the discount rate is a subsidy ($d < i$), discount borrowing is positive, with borrowing rising with the interest rate spread, $(i - d)$. Also, if the nonmonetary cost parameter, "a," is high, then the demand for discount loans is low.

As before, equilibrium in the private loan market is determined by loan supply and loan demand. While loan demand, $L^d = Y - bi$, is the same as in Miron's basic model, loan supply, with a Fed that may extend discount loans in addition to conducting open market operations, becomes

$$\begin{aligned}\left(L^s\right)_{DIS^+} &= L_B + L_{NB} \quad \left[\left(D \quad R^d\right) \quad L_{RB}\right] + S_{RB} \\ &= \left(D \quad R^d\right) + FC = \left(i \quad {}^2/s^2\right) \quad FC,\end{aligned} \tag{4.17}$$

where bank loans to the private sector, L_B, now include the amount that banks borrow from the Fed and Fed credit is now given by $FC = L_{RB} + S_{RB}$. Loan supply arises from funds deposited by the public, net of reserves held by the bank, and from Fed credit. Setting $L^s = L^d$ and solving for the market clearing interest rate on private loans gives

$$\left(\ \right)_{DIS+} = \left(Y \quad S_{RB}\right)s^2 / \left(bs^2 + \quad ^2\right), \text{ for } d \geq i, \tag{4.18a}$$

$$\left(\ \right)_{DIS+} = \left[\left(Y \quad S_{RB}\right) + \left(d / \ \right)\right] \ ^2 / \left[bs^2 + \delta^2 \quad \left(s^2/a\right)\right], \text{ for } d < i. \tag{4.18b}$$

If the discount rate is a penalty, then equation (4.18a), which is the same as equation (4.12), applies. If the discount rate is below market, then equation (4.18b) applies; the interest rate now is affected by the new term, (d/a), in the numerator and the new term, (s^2/a), in the denominator.

The Miron-plus Fed potentially controls the interest rate in two ways. As in the basic model, the Fed can offset the effects of seasonal increases in Y or decreases in δ by purchasing government securities. The other option is to decrease the discount rate, which stimulates discount borrowing, increases loan supply, and decreases the interest rate, as long as the discount rate is lowered to a level below market rates of interest.

Interest Rate Smoothing and the Scissors Effect

Because the Miron-plus model includes discount loans as well as open market operations, it offers the opportunity to explore the scissors effect. If we assume that open market operations are exogenous, then a scissors effect, if it exists, cannot be due to discount loans crowding out government security holdings. Instead, a scissors effect depends on open market operations causing changes in discount loans.

Suppose that the discount rate is below the market rate. Using interest rate equation (4.18b), the discount loan equation (4.16b) can be restated as

$$\left(L_{RB}^{\ d}\right)_{DIS^+} \quad (i \quad d)/a = \left[(Y \quad S_{RB}) - d\left(b + \left(\ ^2/s^2\right)\right)\right]/ \left[1 \quad a\left(b \quad \left(\ ^2/s^2\right)\right)\right], \text{ for } d \quad i. \tag{4.19}$$

Adding government security holdings, S_{RB}, gives Fed credit as

$$(FC)_{DIS^+} = L_{RB} \quad S_{RB} = \left[Y \quad a\left(b \quad \left(\ ^2/s^2\right)\right)S_{RB} - d\left(b + \left(\ ^2/s^2\right)\right)\right]/ \left[1 \quad a\left(b \quad \left(\ ^2/s^2\right)\right)\right], \text{ for } d \quad i. \tag{4.20}$$

Taking the partial derivative of (4.19) and (4.20) with respect to the Fed's government security holdings, S_{RB}, gives

$$\partial \ _{RB}/\partial S_{RB} = -1/\left[1 + a\left(\ + \left(\qquad\right)\right)\right], \text{ for } d < i, \tag{4.21}$$

$$\partial \quad /\partial S_{RB} = a\left(\ + \left(\qquad\right)\right)/\left[1 + a\left(\ + \left(\qquad\right)\right)\right], \text{ for } d < i. \tag{4.22}$$

Equation (4.21) is the scissors effect equation. Given that $a > 0$, then $-1 < \partial L_{RB}/\partial S_{RB} < 0$. An open market purchase causes a scissors effect: discount loans fall when government securities rise. The rationale is that the open market purchase puts downward pressure on the market interest rate, lowering the spread between the market rate and the discount rate. Equation (4.22) shows Fed credit rising with the open market operation, due to the fact that the scissors in (4.21) is less than one-for-one.

The conclusion that a scissors effect is a by-product of Fed discretion depends, however, on viewing government security purchases as literally exogenous—as if, for instance, the Fed received a randomized message from on-high with instructions specifying when to purchase and when to sell bonds. That, of course, is not what Miron had in mind. Rather, Miron assumed that the early Fed consciously pursued an open market policy of smoothing interest rates in order to reduce the likelihood of financial panics. Under these circumstances, Fed policy would be triggered by factors that

cause the interest rate to change. From equation (4.18b) those factors, not controlled by the Fed, are Y, s^2, b, and δ. In keeping with Miron's emphasis on the primacy of open market operations, a change in Y, s^2, b, and δ that causes i to change (holding d and a constant) will cause the Fed to adjust government security holdings in the same direction as the change in i. For instance, an interest rate smoothing Fed will react to an increase in the credit demand parameter, Y, by purchasing government securities. Though the interest rate still increases, it does so by less than if the Fed had not conducted the open market operation. The final outcome is that discount loans increase—since the interest rate increases—along with the Fed's government security holdings. Here, we do not observe a scissors effect: there is a simultaneous increase in Fed security holdings and discount loans resulting in a relatively large rise in Fed credit, though a partial scissors is embedded in the smoothing policy (see equation 4.21).

More generally, a Miron-like discretionary Fed need not give primacy to open market operations. Miron's Fed may actively use both tools at its disposal, open market policy and discount loan policy, in order to smooth interest rates. Furthermore, it seems reasonable to posit that the activist Fed, envisioned as a unified entity, would not have the two policies working at cross-purposes. Under these circumstances, the Fed reacts to an increase in the interest rate by buying government securities and, perhaps, by decreasing the discount rate. If, indeed, the discount rate falls, then discount borrowing now rises for two reasons: (1) the rise in the interest rate (though moderated by the open market purchases) and (2) the decrease in the discount rate. Accordingly, for a given amount of interest rate smoothing, government security holdings rise by less and discount loans rise by more compared to when the Fed relied exclusively on open market operations as a policy tool. The bottom line is that whether we assume that the Fed relies exclusively on open market operations, or actively coordinates open market policy with discount policy, we find that government security holdings and discount loans tend to move in the same direction.

3. Questioning Discretion

We now have our first reason to question the conventional characterization of the 1920s Fed as a discretionary interest rate smoother: discretion of the Miron-type implies that a scissors effect does not emerge as a policy outcome, which flies in the face of what we know about the relationship between discount loans and open market operations in the 1920s.[3] Work by Holland and Toma (1991) offers additional reasons for questioning Miron's supposition that the smoothing of interest rates is due to a discretionary policy. Their empirical tests for 1922–28 highlight the fall harvest season when an increase in the demand for credit tends to place upward pressure on the interest rate. After confirming Miron's finding of seasonal Fed credit, with peaks occurring late in the year, Holland and Toma observe that if discretionary open market operations are the key to reducing seasonal movements

in the interest rate, then the Fed's government security holdings should have surged during the fall, as interest rates did prior to the creation of the Fed. Their key findings are as follows:

1. There are periods after the creation of the Fed when neither Federal Reserve credit nor interest rates exhibit much evidence of seasonality.
2. Fed credit appears to exhibit greater seasonality whenever interest rates exhibit greater seasonality.
3. When Fed credit does fluctuate seasonally, it reflects seasonality of discount loans and bankers' acceptances but not Fed holdings of government securities (Holland and Toma 1991, 666).

Seasonal movements in discount loans (and bankers' acceptances) responded to member bank demands, naturally increasing during seasons of rising interest rates, which even in the 1922–28 period exhibited statistically significant seasonality albeit of dampened amplitude. So while Fed credit does display statistically significant seasonality for the period, 1922–28, seasonal interest rates drove Fed credit, not vice versa. Overall, Holland and Toma's evidence strikes a blow against the hypothesis of a discretionary, interest rate smoothing Fed: the dampening of seasonal interest rate fluctuations has nothing to do with open market operations or, for that matter, discount policy as typically construed.

In addition to Holland and Toma's empirical findings, there is a deeper, theoretical reason for questioning whether the Fed of the 1920s exercised Miron-like discretion. Miron did not attempt to model the behavior of Reserve banks. He simply assumed their actions were directed by a discretionary leader who sought to smooth interest rates by engaging in a seasonal policy of open market operations, purchasing government securities during periods of financial stress. Following a long-standing tradition, he did not pause to consider whether Reserve bank decision makers, who at the time operated in a relatively competitive, gold standard environment, had the incentive to behave in the way attributed to them. Moreover, he did not consider the financial feasibility of the postulated behavior, a glaring omission given that these early Reserve banks individually faced a constraint that prohibited negative profits. Remedying the "glaring omission" entails modeling the behavior of Reserve banks in a decentralized, self-regulated gold standard system, where a bottom-line, requiring that revenues cover costs, gives each Reserve bank a stake in the consequences of its monetary decisions.

4. SELF-REGULATED RESERVE BANKING

Balance Sheet Accounting

Consider a Reserve bank balance sheet in a generic gold standard setting,

$$S_{RB} \quad L_{RB} + G \quad R + C \quad D(r_D + c), \tag{4.23}$$

where G represents the nominal gold reserves of the Reserve bank, C is the public's nominal currency holdings, r_D is the member bank reserve-to-deposit ratio, such that $R = r_D D$, and c is the public's currency-to-deposit ratio, such that $C = cD$. Provisionally assume that D (= δ), r_D, and c are constant, implying that (R + C) is constant. Also, assume that $G = g(R + C)$ where g is the ratio between gold reserves and the monetary base. If g is constant, then $G = g(R + C)$ is constant and balance sheet accounting requires that Fed credit, $S_{RB} + L_{RB}$, be constant. Any increase in S_{RB} must be offset by a corresponding decrease in L_{RB} and any increase in L_{RB} must be offset by a corresponding decrease in S_{RB}. A gold standard of this generic type produces a one-for-one scissors effect.

Of course, the stringent assumptions underlying the conclusion of a complete scissors effect need not have held in the world of the 1920s. The public's real demand for deposits, for instance, is unlikely to have remained constant over the decade. Still, there is no obvious reason why an open market operation (or a discount loan) would affect the real demand for deposits. Nor, in the absence of a formal model, is there an obvious connection between an open market operation (or a discount loan) and r_D, c or g; so the implicit assumption underlying Miron's discretionary model—that open market purchases increase currency demand (increase cD)—is suspect. In lieu of these connections, balance sheet accounting *requires* that, ceteris paribus, an open market operation be accompanied by an exact offset in discount loans. While the burden of proof would seem to be on those who would deny that a scissors effect was a fundamental feature of the 1920s environment, any satisfying explanation moves beyond accounting identities and provides an economic model of the scissors phenomenon that is faithful to the gold and competitive constraints built into the system by the founders of the Federal Reserve.

Competitive Reserve Banking

The setting for such a model builds on chapter 2's discussion of how the Federal Reserve Act shaped the early Reserve banking industry. Start with the assumption that Reserve banks are competitive, nonprofit firms operating in a gold standard setting. To be sure, Miron acknowledges the gold standard setting with his assumption of a fixed price level. But he does not entertain other, more important, ways that the gold standard constrains the actions of the Fed. Just as a member bank is committed to redeem deposits into currency, a Reserve bank is committed to redeem currency (and reserves) into gold. Just as a member bank holds cash reserves behind its deposits, a Reserve bank holds gold reserves behind its monetary liabilities. Yes, a Reserve bank can use open market operations to increase Fed credit, but, assuming the real demand for its monetary liabilities does not change, doing so requires a decrease in its gold reserve. As those gold holdings fall, the expected liquidity costs to the Reserve bank of redeeming its monetary liabilities into gold on short notice rise. And if the possibility of unexpected

withdrawals affects member bank behavior, it stands to reason that the possibility of unexpected redemptions affects Reserve bank behavior. Put differently, liquidity costs are arguably as important in understanding the operation of a Reserve banking system as they are in understanding the operation of a member banking system.

Appropriately qualified, I find Miron's depiction of a competitive member banking system to be useful in depicting a competitive Reserve banking system. To drive home the analogy, recast Miron's discussion of member bank liquidity costs in a way that applies to Reserve bank liquidity costs. With relevant italicized substitutions and insertions, Miron's opening quote in section 2 can be restated.

> The *Reserve* banking system consists of a fixed number of identical *Reserve* banks, each of which is sufficiently small that it acts as a price taker. The representative *Reserve* bank holds *three* types of assets: *gold reserves, G; government securities,* S_{RB}*; discount loans,* L_{RB}. There *are two* type*s* of liabilit*ies*: *bank reserves, R, and the public's currency, C*. The *Reserve* bank accepts *bank reserves* infinitely elastically, *issues* currency on demand *and accommodates member banks at the discount window*. The only decision it faces is what proportion of its assets to hold as *gold* reserves and what proportion as *securities*. The *smaller* the proportion of *gold*, the greater the costs to the *Reserve* bank of managing its portfolio.
>
> There are costs to the *Reserve* bank of holding a *small* proportion of its assets as *gold* because it can suffer unexpected *reserve and currency redemptions*. Under fractional *gold* banking, a sufficiently large amount of *redemptions* causes the *Reserve* bank to fail because some of its assets are tied up in *securities (and discount loans)* and it takes time to convert these into *gold*. If the *Reserve* bank experiences *redemptions*, therefore, it liquidates some of its *securities* to bolster its *gold* reserve position. This imposes costs since the *Reserve* bank accrues capital losses and/or incurs excess brokerage fees when it *sells securities* unexpectedly.

Continuing in the section 2 mode, assume that a Reserve bank's liquidity costs (1) rise as the amount of unexpected redemptions, Z – E(Z), rises, where Z is the amount of redemptions that the Reserve bank experiences, and (2) decline as the ratio of planned gold to expected monetary liabilities, G/(R + C), rises. The liquidity cost function takes the specific form:

$$LC_{RB} = \left[\left(Z \quad E(Z)\right)^2 /2\right]\left\{\left[G/(R+C)\right] \quad 1\right\}^2. \tag{4.24}$$

Equation (4.24) implies that if the Reserve bank holds substantial gold reserves, then it is in a favorable position if hit by unexpected redemptions. In this case, the Reserve bank is highly liquid, its expected liquidity costs are low, and the probability of a redemption crisis is low. Conversely, if gold reserves are low, then the Reserve bank is not well positioned to respond to unexpected redemptions. In this case, the Reserve bank is illiquid, its

expected liquidity costs are high and the Reserve banking system is relatively fragile.

Some of the assumptions implicit in this Miron-like account of the Reserve banking system need spelling out: (1) Reserve bank output is the monetary base, which equals bank reserves plus currency outside the banking system, (2) the Reserve bank commits to redeeming the monetary base into gold, which anchors the overall price level, (3) given redemption, the only costs to the Reserve bank of providing the monetary base are liquidity costs, (4) the Reserve bank can (a) make cash loans, L_{RB}, to member banks at an exogenously determined discount rate, d, (b) conduct open market operations by exchanging cash for government securities, S_{RB}, from the nonbanking public at the constant, risk-free rate, r, and (c) exchange cash for gold, G, from the nonbanking public, (5) the public holds a constant fraction, c, of deposits as currency, which, with Miron's assumption of an inelastic demand for deposits, gives an interest inelastic demand for currency, $C^d = cD$, (6) Reserve bank decision makers strive to maximize discretionary profits, which manifests itself in the form of expense preference behavior, (7) the Reserve bank operates in a competitive environment, which compels it to act as a price-taker, and (8) the Reserve bank faces no executive, congressional, or Federal Reserve Board oversight.

Assumptions 1–3 greatly simplify the operation of a Reserve bank. For one thing, there are other outputs besides the monetary base that the Reserve bank can and does provide. Similarly, there are other costs not captured by the liquidity cost function. With respect to assumption 2, I ignore the possibility that movements in the monetary base could affect the price level: the market for gold anchors the price level in the short run and in the long run.

Assumptions 4a-4c pertain to the asset side of the Reserve bank balance sheet. The Reserve bank prints currency and exchanges it for a member bank IOU at a discount rate that is given; neither the individual Reserve banks nor the Federal Reserve Board is in charge of setting discount rates in this simplified setup. The Reserve bank also prints currency and exchanges it with the nonbanking public for noninterest-bearing gold and constant-rate government securities. Assumption 5 ties currency holdings to deposits, by assuming a constant currency-to-deposit ratio, c. Since deposits are exogenous, currency is exogenous, contradicting the implicit assumption in Miron that currency demand moves with open market operations.

Assumptions 6–8 represent the key departures from the typical way of modeling the Fed. The approach here is to borrow from the tool kit of economists who model government firms as engaging in expense preference behavior. More pointedly, the Reserve bank attempts to maximize the difference between revenues, from discount loans and government security holdings, and liquidity costs. This difference, called discretionary profits, may be used by Reserve bank decision makers through a wide range of activities including perquisites of office, shirking, and larger salaries and staff. Unlike typical government firms, however, third party oversight does not constrain these activities. Instead, tight competitive constraints keep expense preference behavior in check.

The defining element of the competitive Reserve bank's decision problem is that it stands ready to accommodate the member bank's and the public's desire to exchange reserve and currency holdings for gold. With L_{RB} and R determined by the member bank and C determined by the public, the balance sheet constraint, $L_{RB} + S_{RB} + G = R + C$, makes clear that, by choosing S_{RB}, the Reserve bank residually chooses G. Each Reserve bank purchases as many securities as it wants at an exogenous risk-free interest rate, r. In addition to r, a price-taking Reserve bank treats i as given.

Using the liquidity cost function in equation (4.24), the representative Reserve bank's task is to choose the level of government security purchases to maximize expected (discretionary) profits

$$\text{Max } E(\pi_{RB}) \quad dL_{RB} \quad rS_{RB} \quad \left(\quad /2\right)\left\{\left[G \quad (R \quad C)\right] \quad 1\right\}^2, \tag{4.25}$$

subject to the balance sheet constraint

$$G \quad (R + C) - \left(L_{RB} + S_{RB}\right), \tag{4.26}$$

where the italicized symbol s^2, is the variance of redemptions, $E(Z - E(Z))^2$. The open market operation solution satisfies the first-order condition

$$r = \partial LC_{RB}/\partial S_{RB} = s^2\left(L_{RB} + S_{RB}\right)/(R \quad C)^2. \tag{4.27}$$

To solve explicitly for security holdings, rearrange and substitute for R and L_{RB} from the member bank's problem:

$$\left(S_{RB}\right)_{SR} \quad r(R \quad C)^2 / \quad ^2 \quad r\delta^2\left[(1 \quad c) - \left(i \quad /s^2\right)\right]2/ \quad ^2 \quad \text{for d} \quad i, \tag{4.28a}$$

$$\begin{aligned}\left(S_{RB}\right)_{SR} \quad & r(R \quad C)^2 / \quad ^2 \quad L_{RB}{}^{d} = r\delta^2\left[(1+c) \quad \left(i \quad s^2\right)\right]^2 / s^2 \\ & -(i \quad d)/a, \text{ for d} \quad i,\end{aligned} \tag{4.28b}$$

where the SR-subscript indicates the solution in a self-regulated system. Equations (4.28a) and (4.28b) can be summarized with a comprehensive Fed credit equation

$$(FC)_{SR} = L_{RB} \quad S_{RB} = r(R + C)^2 / s^2 = r\delta^2\left[(1+c) \quad \left(i \quad s^2\right)\right]^2 / s^2. \tag{4.29}$$

When the discount rate is below market, equation (4.29) is the same as (4.28b) after adding L_{RB} to both sides. Fed credit equals government security holdings plus discount loans. When the discount rate is at or above market,

equation (4.29) collapses to (4.28a). Fed credit still equals government security holdings plus discount loans, but now discount loans are zero.

Next, turn to the private loan market. In deriving loan supply, a subtle modeling question must be addressed. Miron assumed that an open market operation added directly to private loan supply. When we amended Miron's model to include a second Reserve bank asset, discount loans, we concluded that discount loans added indirectly to loan supply as banks re-lent funds borrowed from Reserve banks. The self-regulated system adds one more asset to a Reserve bank's balance sheet, gold holdings. The question here is whether a Reserve bank purchase of gold, like a Reserve bank purchase of government securities, adds directly to loan supply. If gold is a close substitute for private loans, the answer is *yes*. If, however, the public does not treat gold as a substitute then Reserve bank gold acquisitions do not add to loan supply.

Fortunately, the answer we give here does not make much difference to the interpretation of the final results. I assume close substitutability because it simplifies the presentation. Accordingly, private loan supply in a self-regulated system can be given by

$$\begin{aligned}\left(L^{s}\right)_{SR} &= L_{B} + L_{NB} \quad \left(D \quad R \quad L_{RB}\right) + \left(S_{RB} \quad G\right) \\ &= \left(D \quad R\right) + \left(R \quad C\right) = D \quad C = \delta\left(1 \quad c\right),\end{aligned} \tag{4.30}$$

where now $L_{NB} = S_{RB} + G$. The sum, $L_{RB} + S_{RB} + G$, comprises the Reserve bank's total assets which, according to balance sheet accounting, must equal its total monetary liabilities, $R + C$. So, total loans equal the sum, $(D - R) + (R + C) = \delta(1 + c)$. Ultimately, loan supply to the private market depends on only two factors, neither of which is controlled by Reserve banks: loan supply increases with the public's real demand for deposits (δ) and its real demand for currency (δc).

Setting $L^{s} = L^{d} = Y - bi$ and solving for the market interest rate gives:

$$i_{SR} \quad \left[Y - \delta\left(1 \quad c\right)\right] / b \quad i\left(Y, b, \delta, c\right). \tag{4.31}$$

An increase in $\delta(1 + c)$ shifts the (vertical) loan supply curve to the right and decreases the equilibrium interest rate. On the demand side, an increase in Y or a decrease in b increases the equilibrium interest rate.

An examination of equation (4.31) leads to a strikingly *un*conventional policy implication: the Fed does not in any way influence the market rate of interest. For open market operations, the rationale is clear. We can meaningfully talk about Reserve banks choosing the mix of gold and government security holdings to back up their monetary liabilities. They do so in response to cost and revenue considerations. And that compositional choice will have Fed credit implications: less gold implies more government securities and, therefore, more Fed credit. But that choice does not affect any right-side

variable in equation (4.31); in particular, it does not affect loan supply, $\delta(1 + c)$, which is determined by the public, not the Reserve bank system.

The other potential policy instrument is the discount rate. In this simple version of the self-regulated model, the discount rate is an exogenous variable. More generally, we could posit a board (the Federal Reserve Board), standing outside the network of Reserve banks, which controls the discount rate. A change in the discount rate sets off a chain of events that ultimately leaves Fed credit, loan supply, and interest rates unchanged. In particular, a decrease in the discount rate (for $d < i$), which, taken by itself, expands discount loans, and, hence, loan supply, is accompanied by a Reserve bank sale of government securities (see equation 4.28b), which contracts loan supply by a corresponding amount.

The economic explanation for the policy ineffectiveness of a discount rate change is based on the connection among the public's, the member bank's, and the Reserve bank's decisions. When the discount rate decreases, the member bank visits the discount window and borrows, say, \$1 of newly printed currency from the Reserve bank. Because the member bank's demand liabilities have not changed, it has no desire to add \$1 to reserves, R. Instead, the \$1 is lent in the private loan market. The immediate effect is that the public finds itself holding \$1 more in currency. But the public does not want to hold the new currency (neither δ nor c have changed) and therefore is motivated to redeem the currency for gold. If it does so, then at that moment the Reserve bank would find itself holding less gold. This is not an equilibrium outcome for the Reserve bank: it has no desire to alter its gold reserve, G, since its monetary liabilities, R + C, have not changed. To preempt the disequilibrium outcome, the Reserve bank would have an incentive to accompany the \$1 increase in discount loans with a \$1 sale of government securities, which would prevent the rise in currency holdings in the first place.

Interest Rate Smoothing and the Scissors Effect

At a more fundamental level, the conclusion that the interest rate is invariant to movements in the discount rate is a by-product of the scissors effect in a competitive Reserve bank system. The Fed credit equation is well suited for investigating this type of crowding out effect. Substitute the general function, $i_{SR} = i(Y, b, \delta, c)$ into equation (4.29) to give

$$\begin{aligned}(FC)_{SR} &= S_{RB} \quad L_{RB} = r\delta^2\left[(1+c) \quad \left(i_{SR} \quad s^2\right)\right]^2 / s^2 \\ &= FC\left(r,\ \delta,\ c,\ s^2,\ s^2,\ Y,\ b\right). \end{aligned} \tag{4.32}$$

Significantly, the discount rate does not appear as a right-side variable. To keep Fed credit constant, any discount rate-induced change in discount loans must be associated with a one-for-one offsetting change in government security holdings.

The takeaway from this analysis is not that there will always be an exact one-for-one offset between discount loans and government security holdings. Rather, the important lesson stems from the observation that there are two factors—the discount rate, d, and the nonmonetary cost, a, of visiting the discount window—that affect discount loans without affecting the Fed credit variables in equation (4.32). If a change in d or a is not accompanied by a change in r, δ, c, s^2, s^{*2}, Y, or b, then the scissors-offset must be exact. If a change in d or a *is* accompanied by a change in r, δ, c, s^2, s^{*2}, Y, or b, then the scissors-offset cannot be exact.

That the scissors effect, whether exact or inexact, is a characteristic by-product of a competitive Reserve banking system is reassuring for the self-regulated model, since, as we noted throughout this chapter, there is a substantial body of work that substantiates the scissors relationship. But there is also a substantial body of work that documents that interest rates were seasonally smoother in the 1920s compared to before the Fed's creation. This poses a problem for the self-regulated model. Given that Reserve banks cannot control interest rates, the self-regulated model appears to be silent on the issue of smoothing, a silence that is deafening, since smoothing, alongside the scissors effect, arguably are the two most prominent features of the early Federal Reserve empirical landscape. If we are ready to abandon Miron's discretionary model because it fails the scissors effect test, then equal treatment requires that we be ready to abandon the self-regulated model because it fails the interest rate smoothing test.

The previously mentioned paper by Holland and Toma (1991) provides an escape from the self-regulated dilemma. As an alternative to Miron's discretionary Fed, they develop a model of interest rate smoothing that highlights the lender-of-last-resort responsibilities that the founders assigned to the Fed at its creation. The key attribute of the newly created Fed was its promise to make funds widely available to solvent banks in times of panic through the issuance of an emergency line of credit. Once such a promise is credibly in place, Fed decision makers can adopt a hands-off approach: last resort lending does not entail a discretionary policy of seasonal movements in the money supply. Assuming that the expected availability of emergency credit varies less across seasons after, than before, the creation of the Fed, Holland and Toma's model implies a reduction in the seasonality of nominal interest rates and a reduction in the seasonality of the probability of bank failure and financial panic. This conclusion follows from the supposition that an emergency credit line substitutes for bank reserves. If, during the end-of-the-year harvest season, the expected availability of emergency credit falls by less (or rises by more) after than before the Fed's creation, then member banks will be in a position to reduce reserves and extend more loans, which moderates the harvest time increase in interest rates. Furthermore, Holland and Toma argue that a reliable lender of last resort reduces the probability that a bank will be forced to restrict payments to depositors, thus establishing a positive relationship between the size of the emergency credit line and the demand for deposits and providing an

additional reason why interest rates would not tend to spike during harvest time. The self-regulated model, amended along the lines suggested by Holland and Toma, still implies a scissors effect, but an effect that is now accompanied by the smoothing of interest rates.

5. CONTRASTING THEORIES

The primary difference between the competitive, self-regulated model and the two versions of Miron's discretionary model is the treatment of the Federal Reserve banks. For Miron, the implicit assumption is that there is one leader of the Fed. By controlling open market operations, the Fed leader controls Fed credit and the interest rate. The Fed's power is *not* held in check by (1) a commitment to redeem its monetary liabilities into gold (though a gold standard does peg the price level), (2) a determinant real demand for currency held by the nonbanking public that is independent of open market operations (though the real demand for deposits is assumed to be independent), (3) a bottom-line requiring that Fed credit revenue cover cost, nor (4) competition among Reserve banks.

The competitive model replaces the autonomous, discretionary Fed with numerous price-taking Reserve banks. A Reserve bank's power to control the monetary base and the interest rate *is* held in check by (1) a commitment to redeem its monetary liabilities into gold, which gives rise to a liquidity cost function, (2) a determinate real demand for currency held by the nonbanking public, as well as reserves held by member banks, that is independent of Federal Reserve credit, (3) a bottom-line requiring that Fed credit revenue cover cost, and (4) competition from other Reserve banks.

The commitment to redeem (condition 1) affects the cost of running the Reserve bank under the presumption that the Reserve bank is uncertain when the public might decide to exercise the redemption option. The determinate real demand for currency and reserves (condition 2), along with the public's option to redeem, serves to tether the Fed's monetary liabilities. A bottom-line (condition 3), along with Reserve bank rivalry (condition 4), insures that the costs of running the Reserve bank will affect its mix of government security and gold holdings. Unlike the discretionary Fed of the Miron model, the competitive Reserve bank does not have the power to conduct open market operations, thereby reducing its gold reserve, without threatening its liquidity position, raising expected liquidity costs, and increasing the likelihood of bankruptcy.

More generally, within the context of the self-regulated model, Federal Reserve credit does not matter for any monetary aggregate of interest. In particular, the monetary base is determined by the public's demand for currency, C, and the banks' demand for reserves, R, which is derived from the public's demand for deposits, D. A Reserve bank's decision to increase or decrease its earning assets, Fed credit, does not affect C, R, or D. Put differently, a change in Fed credit changes the proportion of its assets held in nonearning form, gold, but not the overall size of its balance sheet.

Finally, Miron's discretionary model and the self-regulated model come to different conclusions about interest rate smoothing and the scissors effect. In Miron's model an interest rate smoothing objective implies that government security holdings and discount loans tend to move in the same direction. So a cursory look at the data *would not* reveal a scissors effect. In the self-regulated model, government security holdings and discount loans tend to move in the opposite direction. So a cursory look at the data *would* reveal a scissors effect. Moreover, if the self-regulated model is amended along the lines suggested by Holland and Toma (1991), with Reserve banks providing emergency lines of credit that are relatively constant across seasons, then interest rate smoothing emerges as an implication. Unlike Miron's discretionary model that views the Fed as a unified policy activist that deliberately attempts to smooth interest rates, smoothing in the self-regulated model is an unintended consequence of decentralized decision making, where none of the Reserve banks care about movements in interest rates, per se, outside of the effect on discretionary profits.

6. International Twist

To this point, we have been assuming, in both the discretionary and the self-regulated models, that the commitment to redeem the monetary base into gold anchors the overall price level. More generally, the purchasing power of money (the inverse of the price level) will equal the purchasing power of gold, which is determined by supply and demand conditions in a world gold market. So the implicit assumption has been that worldwide gold supply and gold demand do not change.

While the supply-side assumption seems appropriate, gold production does not tend to vary significantly in the short run, there is little reason to posit a fixed worldwide demand for gold. As we will emphasize in future chapters, this consideration was particularly relevant for the 1920s as countries recommitted to redeeming their currencies for gold after abandoning the international gold standard during WWI. As various countries come on board, the worldwide demand for gold tends to increase, the purchasing power of gold tends to increase, and the price level tends to fall.

Allowing for changes in the purchasing power of gold, and therefore the overall price level, does not affect the implications of Miron's discretionary model in any interesting way. This is due to the untethered nature of the monetary base. A gold-induced fall in the equilibrium price level does not prevent the Fed from changing Fed credit and the monetary base by whatever amount needed to smooth interest rates. At any given price level, the discretionary Fed is able to increase Fed credit and the monetary base simply by buying a government security, since, by assumption, the public's willingness to hold currency rises in tandem with the newly injected money.

A change in the purchasing power of gold, however, is not without interest in the self-regulated model. This is due to the tethered nature of the monetary base. As the appendix formally shows, Reserve banks economize their

gold holdings in response to a worldwide increase in the purchasing power (price) of gold. This serves the economic purpose of releasing gold to the rest of the world thus facilitating the return of other countries to the gold standard. As we shall note in our discussion of Reserve bank policy in later chapters, this result, according to the self-regulated model, is not motivated by some altruistic intent to aid other countries. Rather, it is simply a response to market incentives. When the price of gold rises, the first law of demand says that buyers—that is, Reserve banks—of gold reduce the amount they demand. For a given nominal demand for base money, Federal Reserve gold holdings fall and Fed credit rises, representing a change in the composition of Reserve bank assets but not in the size of total assets or in the size of total monetary liabilities on the other side of the balance sheet. When the price of gold falls, gold holdings rise and Fed credit falls.

7. THE OTHER SCISSORS EFFECT

Focusing on movements in gold holdings calls attention to a much discussed feature of the 1920s monetary landscape: the Fed's gold sterilization policy. Commentators, both contemporary and modern-day, have noted that Fed gold and Fed credit often moved in opposite directions during the decade, arguing that this inverse relationship was a by-product of a consciously chosen policy undertaken by the early Fed to sterilize (neutralize) the monetary impact of gold flows. For instance, Friedman and Schwartz observe:

> From 1923 on, gold movements were largely offset by movements in Federal Reserve credit so that there was essentially no relation between the movements in gold and in the total of high-powered money; the fairly irregular dips and rises in the gold stock were transformed into a horizontal movement in total high-powered money (1971, 282).

Note the hint of puzzlement underlying Friedman and Schwartz's comments. Reading between the lines they are essentially saying, "Yes, we would ordinarily expect gold movements to affect high-powered money (the monetary base). But, in fact, gold movements did not, after 1923, due to the Fed's somewhat unorthodox sterilization policy."

Coming from a discretionary policymaker mindset—albeit one that, unlike Miron, acknowledges the existence of Fed gold holdings—the thrust of modern analysis has been somewhat critical of sterilization as inconsistent with the so-called classical international gold standard rules of the game, which call for positive co-movements in Fed gold and government securities holdings to insure the proper, automatic functioning of that standard. Barry Eichengreen's discussion in his influential book, *Golden Fetters*, is representative of the conventional view:

> For most of the 1920s the Fed persisted in sterilizing gold inflows rather than permitting them to produce a more rapid rise in the American money supply

> as required by the rules of the gold standard game. This steady flow of gold toward the United States undermined the balance-of-payments position of other countries. It was a main source of stress on the international monetary system (1992, 205–06).

A bit later Eichengreen identifies open market operations as the component of Fed credit primarily responsible for sterilization:

> For a country in payments surplus, sterilization involved sales of securities from the central bank's portfolio to mop up any addition to the domestic money supply brought about by the conversion into local currency of the gold accumulated by domestic exporters (1992, 206).

According to the conventional view, gold standard constraints are not tight, providing the Fed policymaker with the discretion to influence the money supply and the price level in the short run. Faced with gold inflows, the Fed is free to choose to sterilize or not to sterilize. For whatever reason, policymakers at the time chose sterilization, a choice, as noted above, perceived as preventing the money supply from expanding and, therefore, as inconsistent with "the rules of the gold standard game."[4]

The self-regulated model parts company with the conventional view in assessing the theoretical underpinnings of gold sterilization. According to the self-regulated view, the ease of redeeming dollars into gold implies tight gold standard constraints: Fed decision makers (competitive Reserve banks) are not free to choose to sterilize or not to sterilize. Under the appropriate ceteris paribus conditions, gold sterilization is an *unavoidable* feature of the 1920s monetary landscape. There is no reason for the monetary economist to be puzzled: if the demand for the Fed's monetary base remains constant, Fed gold holdings and Fed credit cannot both increase. When, for instance, gold goes up, then, Fed credit (government securities or discount loans or a combination of the two) must go down. Here, the self-regulated model identifies gold sterilization as a second type of scissors effect, one where a change in gold holdings is associated with an offsetting movement in one (or possibly both) components of Fed credit.

8. Conclusion

Ultimately, what distinguishes the competitive, self-regulated model from either version of Miron's model is whether the Federal Reserve is best viewed as a collection of economic agents whose actions need explaining or as an automaton-like entity standing outside the economy whose actions are uncaused. In the self-regulated model, neither discounts nor open market operations change by the wave of the theorist's hand. Bringing Reserve bank behavior inside the realm of theory is more intellectually satisfying and in this sense the self-regulated model represents an advance over Miron's model. But the true test is whether the self-regulated model does a better

job of predicting. Do its implications better match the facts collected by the empirical economist?

In this chapter I have argued that Miron's discretionary model fails on this score. The two most striking empirical phenomenon characterizing the early Fed period are the smoothness of interest rates across seasons and the scissors relationship between Fed government security holdings and discount loans. Miron's model implies the first but not the second, once an interest rate smoothing objective is posited; indeed, nowhere in his paper is there a hint that he was aware of a scissors-like phenomenon that needed explanation. The self-regulated model, with allowance for the Fed to act as a lender of last resort, can account for both stylized empirical facts. In addition, gold sterilization, which can be understood as representing a second type of scissors effect, is straightforwardly explained by the self-regulated model.

But there are other empirical challenges that await the self-regulated model. A second contender that has historical roots back to the 1920s and which has come to be known among economic historians as the Riefler-Burgess (RB) Doctrine—named after the Depression-era economists, Winfield Riefler and W. Randolph Burgess—shares with Miron the view of the Fed as a discretionary fine-tuner. The two theories differ, however, in their acknowledgment of the scissors effect. Indeed, the genesis of the scissors concept can be traced to the RB Doctrine. The next chapter lays out the theoretical foundations of the RB Doctrine with the goal of deriving the scissors implications of the doctrine, as well as corollary implications, which will enable us to eventually test the doctrine against the self-regulated model.

Chapter 5

The Riefler-Burgess Doctrine

1. Introduction

We saw in the last chapter that a discretionary model, designed to capture the modern view of the Fed as a policy activist intent on smoothing interest rates, failed to explain a 1920s empirical phenomenon, the scissors effect whereby one component of Federal Reserve credit, for instance, discount loans, tends to be offset by another component, for instance, government security holdings. We cannot at this point, however, give up on discretion. There is an older view, with historical roots in the 1920s, that contends that the early Fed was a policy activist who smoothed interest rates *and* that the scissors effect was a characteristic feature of that policy. And, indeed, this older view, originally developed by William Riefler and W. Randolph Burgess and today known as the Riefler-Burgess (RB) Doctrine (Meltzer 2003), has gained traction among a number of modern-day economic historians as a serious account of Fed policy during the interwar years. If the self-regulated model is to be a viable alternative to the discretionary motif, then it must battle with the RB Doctrine, engaging it in a debate over the empirical as well as the theoretical merits of the 1920s scissors effect.

Let us begin the debate with an overview of the 1920s scissors effect. To document the effect, turn to Randolph Burgess who, in his book *The Reserve Banks and the Money Market* (1946), presents a diagram (p. 237), the relevant features of which are reproduced in figure 5.1, showing the relationship between Reserve bank holdings of government securities versus Reserve bank discounts and bills purchased.[1] Burgess summarizes the information embodied in the diagram: "It will be observed that increases or decreases in holdings of government securities have usually been accompanied by almost corresponding decreases or increases in bills discounted and bankers' bills held" (Burgess 1946, 237–38). Although Burgess uses the word "accompanied," which has no causal connotations, it is interesting that changes in

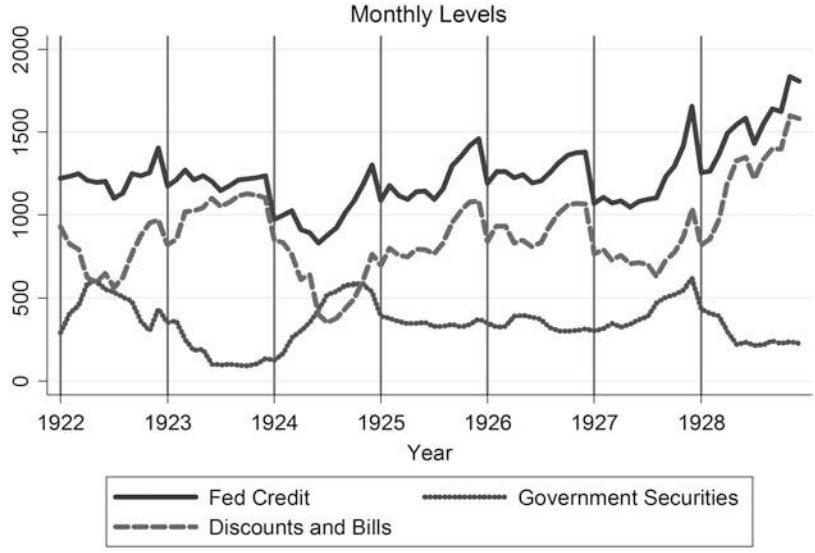


Figure 5.1 Fed credit and components, 1922–28

government securities are mentioned first and changes in bills discounted second in his descriptive account; for, as we shall see, it is a Reserve bank open market operation that initiates the scissors effect according to the RB Doctrine.

The year 1922 best illustrates the scissors effect. In the opening months of the year, discounts and bills fell, reached a trough mid-year, and then increased throughout most of the second half. Government securities rose in the opening months, reached a peak, and then declined for most of the rest of the year.

To be sure, inspection of figure 5.1 does not establish an ironclad case for the presence of a scissors effect. There are clear exceptions. For instance, discounts and bills turned sharply up in the last half of 1924, while securities continued to rise. Similarly, both series rise near the end of 1927. In other years, there are opposing movements in securities versus discounts and bills, but the offset appears to be only partial. Still, offsetting movements, whether partial or full, do seem frequent enough to justify Riefler and Burgess's search for an explanation. Before presenting the details of their explanation, the next section sets the stage by presenting some scissors arithmetic, designed to establish the necessary conditions for the existence of a scissors effect.

2. SCISSORS ARITHMETIC

The scissors effect describes the relationship between the two components of Fed credit, Reserve bank government securities and Reserve bank discount loans. Since Fed credit is simply the sum of the two components, a particular

arithmetical relationship exists among the three variables. Using "scissors arithmetic," this section derives simple conditions that must hold for a scissors effect, whether full or partial.

Start by mathematically defining Fed credit (FC) as the sum of its two components

$$FC = FC_i + FC_r. \tag{5.1}$$

With apologies to a real scissors, where the tips of the two blades move simultaneously and sweep the same arc length, FC_i is the component that *initiates* the scissors effect, while FC_r is the component that *responds*.[2] Solving for the responding component and taking the partial derivative with respect to the initiating factor gives

$$FC_r = FC - FC_i, \tag{5.2}$$

$$\partial \quad _r/\partial FC_i = \partial FC/\partial \quad _i - 1. \tag{5.3}$$

By definition, a scissors effect exists if

$$\partial \quad _r/\partial FC_i < 0. \tag{5.4}$$

Substitute (5.3) into (5.4) and rearrange to get a restatement of the scissors effect as

$$\partial \quad /\partial FC_i < 1 \quad (\qquad\qquad). \tag{5.5}$$

In general, a scissors effect exists if an increase in the initiating component causes Fed credit to decrease, stay the same, or increase by less than one-for-one.

On the basis of equation (5.5), different types of scissors effects can be specified: a full scissors, a partial scissors, and a super scissors. A full scissors effect is said to exist if an increase in the initiating component of Fed credit causes the other component to fall one-for-one; that is, $\partial FC_r/\partial FC_i = -1$. Then, from equation (5.3), Fed credit does not change:

$$/\partial FC_i = 0 \quad (\qquad\qquad). \tag{5.6}$$

A partial scissors effect is said to exist if an increase in the initiating component causes the other to fall by less than one-for-one; that is, $-1 < \partial FC_r/\partial FC_i < 0$. Then, from equation (5.3), Fed credit rises, but by less than one-for-one:

$$0 < \partial FC/\partial F \quad _i < 1 \quad (\qquad\qquad). \tag{5.7}$$

A super scissors effect is said to exist if an increase in the initiating component causes the other to fall by more than one-for-one; that is, $\partial FC_r/\partial FC_i < -1$. Then, from equation (5.3), Fed credit falls:

$$\partial \quad /\partial FC_i < 0 \ (\text{Super scissors effect}). \tag{5.8}$$

Finally, no scissors effect exists if an increase in one component does not cause the other to fall; that is, $\partial FC_r/\partial FC_i \geq 0$. Then, from equation (5.3), Fed credit rises by one-for-one or more:

$$\partial \quad /\partial FC_i \geq 1 \ (\qquad\qquad\qquad\qquad). \tag{5.9}$$

Equation (5.6) leads to an important implication not widely acknowledged in the literature on the scissors effect. Note that, as a matter of arithmetic, any change in Fed credit must be accompanied by a change in at least one of its components. *If Fed credit changes over time, then a full scissors effect cannot exist*, since, in this case, a change in one component of Fed credit (the initiating component) would be associated with a change in Fed credit, thus violating equation (5.6).

Casual inspection of figure 5.1 indicates that Fed credit did change during the 1920s. Moreover, the changes appear to be strongly seasonal, with Fed credit tending to rise in the second half of a year and either flat or falling in the first half. The seasonal movement in Fed credit represents prima facie evidence against an exact, full scissors effect for the 1920s; that is, any effect must be inexact, either partial or super. Measuring the inexact effect, and understanding its genesis, will require explicit recognition of the seasonal forces shaping Fed credit movements.

3. Riefler-Burgess Doctrine

Riefler and Burgess offer an explanation for the scissors effect that, at first reading, sounds strange to modern ears. It seems to contradict our understanding of how Fed policy affects the banking system; namely, that an open market purchase of securities increases both Federal Reserve credit and deposits in the banking system. One is tempted to view the RB Doctrine as an historical relic that we moderns, backed by a century's worth of economic research, have outgrown. If Riefler and Burgess had been exposed to modern monetary economics, then surely, we are tempted to argue, they would not have offered their ill-conceived doctrine in the first place.

We should not give-in to this temptation: Riefler and Burgess explicitly acknowledged the modern view. Most relevant is Burgess's discussion of the possible effects of open market operations:

> Without careful analysis it might be supposed that the effect on the credit situation of a purchase of government securities by the Reserve Banks would

> be an immediate increase in the total volume of credit. The Reserve Bank purchasing the securities pays for them with Federal Reserve funds. The seller of the securities deposits these funds in his own bank, and that bank in turn deposits the funds in the Federal Reserve Bank and thus finds itself in the possession of additional reserves which could be used for making additional loans or investments. Since these are reserve funds they might form the basis for an increase in the volume of bank credit considerably greater than their dollar amount. One might expect, therefore, that purchases of government securities by the Reserve Banks would result, first, in an increase in the total loans and investments of the Reserve Banks; and, second, in an increase of several times that amount in the total volume of bank credit in use (Burgess 1946, 235).

While *one* might expect that an open market operation would result in an increase in Fed credit and bank credit (bank deposits), Burgess did not, commenting, in the sentence immediately following the above paragraph, that "as a matter of practice this seldom takes place" (1946, 235). Why not? The simple answer is the scissors effect in the form of an offsetting reduction in discount loans. In the words of Burgess:

> Whenever the member banks are in debt at the Reserve Banks they try to pay off that indebtedness. Under these conditions, when a member bank receives a Federal Reserve check, put into the market through the purchase of government obligations, that bank will ordinarily use the check to liquidate borrowings from the Federal Reserve Bank rather than use it for a further extension of credit. In the case the member bank receiving the check is not in debt at the Reserve Bank and therefore employs the funds by purchasing additional investments or making additional loans, the extra amount of credit thus put into the market usually finds its way promptly to some bank which is in debt at the Reserve Bank. Thus the usual effect of a purchase of government securities by the Reserve Banks has been a corresponding reduction in the borrowing of member banks (Burgess 1946, 235–36).

The opening sentence establishes a necessary precondition for the scissors effect: member banks must be in debt at the Reserve banks. If the first bank (the one receiving the Federal Reserve check) is out of debt at the Fed, then a scissors effect does not immediately occur; that bank cannot retire debt because there is no debt to retire. The presumption, however, is that there is some bank down the line which is in debt and whose attempt to retire that debt will activate the scissors effect. In this account, all banks employ the same decision-making criteria: retire debt when the opportunity arises. Each "purchases additional investments" or "makes additional loans" not on the basis of profit considerations but only as a last resort, when there is no debt left to retire.[3] When discount debt does exist, the bank responds to the Federal Reserve open market purchase by retiring its debt at the Federal Reserve. And importantly, that offset, the scissors effect, is taken to be one-for-one, as suggested by the use of the word "corresponding" in the last line of the passage quoted above.

Burgess's line of thinking raises three additional questions. First, why do member banks attempt to pay off discount debt when given the opportunity, regardless of the rate of return on alternative uses of funds; for example, loans? Second, why would they borrow from their Reserve banks in the first place? Third, granting the existence of a scissors effect, what is the policy motivation that underlies a Reserve bank open market operation? Why would a Reserve bank purchase a government security if, due to the scissors effect, Fed credit does not change?

With respect to the first question, member banks are presumed to distaste discount debt so intensely that, at least under normal circumstances, the benefits of paying off the debt outweigh the potential interest revenues that could be earned by extending a loan. As primary justification for this distaste, both Riefler and Burgess cite the tradition against borrowing. In his book, *Money Rates and Money Markets in the United States* (1930), Riefler observes that, traditionally, borrowing of any kind "was viewed with such distrust as an evidence of weakness, or at the least of unsound practice" (Riefler 1930, 29–30). Similarly, Burgess argues: "Just as in the old days the bank which borrowed largely and continuously from its correspondents was looked upon with suspicion, so today there exists generally a feeling against large and continuous borrowing from a Federal Reserve Bank. This is a feeling which the officers of the Reserve System have at times encouraged" (Burgess 1946, 219–20). Accordingly, RB are inclined to replace the assumption underlying the discretionary and self-regulated models of chapter 4, that member banks *willingly borrow* from their Reserve bank when the profit opportunity becomes too tempting, with the assumption that member banks *avoid borrowing* at all costs, due to the stigma attached to such borrowing by the public as well as the likelihood that holding discount debt would subject the bank's balance sheet to additional scrutiny by "the officers of the Reserve System," that is, the Federal Reserve Board.

The second question—why would a bank borrow from its Reserve bank in the first place?—is a more difficult one that calls attention to a possible motivational asymmetry between open market operation purchases and sales. As indicated by the Burgess passage quoted above, when confronted by an open market-induced injection of reserves, a member bank that wants to avoid the stigma and scrutiny associated with discount debt would seek to pay off any preexisting debt. Similar logic would seem to dictate that, when confronted by an open market-induced drain of reserves, a member bank that wants to avoid stigma and scrutiny would choose to borrow in the federal funds market (or call in loans), to replace the reserve loss, rather than visit the discount window to incur new debt. The problem with this reasoning for RB is that if they consistently adhere to the motivational assumption that a member bank hates discount debt, then they are led to the conclusion that open market-induced injections of reserves call forth a scissors effect, but drains do not. So logic dictates that they either give up the assumption that member banks hate discount debt or they give up the scissors effect that open market operations are *generally* offset by discount loans.

I suggest that a careful reading of Riefler and Burgess indicates that they too had some uneasiness with respect to this logical dilemma. Indeed, Burgess immediately follows his account of a Reserve bank open market purchase, outlined above, with an account that seeks to explain why, when logic seems to dictate otherwise, a reserve-draining sale produces a scissors effect.

> Conversely, when a Reserve Bank sells government securities it receives in payment a check drawn on some member bank. This check is chargeable against the reserve deposit of the member bank at the Reserve bank, and the member bank, unless there is some offsetting credit, finds itself deficient in its reserves. In order to correct this reserve deficiency the member bank either borrows from the Reserve Bank or sells it bills, *or else throws the burden on some other bank* by selling investments or calling loans to brokers in the open market. The net result is usually an increase in member bank borrowings or in some other form of Reserve bank credit (Burgess 1946, 236–37; italics added).

The problem with this account is that the member bank in this passage, facing a reserve drain, appears to be a different creature from the bank in the earlier passage, facing an injection. In responding to an injection, the first member bank that receives the funds (and is in debt at its Reserve bank) takes definitive action: it visits the discount window to retire discount debt ("that bank will ordinarily use the check to liquidate borrowings from the Federal Reserve Bank rather than use it for a further extension of credit"). The bank categorically rejects the option of visiting the credit market to extend a loan, since it has discount debt to repay and it hates discount debt. In responding to a drain, however, the first member bank is less dogmatic, willing either to sell an investment (or, equivalently, call-in a loan) or visit the discount window (or, equivalently, sell its bills) to replenish funds. If the member bank rejects the second option, as you might have expected a hater of discount debt to do, then an offsetting increase in discount borrowing, the scissors effect, does not occur.

Significantly, Burgess offers a loophole that, in his mind, rescues the scissors effect. The loophole is contained in the italicized phrase "or else throws the burden on some other bank." Presumably, Burgess believes that if the first member bank rejects the discount window option, instead preferring to sell an investment, then the reserve deficiency is pushed onto some other member bank who will visit the discount window. Burgess's rescue attempt implies a decision-making criterion for the first member bank that differs from the criterion employed by another member bank down the line. But why should the two banks decide differently: if the profit-maximizing solution for the first member bank is to sell an investment, then is it not profit-maximizing for every other member bank, when faced with the same set of opportunities and constraints, to sell an investment? If the answer is yes, which I contend logical consistency requires, then the scissors effect is never triggered.

Pushing this objection aside for the moment, assume that the scissors effect is in play for both open market purchases and sales. Then, the third

question posed above is relevant. What is the policy motivation for Fed open market operations that, due to the scissors phenomenon, do not affect monetary aggregates? The answer is interest rates. Even though open market operations are Fed credit-neutral, they still have the power, or so the RB Doctrine claims, to smooth interest rates.

To best understand this somewhat surprising answer, we turn from Burgess to Riefler. In his chapter, "The Relation of Reserve Bank Operations to Money Rates," Riefler first argues that, given member banks' distaste for discount loans, the discount rate does not peg—indeed, it does not even influence—the market rate of interest. What, then, is the critical factor that determines the interest rate? Riefler observes:

> The functioning of the reserve banks in the money markets must, therefore, be considered from the point of view of the theory that changes in the volume of member bank borrowing exert a more important influence on rates then [*sic*] do changes in discount rates...
>
> If this theory is correct, fluctuations of money rates in the short-term open markets should be governed by corresponding fluctuations in the aggregate volume of member bank indebtedness at the reserve banks, increased borrowing there being reflected in a rise of money rates, and decreased borrowing in a decline of rates in these markets (Riefler 1930, 25–26).

Riefler goes on to indicate why this relationship between member bank indebtedness and interest rates holds:

> This would be expected because under this theory member banks do not borrow in order to increase their loans, but rather endeavor to contract their loans in order to repay their indebtedness. During the period under review, this appears to have happened in that increased borrowing from the reserve banks has not led to increased offers of funds in the short-term open markets, but rather to withdrawals. In other words, to the extent that member banks have hesitated to borrow from the reserve banks during this period and have repaid their indebtedness as soon as possible, one would expect to find—as one does in fact find—that loans were most costly in the money markets when borrowing at the reserve banks was large, and that funds have been offered most freely when indebtedness at the reserve banks was low. Fluctuations of money rates in the short-term open markets, therefore, would be expected under this theory to show a distinct correspondence with fluctuations in member bank borrowing at the reserve banks (Riefler 1930, 26).

Burgess seconds this theme, drawing a direct connection between open market operations, member bank indebtedness, loan supply in the credit market, and interest rates.

> The principle of open-market operations may be summarized by saying that purchases of securities by Reserve Banks tend to relieve member banks from debt to the Reserve Banks, and lead them to adopt a more liberal lending and investing policy. Money rates become easier (Burgess 1946, 239).

So there you have it. Riefler and Burgess present a somewhat lengthy (and unorthodox), but tightly argued, theory of interest rate determination and Reserve bank open market operation policy. When member bank indebtedness is high, member banks feel unduly burdened by the enhanced balance sheet scrutiny from their Reserve bank that such indebtedness entails. Feeling the heat, member banks tend to be cautious in their lending policy. They withdraw funds from the short-term open markets, which builds-up reserves, presumably buying some goodwill from Reserve banks. The cutback in credit supply then puts upward pressure on the interest rate. Reserve banks respond by purchasing government securities, which, due to the scissors effect, tends to "relieve member banks from debt to the Reserve Banks" and leads those member banks "to adopt a more liberal lending and investing policy." The final result of those open market operations is an interest rate smoothing one: "Money rates become easier."

Interestingly, Riefler thinks it important to call attention to the speed with which member bank borrowing calls forth an increase in interest rates:

> The correspondence, moreover, as would be expected from the theory, is free of any lag. In general, an increased volume of indebtedness at the reserve banks has been closely accompanied by an increase in money rates in the short-term open markets, and a decrease in indebtedness has been currently reflected in falling rates (Riefler 1930, 27).

Under this interpretation, the *current* level of member bank indebtedness serves as a reliable indicator of *current* credit market ease or tightness (low or high interest rates). And it is this relationship, between member bank indebtedness and interest rates,

> which has given to reserve bank operations in the open markets that peculiar efficacy for control over the money markets . . . Induced through open market operations, changes in the volume of member bank indebtedness have been used since 1922 both to tighten and to ease the money markets, independently of changes in discount rates (Riefler 1930, 27–28).

Riefler finally attempts to identify factors, other than open market operations, that determine the level of member bank indebtedness. In his mind, "Month-to-month change in currency demand is one of the more important factors" (Riefler 1930, 136). Here, Riefler explicitly acknowledges the seasonal underpinnings of movements in currency demand.

> During the fall and winter . . . from late harvesting time on, when both retail trade and industry are more active, a larger volume of currency is withdrawn from our banking institutions to meet wage payments in harvesting, industrial payrolls, and the till and pocket money requirements of retail trade. This movement draws an increasing amount of currency into circulation from August until the year-end holidays. To obtain this currency non-member banks draw on their member bank correspondents, and member banks draw on the reserve

> banks where the withdrawal is charged against their reserve balances, and, in the absence of new supplies of reserve funds from other quarters, results in an increase in borrowing at the reserve banks (Riefler, 1930, 137).

An important element of Riefler's overall thesis is that seasonally timed credit market stringency (high interest rates) is first and foremost a supply side phenomenon: the credit market loan supply curve shifts left. First, the public withdraws currency from their bank deposits.[4] Second, banks borrow from their Reserve banks. And, third, banks cut back on their loan supply. Under these circumstances, discount borrowing, which triggered the supply shift, is a reliable indicator of credit market stringency. If, in contrast, seasonal-timed credit market stringency is routinely driven by a (right-ward) shift in the credit market loan demand curve, then the level of discount borrowing is an unreliable signal of stringency, since "changes in the demand for credit do not bear a constant relationship to changes in member bank indebtedness at the reserve banks" (Riefler 1930, 135). The reason for the lack of a constant relationship is that the public may borrow from banks (demand credit) to obtain funds to be left on deposit. While the increase in deposits may induce a bank visit to the discount window, it does so only to acquire the required reserves needed to back the new deposits. "It is apparent, therefore, that credit expansion . . . may be rapid without increasing greatly the demand for reserve bank funds" (Riefler 1930, 136). The bottom line is that Riefler's supposition that the level of discount borrowing is a reliable indicator of credit market conditions holds only if, in the credit market, shifts in loan demand are secondary to shifts in loan supply.

After this lengthy account, we are now in a position to summarize the RB Doctrine pertaining to movements in Fed credit and its components, discount loans and government security holdings. The two key elements in the doctrine are (1) a one-for-one scissors effect and (2) a Reserve bank interest rate smoothing objective. The story starts with a seasonal movement (e.g., an increase) in the demand for currency. The public withdraws currency from their deposits and banks replenish those reserves by borrowing from Reserve banks, even though they know that their balance sheets will be subject to increased scrutiny as a result of their discount window visits. Feeling the burden of holding discount debt, banks are inclined to withdraw loans from the credit market. The reduction in loan supply raises interest rates and an interest rate smoothing Federal Reserve responds by buying government securities, which injects reserves into the banking system. Discount debt-hating banks act in the way anticipated by the Federal Reserve. They take advantage of this injection by reducing discount debt dollar-for-dollar with the open market operation. Here we observe the one-for-one scissors effect (albeit an effect that is embedded in a longer chain of events): Federal Reserve government security holdings increase and discount loans decrease by a corresponding amount. Thus comforted by the knowledge that indebtedness to Reserve banks is lower, member banks more freely extend loans to the credit market. That is exactly what Reserve banks had intended by

initiating open market operations—upward interest rate pressure is released thereby avoiding a seasonal spike in interest rates.

4. SELF-REGULATED RESERVE BANKING: BAREBONES

The competitive Reserve banking model presented in the last chapter provides a different explanation for the scissors effect and for what drives discount loans and open market operations. To make the contrast as sharp as possible, this section outlines a "barebones" model of competitive Reserve banking, based on the empirical observation that member banks, circa the 1920s, generally did not choose the amount of reserves to hold behind deposits; instead, they faced a binding reserve requirement. With the demand for deposits determined by the public, a bank's only decision variable under these circumstances would be the amount of funds to borrow from its Reserve bank. Then, loans extended by a bank are residually determined by the amount remaining after subtracting required reserves from the source of funds, deposits and discount borrowing.

Under this barebones setup, the solutions of the self-regulated model can be described by a concise set of equations:

$$L_{RB} \quad (i \quad d)/a, \tag{5.10}$$

$$S_{RB} \quad \left(rB^2/ \quad \right) - L_{RB}, \tag{5.11}$$

$$FC = rB^2/s^2, \tag{5.12}$$

$$B \quad \mathbf{r_D D} \quad \mathbf{C = D}(\mathbf{r_D} + c), \tag{5.13}$$

$$i \quad \left[Y \quad \mathbf{D}(1+c)\right]/b \quad i[Y \quad D \quad C \quad b], \tag{5.14}$$

where the reserve ratio, r_D, is now assumed to be fixed by an exogenously imposed reserve requirement behind deposits and B = R + C is the monetary base. Equations (5.10)–(5.14) are the same as the corresponding equations in chapter 4 with the proviso that $R = r_D D$ is substituted for $R = \delta[1 - (i\delta/s^2)]$.

The scissors effect is given by equation (5.11). The parenthetical term is Fed credit, equation (5.12). Using equations (5.12) and (5.13), Fed credit can be restated in general functional form as

$$FC = f\left[r, \ \mathbf{B}(\mathbf{r_D}, \ D, \ C), s^2\right]. \tag{5.12'}$$

A one-for-one scissors effect arises when L_{RB} changes but FC does not; that is, when i, d, or a change, holding constant r, r_D, D, C, and s^2. A comparison

of (5.14) with (5.12') indicates that the right-side variables in the interest rate equation but not in the Fed credit equation are the credit demand shift and slope parameters, Y and b. Accordingly, the only factors that change L_{RB} but not FC are d, a, Y, and b. Changes in any of the four result in exactly offsetting changes in discount loans and government securities and in this sense represent primary triggers for the scissors effect.

The scissors offset will not be exact if Fed credit changes. Suppose a primary trigger, d, a, Y, or b, causes discount loans to increase. At the same time, one of the Fed credit (FC) parameters, r, r_D, D, C, or s^2, in equation (5.12') changes. Then, the decrease in government securities will not be one-for-one. If Fed credit increases, the offset is less than one-for-one (a partial scissors effect). If Fed credit decreases, the offset is more than one-for-one (a super scissors effect). Either way, the Fed credit parameters, r, r_D, D, C, or s^2, represent secondary factors that undermine an exact scissors effect.

An example helps illustrate the role played by primary triggers and secondary factors in the scissors effect. Suppose Y (a primary trigger) and C (a secondary factor) rise, with Y dominating C in equation (5.14) causing a modest rise in the interest rate. Provisionally holding Fed credit constant, the interest rate-induced rise in discount loans causes Reserve bank security holdings to fall one-for-one. But, in the face of the currency increase, Fed credit will not stay constant, it rises (equation 5.12), implying that the fall in securities will be less than one-for-one. According to the competitive model, therefore, an assessment of the scissors effect is incomplete unless it takes into account secondary factors, like C, that affect the demand for Fed credit. Put differently, the competitive theory implies that an exact scissors effect emerges only after controlling for all possible secondary factors: r, r_D, D, C, and s^2.

The identification of likely secondary factors can be further refined. Since we suspect that seasonal components drive Fed credit, only those factors that are seasonal need be identified and held constant in assessing the scissors effect relationship between discount loans and government securities. We will use this observation in the next chapter as a guide in choosing the appropriate control variables to include in a scissors regression equation.

5. RIEFLER-BURGESS VERSUS SELF-REGULATED RESERVE BANKING

The RB Doctrine offers a striking contrast to the self-regulated theory of Reserve banking. The contrast can be traced to the basic assumptions of each theory. First, according to RB, the costs of acquiring and holding discount debt outweigh the benefits, even at the margin; according to the self-regulated theory, a profit-maximizing member bank balances costs with benefits, so that at the margin the bank is indifferent between visits to the discount window versus visits to the loan (e.g., federal funds) market. Second, while gold plays, at best, a behind the scenes role according to RB, in the self-regulated theory a Reserve bank's commitment to redeem its

monetary liabilities, bank reserves plus the public's currency, for gold serves to anchor the total demand for those liabilities, providing an upper bound on the amount of a Reserve bank's total assets. Third, while RB tend to view Reserve banks as acting cooperatively, with Miron-like discretionary powers, the self-regulated theory is a story of intense rivalry, which transforms each Reserve bank into a price-taker, willing to accommodate the demand for its monetary liabilities.

While both theories posit the existence of a scissors effect, the different assumptions lead to different seasonal triggering mechanisms. Posit, two generic seasons, the harvest and nonharvest seasons. According to RB, a currency withdrawal (currency increase accompanied by a deposit decrease) during the harvest season is the primary trigger and an increase in credit demand a secondary factor. According to the competitive Reserve banking model, an increase in credit demand (increase in Y or decrease in b) and/or a decrease in discount loan "cost" (decrease in d or decrease in a) are the primary triggers with r, r_D, D, C, and s^2 possible secondary factors.

The different assumptions also generate opposing stories about the course of events after the seasonal trigger is pulled. According to the RB Doctrine, the scissors effect does not commence immediately after the currency withdrawal. First, member banks respond to the harvest season withdrawal by visiting the discount window and, because of this visit, they reduce their willingness to supply loans. Next, interest rate smoothing Reserve banks intervene to purchase government securities. Finally, the scissors effect kicks-in as discount loans fall one-for-one. Because member bank willingness to lend rebounds, Reserve banks find that their discretionary open market operations have achieved their objective: moderate the rise in the interest rate during the fall harvest season.

In its simplest form, the RB Doctrine implies a particular sequence of Fed credit changes over the course of a typical year. During the harvest season, (1) the public withdraws currency (the seasonal trigger), (2) member bank discount borrowing rises, (3) Reserve bank government security holdings rise, and (4) member bank discount borrowing falls, one-for-one with the government security purchases in the previous step. During the nonharvest season, (1) the public deposits currency, (2) member bank discount borrowing falls, (3) Reserve bank government security holdings fall, and (4) member bank discount borrowing rises, one-for-one with the government security sales in the previous step.

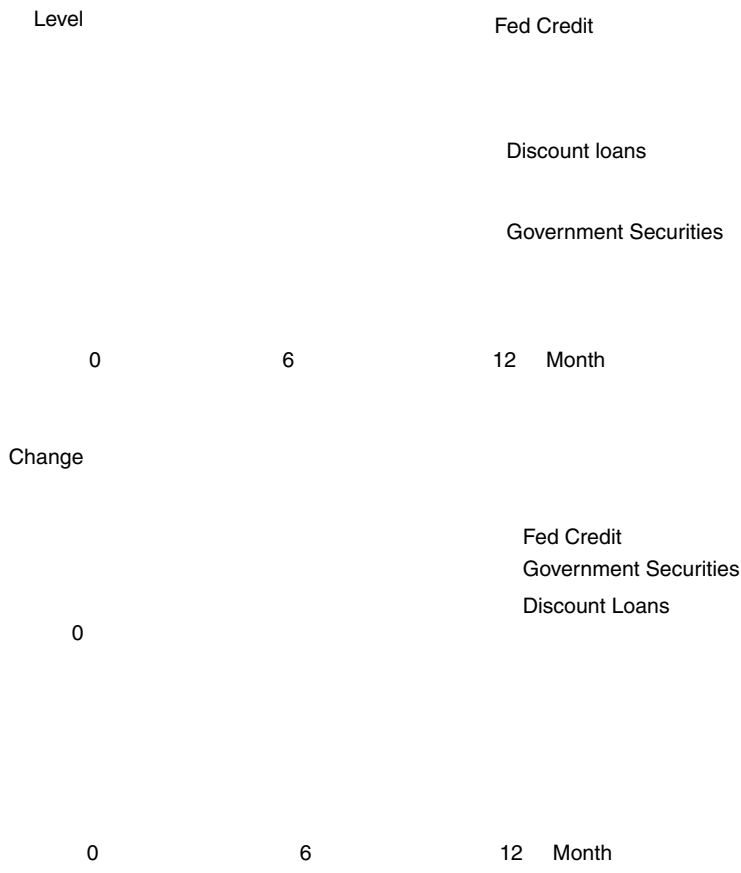
Interestingly, over the course of a particular season, changes in Fed credit, the sum of discount borrowing and government security holdings, do occur, even though the scissors effect is fully operative. The reason is that a change in discount borrowing (step 2) precedes Reserve bank discretion (step 3). During the harvest season, member bank discount borrowing rises and Reserve banks, exercising their discretionary powers, purchase government securities. Then, the one-for-one scissors effect occurs in moving from step 3 to step 4, as member banks decrease their discount borrowing by an amount that offsets the open market operations. Overall, Fed credit rises,

government security holdings rise (step 3), while the change in discount borrowing is ambiguous (borrowing goes up in step 2 but down in step 4), though if Reserve bank discretion fails to completely smooth the seasonal interest rate increase, it must be because step 2 dominates step 4 such that on net discount borrowing rises. Over the entire year, however, there is no net change in Fed credit or in the individual components of Fed credit due to purely seasonal factors. Other things constant, changes occurring in the nonharvest season unwind changes occurring in the harvest season.

The competitive theory of Reserve banking entails different seasonal implications for Fed credit changes. Under this theory, the scissors effect commences immediately after the trigger. Take the credit demand parameter, Y, as the stand-in for the seasonal trigger. During the harvest season, (1) the demand for credit increases, putting upward pressure on interest rates (2) member bank discount borrowing rises, and (3) Reserve bank government security holdings fall, one-for-one, with the rise in discount borrowing, holding other factors constant. During the nonharvest season, (1) the demand for credit decreases, (2) member bank discount borrowing falls and (3) Reserve bank government security holdings rise, one-for-one, with the fall in discount borrowing, holding other factors constant. A possible seasonal change (increase in the harvest season and decrease in the nonharvest season) in currency demand is a secondary factor that would weaken the scissors effect, the response of government security holdings to discount loans, making it less than one-for-one.

The competitive theory of Reserve banking disagrees with the RB Doctrine about the *initiating and responding* blades comprising the scissors effect. According to the RB Doctrine, Reserve banks, exercising discretionary powers, initiate open market purchases and member banks respond by reducing discount borrowing. If there are no discretionary open market operations, there is no scissors effect in the form of offsetting changes in discount loans. But presuming an interest rate smoothing objective, there are discretionary open market operations and there is a scissors effect, with open market operations (the *initiating* blade) driving discount loans (the *responding* blade). According to the competitive theory, member banks, pursing profits, visit the discount window and Reserve banks, pursing profits (engaging in expense preference behavior), respond by conducting open market sales. With respect to the scissors effect, discount loans (the *initiating* blade) drive open market operations (the *responding* blade).

Figures 5.2 and 5.3 illustrate the contrasting seasonal implications of the RB Doctrine and the competitive theory. The RB Doctrine requires seasonality in Fed credit and the initiating component, government securities, with both exhibiting a V-shaped pattern in figure 5.2a. Strictly speaking, the theory is silent on the issue of discount loan seasonality, though if interest rate smoothing by the Reserve banks is less than complete, discount loans will also exhibit at least a modest V-shape. Note here that while government securities and discount loans move down and up together, a full one-for-one scissors is embedded in the RB storyline, but does not manifest itself due

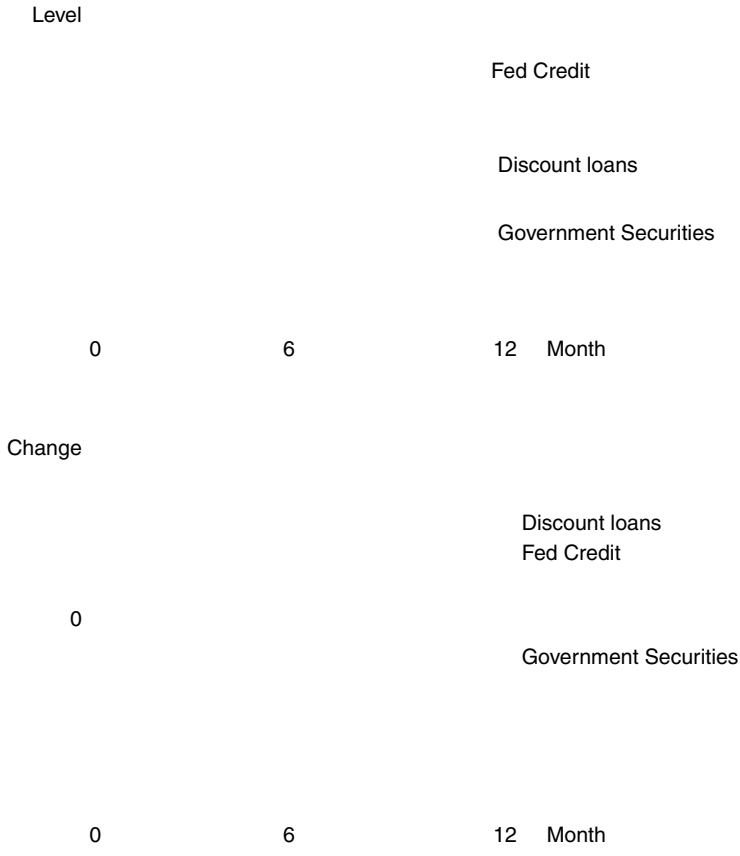


Figures 5.2a and 5.2b Riefler-Burgess Doctrine and Miron-plus Theory: Seasonality

to the added effect of the original seasonal trigger (currency deposits and withdrawals) on discount loans.

The competitive Reserve bank theory requires seasonality in the initiating component, discount loans, with discount loans exhibiting a V-shaped pattern in figure 5.3a. Holding r, B, and s^2 constant, the theory predicts a full scissors effect, with government securities exhibiting an inverted V-shape, such that Fed credit is constant throughout the year. However, figure 5.3a presumes seasonal movements in r, B, or s^2 such that Fed credit tends to rise in the harvest month and fall in the remaining months, which dilutes seasonality in government securities, thus flattening (or possibly eliminating) its inverted V-shape and imparting V-seasonality to Fed credit.

The main difference between the RB Doctrine and the competitive theory emerges most clearly in a comparison of the first difference figures, 5.2b and 5.3b. The core prediction of the RB Doctrine is that first differences of Fed credit and government securities are positive during the harvest months, with a tendency for Fed credit first differences to exceed government security



Figures 5.3a and 5.3b Self-regulated Theory: Seasonality

differences which, in turn, exceed discount loan differences. The core prediction of the competitive theory is that first differences of Fed credit and discount loans are positive during the harvest months, with discount loan differences exceeding Fed credit differences if government securities retain their inverted V-shape; or, alternatively, with discount loan differences equaling Fed credit differences if the inverted V-shaped pattern for government securities is eliminated.

While figures 5.2 and 5.3 show Fed credit tending to return to its original level by season end, this need not be the case. Fed credit, and its components, may have a tendency to be higher or lower at the year-end, while still exhibiting seasonality. Put differently, seasonality in a series does not imply that the series is stationary. According to the competitive theory, however, a strong presumption exists that the monetary base and, hence, Fed credit are stationary due to the gold anchor. In contrast, the RB Doctrine is weaker on the issue of stationarity. Because gold plays at best a secondary role, there is no "heavy" long-run anchor for the monetary

base and Fed credit across years. Changes in the base and in Fed credit may persist over time.

6. Riefler-Burgess versus Miron's Fed

Interestingly, the seasonal implications for Fed credit, government security holdings and discount loans of Jeffrey Miron's discretionary Fed model (see the Miron-plus model in chapter 4) are the same as the seasonal implications of the RB Doctrine. Accordingly, figures 5.2a and 5.2b depict the seasonal implications for not only the RB Doctrine but also for Miron's model. This is somewhat of a puzzle, since (1) RB made a big deal about the scissors impact of a change in government securities while Miron did not, and (2) the microeconomic underpinnings of member bank borrowing differ under the two theories: RB assume that member bank indebtedness at Reserve banks is insensitive to price (the spread between market rates of interest and the discount rate) while the Miron-plus model assumes that member bank indebtedness at Reserve banks is sensitive to the interest rate spread. The key to resolving the puzzle is to appreciate that both theories posit a discretionary Federal Reserve whose stated objective is to smooth nominal interest rates.

The primary reason that Miron did not make a big deal about the scissors effect is rather obvious: his basic model did not contain discount loans. The last chapter extended his basic model to include discount loans adding the assumption, which rings true to modern ears, that discount borrowing by member banks is profit driven, tending to rise and fall with increases and decreases in the spread between the market rate of interest and the discount rate. During the fall harvest season, the interest rate spread tends to rise and an interest rate smoothing Fed tends to purchase government securities to offset the seasonal increase in the interest rate. The open market operation has the intended effect. It reduces the interest rate, thereby reducing the interest rate spread, which causes discount loans to fall, that is, to rise by less than what they otherwise would. Open market operations, taken in isolation, result in a *partial* scissors effect, the size of which depends on the sensitivity of interest rates to open market operations.

Still, I would suggest, a proponent of the Miron-plus model would not be inclined to mention the scissors effect as a crucial feature of the seasonal landscape. One reason is that the scissors effect is embedded in a more encompassing seasonal storyline. Also, the embedded scissors is only partial. The final, and perhaps most important reason, is that it is natural, in the context of the Miron-plus model, to describe all of the elements in the seasonal story as occurring simultaneously. That is, the Fed, in anticipation of the fall harvest season, conducts open market operations, interest rates rise (but not by as much as they would in the absence of the open market operation), and discount loans rise. So what the impartial observer sees is *not* a step-by-step temporal sequence where the scissors effect comprises one of those steps. Rather, what is observed is a rise in government securities accompanied by a rise in discount loans. A proponent of the Miron-plus model would be

excused from highlighting the scissors effect because no discount loan offset is observed.

But isn't the same true of the RB model? Isn't the scissors effect embedded in a more encompassing seasonal storyline where movements in government securities are accompanied by movements in discount loans in the same direction? The answer is *yes*, but . . . In their descriptive account RB did not tend to describe all of the elements in the seasonal storyline as occurring simultaneously. During the fall harvest season, currency is withdrawn from member banks, member bank indebtedness at Reserve banks rises and the interest rate increases. While these events do happen all at once, the Reserve banks' response, or so the story goes, is not contemporaneous. There is a temporal element to the Reserve banks' targeting of member bank indebtedness. Discount borrowing rises, Reserve banks recognize the increase, and then, presumably after some time lapse, they respond by purchasing government securities, which decreases discount borrowing one-for-one with the open market operation. A full scissors effect, induced by the open market operation, is temporally separated from the preceding set of events, which makes it difficult to ignore. Hence, the RB Doctrine gets linked to the scissors effect in the economic history literature, even though RB's full-blown seasonal storyline, like the Miron-plus storyline, implies that, on net, discount borrowing increases with Reserve bank government security holdings during the fall harvest season.[5]

7. CONCLUSION

At this point, where do we stand with respect to giving a credible account of the scissors effect in the 1920s? Over the last two chapters we have identified two discretionary models, Miron's model and the RB Doctrine, and one nondiscretionary model, the self-regulated model, whose implications have relevance for the scissors effect. We have seen that an interest rate smoothing objective is posited for the Federal Reserve under both discretionary models. Given this objective, the major implication is that government securities will exhibit a strong tendency to increase during the harvest season and decrease during the nonharvest season. A secondary implication is that, on net, discount loans tend to move in the same direction as government securities within seasons: a scissors effect will not necessarily reveal itself in the data. In contrast, the self-regulated theory does not posit an explicit interest rate smoothing objective; rather smoothing occurs as a by-product of Reserve bank competition. The major implication is that discount loans will exhibit a strong tendency to increase during the harvest season and decrease during the nonharvest season. A secondary implication is that government securities tend to move opposite to discount loans within seasons, though this scissors effect may be muted.

We have suggested in this chapter and in the previous one that a cursory look at the data does tend to reveal a scissors effect which lends support to the self-regulated model over the two discretionary models. But to have any

confidence in this preliminary assessment, we need to run a formal empirical race between the discretionary and the self-regulated models. That is we need to place under the empirical microscope the contrasting scissors implications of the two sides along with a number of corollary implications that the discretionary models do not share with the self-regulated model. The next chapter represents the staging grounds for this empirical contest.

Chapter 6

Coming to Terms with the Scissors Effect

1. Introduction

This chapter tests the scissors effect and related implications of the two discretionary theories, the Riefler-Burgess (RB) Doctrine and the Miron-plus theory, versus the self-regulated theory of Reserve banking, as presented in the previous two chapters. On the whole, I find that the evidence is consistent with the implications of the self-regulated theory, while at least some of the evidence is inconsistent with the implications of the two discretionary theories. For the period, 1922–28, the major findings for the seasonality of monetary aggregates are as follows:

1. Fed credit is seasonal, rising during the harvest season and falling otherwise. Discount loans are seasonal, rising during the harvest season and falling otherwise. Government security holdings are not seasonal.[1]
2. The monetary base is seasonal, rising during the harvest season and falling otherwise. Currency and its major component, Federal Reserve notes, are seasonal, rising during the harvest season and falling otherwise. Reserves are not seasonal.

The major findings for the seasonality of credit market variables are as follows:

3. Loans are seasonal, rising during the harvest season and falling otherwise. Demand deposits are not low during the harvest season.
4. The interest rate on private loans (the call rate) and the spread between the private rate and the discount rate are seasonal, rising during the harvest season and falling otherwise. Seasonal movements in discount loans are positively related to seasonal movements in the interest rate spread.

The major findings for the scissors effect are as follows:

5. Before controlling for movements in Fed credit, there is at best weak evidence of a scissors relationship between contemporaneous movements in discount loans and government securities.
6. Controlling for factors that the self-regulated theory predicts will influence Fed credit results in a scissors effect, though the offset is less than one-for-one.

Finally, with respect to the gold anchor, the major findings are as follows:

7. There is no tendency for Federal Reserve notes to rise in the long run. Moreover, per capita monetary base and per capita Fed credit are stationary.

The remainder of this chapter documents and discusses each of these findings, with special emphasis on which are consistent or inconsistent with the contending explanations of the 1920s scissors effect, the discretionary theories and the self-regulated theory.

2. Seasonality of Monetary Aggregates

Figure 6.1 shows (once again) the levels of Fed credit and its components, using end-of-the-month data for 1922–28. Replicating the procedure outlined in Holland and Toma (1991), figure 6.2 shows the seasonal pattern in these series. The figure is constructed by taking the coefficients from a regression of monthly first differences of the log of each variable on 12 seasonal dummies (with no intercept) and the subtracting the mean value of the coefficients. Broadly speaking, figure 6.2 is consistent with the self-regulated pattern illustrated in figure 5.3b of chapter 5 and inconsistent with the RB and Miron discretionary patterns illustrated in figure 5.2b of that chapter. In particular, Fed credit and discount loans appear to be strongly seasonal, with positive first differences over the last five months of the year, while seasonality of government securities is muted at best.

Table 6.1 formally tests the seasonality predictions using end-of-the-month data for Fed credit, discount loans and government securities over 1922–28. Again, following Holland and Toma (1991), the first step is to take the log of each of the three variables and regress its first difference on a set of 12 monthly dummies (with no intercept). Then, for each regression, two F-statistics are computed to test whether (1) the last 11 dummy coefficients jointly differ from the first and (2) the sum of the 5 end-of-the-year harvest dummies (August, September, October, November, and December) equal zero. The first is a general seasonality test while the second tests the specific seasonal pattern, for example, whether monthly changes are relatively high during the harvest season. The F-statistics in column (1) of table 6.1 for Fed credit and discount loans indicate statistically significant seasonality. The F-statistics in

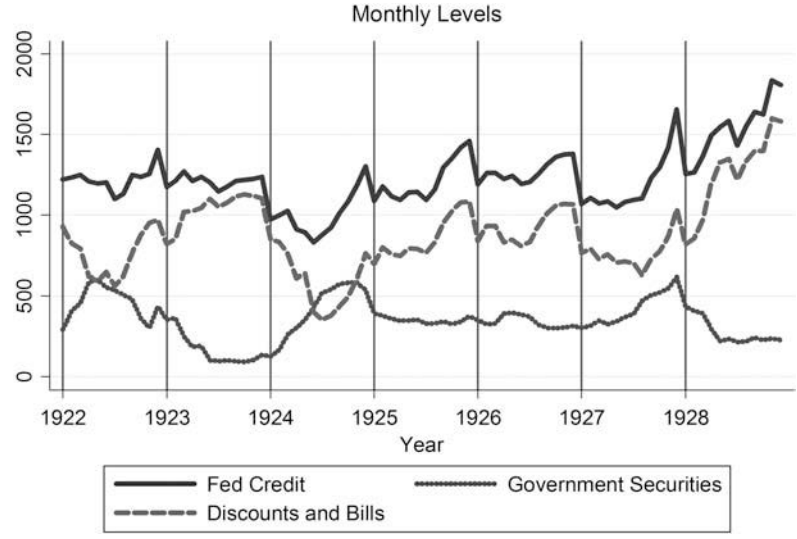


Figure 6.1 Fed credit and components, 1922–28

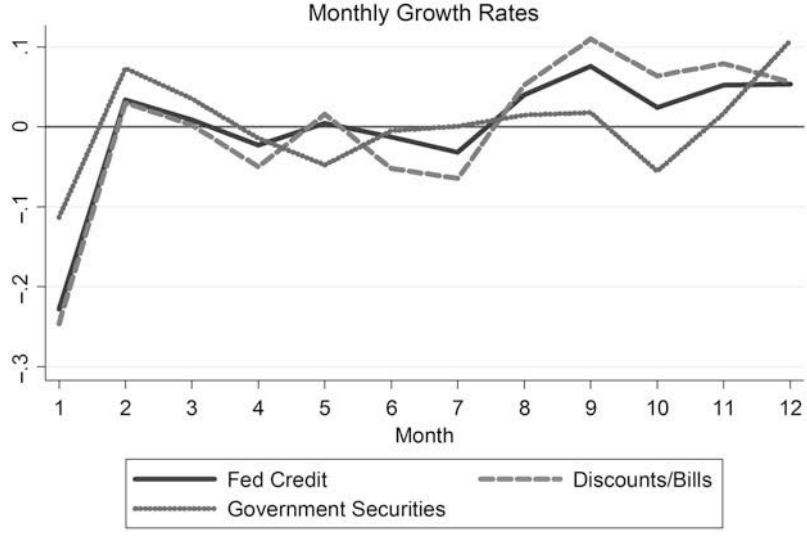


Figure 6.2 Seasonal Fed credit and components, 1922–28

column (2) indicate that seasonality is due to relatively large monthly changes during the harvest months. The F-statistics in columns (1) and (2) for government security holdings, however, indicate the absence of statistically significant seasonality. Overall, these results confirm the conclusions from visual inspection of figure 6.2. They reject the RB implication, as well as the Miron-plus implication, that the Fed conducted a discretionary policy of seasonal

Table 6.1 Tests for seasonality in the monthly growth rate of Fed credit, base and components 1922–28

$$\Delta \ln Y_t = \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 D_6 + \alpha_7 D_7 + \alpha_8 D_8 + \alpha_9 D_9 + \alpha_{10} D_{10} + \alpha_{11} D_{11} + \alpha_{12} D_{12} + \varepsilon_t$$

Y	F-stat ($\alpha_1 = \alpha_2 = \ldots = \alpha_{12}$) (1)	F-stat ($\alpha_8 + \alpha_9 + \alpha_{10} + \alpha_{11} + \alpha_{12} = 0$) (2)
Fed credit	23.01	48.25
	(0.0000)	(0.0000)
Discounts/Bills	6.95	21.86
	(0.0000)	(0.0000)
Government securities	0.75	0.34
	(0.683)	(0.562)
Base	26.00	67.84
	(0.0000)	(0.0000)
Reserves	1.67	7.23
	(0.098)	(0.009)
Currency	33.47	59.49
	(0.0000)	(0.0000)
Federal Reserve notes	25.35	36.05
	(0.0000)	(0.0000)
Other Currency	7.88	22.62
	(0.0000)	(0.0000)

Source: Board of Governors (1943).

Notes: D is a monthly dummy variable. Significance level is in parentheses.

open market operations. They fail to reject the self-regulated implication that the seasonal pattern in Fed credit was due to seasonal member bank borrowing from Reserve banks.

Having cleared this first empirical hurdle, the self-regulated model has a more stringent set of Fed credit seasonality implications that can be put to the test. From the barebones model of self-regulation presented in the previous chapter, Fed credit (FC) is given by

$$FC = rB^2/s^2. \tag{6.1}$$

Accordingly, the seasonality of Fed credit, documented above, requires that at least one of (or a combination of) the three right-side variables—the monetary base (B), the government interest rate (r), or the variance of gold redemptions from Reserve banks (s^2)—be seasonal.

Focusing first on the monetary base, figure 6.3 shows the levels of the monetary base and its components, currency and reserves. Casual inspection indicates a seasonal pattern for the monetary base, with the base tending to be higher at the end of each year compared to the rest of the year. Moreover, base seasonality appears to be due to seasonality in currency; reserves show little indication of seasonality. A more systematic empirical approach reinforces

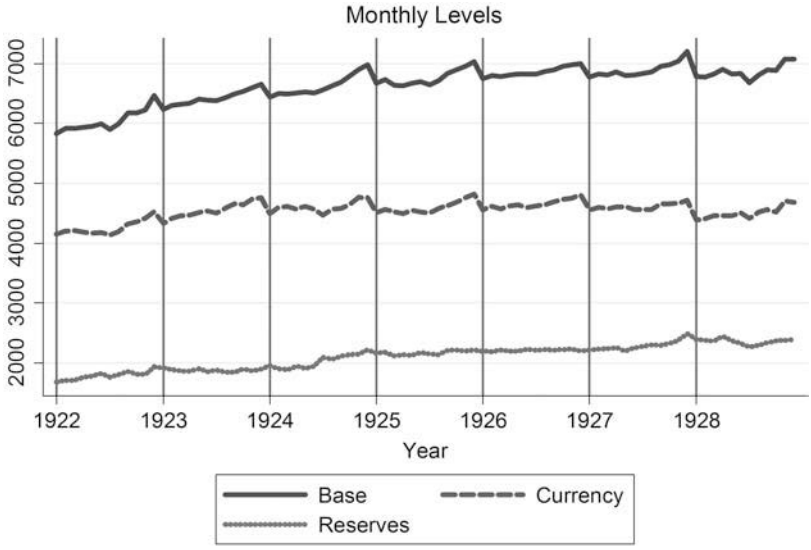


Figure 6.3 Base and components, 1922–28

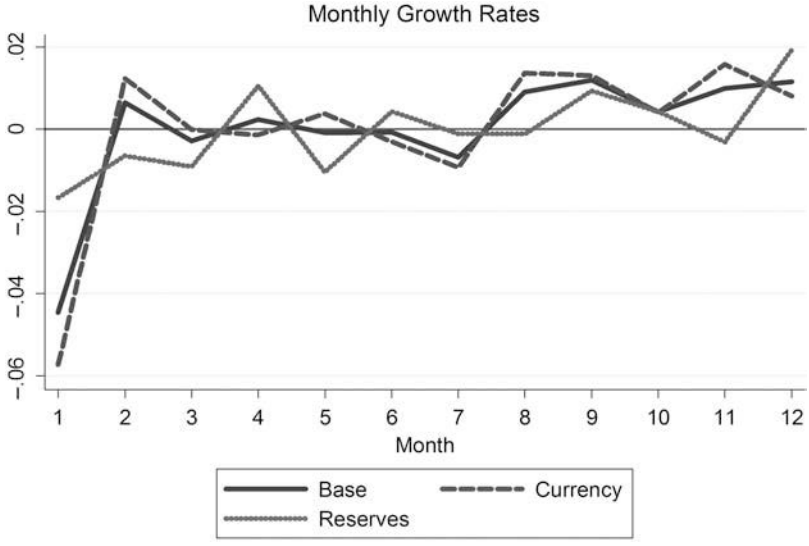


Figure 6.4 Seasonal base and components, 1922–28

these conjectures. The seasonal patterns displayed in figure 6.4 show strong signs of seasonality for the monetary base and the currency component and weaker signs for the reserve component. F-statistics presented in table 6.1 indicate significant seasonality for the monetary base and currency due to relatively large monthly changes during the harvest months. For the reserve

component, however, findings are mixed with the results in column (1) rejecting the general seasonality hypothesis.

We can push the empirical analysis another step forward by subdividing currency, the factor responsible for base seasonality, into a Federal Reserve note component and an "other currency" component. Figure 6.5 shows the levels of currency, Federal Reserve notes and "other currency," and figure 6.6 shows the corresponding seasonal patterns. Inspection of figure 6.5 suggests that each of the three currency measures were seasonally high near the end of the year, a result that is supported by the F-statistics reported in columns (1) and (2) in table 6.1. Inspection of figure 6.6 reveals that for months 8 through 12, the Federal Reserve note series lies above the total currency series, which lies above the "other currency" series. For month 1 the Federal Reserve note series lies below the total currency series, which lies below the "other currency" series. The inference is that relatively strong seasonal movements in Federal Reserve notes are the driving force behind the seasonality in total currency and, hence, the monetary base.

Returning to equation (6.1), the monetary base is only one of three variables that, according to the self-regulated model, could be responsible for movements in Fed credit. The variance of gold redemptions from Reserve banks is not readily observable so it does not help us out empirically. And, as indicated below, there is at best weak support for end-of-the-year upticks in the government rate. According to the self-regulated theory, therefore, there is a strong presumption that the seasonality observed in Fed credit is due to seasonality in the monetary base that in turn is due to seasonality in currency, Federal Reserve notes to be specific, with Reserve banks endogenously

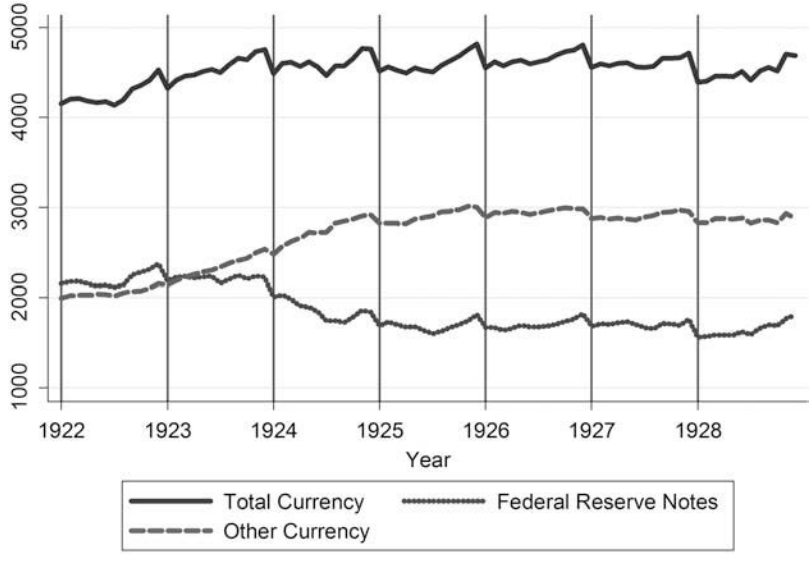


Figure 6.5 Total currency and components, 1922–28

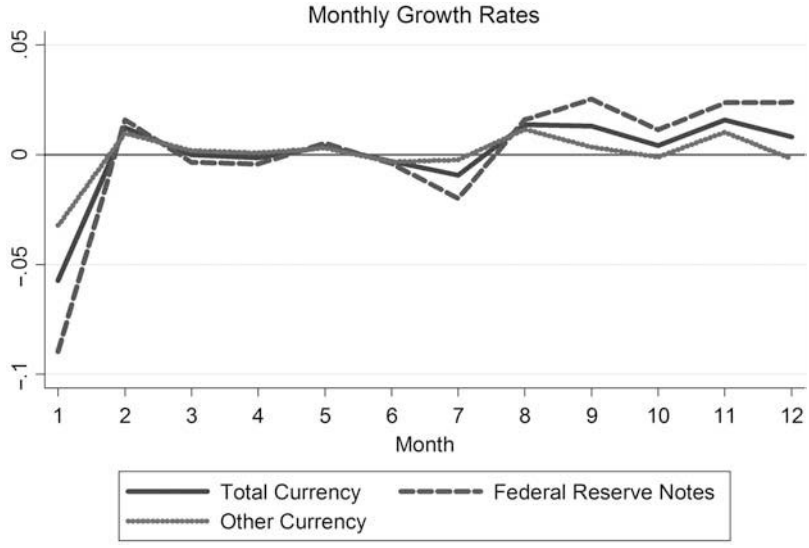


Figure 6.6 Seasonal currency and components, 1922–28

responding to the public's demand for currency, a factor largely exogenous to Reserve banks in the gold setting of the 1920s.

This last point suggests an interesting interpretation the self-regulated theory offers regarding the founding of the Federal Reserve. The preamble of the Federal Reserve Act pointed to the fundamental purpose of the Federal Reserve System: "to furnish an elastic currency." Generally, monetary historians, coming from a discretionary mindset, have interpreted the founders' intent as one of asserting a mandate. Future Fed decision makers must use their discretionary powers to adroitly fine-tune Federal Reserve note supply to satisfy the elasticity mandate. The self-regulated theory begs to differ. The genius of the founders' was not in crafting an apt mission statement for the Fed-to-be. You don't need to be a genius to do that. Rather, it was in setting up a decentralized system that would automatically produce Federal Reserve note elasticity without having to rely on the wisdom of future Fed decision makers.

3. Credit Market

The RB Doctrine and the self-regulated theory differ on the nature of the credit market shock that triggers the seasonal scissors effect. The Miron-plus model is agnostic on this issue. For the RB Doctrine, the triggering mechanism is a restriction in loan supply, resulting from the substitution of currency for deposits during the harvest season, causing interest rates to rise. A necessary requirement of the RB Doctrine, therefore, is that deposits and the equilibrium amount of loans should be seasonal with both loans and deposits falling during the harvest season. For the self-regulated theory, the triggering

mechanism is an increase in loan demand (an increase in Y or decrease in b from the chapter 4 model) during the harvest season. In addition, the self-regulated theory posits that deposits need not fall, and could even rise, during the harvest season;[2] indeed, evidence presented in the next paragraph suggests a harvest season increase in deposits, which would increase loan supply. As long as the loan demand shift dominates the loan supply shift, interest rates rise and, in opposition to the RB hypothesis, the equilibrium amount of loans rises.

Figure 6.7 shows the seasonal pattern of deposits for 1922–28. Unlike the pre-Fed period, demand deposits near the end of the year were not unusually low. If anything, they tended to be higher than average during the last four months of the year; F-statistics reported in table 6.2 do not indicate statistically significant overall seasonality, though the hypothesis that the

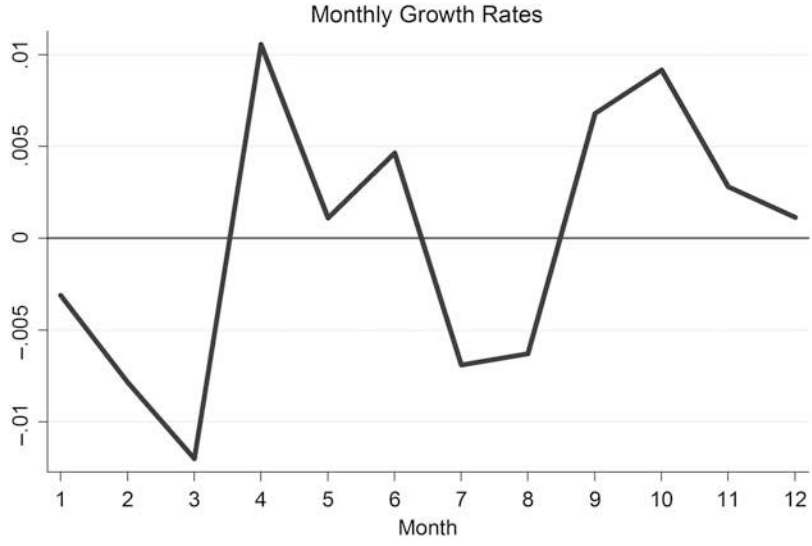


Figure 6.7 Seasonal deposits, 1922–28

Table 6.2 Tests for seasonality in the monthly growth rate of deposits and loans 1922–28

$$\Delta \ln Y_t = \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 D_6 + \alpha_7 D_7 + \alpha_8 D_8 + \alpha_9 D_9 + \alpha_{10} D_{10} + \alpha_{11} D_{11} + \alpha_{12} D_{12} + \varepsilon_t$$

Y	F-stat ($\alpha_1 = \alpha_2 = \ldots = \alpha_{12}$) (1)	F-stat ($\alpha_8 + \alpha_9 + \alpha_{10} + \alpha_{11} + \alpha_{12} = 0$) (2)
Deposits	1.51	4.97
	(0.146)	(0.029)
Loans	5.73	36.72
	(0.0000)	(0.0000)

Source: Board of Governors (1943).

Notes: D is a monthly dummy variable. Significance level is in parentheses.

end-of-the-year dummies sum to zero can be rejected. These results are broadly consistent with the seasonal results for reserves presented in table 6.1.

Figure 6.8 shows the seasonal pattern of loans. Unlike the pre-Fed period, loans near the end of the year were unusually high, not low; the seasonal loan pattern is statistically significant in table 6.2. The presumption here is that the end-of-the-year increase in interest rates is driven by an increase in credit demand, not a decrease in credit supply. Overall, the finding that loans were unusually high at the end of the year—along with the finding that deposits were not unusually low—is consistent with the self-regulated theory and inconsistent with the RB Doctrine.

According to the self-regulated theory, the next step in the scissors story is that the seasonal increase in loan demand elevates the spread between the interest rate and the discount rate (assuming no change in the discount rate), causing discount loans to rise. So a testable implication is that the end-of-the-year increase in discount loans, documented in the previous section, be linked to an end-of-the-year increase in the interest rate spread. In figure 6.9, the first differences in the interest rate, as measured by the call rate, are positive for months 8, 9, and 12 (August, September, and December), with the rate 1.5 percentage points higher in December than the norm. Because seasonal movements in the discount rate are relatively small, the seasonal pattern of the interest rate spread, depicted in figure 6.10, corresponds closely to the call rate pattern in figure 6.9. Moreover, except for November to December, figure 6.10 shows a rough correspondence between seasonal movements in discount loans and seasonal movements in the spread, thus supporting the self-regulated theory.

The F-statistics presented in table 6.3, column (1), formally confirm the conclusions from visual inspection of figures 6.9 and 6.10. The seasonality

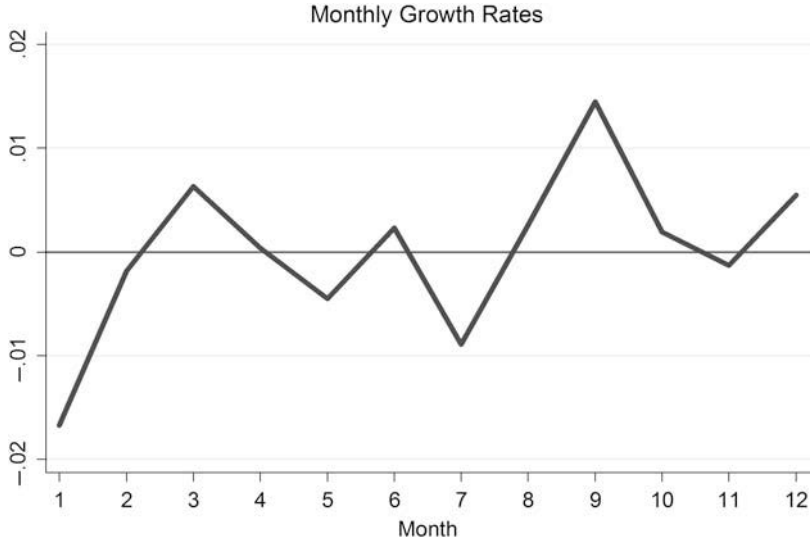


Figure 6.8 Seasonal loans, 1922–28

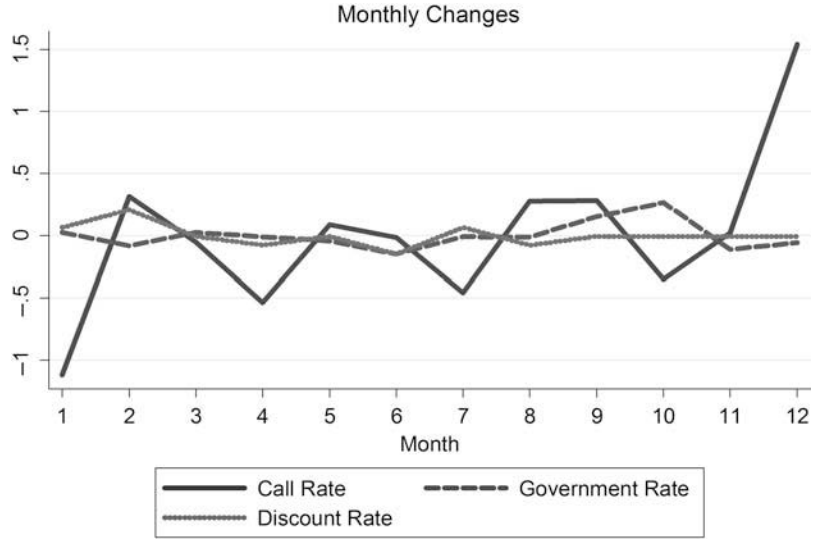


Figure 6.9 Seasonal interest rates, 1922–28

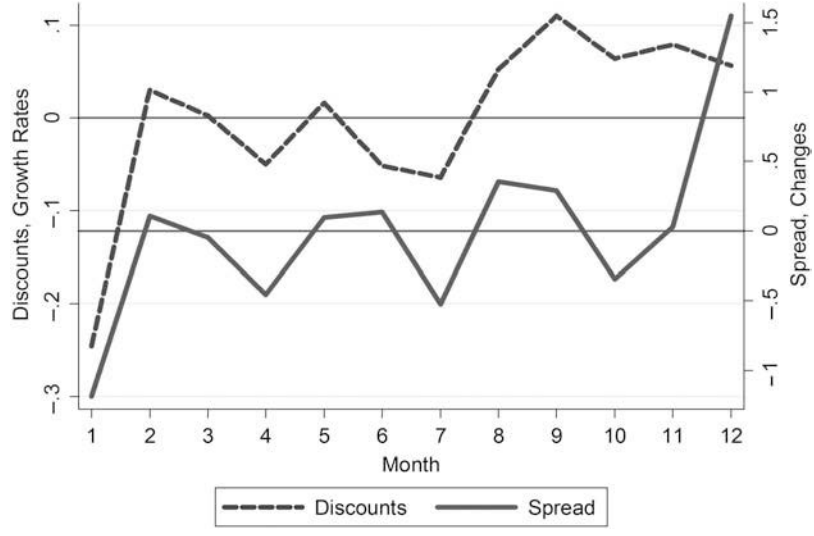


Figure 6.10 Seasonal spread and discounts, 1922–28

hypothesis cannot be rejected for the call rate and the spread between the call rate and the discount rate, but can be rejected for the discount rate. In addition, F-statistics in column (2) are consistent with the hypothesis that call rate and spread first differences are relatively large during the harvest months. Finally, table 6.4 reports the results of running an OLS regression with the first difference of discounts as the dependent variable and the first difference

Table 6.3 Tests for seasonality in the monthly change in interest rates 1922–28

$$\Delta Y_t = \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 D_6 + \alpha_7 D_7 + \alpha_8 D_8 + \alpha_9 D_9 + \alpha_{10} D_{10} + \alpha_{11} D_{11} + \alpha_{12} D_{12} + \varepsilon_t$$

Y	F-stat ($\alpha_1 = \alpha_2 = \ldots = \alpha_{12}$) (1)	F-stat ($\alpha_8 + \alpha_9 + \alpha_{10} + \alpha_{11} + \alpha_{12} = 0$) (2)
Call rate	6.84	14.85
	(0.0000)	(0.0003)
Government rate	2.66	2.81
	(0.006)	(0.098)
Discount rate	1.50	0.19
	(0.152)	(0.660)
Spread (Call rate – Discount rate)	7.71	17.37
	(0.0000)	(0.0001)

Source: Board of Governors (1943).

Notes: D is a monthly dummy variable. Significance level is in parentheses.

Table 6.4 Discount loans and the interest rate spread 1922–28

$$\Delta(\text{Discounts}_t) = a + b\Delta(\text{Spread}_t) + \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 D_6 + \alpha_7 D_7 + \alpha_8 D_8 + \alpha_9 D_9 + \alpha_{10} D_{10} + \alpha_{11} D_{11} + \varepsilon_t$$

	Δ(Discount Loans) (1)	(2)
Constant	–0.86	–6.65
	(–0.08)	(–0.18)
Δ(Spread)	62.52	32.17
	(5.06)	(2.21)
Dummies		
Jan.		–191.32*
Feb.		26.33
Mar.		16.05
Apr.		–4.62
May		9.88
Jun.		–5.22
Jul.		–25.22
Aug.		39.71
Sep.		80.78
Oct.		66.37
Nov.		79.28
R^2	0.238	0.580
DW	1.41	1.27

Source: Board of Governors (1943).

Notes: t-statistic is in parentheses. For monthly dummies, * indicates significant at 5% level.

of the spread as the independent variable, with and without monthly dummy variables to control for possible seasonal variations in Reserve bank scrutiny of discount borrowing (variable "a" in the discount loan equation of the self-regulated model). As expected from figure 6.10, the coefficient on the spread in columns (1) and (2) is positive and statistically significant.[3]

4. SCISSORS EFFECT

In the past a great deal of ink has been spilt in an attempt to document the scissors effect for the decade of the 1920s. Indeed, I have done my part in contributing to the ink-overload (Toma 1989). The main scissors effect questions that have been addressed by myself and others are (1) Does a scissors effect exist?, (2) If so, is the effect exact (full)?, and (3) Whether exact or not, is the effect due to discount loans causing government securities, government securities causing discount loans or possible bidirectional causality? The answers to these questions have been across the board. While a consensus has emerged that a scissors effect exists, some have found the effect to be exact (Toma 1989 and La Croix and Williams 1989) while others have found only a partial effect (Hamilton 1987, Meltzer 2003, and Wheelock 1991). Also, employing Granger causality tests, some empirical work concludes that loans cause securities, some that securities cause loans, and some that causality is bidirectional.

The self-regulated theory of Reserve banking is ambivalent on the import of this mixed empirical scissors bag. On the one hand, the theory takes seriously the existence of a scissors effect in the 1920s monetary environment. Indeed, a scissors effect is a core implication of the theory, rooted in gold backing for Reserve bank money. On the other hand, the self-regulated theory suggests that the scissors questions and answers posed above are not the ones that should take center stage in the mindset of the monetary economist. The theory would suggest, for instance, that a full scissors, while not literally impossible, should be viewed as occurring only under the most unlikely of circumstances; it would require that the demand for Fed credit, and hence the equilibrium amount of Fed credit supplied, be literally constant from one period to the next. A cursory examination of figure 6.1, indicating seasonal movements in Fed credit is sufficient to rule out a full scissors effect for the 1920s.

In addition, the self-regulated perspective might question the use of Granger-causality tests to determine which component of Fed credit is the initiating component and which the responding component. A Granger-causality finding that movements in one component temporally precede movements in the other does not imply that the first causes the other in any economic sense. Consider, for instance, a finding that government securities Granger cause discount loans. One interpretation is that Reserve banks forecast a seasonal increase in discount loans and, consistent with the self-regulated theory, sell government securities in advance of the increase in discount loans. Here, Reserve banks anticipate the seasonal increase in discount loans by selling government securities.

What counts as scissors effect evidence that helps the monetary historian weigh the validity of the self-regulated theory? Start with the definition that $S_{RB} = FC - L_{RB}$. Running a simple regression using actual values for government securities, Fed credit, and discount loans, must give an exact one-for-one scissors, regardless of the validity of the self-regulated

theory. A more interesting empirical exercise would be to run a regression based on

$$S_{RB} \quad \sim FC \quad L_{RB}, \tag{6.2}$$

where ~FC represents the level of Fed credit *predicted* by the self-regulated model. From equation (6.1), ~FC = rB^2/s^2; predicted Fed credit is a function of the interest rate on government securities, the monetary base, and the variance of gold redemption. On the basis of evidence presented earlier, Fed credit and currency move seasonally in a V-shaped pattern. So the self-regulated theory suggests that the seasonal pattern in Fed credit is driven largely by the currency component of the monetary base. Any measured scissors effect without taking into account seasonal movements in Fed credit, such as those driven by movements in currency, will be inexact or perhaps nonexistent. Controlling for predicted Fed credit movements, however, should strengthen the scissors effect. Indeed, if predicted equals actual Fed credit (~FC = FC)—that is, if the self-regulated theory is a complete theory—then, as indicated above, the estimated scissors effect in equation (6.2) must be exactly one-for-one.

So how to proceed for testing purposes? I first estimate a scissors equation without controlling for movements in Fed credit. That is, I regress the change in government securities against a constant and the change in discount loans. The results, reported in column (1), table 6.5 are not too surprising. The coefficient on the discount loan variable equals -0.10, but is not significantly different from zero. Indeed, the R^2 is a miniscule 0.04.

Next, I control for movements in Fed credit, based on factors the self-regulated theory suggests should be important in driving Fed credit. One simple approach is to rely on the finding reported above that Fed credit moves seasonally, largely due to seasonal movements in the monetary base, one of the right-side variables in equation (6.1). Column (2) reports the results of adding monthly dummies to the column (1) regression to control for seasonality in Fed credit. The coefficient on discount loans is now negative and significant and the R^2 of the overall regression now equals 0.53. The point estimate indicates a partial scissors effect: a one dollar increase in discount loans causes a forty-six cent offset. Consistent with the self-regulated theory, the measured scissors effect increases when some, admittedly crude, attempt is made to control for seasonal movements in Fed credit.

But surely we can devise a better test of the self-regulated theory. After all, many theories, including the RB Doctrine and the Miron-plus theory, imply seasonal movements in Fed credit. A finding that the measured scissors effect increases when controlling for seasonal movements in Fed credit is consistent with the discretionary theories as well as the self-regulated theory.

In an effort to empirically discriminate between the self-regulated theory and the discretionary theories, we can take advantage of the fact that the self-regulated prediction equation, equation (6.1), does more than simply

Table 6.5 Tests of the competitive scissors effect 1922–28

$$\Delta(S_{RBt}) = d + e\Delta(L_{RBt}) + f\Delta(\sim FC_t) + \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 D_6 + \alpha_7 D_7 + \alpha_8 D_8 + \alpha_9 D_9 + \alpha_{10} D_{10} + \alpha_{11} D_{11} + \varepsilon_t$$

	Δ(Government Securities)		
	(1)	(2)	(3)
Constant	0.24	52.23	0.19
	(0.04)	(3.40)	(0.06)
Δ(Discount Loans)	–0.10	–0.46	–0.63
	(–1.91)	(–7.67)	(–14.01)
Δ(Predicted Fed Credit)			0.55
			(14.92)
Dummies			
Jan.		216.52*	
Feb.		-24.93	
Mar.		-42.54	
Apr.		-58.14*	
May		-45.98*	
Jun.		-58.22*	
Jul.		-68.75*	
Aug.		-26.69	
Sep.		-4.87	
Oct.		-48.21*	
Nov.		-16.12	
R^2	0.043	0.531	0.745
DW	1.79	1.96	1.34

Source: Board of Governors (1943).

Notes: t-statistic is in parentheses. For monthly dummies, * indicates significant at 5% level.

identify potential factors responsible for seasonal movements in Fed credit. Point predictions of how changes, seasonal or nonseasonal, in each of the right-side variables affect Fed credit can be inferred. Taking the natural log of equation (6.1) gives

$$\ln(FC) = \ln(\mathbf{r}) \quad 2\ln(B) \quad \ln(s^2). \tag{6.3}$$

Of particular interest, the theory predicts that the elasticity of Fed credit with respect to the monetary base equals 2; that is, Fed credit should grow at twice the rate at which the monetary base grows. If Fed credit is growing faster than the base, then gold holdings, the other component of the base, must be growing slower. As the monetary base expands, the competitive theory implies that Reserve banks will have an incentive to economize their holdings of gold; that is, there are economies of scale in gold holdings.

How seriously should we take the model's specific prediction of a base elasticity of Fed credit equal to 2? How seriously should we take the model's general prediction of economies of scale in gold holdings? The answers are not so seriously and seriously. With respect to the first question, the model's

point prediction of exactly "2" is an artifact of following Miron in the way he originally modeled the member bank liquidity cost function in chapter 4.[4] Miron warned that his specification was meant to be illustrative only and should not be taken as a realistic depiction of the precise cost conditions that banks confront. The same warning applies when we use his specification to model the Reserve bank liquidity cost function. Accordingly, I take the preciseness with which the model predicts elasticity as being of illustrative interest only.

But what is the elasticity prediction meant to illustrate, if not an exact elasticity outcome? Here we are on to the second question. I interpret the prediction as illustrating the tendency of reserves to exhibit economies of scale. This more general prediction has sound footing in the economic literature on how commercial banks make optimal portfolio choices under uncertainty (Baltensperger 1974). Accordingly, any empirical finding of economies of scale in gold reserves favors the self-regulated theory and any finding of constant or diseconomies of scale represents a strike against the self-regulated theory.[5]

We are now positioned to test the self-regulated theory, and its implications for the scissors effect. First, estimate the following self-regulated first-differenced Fed credit equation, in natural log form, for the period 1922–28:

$$\Delta \mathrm{l}\ (\mathrm{FC}_{\mathrm{t}}) \quad \mathrm{a} \quad \mathrm{b}\Delta\ln(\mathrm{r}_{\mathrm{t}}) + \mathrm{c}\Delta\ln(\mathrm{B}_{\mathrm{t}}) \quad \sum_{\mathrm{i}=1}^{11} {}_{\mathrm{i}}\mathrm{D}_{\mathrm{i}} + \varepsilon_{\mathrm{t}}, \tag{6.4}$$

where t is a time-script indicating the month, D_i represents 11 monthly dummies designed to capture any seasonal movement in the variance of gold redemptions, and ε_t is the error term.[6] Second, recover, from the estimation of equation (6.4), a predicted natural log Fed credit series and transform it into a predicted de-logged Fed credit series, ~FC. Finally, estimate the following government securities equation for the period 1922–28:

$$\Delta\left(\mathrm{S}_{\mathrm{RBt}}\right) \quad \mathrm{d} \quad \mathrm{e}\Delta\left(\mathrm{L}_{\mathrm{RBt}}\right) + \mathrm{f}\Delta\left(\ \mathrm{FC}_{\mathrm{t}}\right) + \varepsilon_{\mathrm{t}}. \tag{6.5}$$

If the self-regulated theory explains "everything," then estimation of equation (6.4) would result in b = 1, c > 1 and $R^2 = 1$. Under these circumstances, predicted Fed credit equals actual Fed credit, that is, ~FC = FC, and estimation of equation (6.5) would result in a scissors coefficient, e, equal to –1, a predicted Fed credit coefficient, f, equal to 1, and $R^2 = 1$. These results would offer the strongest possible support for the self-regulated model.

Table 6.6 reports results from estimating equation (6.4). Column (1) uses the monetary base and the government rate as the explanatory variables and

Table 6.6 Tests of the competitive Fed credit equation 1922–28

$$\Delta\ln(FC_t) = a + b\Delta\ln(r_t) + c\Delta\ln(B_t) + \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 D_6 + \alpha_7 D_7 + \alpha_8 D_8 + \alpha_9 D_9 + \alpha_{10} D_{10} + \alpha_{11} D_{11} + \varepsilon_t$$

	Δln(Fed Credit)	
	(1)	(2)
Constant	–0.01	0.01
	(–1.72)	(0.69)
Δln(Government rate)	0.16	0.16
	(2.83)	(2.66)
Δln(Base)	4.80	3.69
	(21.34)	(7.80)
Dummies		
Jan.		–0.08*
Feb.		–0.0004
Mar.		0.005
Apr.		–0.04*
May		–0.004
Jun.		–0.02
Jul.		–0.02
Aug.		–0.006
Sep.		0.01
Oct.		–0.02
Nov.		0.01
R^2	0.851	0.886
DW	1.62	1.33

Source: Board of Governors (1943).

Notes: t-statistic is in parentheses. For monthly dummies, * indicates significant at 5% level.

column (2) adds the seasonal dummies. The results on the whole support the self-regulated theory. Both the government rate and the monetary base have the correct (positive) signs, with $R^2 = 0.85$ in the column (1) regression and $R^2 = 0.89$ in the column (2) regression.

The bit of bad news for the self-regulated theory is that the coefficient estimate on the government rate in both regressions is only 0.16, indicating that government security holdings do not rise as much as expected with an increase in the government rate. One interpretation, favorable to the self-regulated theory, is that, in a gold standard setting, any change in interest rates may not be perceived as permanent. Hence, Reserve banks react to the temporary increase in the government rate by only partially adjusting government security holdings.

With respect to the monetary base, the coefficient reported in column (1) implies that Fed credit grows at 4.80 times the rate of base growth. Controlling for seasonal dummies in column (2) reduces the estimated effect to 3.69 times the rate of base growth, with a 95 percent confidence interval of 2.75 to 4.64. These estimates are consistent with the self-regulated thesis that Reserve banks economize gold.

The next empirical task is to construct a predicted (de-logged) Fed credit series from the results of estimating equation (6.4) and then add predicted

Fed credit as a control variable to equation (6.5) to test the scissors effect under self-regulation. In table 6.5, the estimated scissors effect rises from 0.46 to 0.63 in moving from column (2) to column (3). Also, the R^2-statistic rises to 0.75 from 0.53. But total victory for the self-regulated theory cannot be declared. First, the predicted Fed credit coefficient, f = 0.55, differs significantly from plus one (95 percent confidence interval is 0.48 to 0.63). More important, the 95 percent confidence interval (–0.72 to –0.54) for the scissors coefficient does not encompass –1. Holding constant the factors the self-regulated model purports to be important in determining Fed credit, Reserve bank open market operations fail to completely neutralize changes in discount loans.

Two possible reasons for the incomplete scissors finding are (1) the basic self-regulated theory holds but the explanatory variables, B, r and s^2, in the Fed credit equation are not correctly measured or (2) the variables are measured correctly but the self-regulated theory does not hold as a complete explanation of Reserve bank decision making. In the second case we can still ask the question, "Is the damage done to the self-regulated thesis life-threatening?" Here it needs emphasizing that there is no absolute standard, such as $R^2 = 1$, by which to empirically judge an economic theory. Winning theories are those whose predictions closer conform to the facts as we know them, as compared to any other conceivable explanation, in particular, the RB Doctrine and the Miron-plus theory. Judged on this criterion, the self-regulated theory is the provisional winner of the scissors contest.[7]

5. The Gold Anchor

But before awarding the scissors gold medal to the self-regulated theory, we must verify that there are no "violations" of the theory's underpinnings that would invalidate the findings. For the self-regulated model, a precondition for a scissors effect is the presence of a commitment device that tethers the general price level. With a gold anchor, the self-regulated theory says that Fed credit depends on a determinant real demand for base money, such that, given the gold-anchored price level, the public determines their demand for nominal base balances and then Reserve banks passively accommodate that nominal demand. The chain of causation cannot run in the other direction with the Fed determining nominal supply, the price level adjusting, and then the public passively holding whatever nominal balances are supplied. For then we would be back in the world of Fed discretion, either of the modern fiat variety or of the Miron-plus variety. Without gold, or some such commitment device, it is difficult to see how self-regulation could be sustained; how it would not breakdown into some form of discretion, rendering the scissors effect null and void. So a finding of untethered monetary aggregates would cast more than a shadow of doubt on the self-regulated theory's explanatory power.

Chapter 2 argued that the founders of the Fed were well aware of the importance of a gold anchor. Moreover, they were aware that the

effectiveness of the anchor is tied to the redemption option, in particular, the ease of converting Federal Reserve notes into gold. Given low cost redemption, the purchasing power of Federal Reserve notes is tied to the purchasing power of gold, so that, absent shocks to the supply or demand for gold, the purchasing power of gold, and, therefore, the general price level will be constant over time. Price level constancy does not imply, however, that monetary aggregates necessarily will be constant. If, for instance, the demand for money increases—say, due to an increase in population—then the supply of money must increase to keep the price level constant.[8] Here, the gold anchor tethers population-adjusted monetary aggregates, not the unadjusted levels.

The empirical question of interest is whether monetary aggregates, in particular, per capita monetary aggregates, were nonstationary or stationary in the 1920s. Loosely speaking, a time series is nonstationary if changes in the series tend to persist. More technically, a series is nonstationary if there is no tendency for reversion to a fixed mean over the relevant time horizon. Conversely, a stationary series is mean-reverting, such that the expected endpoint value is the same as the starting value. Of course, the major concern of note-holders in the 1920s was *over*issue of monetary aggregates in general and Federal Reserve notes in particular. Evidence against the anchor hypothesis, therefore, would be if per capita monetary aggregates were nonstationary in an upward direction.

Return to figures 6.1 and 6.3, which show the levels of Fed credit and the monetary base, along with their components. End-of-the-period values for both Fed credit and the monetary base are higher than beginning-of-the-period values. For Fed credit, there seems to be an upward trend over the last two years; for the monetary base, there seems to be an upward trend over the first three years with a leveling over the remaining years. Dickey-Fuller tests, presented in table 6.7, cannot reject the nonstationary hypotheses of a unit root for each series at the 5 percent significance level. But once Fed credit and the monetary base have been adjusted, dividing each by the US population, the nonstationary hypothesis can be rejected.

Table 6.7 Dickey-Fuller tests for unit root 1922–28
$\Delta Y_t = a + bY_{t-1} + \varepsilon_t$

	Currency (1)	Currency Per capita (2)	Fed Credit (3)	Fed Credit Per capita (4)	Base (5)	Base Per capita (6)
Constant	804.66	10.13	177.54	2.18	406.83	13.98
(t-stat)	(2.82)	(3.51)	(2.21)	(2.93)	(1.66)	(3.35)
Y_{t-1}	–0.18	–0.26	–0.14	–0.20	–0.06	–0.24
(t-stat)*	(–2.81)	(–3.52)	(–2.20)	(–2.95)	(–1.62)	(–3.35)

Sources: Board of Governors (1943) and Population Estimates Program, Population Division, US Census Bureau: Historical National Population Estimates: July 1, 1900 to July 1, 1999. Revised date: June 28, 2000.

*Dickey fuller critical value equals –2.59 (–2.90) at the 0.10 (0.05) significance level.

Figure 6.5 shows the levels of total currency and its components. For total currency, end-of-the-period values are higher than beginning-of-the-period values, with most of this rise coming in the first two years, 1922 and 1923. While the Dickey-Fuller test in table 6.7 cannot reject the unit root hypothesis for unadjusted currency, the test-statistic does reject a unit root for per capita currency. More importantly, Federal Reserve notes in figure 6.5 do not show a tendency to rise over the long run; indeed, if anything, Federal Reserve notes fall in 1924 and then level off for the rest of the period, 1925–28. These results, while not a direct test, do not lead one to doubt the effectiveness of the redemption option in preventing the long-run overissue of Federal Reserve notes in particular and currency more generally.

6. Conclusion

The goal in this chapter was to "come to terms with the scissors effect." The orthodox explanation can be traced back to the two economists, Riefler and Burgess, who were the first to formally document offsetting movements in Fed government security holdings and discount loans. The competing explanation is the one that emerges from the self-regulated theory of Reserve banking. While both imply the existence of a scissors effect, rooted in seasonal movements in the components of Fed credit, they differ in the details of those movements. Most important, open market operations, as the initiating blade, should move seasonally according to the RB Doctrine, as well as the Miron-plus model; discount loans, as the initiating blade, should move seasonally according to the competitive theory of Reserve banking. The evidence here weighs strongly on the side of the self-regulated theory. And though the basic self-regulated theory does not completely explain all scissors effect phenomena—for example, the scissors effect is incomplete even after controlling for factors that the theory suggests move Fed credit—still, in a head-to-head contest the self-regulated theory empirically dominates the discretionary theories.

The next chapter shows how the failure to come to terms with the scissors effect (or worse yet, to even acknowledge the effect) has led astray Austrian and Monetarist accounts of the onset of the Great Depression. Remarkably, the two camps reach different conclusions about the ease or tightness of monetary policy in the 1920s, even though they use the same set of monetary data, in particular, the same Fed credit data. The scissors effect helps us understand how this is possible. Suppose Fed credit does not change, but one component rises and, due to the scissors effect, the other falls. The natural tendency of each side is to seek out data that supports their theory. Austrians, seeking signs of excessive ease, call attention to the component of Fed credit signaling ease. Monetarists, seeking signs of excessive tightness, call attention to the component of Fed credit signaling tightness. Hence, Austrians falsely blame the onset of the Great Depression on excessive ease and Monetarists falsely blame the onset on excessive tightness. You may at this point be thinking to yourself, "Come on, is it really possible that the two camps could make such an obvious mistake?" My simple rejoinder, "Let's see."

Chapter 7

Austrian and Monetarist Theories of the Onset of the Great Depression

1. Introduction

The conventional approach to modeling monetary policy is to posit a discretionary, controlling authority, the Fed, whose monetary decisions are not limited by ordinary economic constraints. Given the Fed's power to control the money supply, the political economist's task is to (1) posit some policy objective, (2) evaluate the extent to which Fed decision making satisfies the objective, and (3) examine the economic consequences of those decisions. With respect to monetary policy of the 1920s prior to the onset of the Great Depression, chapter 3 suggested that two traditions, Austrian and Monetarist, best exemplify the conventional approach.

According to Austrian business cycle theory, the Fed is an inherently inflationary institution, with a tendency to expand the money supply beyond what a market-based money supply mechanism would generate. The Fed's monetary expansion, throughout the decade of the 1920s, lowered interest rates below their natural levels, inducing firms to undertake investment projects that they would not have undertaken in the absence of monetary expansion. Eventually, these projects proved unsustainable and the discovery of this truth launched the Great Depression.

Unlike the Austrian theory, the Monetarist approach does not necessarily presume a flawed policy objective. Indeed, standard Monetarist accounts of the business cycle posit a Fed whose objective is to promote economic stability. Mistakes, however, may be made. And while Monetarists tend to view the decade of the 1920s as the Fed's "high tide," with policy appropriately accommodative, their critique of the Great Depression's onset is that Fed decision makers unduly (mistakenly) tightened money in 1928–29. The

contraction in the supply of money led to a fall in nominal income and, with sticky prices, a fall in real income, thus, setting the stage for the Great Depression.

What is striking about these two leading theories of the onset of the Great Depression is that, theoretically, they come to *opposite* conclusions about the nature of the instigating monetary shock: Austrians point to excessive money expansion and Monetarists to excessive money contraction. Even more striking, Murray Rothbard, a leading Austrian proponent, wrote a book, *America's Great Depression* (1975), in which he reviewed movements in monetary aggregates that the Fed *consciously controlled* and concluded that the 1920s evidence supported the Austrian theory; James Hamilton, a leading Monetarist proponent, reviewed essentially the same 1920s data set in his influential article, "Monetary Factors in the Great Depression," (1987) and concluded that the evidence supported the Monetarist theory!

I contend that the disparity in findings is not a simple matter of one side getting the empirics right and the other wrong. Instead, both sides botched the job. Moreover, each side committed the same empirical sins: (1) a tendency to select the boundaries of the period of relevance that best supports the predictions of its theory and (2) a tendency to focus on movements in the component (discounts, bills bought, or government securities) of total Fed credit within the preselected boundaries that best supports the predictions of its theory. So Rothbard focused on the period, 1921–25, because the monetary base tended to expand (albeit modestly) and Hamilton focused on the period, 1928–29, because the monetary base tended not to expand. Similarly, when Rothbard observes a subperiod within 1921–25 when discounts increase and government securities decrease, he highlights discounts to illustrate monetary expansion; when discounts decrease and government securities increase, he highlights government securities. When Hamilton observes a subperiod within 1928–29 when discounts increase and government securities decrease, he highlights government securities to illustrate monetary contraction; when discounts decrease and government securities increase, he highlights discounts.

The goal of this chapter is to examine the validity of Austrian and Monetarist theories of the onset of the Great Depression. Was monetary policy systematically expansionary or contractionary over the entire period? Was monetary policy systematically expansionary or contractionary over subperiods identified as relevant by the Austrians and the Monetarists?

2. EMPIRICAL OVERVIEW

Before reviewing and critiquing the Austrian and Monetarist empirical analyses of the onset of the Great Depression, an overview of key monetary aggregates is presented. As indicated above, it is rather striking that the two sides used much the same set of data in "testing" the implications of their theories. Both highlight annual data and both choose the starting and terminal dates for the decade based on business cycle considerations.

For Hamilton, the key monetary data are provided in his table 2, "Alternative Measures of U.S. monetary policy," where he explains:

> In table 2, I have standardized my summary of the data on the basis of the following criteria: (1) where monthly or daily data are available, the magnitude reported for a given year is that for the end of June (using data on such a yearly basis also relieves one of the difficult task of separating seasonal from cyclical factors, and choosing June helps highlight events prior to the cyclical peak in the summer of 1929), and (2) a given change in the series is to be regarded as "contractionary" only when it is clearly more severe than in any year since the recession of 1921 (1987, 150).

Using end-of-June annual data, Hamilton's focus is on the decade of the 1920s, which, on the basis of cyclical criteria, he defines as starting in 1922 ("since the recession of 1921") and terminating in 1929 ("prior to the cyclical peak in the summer of 1929").

For Rothbard, the key monetary data are provided in his tables 1–7 from chapter 4, "The Inflationary Factors," of his book. He introduces the tables with the observation: "It is generally acknowledged that the great boom of the 1920's began around July, 1921, after a year or more of sharp recession, and ended about July, 1929" (1975, 86). Like Hamilton, the decade of the 1920s is defined on the basis of cyclical ("boom") considerations. The slight difference is that Hamilton views the starting point as end-of-June 1922, while Rothbard views the starting point as end-of-June 1921.

The tabular data provided by Rothbard and Hamilton include monetary aggregates consciously controlled by the Fed, broader measures of the money supply, and macroeconomic measures such as the CPI and various interest rates. My focus in the present chapter is on monetary aggregates consciously controlled by the Fed. For this reason, tables 7.1–7.3 report annual and summary statistics for Fed credit and components, and for the monetary base and components. While Rothbard and Hamilton do not report their data in exactly this form (for instance, Hamilton reports growth rates rather than levels for each year, and Rothbard, in his table 7, divides the decade into 12 subperiods rather than 9 years), this raw data underlies their presentations.

Table 7.1 Fed credit and components 1921–29 [End of June, billions of dollars]

	1921	1922	1923	1924	1925	1926	1927	1928	1929
Discounts	1.75	0.46	0.84	0.33	0.49	0.52	0.44	1.10	1.04
Bills	0.04	0.16	0.21	0.04	0.25	0.25	0.21	0.22	0.08
Gov. Sec.	0.26	0.56	0.10	0.43	0.35	0.39	0.37	0.24	0.22
Fed credit	2.10	1.20	1.20	0.83	1.14	1.19	1.08	1.59	1.40

Source: Board of Governors (1943, 374–75, table 102).

Fed credit = Discounts + Bills Bought + Government securities + All other.

Table 7.2 Monetary base and components 1921–29 [In billions of dollars]

	1921	1922	1923	1924	1925	1926	1927	1928	1929
Currency	3.68	3.35	3.74	3.65	3.57	3.60	3.56	3.62	3.64
Reserves	1.60	1.82	1.85	1.94	2.17	2.23	2.25	2.33	2.36
Base	5.28	5.17	5.59	5.59	5.74	5.83	5.81	5.95	6.00

Sources: Currency outside banks, June 29/30, Board of Governors (1943, 34, table 9); Reserves, End of June, Board of Governors (1943, 374–75, table 102).
Base = Currency + Reserves.

Table 7.3 Summary statistics decade

	Annual growth rates	
	1921–29	1922–29
Fed credit	–4.9%	+2.2%
Base	+1.6%	+2.1%

At this preliminary stage of analysis, my interest is in what can be gleaned from this broad statistical overview. What signs of monetary expansion or contraction jump out at the reader? With respect to Fed credit (table 7.1), a cursory examination of movements in components is not too instructive, since such movements are frequently offsetting. Total Fed credit does exhibit significant intra-decade movements, particularly from 1921 to 1922, which is largely responsible for the negative annualized growth rate, 1921–29, reported in table 7.3. Note, however, that if we follow Hamilton in omitting 1921 (because it represents the tail end of the 1921 recession), then the annualized growth rate for 1922–29 is +2.2 percent. With respect to the monetary base, currency outside banks is relatively stable from year to year, while reserves show a modest upward trend over the decade (table 7.2). The annualized growth rate for 1922–29 is +2.1 percent (table 7.3).

I'll leave the reader to form his or her own assessment, but mine is that this broad overview of the data screams neither monetary expansion nor contraction. Of course, a more careful, nuanced analysis of the data might suggest ease or tightness over the decade. Perhaps there is a sharp turn in Fed credit or the monetary base at a critical juncture that is disguised by the annual data but nevertheless has important economic consequences. With this type of possibility in mind the next two sections turn to the principals in the debate, Rothbard and Hamilton, to see how they dissect the data to defend their positions.

3. Austrian Expansion

Taking the Fed's contribution to the broad money supply to be its control over the monetary base, currency outside banks and reserves, Rothbard first

observes that the currency component did not change much from June 30, 1921, to June 30, 1929, falling only slightly from $3.68 to $3.64 billion (table 7.2). So Rothbard turns to reserves, noting that they grew from $1.60 billion in 1921 to $2.17 billion in 1925 to $2.36 billion in 1929. On this basis, he concludes:

> Clearly, the first four years of this period was a time of greater monetary expansion than the second four . . . Total reserves expanded by 35.6 per cent from 1921 to 1925 . . . In the later four years, reserves expanded by only 8.7 per cent . . .
>
> Thus, the prime factor in generating the inflation of the 1920's was the increase in total bank reserves: this generated the expansion of the member banks and of the non-member banks, which keep their reserves as deposits with the member banks. It was the 47.5 per cent increase in total reserves (from $1.60 billion to $2.36 billion) that primarily accounted for the 62 per cent increase in the total money supply (from $45.3 to $73.3 billion) (1975, 95–96).

The bottom line Rothbard takes away from this statistical account is that increases in the money supply during the 1920s are driven by increases in reserves, in particular, by the 35.6 percent increase from 1921 to 1925. In Rothbard's view, the expansion of reserves, 1921–25, set the stage for the Great Depression, commencing some four years later.

Table 7.4 highlights the early 1920s as Rothbard's period of interest, presenting summary statistics on an annual basis. To be sure, the annual growth rate of reserves is significant: 7.9 percent for 1921–25 and 5.9 percent for 1922–25. But Reserve banks do not control reserves per se; the banking and nonbanking public determine the composition of the monetary base between reserves and currency. For the base, table 7.4 reveals more modest growth rates of 2.1 percent and 3.5 percent for 1921–25 and 1922–25, which are not much out of line with the decade long rates of growth reported in table 7.3.

Putting aside for the moment the modest growth of the base, Rothbard's attention is drawn to reserves, so his next question is, "What then caused the increase in total reserves?" (1975, 96). Here, Rothbard turns to Fed credit, since for the most part, he views Fed credit as under the control of Federal Reserve authorities (1975, 96–99). Examination of table 7.4, however, indicates an immediate problem for Rothbard's inflation thesis. Depending

Table 7.4 Summary statistics early decade

	Annual growth rates	
	1921–25	1922–25
Reserves	+7.9%	+5.9%
Base	+2.1%	+3.5%
Fed credit	–14.2%	–1.7%

upon whether we define the early period as Rothbard does, 1921–25, or as 1922–25, Fed credit *fell* by 14.2 percent or by 1.7 percent.

Rothbard, however, does not arrive at what would seem to be an inescapable conclusion: for the early 1920s (table 7.4) and for the entire decade (table 7.3), changes in the monetary aggregate, Fed credit, under the Fed's control were deflationary. Remarkably, Rothbard comes to the opposite conclusion! Referring to the rise in reserves from $1.60 to $2.36 billion over the decade, Rothbard declares that "the inflation was clearly precipitated deliberately by the Federal Reserve" (1975, 101).

Rothbard is able to adhere to the "Fed inflation" thesis in the face of contradictory Fed credit evidence, only by *ignoring that evidence.* At no time in "The Inflationary Factors" chapter does he explicitly compute the early decade or full decade growth in Fed credit, either in raw changes or in rates of growth. Instead, Rothbard's empirical style is to first subdivide the entire decade into 12 short subperiods, with a brief statement summarizing movements in Fed credit for that subperiod (1975, 104–05). Then, for each subperiod he focuses on movements in a particular component of Fed credit, emphasizing how movements in that component support the inflation thesis.

Rothbard's discussion of period IV, October 1923–June 1924, illustrates his approach. He begins by briefly summarizing the subperiod, "Bills Bought fell abruptly, to reach a trough in July. Total Reserve Credit reached a trough in June" (1975, 104–05). Two pages later Rothbard provides a more detailed account:

> Period IV . . . began to repeat the pattern of Period I and resume the *march of inflation.* Uncontrolled factors this time fell by $149 million, but they were more than offset by a controlled increase of $198 million, led by the *heavy purchase of government securities* ($339 million)—the heaviest average monthly buying spree yet seen in the 1920's ($47.4 million) (1975, 107; italics added).

In this passage, taken alone, the conjunction of the phrase "march of inflation" with the phrase "heavy purchase of government securities" leaves the reader with the impression that Fed policy during the subperiod is inflationary. But here the impression is sustained only to the extent that offsetting movements in Fed credit, "Bills Bought fell abruptly," was mentioned two pages ago and is now forgotten. Indeed, overall Fed credit for subperiod IV decreased. The bottom line is that Rothbard's faith in the "Fed inflation" thesis bares-up under the harsh light of the data only because Rothbard selectively chooses the subperiods and the Fed credit components to highlight.

Rothbard is as a premier monetary historian with big picture insights and, perhaps, for this reason can be forgiven for a hurried look at the data. Simply put, careful empirical analysis is not his forte as an economist. The next section turns attention to the work of James Hamilton, whose forte is empirical analysis.[1] Surprisingly, however, his approach to analyzing the 1920s monetary data is similar to Rothbard's and suffers from the same type of flaws.

4. Monetarist Contraction

Hamilton's monetarist account of the onset of the Great Depression emerges in the opening lines of the abstract of his paper, "Monetary Factors in the Great Depression," (1987) and continues into the opening paragraph of the text. He begins:

> This paper examines the role of monetary policy in the early stages of the Great Depression and considers the mechanism whereby this policy may have affected real activity. I conclude that the depression was preceded by *a dramatic shift towards a highly contractionary monetary policy.*
>
> *. . . that in terms of the magnitudes consciously controlled by the Federal Reserve, it would have been difficult to design a more contractionary policy than that adopted in January of 1928.* I further argue that this change of regime shows up in virtually any macroeconomic or monetary aggregate that has been proposed for gauging the effects of monetary policy on the economy (Hamilton 1987, 145; italics added).

Though Hamilton tangentially discusses the years 1930–1933, he is most interested in the onset of the Great Depression. With respect to the years 1928 and 1929, Hamilton intends to empirically investigate the monetarist thesis of "a dramatic shift towards a highly contractionary monetary policy," a shift so dramatic that "it would have been difficult to design a more contractionary policy."

The contrast between Hamilton's monetarist thesis and Rothbard's Austrian thesis is clear-cut. While Rothbard posited that the stage was set for the Great Depression in the early 1920s, 1921–25, Hamilton points to the late 1920s, 1928–29, as his period of interest. While Rothbard's interpretation of the data points to the Fed's culpability in excessively creating money, Hamilton's interpretation of the data points to the Fed's culpability in excessively destroying money, or at least in restraining its creation.

Hamilton first seeks confirmation of dramatic contractions in monetary aggregates consciously controlled by the Federal Reserve in the section titled, "The development of monetary policy, 1928–1929." Hamilton identifies the meeting of the Open Market Investment Committee on January 12, 1928, as the beginning of the contractionary phase.

> Between December 1927 and July 1928, the Fed sold $393 M worth of securities so that by August only $80 M remained in the Open Market account which could be sold. Buying rates on acceptances were raised from 3% in January to 4 1/2% by July, inducing a further $193 M reduction in Fed holdings of such bills, leaving only a total of $185 M in these balances remaining with the Fed. Finally, the discount rate was raised from 3 1/2% to 5%, its highest value since the monetary contraction of 1921. *In short, in terms of the magnitudes consciously controlled by the Fed, it would be difficult to design a more contractionary policy than that initiated in January 1928*; the Fed had virtually no more securities to sell nor balances of acceptances to be reduced (Hamilton 1987, 147; italics added).

As indicated by this passage, the sources of Fed-induced monetary contraction were the three components of Fed credit (1) open market operations, (2) acceptance (bill) policy, and (3) discount policy.

Did the three components, taken together, represent a dramatic monetary contraction over the period December 1927 to July 1928? Table 7.5 highlights Fed credit and its components for Hamilton's period of interest. From end-of-the-month December 1927 to end-of-the-month July 1928, discounts rose while bills and government securities fell. Overall, Fed credit fell at a *monthly* rate of negative 2 percent. Taken at face value, the Fed credit record does seem to justify a monetary tightness verdict if not the more dramatic conclusion that "it would be difficult to design a more contractionary policy."

Probing below the surface, however, raises a red flag. As documented in the last chapter, Fed credit was significantly seasonal during the 1920s, with Fed credit relatively high at the end of a year and relatively low in the middle of a year. So the decrease in Fed credit from December 1927 to July 1928 may have reflected normal seasonal variation.

To investigate this possibility, table 7.6 presents growth rates on a monthly basis for Fed credit from December of each year to July of the following year.Consistent with Holland and Toma's (1991) seasonal findings, the rate of growth in Fed credit was negative in all eight of the subperiods. The 2 percent monthly rate of decline during Hamilton's period indeed is exceptional. It is the *least* negative of the eight subperiods. That

Table 7.5 Fed credit and components 1928 [End of month, billions of dollars]

	December 1927	July 1928
Discounts	0.58	1.03
Bills	0.39	0.16
Gov. Sec.	0.62	0.22
Fed credit	1.66	1.43

Source: Board of Governors (1943, 374–75, table 102).
Fed credit = Discounts + Bill Bought + Government securities + All other.

Table 7.6 Seasonal Fed credit

End of month	Monthly growth rates
December 1921–July 1922	–4.2%
December 1922–July 1923	–2.6%
December 1923–July 1924	–4.1%
December 1924–July 1925	–2.3%
December 1925–July 1926	–2.4%
December 1926–July 1927	–3.0%
December 1927–July 1928	–2.0%
December 1928–July 1929	–3.6%

Source: Board of Governors (1943, 374–75, table 102).

monetary policy was more contractionary in every other subperiod contradicts Hamilton's twice advanced claim (see above) that "it would have been difficult to design a more contractionary policy than that adopted in January of 1928."

What led Hamilton astray in his assessment of late 1920s monetary policy? Though generally a careful empirical economist, Hamilton committed the same types of mistakes as Rothbard. First, by ignoring the seasonality issue, he selectively singled out one period, December 1927–July 1928. Second, during this period, he selectively singled out the two components of Fed credit that favored his thesis; his table 1 (Hamilton 1987, 148) shows that US securities and bills held by the Fed fell substantially. Missing from the table, however, is that discount loans grew substantially, which explains why the overall drop in Fed credit over the period was, after seasonal adjustment, exceptionally small not large.

Later in his article, Hamilton acknowledges the mitigating effect of discount loans on the decrease in Fed credit between December 1927 and July 1928. He explains:

> In part the replacement of lost reserves with discount borrowings was a manifestation of the "scissors effect" discussed by Friedman and Schwartz (1963, p. 272). If banks are reluctant to change the total quantity of loans, then open market sales by the Federal Reserve would always be partly matched by increased borrowing even in the face of a rising discount rate. For monthly data during 1920:2–1929:12, an OLS regression of the change in bills discounted on the change in Fed holdings of government securities yields (standard errors in parentheses)
>
> $$B_t \quad B_{t-1} = -1 \quad 6 - 0\ 56(S_t \quad S_{t\ 1}).$$
> $$(7.6) \quad (\ .16)$$
>
> That is, half of the reserves lost through open market sales were typically made up by borrowing over this period (Hamilton 1987, 149).[2]

Hamilton then identifies additional factors that contributed to the increase in borrowing. Most important, "a perceived increase in the marginal product of capital owing to new technological opportunities led to an increased demand for loans, particularly brokers' call loans, so that banks found it profitable to replace unborrowed reserves with borrowed reserves despite the sharply higher cost of doing so" (Hamilton 1987, 149).

Thus, there are two reasons why Fed credit did not fall by more as a result of the Fed's open market sales: (1) the scissors effect and (2) an increase in the demand for loans. The explanation, however, does not overturn the conclusion emerging from table 7.6. The Fed's policy in 1928, as measured by Fed credit, was not contractionary when placed in context of the entire decade. To conclude otherwise ignores the seasonal nature of Fed credit and downplays discounts loans as a component of Fed credit.

5. WHERE DO WE STAND?

Closing the chapter on "Austrian and Monetarist Theories of the Onset of the Great Depression" seems an apt time to pause and assess where we stand on the main topic of this book, the innocence or guilt of monetary policy. Previous chapters have provided evidence on seasonality and the scissors effect that is inconsistent with an early model of Federal Reserve discretion, based on work by William Riefler and W. Randolph Burgess, and a more recently developed model of discretion, based on work by Jeffrey Miron. The Austrian and Monetarist explanations of the onset of the Great Depression can be viewed as specific applications of a generic discretionary model designed to show what can go wrong when discretion is abused. For Austrians the abuse takes the form of a monetary policy that is too easy and for Monetarists a policy that is too tight. For Austrians abuse is almost a foregone conclusion. Discretion relies on leaders, and leaders who are beholden to upper-level government tend to err on the side of inflation. For Monetarists abuse is accidental, the result of an unfortunate event. With respect to the onset of the Great Depression, that unfortunate event was the illness and subsequent death of a decisive leader, Benjamin Strong, in 1928. His demise marked the transition from wise to unwise leadership and with it an unduly tight monetary policy.

As this chapter has documented neither side of the onset debate stopped with mere explanations. Both sides conducted extensive examinations of the evidence with the intent of demonstrating the power of their explanations. And here is where you, the reader, might expect the fireworks to go off. The two sides hold diametrically opposing views—one says the onset is caused by monetary ease and the other monetary tightness—so surely a look at the evidence is going to force one side to walk away head down in defeat.

Our own look at the evidence has shown that both sides got it wrong. There is little in the monetary data to suggest undue ease or tightness for extended periods of time. The mistake both sides made was to employ a discretionary framework that did not forthrightly "come to terms with the scissors effect" (Hamilton's scissors regression noted above, notwithstanding).

So in answer to the subsection title "Where do we stand?" I suggest we stand with the competitive, self-regulated model. That is the model that implies interest rate smoothing and at the same time is in broad accord with the scissors effect evidence of the last chapter. It does "come to terms with the scissors effect." Moreover, the self-regulated model has no problem with the finding of this chapter that there is little in the data suggesting excessive monetary ease or tightness. The gold standard underpinnings of the model, along with the presumption of Reserve bank competition, guards against either extreme.

But to close the book at this time would be premature. My sense is that I have raised doubts in the reader's mind about the explanatory power of the discretionary model, both as a general account of monetary policy throughout the 1920s and as a specific account of the onset of the Great Depression.

And while the evidence I have presented thus far has been on the whole consistent with the self-regulated model, my sense is that the reader is yet convinced to jump on-board with the characterization of the Reserve banking system of the 1920s as a thorough-going decentralized, competitive one.

Part of this skepticism undoubtedly stems from the fact that Miron's theory, the Riefler-Burgess Doctrine, and the Austrian and Monetarist adaptations do not represent the universe of all possible theories of discretionary monetary policy in the 1920s. One likely candidate, that I have not formally engaged, is what might be referred to as the occasional decisive leader theory. Part of being a decisive leader, I would argue, is to know when to intervene, when to be decisive in exercising discretion. Acting decisively when the payoffs to intervention are relatively low is a misuse of scarce discretionary capital. Hence, the occasional decisive leader theory would argue that the leader, Benjamin Strong, exercises discretion only on those occasions when the absence of decisive leadership results in an outcome that is clearly inferior to the self-regulated outcome. And when might those occasions be? As discussed in chapter 3, even Austrians and Monetarists tend to agree that 1924 and 1927 were special years when Benjamin Strong, driven by his concern for the international gold standard, nudged Reserve banks to purchase more government securities than what they would on their own. So while the occasional decisive leader theory would admit that on many occasions Benjamin Strong passively accepted the results of a self-regulated system, along with the scissors effect implied by that system, there were special occasions, 1924 and 1927, when he aggressively pushed for monetary ease. More specifically, as discount loans tended to rise during the harvest seasons of 1924 and 1927, Strong did not passively accept the self-regulated scissors response, allowing government securities to fall; rather, he aggressively intervened and purchased government securities on behalf of the entire system. As we shall see in the next chapter this is a particularly compelling line of argument. For the occasional decisive leader theory predicts easy money precisely at those times when the self-regulated theory is at its weakest; that is, when it under-predicts Fed credit.

Chapter 8

Coming to Terms with Benjamin Strong

1. Introduction

The previous chapter cast doubt on a core implication of the Austrian and Monetarist theories: that monetary policy was to blame for the onset of the Great Depression. For Austrians the problem was too much money in the early 1920s. For Monetarists, the problem was too little money in the late 1920s. Each side was misled, I argued, because they failed to come to terms with the scissors effect.

The Austrians and Monetarists offer one more challenge that the self-regulated theory must confront and engage in battle. Each offers a historical narrative that interprets the twists and turns of monetary policy throughout the 1920s within the context of a policy activist framework, where Benjamin Strong occasionally exercised decisive leadership. Here, as we discovered in chapter 3, there is something of a consensus between Austrians and Monetarists. Both sides tend to agree that before creation of the Open Market Investment Committee's (OMIC) Special System Investment Account in late 1923, earnings considerations played an important role in motivating Reserve banks. Both sides point to 1924–28 as the special period, when the OMIC, largely under the control of Benjamin Strong, was able to centralize Fed decision making and pursue a policy of monetary activism.

We also discovered in chapter 3 that two years, 1924 and 1927, stand out as the key test years for the occasional decisive leader interpretation of the historical narrative. In late 1923, and perhaps early 1924, the consensus view is that Reserve banks under the guidance of the OMIC acquiesced to the board's and the Treasury's mandate to restrain open market security purchases to avoid disturbing the money market. Benjamin Strong, in particular, was sensitive to the outside pressure, judging that the board and Treasury would not tolerate additional open market purchases, even though there were signs the economy was in recession (Meltzer 2003, 201). But sometime

in 1924, there appeared to be a switch in upper-level government policy preferences: a switch from open market operation restraint to open market operation expansion. Here, the occasional decisive leader interpretation posits that Reserve banks, in deference to Strong, allowed him to orchestrate a program of excessive—more than what the self-regulated theory implies—open market purchases in late 1924 to facilitate Great Britain's eventual return (early 1925) to the international gold standard and then again in 1927 to sustain Great Britain's continued participation. The primary working hypothesis, in its most general rendition, is that Reserve bank government security holdings will tend to be *more* than what is predicted by the self-regulated theory in the months leading up to 1925, specifically in late 1924, and also throughout 1927. A secondary hypothesis is that Reserve bank security holdings will tend to be *less* than predicted in early 1924 to avoid disturbing the money market.

One way of getting a sense of the predictive power of the occasional decisive leader theory, relative to the self-regulated theory, is to posit 1922–28 as an uninterrupted period of Reserve bank competition. Next, identify particular subperiods within 1922–28 when the self-regulated theory does a relatively poor job of predicting Reserve bank government security holdings. Finally, pose the question: Does the occasional decisive leader theory show promise in improving upon those predictions?

The best case scenario for the self-regulated theory would be if predicted security holdings correspond closely to actual over the entire period, 1922–28. Then, the entire period could be viewed as one continuous episode of Reserve bank competition. Alternatively, a single regression equation may ill-fit the data, perhaps with actual government securities over-predicted for some subperiods and under-predicted for others. Then, the competitive theory cannot be judged a complete success; the entire period cannot be viewed as one continuous episode of Reserve bank competition and we can turn to the occasional decisive leader theory to ascertain whether it does a better forecasting job.

2. TESTING

Overview

The first step in the testing agenda is to determine how well the self-regulated theory fits the data: how well it predicts Fed open market operations. Fortunately, much of the hard work was undertaken in chapter 6. There, using aggregate monthly data, I first estimated the following competitive Fed credit equation, in natural log form, for the period 1922–28:

$$\Delta \mathrm{l}\ (\mathrm{FC}_t) \quad \mathrm{a} \quad \mathrm{b}\Delta\ln(\mathrm{r}_t) + \mathrm{c}\Delta\ln(\mathrm{B}_t) \quad \sum_{i=1}^{11} {}_i\mathrm{D}_i + \varepsilon_t, \tag{8.1}$$

where t is a time-script indicating the month, r is the interest rate on government bonds, B is the monetary base, D_i represents eleven monthly dummies designed to capture any seasonal movement in the variance of gold redemptions, and ε_t is the error term. The results, reproduced in column 1 table 8.1, are broadly consistent with the self-regulated model. In particular, $b > 0$ and is statistically significant, indicating that Fed credit responds positively to the government bond rate; $c = 3.69$ and is statistically significant, implying economies of scale in gold holdings. The R^2-statistic for the regression equation is 0.886.

Table 8.1 Tests of the competitive Fed credit equation

$$\Delta\ln(FC_t) = a + b\Delta\ln(r_t) + c\Delta\ln(B_t) + g\Delta(GoldRes_t) + h\Delta(GoldNat_t) + \alpha_1D_1 + \alpha_2D_2 + \alpha_3D_3 + \alpha_4D_4 + \alpha_5D_5 + \alpha_6D_6 + \alpha_7D_7 + \alpha_8D_8 + \alpha_9D_9 + \alpha_{10}D_{10} + \alpha_{11}D_{11} + \varepsilon_t$$

	Δln(Fed Credit)				
	Benchmark Tests			Gold Market Tests	
	(1) 1922–28	(2) 1922–23	(3) 1922–23	(4) 1922–28	(5) 1922–28
Constant	0.01	–0.02	–0.01	–0.0006	–0.01
	(0.69)	(–6.13)	(–1.03)	(–0.04)	(–0.65)
Δln(Government	0.16	0.18	0.10	0.16	0.13
rate)	(2.66)	(2.40)	(1.45)	(2.62)	(2.10)
Δln(Base)	3.69	4.03	3.24	3.74	3.85
	(7.80)	(19.79)	(9.35)	(8.08)	(8.48)
Δ(GoldRes)				0.009	
				(2.07)	
Δ(GoldNat)					0.003
					(2.88)
Dummies					
Jan.	–0.08*		–0.06*	–0.08*	–0.07*
Feb.	–0.0004		–0.005	–0.0002	0.0001
Mar.	0.005		0.03*	0.01	0.01
Apr.	–0.04*		–0.03*	–0.04*	–0.04*
May	–0.004		–0.004	–0.003	–0.002
Jun.	–0.02		–0.01	–0.02	–0.01
Jul.	–0.02		–0.03	–0.02	–0.02
Aug.	–0.01		–0.001	–0.01	–0.01
Sep.	0.01		0.01	0.01	0.01
Oct.	–0.02		–0.01	–0.02	–0.01
Nov.	0.01		–0.005	0.01	0.01
R^2	0.886	0.950	0.991	0.892	0.898
DW	1.33	2.67	2.09	1.46	1.50

Sources: Board of Governors (1943) and Eichengreen (1992, 188–90, table 7.1).

Notes: t-statistic is in parentheses. For monthly dummies, * indicates significant at 5% level.

Next, I recovered, from the estimation of equation (8.1), a predicted Fed credit series that I transformed from natural logs into de-logged levels. I then

estimated the following competitive government securities equation for the period 1922–28:

$$\Delta(S_{RBt}) \quad d \quad e\Delta(L_{RBt}) + f\Delta(\ FC_t) + \varepsilon_t, \tag{8.2}$$

where S_{RB} is government securities, L_{RB} is discount loans, and ~FC is predicted Fed credit. My interest at that time was the size of the scissors parameter, after controlling for factors that, according to the competitive theory, would influence Fed credit. If Fed credit had been precisely predicted in the first stage equation (i.e., if predicted had equaled actual Fed credit with $R^2 = 1$), then the scissors parameter, e in equation (8.2), would equal minus one, the Fed credit parameter, f, would equal one, and the R^2-statistic would equal one. These results would offer the strongest possible support for the self-regulated model.

The actual results from estimating equation (8.2) are reproduced in column 1 table 8.2. The scissors parameter, e = –0.63, is statistically significant, implying the existence of a scissors effect. However, the scissors parameter differs significantly from minus one (95 percent confidence interval is –0.54 to –0.72). Also, the predicted Fed credit parameter, f = 0.55, differs significantly from plus one (95 percent confidence interval is 0.48 to 0.63) and the R^2-statistic is 0.745. These results suggest that the basic self-regulated model does not provide a complete explanation of Fed credit and government security movements over the entire period, 1922–28.

Table 8.2 Tests of the competitive scissors effect
$\Delta(S_{RBt}) = d + e\Delta(L_{RBt}) + f\Delta(\sim FC_t) + \varepsilon_t$

	Δ(Government Securities)			
	Benchmark Tests		Gold Market Tests	
	(1) 1922–28	(2) 1922–23	(3) 1922–28	(4) 1922–28
Constant	0.19	1.32	0.06	0.02
	(0.06)	(0.56)	(0.02)	(0.01)
Δ(Discount Loans)	–0.63	–0.995	–0.63	–0.67
	(–14.01)	(–28.32)	(–13.76)	(–16.13)
Δ(Predicted Fed Credit) Benchmark	0.55 (14.92)	0.958 (24.24)		
Δ(Predicted Fed Credit) Using ΔGoldRes			0.60 (14.62)	
Δ(Predicted Fed Credit) Using ΔGoldNat				0.66 (17.12)
R^2	0.745	0.975	0.737	0.793
DW	1.34	1.94	1.50	1.40

Source: Board of Governors (1943).
Note: t-statistic is in parentheses.

Ultimately, a theory can be judged only by its performance relative to competing theories, in this case the policy activist theory. To aid in this assessment, figure 8.1 plots actual first differences of government securities along with the predicted first differences (based on the results from equation 8.2) for 1922–28 and figure 8.2 plots the corresponding residuals. Also, as a point of reference, figure 8.3 plots the level of Fed credit and its components. The activist theory asks us to pay close attention to 1924 and 1927. While there is little indication that the OMIC catered to the Treasury's debt retirement concerns in early 1924—residuals were not systematically negative—the primary working hypothesis does receive some support. If, indeed, Reserve banks are being instructed by Strong to overextend themselves for Great Britain's sake, for its return to and continued participation in the international gold standard, then the actual government security series would tend to lie *above* the predicted series in late 1924 and in 1927. For 1924, actual exceeds predicted for a relatively short span, July to September, and, for 1927, actual exceeds predicted throughout the period, May 1927 to December 1927. The preliminary assessment is that the occasional decisive leader theory does a better job of explaining open market operations over the period, 1924–28, than does the self-regulated theory. In particular, Benjamin Strong was able to tilt policy away from the self-regulated outcome toward international cooperation when he perceived that such cooperation was needed.

Figures 8.1 and 8.2 raise one other cautionary note for the self-regulated theory. An eyeball test indicates that the residual pattern for 1922–23 systematically differs from the pattern for 1924–28. After the first few months in 1922, first differences of government securities tend to be less than predicted

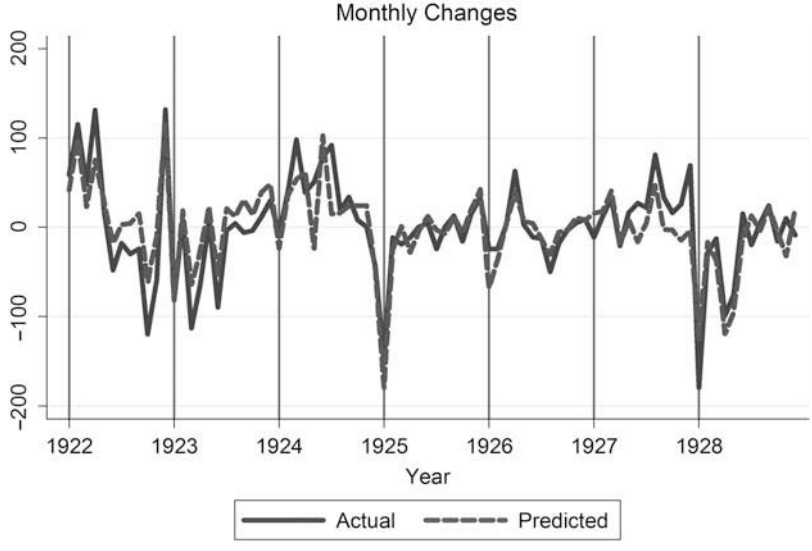


Figure 8.1 Actual and predicted government securities, 1922–28

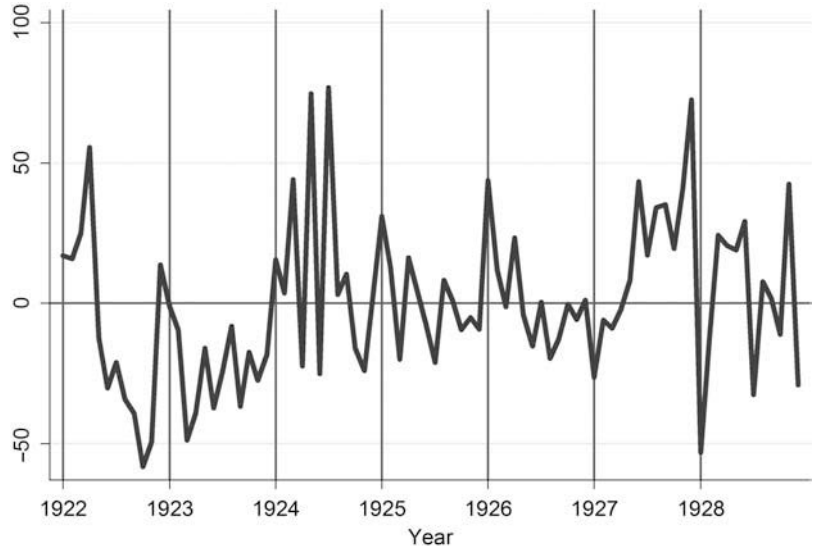


Figure 8.2 Government security residuals, 1922–28

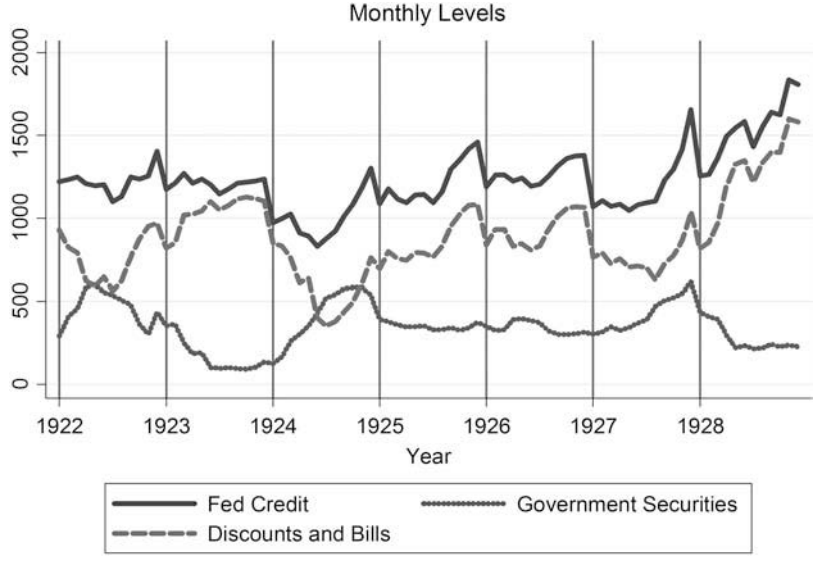


Figure 8.3 Fed credit and components, 1922–28

(residuals tend to be negative) and continue to be so up to the beginning of 1924. Then, there is a mix of positive and negative residuals, but with positive residuals tending to dominate the negative both in magnitude and frequency. The picture that emerges is that the self-regulated theory has misspecified the factors responsible for movements in government securities.

One interpretation is that there seems to be some factor(s) omitted by the theory, whose inclusion would explain why government securities tended to be "high" over the years 1924–28 relative to the years 1922–23. Of course, the decisive leader theory would assert that the omitted factor is Benjamin Strong.

1922–1923

Much of the evidence from previous chapters, on the seasonality of the components of Fed credit and on the (lack of) persistence in monetary aggregates, has been consistent with the implications of the self-regulated theory. But the last section alerts us to potential weak points in the theory, at least as exemplified by estimation of equation (8.2). First, there are subperiods after 1923 when the activist theory seems to do a better job of explaining Reserve bank open market operations. Second, the estimation equation applied to the full sample, is not an unbiased predictor, suggesting that it may be ill-advised, despite what the self-regulated theory contends, to treat 1922–28 as one continuous episode of Reserve bank rivalry.

As a preliminary step in exploring these issues, I turn attention to 1922–23 and pose the question: Did Reserve banks compete? The answer will be relevant for two reasons. First, an affirmative answer will provide a base line against which the self-regulated theory can be judged in the subsequent period, 1924–28. Second, while both the self-regulated and decisive leader theories take as their starting point the proposition that Reserve banks competed during the 1922–23 subperiod, the two theories differ in their ability to survive a negative answer. With respect to the decisive leader theory, for instance, a finding that cast doubt on inter-Reserve bank rivalry in 1922 and 1923 need not make one less willing to accept the hypothesis that Strong's leadership was important for Fed policy in 1924 and 1927. A negative finding would sound the death knell for the self-regulated theory, however; it seems farfetched to maintain that Reserve banks competed in 1924–28, when a co-coordinating body designed to impede competition was in place, but not in 1922 and 1923, when no such oversight body existed.

Figure 8.3 shows a scissors pattern of government security holdings and discount loans broadly consistent with what we would expect if Reserve banks were competing in a gold standard setting, under the proviso that factors driving Fed credit remained constant. From January 1922 to May 1922, Reserve banks responded to the decrease in the earning asset discount loans by increasing the earning asset government securities, such that Fed credit was roughly the same in May 1922 compared to January 1922. From June 1922 to November 1922, the pattern reverses with rising discount loans associated with declining government securities. The next two months represent obvious deviations from the scissors pattern, as discount loans and government securities move up together from November to December and down together from December to January of the next year, 1923. Then the

scissors pattern resumes as discount loans increase and government security holdings decrease for the remainder of 1923.

A more systematic exploration of the competitive hypothesis requires that we return to equation (8.1), the competitive Fed credit test equation, and reestimate it for the subperiod, 1922–23. Table 8.1 shows the results of estimating two versions of this equation, one without the monthly dummies to conserve degrees of freedom and one with. The striking feature of the second more comprehensive version is the overall explanatory power as indicated in column (3) by the summary statistic, $R^2 = 0.991$ (compare to $R^2 = 0.886$ for the 1922–28 equation in column (1)). In addition, the coefficient on the monetary base points to economies of scale in gold holdings, as implied by the competitive theory, though the government rate, while of the right sign, is not statistically significant. Estimating the more parsimonious equation, without seasonal dummies, gives a close but somewhat looser fit in column (2).

The preciseness with which both versions predict Fed credit implies that if we next run a scissors equation, using predicted Fed credit as a control, we would find the coefficient on predicted Fed credit very close to +1, the coefficient on discount loans very close to –1, and the R^2-statistic very close to 1. This follows from the very definition of Fed credit as the sum of government security holdings and discount loans. The scissors results presented in column (2), table 8.2—for the dummy version of the Fed credit test equation—confirm this expectation: the Fed credit coefficient is 0.96 (95 percent confidence interval is 0.88 to 1.04), the scissors coefficient is –0.995 (95 percent confidence interval is –1.07 to –0.92), and the R^2-statistic is 0.975.

These results are consistent with the supposition that both the decisive leader and the self-regulated theory share: that 1922 and 1923 represented years of inter-Reserve bank rivalry. Indeed, I view these results as among the most important empirical findings of this chapter. Not only do they provide a formal empirical foundation for the consensus view—a view based largely on anecdotal evidence of inter-Reserve bank rivalry during 1922 and 1923—they also lend credence to the particular model—a model stripped down to the bare essentials—presented in chapters 4 and 5 to explain episodes of Reserve bank rivalry. That model was based on Jeffrey Miron's model of commercial bank competition in the early days of the Fed. My model extended his framework to the Reserve banking system by assuming that Reserve banks operated in an environment of uncertainty, choosing gold reserves to maximize expected profits (Reserve banks engaged in expense preference behavior) based on a simple liquidity cost function. Applied to a period judged by all interested monetary historians as a competitive one, the barebones model of competitive Reserve bank decision making performs with flying colors (albeit the model is assessed using aggregate data and a limited sample size; but see the next chapter for corroborating evidence). Accordingly, I shall use the test results for 1922–23 as a benchmark, or standard, for assessing whether rivalry also characterized the post-1923 Reserve bank system.

1924

Given that the competitive thesis does well in explaining open market operations for 1922–23, we turn our attention to the period, 1924–28. An examination of the year 1924 seems a most appropriate starting point. In 1922, there was no mechanism, formal or otherwise, compelling Reserve banks to cooperate in conducting open market operations. By 1924, there was a formal coordination mechanism in the form of a Special System Investment Account administered by the recently created OMIC (see chapter 3). The conventional view is that, while not perfect, the committee was successful in inducing Reserve banks to be less focused on the bottom-line and more amenable to cooperating, whether directly with the board, acting as an agent of upper-level government, or with an intermediary, Benjamin Strong, who, at least in some versions of the conventional wisdom, assumed the role of an occasional decisive leader. In contrast, the competitive claim is that the OMIC's attempt to quell independent adjustment by the Reserve banks was not successful.

Return to figure 8.3, which shows that the pattern of discount loans in 1924 tends to mimic the pattern in 1922 with both exhibiting classic V-shaped seasonality. Accordingly, a comparison of open market operations in 1924 and 1922 comes somewhat close to a natural experiment: if Reserve banks continue to act as competitive, self-regulated firms, then we might expect that the pattern of government security holdings in 1924 would correspond closely to the pattern in 1922.[1] The existence of a formal coordinating body, the OMIC, does not matter, either because individual Reserve banks directly end-run the OMIC by conducting their own open market operations or because repeated *threats* of independent adjustment force the OMIC to conduct open market operations in a way that produces the outcome that would have been forthcoming in the absence of a coordinating body. Alternatively, the decisive leader prediction is that the pattern should systematically differ. The primary working hypothesis is that in late 1924 Reserve banks, acting through Strong's leadership at the OMIC on behalf of the international gold standard, will purchase more than if they had operated in a self-regulated system. A secondary hypothesis is that in early 1924 Reserve banks, acting through Strong's leadership at the OMIC on behalf of the Treasury, will purchase less.

A first look at government securities for 1924 does not seem to bode well for the secondary hypothesis. Government security holdings rose over the period of declining discount loans (January to July) in 1924, much like they did over the period of declining discount loans (January to May) in 1922. The scissors offset may have been somewhat muted in 1924 compared to 1922, but not much: Fed credit fell from $1221 to $1195 million, January to May 1922 and fell from $972 to $875 million over the longer period, January to July 1924.

The decisive leader theory fares better with respect to the primary hypothesis of open market ease in late 1924. Contrary to the prediction of the self-regulated theory, figure 8.3 shows that government securities continued to

rise several months after the turning point for discount loans. The result is that Fed credit rose sharply in the second part of the year, leaving Fed credit much higher in January 1925 than in January 1924.

To more systematically evaluate whether open market operations in 1924 are best modeled as driven by competition or decisive leadership, I exploit the finding that equation (8.1), the competitive Fed credit test equation, does a bang-up job of explaining Fed credit during the consensus competitive period, 1922–23. Accordingly, I interpret the estimated coefficients from that regression exercise as capturing the *true* relationship between Fed credit and the relevant independent variables in a setting characterized by Reserve bank rivalry. Then, to provide insight into whether the 1922–23 spirit of competition spilled over into 1924, I take the in- and out-sample predicted (non-log) Fed credit levels derived from estimating equation (8.1) for 1922–23, and from these predicted values I subtract actual discount loans to get a series for predicted government securities, 1922–24.[2] From the discussion in the previous section, we expect that predicted and actual government securities will closely match each other in 1922–23, since predicted Fed credit closely matches actual Fed credit and Fed credit is defined simply as the sum of government securities and discount loans. The question for the competitive theory is whether the match between predicted and actual government securities continues to be close in 1924? The question for the decisive leader theory is whether there is any mismatch in the direction predicted: most important, under the Strong as decisive leader thesis, toward under-prediction in late 1924.

Figure 8.4 plots actual and predicted government securities for 1922–24. For 1922, the predicted series tightly fits the actual series. In January 1923, there is an underestimate of government securities and the predicted

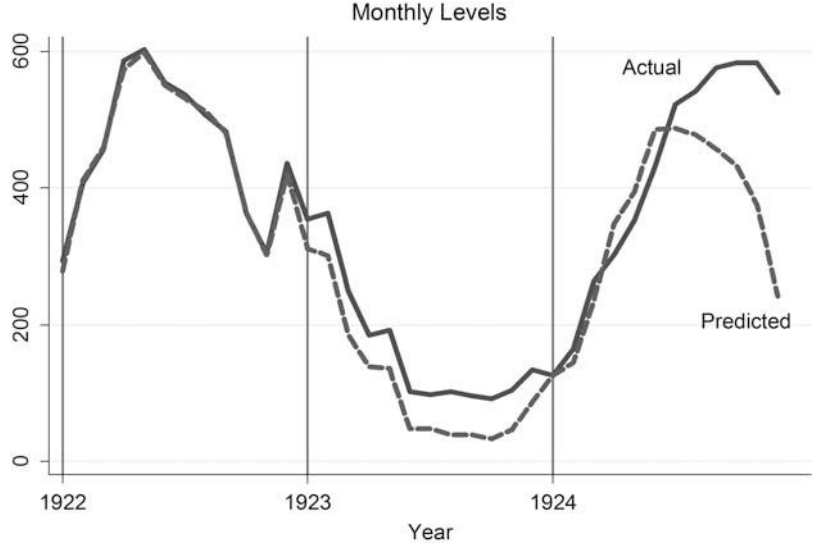


Figure 8.4 Actual and predicted government securities, 1922–24

series lies below the actual series for the remainder of the year, roughly by the amount of the January misestimate. In January 1924, there is again a misestimate—this time an overestimate—that allows the predicted series to catch-up with the actual series. From January 1924 to June/July 1924 the predicted and actual series closely track each other. Then, the competitive model suffers a meltdown. While the competitive model predicts falling government securities in subsequent months, actual government securities continue to rise. By December 1924 actual government securities exceed predicted by almost $300 million.

Clearly, the competitive, self-regulated theory has difficulty explaining open market operations in the second half of 1924: why the scissors effect did not hold. Qualitatively, the actual and predicted series depicted in figure 8.4 are consistent with the primary hypothesis of the decisive leader theory. With creation of the system account under the auspices of the OMIC in December, 1923, Strong now had the means with which to advance his agenda: expand Fed credit to aid Great Britain's return to the international gold standard.

The genesis of Strong's strategy can be traced to early 1924. As recounted by his biographer, Lester Chandler, Strong traveled to Europe in March, meeting with Montagu Norman, head of the Bank of England, to review and study the Dawes Plan, designed to stabilize the international economy in the aftermath of WWI:

> On May 27, shortly after his return from Europe, he wrote a long letter to Secretary Mellon outlining a comprehensive plan for European stabilization. At about the same time he emphasized the need for creating easy-money conditions in the United States. In part this was to combat domestic recession; it was also to assure that efforts to utilize the new favorable opportunities abroad should not be hindered by any unavailability of loans from the United States. The upsurge of foreign lending by the United States in the latter half of 1924 cannot be explained without reference to the new hope created by the Dawes Plan and the favorable money market conditions created by Federal Reserve policies (Chandler 1958, 271–72).

Chandler's rendition of Strong as policy activist accords well with the predictive pattern displayed in figure 8.4. At the turn of the month from May to June, Strong announces that for the good of the domestic and the international economies, the United States needs to create easy money conditions. That is, Strong needs to orchestrate a policy that induces Reserve banks to purchase more than they would if left to their own competitive urges. The decisive leader view can then refer to figure 8.4 for corroboration, pointing out that actual government securities exceeded predicted in July with the gap widening throughout the year.

1927

The success of the decisive leader theory in explaining open market policy in 1924 suggests that we leap forward in time and investigate the other year,

1927, when Benjamin Strong was purported to have reasserted his leadership powers. Empirically, 1927 is a good year to turn for another reason. Like 1922 and 1924, 1927 is the only other year in the 1920s when discount loans strongly exhibited the classic V-shaped pattern. Figure 8.3 shows discount loans generally falling over the first 8 months and rising over last 4.

As in 1924, government security holdings respond in scissors-like fashion for the first part of the year. Over the first 8 months, government securities rise from $304 million to $473 million, more than compensating for the discount loan fall from $766 million to $629 million. Also, as in 1924, government security holdings continue to rise, even when discount loans reverse course in month 8, raising red flags regarding the explanatory power of the self-regulated theory.

More formally, figure 8.5 compares actual and predicted government security levels in 1927, following the procedure described in the previous section, with the proviso that predicted levels are set equal to actual levels in January to facilitate comparison. The notable feature of the 1924 pattern, depicted in figure 8.4, is that actual levels exceed predicted levels from month 7 to month 12. Correspondingly, for 1927 actual levels exceed predicted levels from month 6 to month 12, with the gap over $100 million by month 9 and over $500 million by the end of the year. The self-regulated theory faces the same type of critique that it faced in 1924: "What accounts for its relatively poor predictive power in the second part of the year?"

Does the decisive leader theory, once again, hold out promise of explaining the actual pattern of government security holdings? As was the case for 1924, Strong's biographer, Chandler, lays the foundation. In a chapter titled, "The Franc," Chandler outlines the monetary policy implications of a now

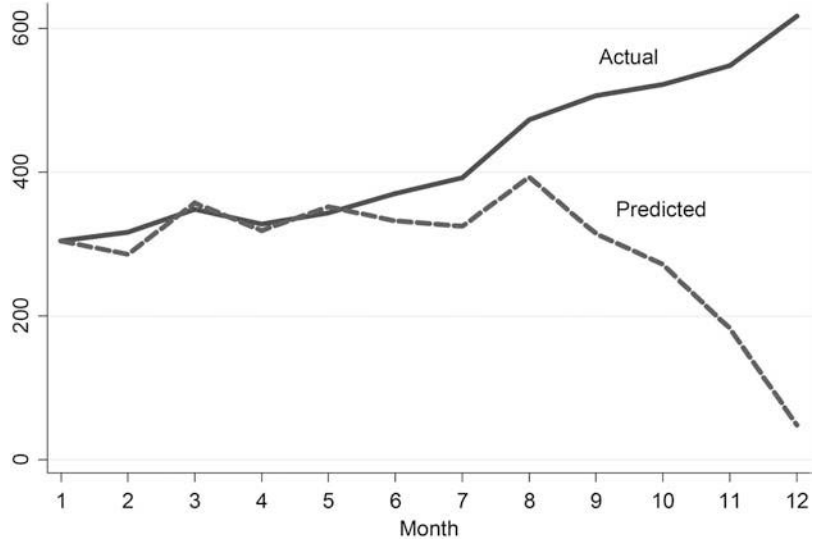


Figure 8.5 Actual and predicted government securities, 1927

famous meeting in New York in early July 1927 among Strong, Norman (Bank of England), Hjalmar Schacht (Reichsbank), and Deputy Governor Charles Rist (Bank of France), designed to facilitate central bank cooperation as more nations returned to gold.

> The situation was much relieved for some months after the conference. The Bank of France shifted its gold purchases from London to New York, as did also the Reichsbank. But the greatest relief was provided by the now famous Federal Reserve easy-money policy of 1927. The Open Market Investment Committee added about $200 million to its holdings of government securities and a comparable amount to its holdings of bills during the second half of the year, mostly from June to November. All the Reserve Banks lowered their discount rates from 4 to 3(1/2) per cent in the period from July 29 to mid-September.
>
> This easy-money policy had a double objective—to combat business recession at home and to relieve monetary strains abroad (Chandler 1958, 377).

Later in a summary chapter, "The Last Years," Chandler suggests the motivation for the Fed's policy:

> There can be no doubt that the international situation was a major reason for the 1927 easy-money policy, that Strong was motivated by an altruistic concern for European countries, especially Britain, and that at least the timing of the policy was related to the conference with foreign central bankers in early July. But it would be grossly misleading to say that the policy was initiated solely because of the international situation and solely for altruistic purposes. Domestically, a mild recession seemed to have started. Wholesale prices had declined about 6 per cent in the past year. Industrial production was receding slowly, with significant declines in autos, iron and steel, and minerals. Factory employment was down about 5 per cent from its peak in the spring. A memorandum prepared at the New York Bank for the July 27 meeting of the Open Market Investment Committee mentioned developments of these types as well as those abroad (Chandler 1958, 440).

There are two key elements to Chandler's version of the decisive leader theory as it applies to 1927. The first is motivational. While not the full story, Strong's "altruistic concern for European countries, especially Britain" was a "major reason for the 1927 easy-money policy." The second element is one of timing: "the policy was related to the conference with foreign central bankers in early July."

Here, we have a clear-cut basis for evaluating Chandler's rendition of the decisive leader theory against the basic self-regulated theory. The decisive leader theory posits that, starting in July, Reserve bank security holdings will be greater than what is predicted by the competitive theory. Figure 8.5 offers confirmation, since, as noted above, the gap between actual and predicted security holdings widened significantly from July (month 7) to the end of the year. While the basic self-regulated theory fails to explain the widening gap, the decisive leader theory can point to the activism of an altruistically inclined

Benjamin Strong. In a head-to-head contest, therefore, the decisive leader theory can once again claim victory over its self-regulated rival.

Figure 8.5 does raise a timing issue for the decisive leader theory, however. The gap between actual and predicted government security holdings started to widen one month before the famous meeting, in June (month 6) rather than July (month 7). But this does not seem too much of a strike against the theory. A proponent might argue that Strong initiated the easy-money policy in June in anticipation of the success of the July meeting. In any event, the basic self-regulated theory is silent on this score. It fails altogether to explain the so-called easy-money policy of 1927, whether commenced in June or July.

3. COMPETITION AND THE GOLD MARKET

The last section posed the question: Were the competitive forces driving government security holdings in 1922 and 1923, before formation of the OMIC's system account, operative in the years 1924 and 1927? The results gave a thumbs-down. A competitive regression equation, estimated for 1922–23, systematically under-predicts government security holdings for 1924 and 1927, opening the door for the policy activist theory.

The years 1924 and 1927 are not the only years when the competitive regression does a relatively poor job of explaining government securities. Figure 8.6 shows the under-prediction (actual minus predicted) of government securities for 1922–28, where the predicted series is based on the procedure described in section 2: take the in- and out-sample predicted (non-log)

Figure 8.6 Under-prediction of government securities

Fed credit levels derived from estimating equation (8.1) for 1922–23 and from these predicted values subtract actual discount loans to get a series for predicted government securities. As we know from our earlier analysis (see figure 8.4), the competitive regression does well in predicting government securities for 1922 and 1923. Thereafter, the under-prediction series indicates a breakdown in the performance of the competitive regression, with government securities consistently under-predicted starting in July 1924. With the exception of 1926, the under-prediction series exhibits a clear upward trend.

Figure 8.6 points to the possible existence of an explanatory variable, heretofore omitted, whose inclusion into the competitive test equation, would resolve the puzzle of systematically high, at least by the standard of the self-regulated theory, government security holdings from July 1924 to December 1928. The crucial question is where the omitted variable can be found. The basic competitive theory, as presented in chapter 4, gives no hint; nor does the occasional decisive leader theory come up with a completely satisfactory answer, with its emphasis on 1924 and 1927 as the years when Strong pushed for easy money. Must we throw up our hands at this point, whisper the problem of unobserved variables, and quickly move on?

Before giving in to this temptation, return to the end of chapter 4, which offered an amendment to the basic self-regulated theory in a section titled, "International Twist." There we noted that the basic self-regulated theory assumes unchanging supply and demand conditions in the world market for gold. If, however, conditions change, then Reserve banks will confront a change in the relative price of holding gold. In particular, an increase in the world demand for gold increases the price of gold. Now Reserve banks have an incentive to economize gold while expanding their government security holdings beyond the level implied by the basic competitive model. Could an increase in the relative scarcity of gold on the world market be the omitted variable?

There are tantalizing hints from the work of other monetary scholars suggesting that this is an avenue worth pursuing. Barry Eichengreen, in his influential book, *Golden Fetters* (1992), introduces a chapter titled, "International Gold Standard in Operation," with the observation:

> Great Britain joined the United States on the gold standard in April 1925. By the end of that year, nearly three dozen countries had effectively restored convertibility. The French franc was stabilized de facto in 1926, the Italian lira in 1927. By the beginning of 1928, the gold standard system's reconstruction was essentially complete (Eichengreen 1992, 187).

In addition, Germany returned to gold in September 1924 and France returned de jure in 1928. Thus, throughout the period 1924–1928, important, core countries joined the gold standard.

An article by Ronald Batchelder and David Glasner, "Debt, Deflation, the Great Depression and the Gold Standard" (1995), explicitly draws

the connection between restoring the gold standard, the relative price of gold, and deflation in the 1920s. They introduce their paper by contrasting their approach with the standard monetary interpretation of the interwar period.

> This paper proposes a revised interpretation of the prolonged deflation and monetary contraction in the United States and most of the world during the Great Depression. Contrary to modern Monetarist explanations, we argue that the monetary contraction of 1929–33 was the consequence of U.S. adherence to the gold standard; that the sequential return to gold convertibility by most countries during the 1920's increased the world's monetary demand for gold which induced a worldwide deflation (Batchelder and Glasner 1995, 277).

Thus, the basic self-regulated assumption of unchanging gold demand and supply conditions does not hold under Batchelder and Glasner's interpretation of the operation of the interwar gold standard.

Before exploring whether Batchelder and Glasner's interpretation identifies the missing variable needed to explain *easy money* from 1924–28, first note that their work employs a theory of the interwar monetary system that is in full accord with the framework underlying the self-regulated theory of Reserve banking, a framework that tends to downplay the monetary import of a central bank's decision to tradeoff gold holdings for Fed credit, except as that decision may affect the international market for gold. As Batchelder and Glasner explain:

> Since the world stock of gold is virtually fixed in the short run, the combined world monetary and non-monetary demands for gold imply a determinate worldwide value of gold in relation to all other commodities . . . This internationally determined value of gold (in relation to all other goods) is the worldwide price level (in terms of gold). Given this (worldwide) "international" gold price level, the national *nominal money* price levels within each of the gold standard countries are dictated by the conversion rates of their national currencies into gold . . . Only insofar as the gold-reserve accumulations of banks affects the world demand for gold can banks affect the price level (in terms of gold).
>
> The crucial implications of this (English) convertibility version of the international gold standard is that domestic monetary authorities cannot affect the domestic price level. Central banks can only control the rate at which they accumulate gold or equivalent foreign-exchange reserves . . .
>
> There is no essential monetary role for monetary gold reserves under this gold convertibility standard. The supply of currency in the nation does not vary with the *monetary authority's* gold reserves . . . Maintaining convertibility at the gold parity is simply a policy of changing one nation's amount of money along a perfectly elastic supply of money to match the fluctuating demand for money at an *exogenously determined gold price level* (Batchelder and Glasner 1995, 283–84).

Holding constant worldwide demand and supply conditions in the gold market, a change in the rate at which an individual Reserve bank accumulates

gold has no domestic monetary policy implications, affecting neither the domestic monetary base nor the money supply.

When worldwide conditions in the gold market do change, however, then Batchelder and Glasner join hands with the "International Twist" extension of the self-regulated theory of Reserve banking.[3] In particular, an increase in the world demand for gold places upward pressure on the relative price of gold and downward pressure on the general price level. Competitive Reserve banks respond by switching out of the relatively more expensive asset, gold, into the relatively less expensive asset, government securities. The testable conjecture here is that the change in gold market conditions, an increase in the worldwide demand for gold, represents the missing factor that resolves the under-prediction puzzle highlighted in figure 8.6.

The first step in exploring this solution is to identify empirical proxies for the missing variable, a demand-induced increase in the relative price of gold. One possible proxy is the world price level, since, under the gold standard, the counterpart to an increase in the purchasing power of gold is a decrease in the general price level. A second avenue to pursue is to estimate the world demand for gold under the presumption that world supply conditions are relatively stable over the course of a decade.

The direct approach, calculating a world price level, is no easy task. For one thing, the world of the 1920s consisted of numerous economies each with their own currency and their own price level measure. Moreover, Armen Alchian and Benjamin Klein (1973) have persuasively argued that conventional price measures, such as the US consumer price index, are not appropriate measures of the true price level.[4] For this reason, I turn to Batchelder and Glasner's indirect approach, estimating the world demand for gold during the 1920s, though this too is no easy task.

To illustrate the problems an empirical economist confronts in following Batchelder and Glasner's lead, let's suppose she identifies a specific date when a "large" country returns to the international gold standard. She might be tempted to conclude that the demand for gold increases at that date. But what if that country's central bank, or simply an astute observer of international affairs, buys gold in advance of the scheduled date? Then, the demand for gold, and hence the relative price of gold, rises in anticipation of the return to gold, with no bump-up in demand on the official return date. If the empirical economist is not a mind reader (i.e., she is unable to date the actual moment when central banks, or astute observers, decide to act on their anticipation of the return to gold), then she will be unable to date the "true" run-up in the demand for gold. The empirical economist is left, in other words, without a proxy for the relative price of gold.

In spite of these theoretical difficulties I will follow Batchelder and Glasner's lead and make do with what the empirical realm has to offer. They emphasize the role of two countries in the international gold market of the 1920s. First, "the United States owned about 40 percent of the gold held by the world's *monetary* authorities," which meant that "a willingness by the U.S. government to tolerate an outflow of gold could counteract the

deflationary pressures inherent in the international monetary system" (1995, 288). Second, "The uneasy balance of the world economy on the edge of deflation was first threatened in 1926–27 by the French stabilization of the franc under the national-unity government of Poincare" (1995, 288). A series of reforms initiated by Poincare in 1926 to stabilize the franc was followed in 1928 by passage of a stabilization law that "severely restricted the kinds of assets other than gold that the Bank of France could hold" (1995, 289). Before 1928, the Bank of France had been accumulating foreign exchange reserves rather than gold to satisfy the public's demand for notes. After 1928, the stabilization law dictated that the Bank of France accumulate gold. Thus, for Batchelder and Glasner, passage of the 1928 stabilization law is the key international gold market event of the 1920s. As Glasner has argued elsewhere, in reference to the work of Ralph Hawtrey, when the Bank of France began cashing in its foreign exchange reserves for gold bullion, it launched "a scramble for gold by countries seeking to restore the gold standard, a scramble that began in earnest in 1928" (Glasner, David. 2011. "Keynes v. Hayek: Advantage Hawtrey." *Uneasy Money* (blog), September 6. http://uneasymoney.com/2011/09/page/2/).

Batchelder and Glasner also provide insights into constructing a measure for the world demand for gold. While studies of the interwar gold standard tend to focus on intercountry gold flows, Batchelder and Glasner observe that

> international gold *flows* do not capture the degree of increased demand for gold in the world. With a fixed stock of gold, redistributions of gold among countries occurred in response to changes in their *relative* demands for gold. Changes in relative demands tell us nothing about what was happening to the *absolute* demand for gold, which is what determines the world price level under the gold standard. It is our contention that it was increasing rapidly. However much it increased, a uniform increase in gold demand would not cause any redistribution of existing stocks, so that looking at changes in gold holdings misses an important part of the story. A more appropriate measure of the increase in the demand for gold is the increase in the percentage of world gold held in central bank assets (Batchelder and Glasner 1995, 303).

Following Batchelder and Glasner's advice, I calculated the percentage of world gold held by 50 national governments (central banks and Treasuries), not including gold reserves held by the Fed, for the years 1922–28.[5] Figure 8.7 depicts the results, superimposed on the under-prediction series for government securities from figure 8.6. The first thing to notice is the overall positive correlation between the gold-demand and the under-prediction series: the gold-demand percentage climbs from just under 29 percent in 1922 to almost 36 percent in 1928 and the under-prediction series climbs from $0 to close to $1500 million. Both start-off low in 1922, with gold demand increasing modestly in 1923 as does the under-prediction series. The characteristic feature of each of the years 1924, 1927, and 1928 is that a significant increase in gold demand, from

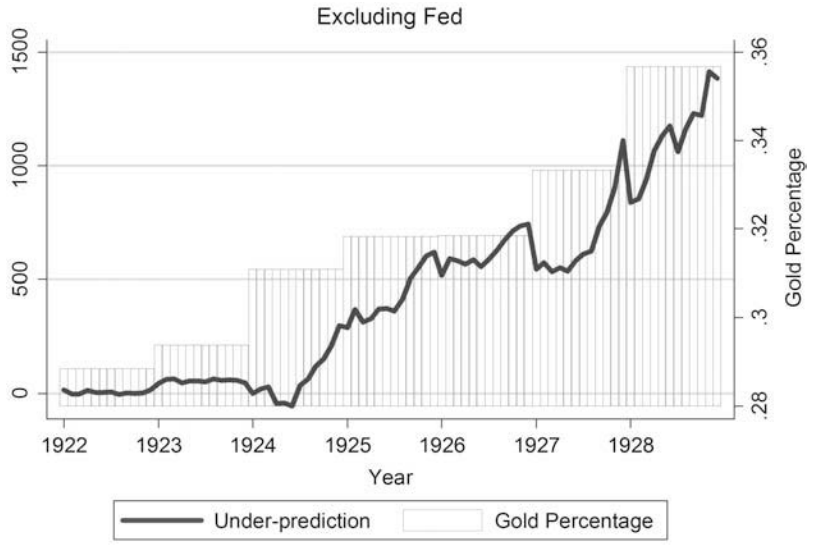


Figure 8.7 Percentage of gold held by governments

the previous year, is accompanied by a significant beginning-to-the-end-of-the-year increase in the under-prediction series. Moreover, the biggest surge in gold demand for the decade occurred in 1928, when, paraphrasing Glasner, an international scramble for gold reserves began in earnest. For 1926, gold demand is unchanged from the previous year and the under-prediction series is only modestly higher at the end compared to the beginning of the year. The year 1925 represents the only true outlier, with a modest increase in gold demand accompanied by a more than modest increase in under-prediction.

A second proxy for the world demand for gold, motivated by the work of Eichengreen (1992), measures the number of countries on the interwar gold standard over the period 1922–28. Simply counting countries appears to weigh large core economy entrants—Germany, Great Britain, and France—onto the gold standard, the same as small entrants. This seeming defect is largely mitigated, however, by the fact that a noncore country, aligned with a particular core country (e.g., a colony of a core country) tended to join the gold standard at about the same time as the core country to which it was affiliated. Great Britain and its colonies would be particularly noteworthy in this respect.

Figure 8.8 superimposes the number-of-nations series on the under-prediction series. As with the gold-percentage measure, the number-of-nations measure generally rises over the period 1922–28, climbing from 8 to 44. In contrast to the percentage measure, however, 1925 no longer shows-up as an outlier. The more than modest increase in under-prediction in 1925 is accompanied by a more than modest increase in the number-of-nations measure. Indeed, the biggest surge in the number-of-nations measure occurs

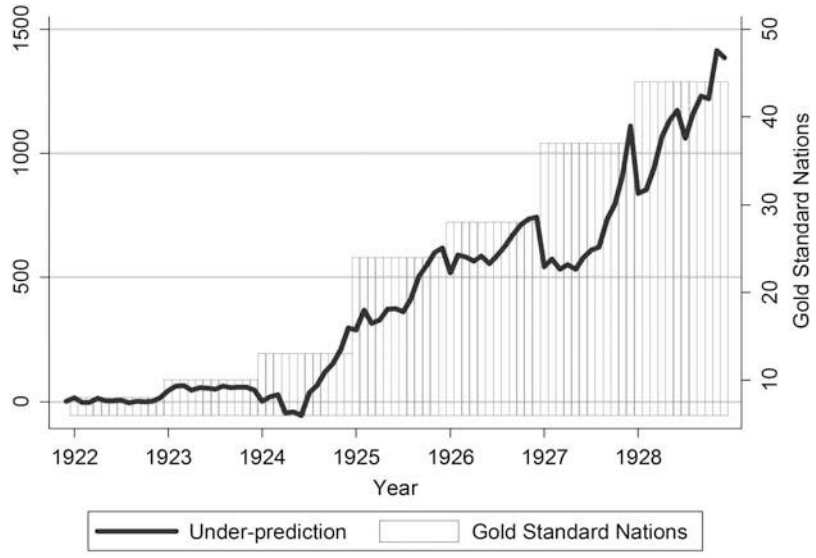


Figure 8.8 Number of gold standard nations

in 1925, the year of Great Britain's entrance, when 11 countries joined. Second and third are the years 1927 and 1928, with 9 and 7 entrants.

Taken together, figures 8.7 and 8.8 highlight the significance of the years 1927 and 1928—in each figure 1927 and 1928 rank in the top three in terms of *changes* in gold demand—as well as the years 1924 and 1925. This observation accords reasonably well with the pattern of government security under-prediction. The magnitude of under-prediction increased significantly in each of the four years, 1924, 1925, 1927, and 1928.

To more systematically explore whether international considerations help explain the under-prediction of government securities, and by implication Fed credit, I start with the 1922–28 benchmark Fed credit test equation (8.1). Then, I add, in separate regressions, the two measures of world gold demand as independent variables. Each measure is transformed from annual levels into monthly changes in two steps. First, I difference the annual level series to get seven first-differenced observations, one for each year, 1922–28. So, if the number of gold standard nations increases from 6 in 1921 to 8 in 1922 to 10 in 1923 to 13 in 1924, the change in gold standard nations is 2 for 1922, 2 for 1923, and 3 for 1924. Then, to construct the series for monthly changes in gold standard nations, I simply assign to each of the 12 months within a year the amount of the annual change for that year. So, the change for each month January to December 1923 is 2 and for each month January to December 1924 is 3. Once the two series are constructed in this fashion, the relevant questions are whether the gold-demand measures are statistically significant with the correct (positive) signs and whether the inclusion of these international variables significantly improves the overall fit of the competitive regression.

With respect to the second question, our expectations should be modest. The two proxies for world gold demand are coarse-grained in that they treat the change in gold demand as invariant across months within a particular year. Hence, they will not contribute anything to our understanding of why the change in Fed credit may be relatively large in one month of a year and relatively small in another month of the same year. At best, the gold-demand measures are equipped to shed light on the following type puzzle: Why were Fed credit first differences unusually high across months in (say) 1928 and unusually low across months in (say) 1926? In short, due to the coarse-grained nature of the data, we must expect only relatively modest improvements in the overall explanatory power of the amended competitive regression, *even if the self-regulated theory with an international twist is the correct theory.*

Columns (4) and (5) of table 8.1 report the results of separately adding the gold-demand variables to the column (1) benchmark Fed credit regression for 1922–28. Column (4) adds, as an independent variable, the first difference of the percentage of world gold reserves (*Gold Res*) held by national governments, excluding those held by Federal Reserve banks. Column (5) highlights the alternative measure of world gold demand, adding the first difference of the number of nations (*Gold Nat*) on the gold standard. An increase in either *Gold Res* or *Gold Nat* signifies an increase in the (rest of the) world demand for gold. Ceteris paribus, Reserve banks will respond to a demand-induced increase in the relative price of gold by economizing gold holdings and increasing Fed credit. Thus, the self-regulated theory, with an international twist, predicts positive signs on both gold variables. The evidence is consistent with this prediction: the gold demand coefficients in columns (4) and (5) are positive and statistically significant. As in the benchmark regression, the results imply economies of scale in gold holdings and that government security holdings increase with the government interest rate.

Note that the overall explanatory power of the self-regulated regressions, as measured by the R^2-statistic, increases as we move from the benchmark, to the *Gold Res*, to the *Gold Nat* regressions. That the *Gold Nat* regression does slightly better than the *Gold Res* regression is not too surprising since, from figures 8.7 and 8.8, the match between the benchmark under-prediction series and the *Gold Nat* series appears closer than the match between the under-prediction series and the *Gold Res* series. Still, the fit with any of these 1922–28 regressions is far from perfect: compare, for instance, the 1922–23 benchmark results reported in column (3) with the 1922–28 results in columns (4) and (5).

The gold market results from table 8.1 are used to derive two predicted Fed credit series, each to be used as an independent variable in a government securities regression for 1922–28. Since Fed credit is predicted with less than perfect precision, we should not expect the gold market regressions to result in precisely estimated one-for-one scissors effects. In table 8.2, Columns (3) and (4) show the scissors results using predicted Fed credit based on *Gold Res* and *Gold Nat*. Consistent with the table 8.1 results, the regression based

on *Gold Nat* does better than either the benchmark regression, which uses predicted Fed credit derived from the benchmark (no gold-demand component) regression reported in column (1) table 8.1, or the *Gold Res* regression. Comparing results in column (1) with those in column (4), the coefficient on predicted Fed credit rises from 0.55 (95 percent confidence interval is 0.48 to 0.63) to 0.66 (95 percent confidence interval is 0.58 to 0.73), the scissors effect rises from –0.63 (95 percent confidence interval is –0.72 to –0.54) to –0.67 (95 percent confidence interval is –0.75 to –0.59), and the R^2-statistic rises from 0.745 to 0.793. These results, when combined with those from table 8.1, support the international twist hypothesis that Reserve banks, during the years 1922–28, responded to an increase in the relative price of gold by expanding their government security holdings and, hence, Fed credit, beyond the levels that could be predicted on the basis of the basic, benchmark self-regulated model, though it is still the case that the point estimates from the gold market regressions do not give a one-for-one scissors.

4. STRONG AS INTERNATIONAL POLITICAL ENTREPRENEUR

There are qualifications to this thumbs-up verdict on the self-regulated model. An empirical cause for concern is that the gold-amended competitive test equation is not nearly as precisely estimated for 1922–28 as is the unamended test equation for 1922–23. I have attributed this outcome to the difficulty of measuring the worldwide relative price of gold. The optimistic view, here, is that a better proxy for the gold price would lead to a more precisely estimated Fed credit test equation as well as a more precisely estimated one-for-one scissors effect. But as things stand now this is certainly an open question.

A potentially more important concern is a theoretical one that stems from the assumption that the purchasing power of gold is exogenous in the self-regulated model. In particular, the purchasing power of gold is assumed to be not under the control of the individual Reserve banks. A possible objection is that one particular Fed agent, Benjamin Strong, was able to—and, in fact, did—influence the purchasing power of gold during the 1920s. Acting as a worldwide political entrepreneur, Strong used his powers of persuasion to foster the return to the international gold standard. A side effect of his entrepreneurship was an increase in the world-demand for gold and thereby an increase in the purchasing power of gold. According to this objection, the purchasing power of gold was not exogenous to the Federal Reserve System in the 1920s. Instead, the price of gold was pushed up by the actions of one influential Fed-insider, Benjamin Strong.

The question that arises in this context is whether the view of Strong as international political entrepreneur, which does seem an apt description of Strong's role in the 1920s international monetary scene, undermines our thumbs-up verdict on the self-regulated model. I suggest not. First, note that in explaining why Strong would seek a return to the gold standard one need

not rely on a rather nebulous *altruistic* motivation. Instead, Strong may have had a deep understanding that when only one country, the United States, in an international setting is committed to the redemption of its domestic currency into gold, then the world purchasing power of gold would tend to be relatively unstable. Why? As George Selgin, William D. Lastrapes, and Lawrence H. White recently have argued in comparing a gold standard to a fiat regime:

> A principal virtue of the classical gold standard was its status as an *international* standard. A single nation's return to gold would not reestablish a global currency area, and would achieve only a relatively limited reduction in the speculative demand for gold as an inflation hedge. As it would also fail to substantially increase the transactions demand for gold, it could not be expected to make the relative price of gold as stable as it was under the classical system (White 2008). To provide considerably greater stability than the present fiat-dollar regime, a revived US gold standard would probably need to be part of a broader international revival (2012, 590).

Hence, Strong, acting either as a spokesman for his New York Federal Reserve or as a spokesman on behalf of all 12 Reserve banks, would have a self-interested motive to advocate for a return to an international gold standard; such a return would enhance the demand for each Reserve bank's monetary liabilities by making the purchasing power of gold less volatile. Put differently, a commitment to redeem a currency into a commodity is of little value to the money holder, thereby offering little profit opportunity for the money supplier, if that commodity is subject to unpredictable price fluctuations.

Second, note that Strong wore several different hats throughout his tenure at the Federal Reserve in the 1920s: (1) head (governor) of the New York Reserve bank, (2) head (president) of the OMIC, and (3) international political entrepreneur. The occasional decisive leader model posits that, in 1924 and 1927, Strong used his position on the domestic front, as head of the New York bank and head of the OMIC, to further his international objectives. As leader of the OMIC, he orchestrated a cutback in gold holdings across all Reserve banks under the presumption that such a cutback would relieve, somewhat, worldwide deflationary pressures, making more likely a return to the international gold standard. According to the decisive leader model, domestic Fed policy, which Strong presumably controlled, was subservient to his international objectives.

The self-regulated theory takes issue with the supposition that Strong controlled domestic policy, making a sharp distinction between control on the domestic front and control on the international front. The self-regulated theory is a theory of the conduct of domestic policy, hats (1) and (2). It has nothing to say about Strong's role as international political entrepreneur, that role is simply outside its theoretical purview. What the self-regulated theory does assume is that at any moment in time an individual Reserve bank, in choosing its government security holdings, faces a price of gold—or more to the point a time path for current and future prices—which it takes as datum.

This assumption purportedly holds even for the New York Reserve bank.[6] True, in his capacity as international political entrepreneur, Strong may indirectly influence the price of gold by encouraging nations to join the gold standard. But, when he turns attention to domestic open market policy, the constraints he faces as head of the New York Reserve bank now require that he acknowledge that gold is more expensive, providing him with an incentive to economize gold, switching into government securities. Importantly, that open market operation will have no feedback effects on the worldwide price of gold assuming, as does the self-regulated theory, that the New York bank, along with the other Reserve banks, is a (gold) price-taker with respect to the trade-off between gold and government securities. The bottom line is that the self-regulated model should stand or fall on the basis of evidence gleaned from the domestic monetary side of the empirical ledger. Strong's success, or lack thereof, as an international political entrepreneur should have no bearing on this assessment.

5. CONCLUSION

We have traveled a long way in this chapter, making, substantial progress, I would claim, in addressing the relative merits of the self-regulated theory, which highlights Reserve bank rivalry, versus the policy activism theory, which highlights Benjamin Strong's leadership. Certainly, for the years 1922–23 all the evidence points in the direction of Reserve bank competition. The barebones self-regulated theory provides a complete explanation of movements in Fed credit based on movements in the monetary base, movements in the rate on government securities, and a set of seasonal dummy variables.

But this finding, while increasing our confidence that the barebones model captures the essential features of a competitive system, is not too surprising. After all, the consensus among economic historians is that these were years of intense rivalry among the 12 Reserve banks: a period, perhaps, where they were too preoccupied with the bottom line. The question for the rest of the decade is whether competition persisted.

The consensus among economic historians is that this too is a question of little intrigue. Most notably, the OMIC, under the leadership of Benjamin Strong, wrested control of open market operations from the individual Reserve banks and conducted open market operations on behalf of the entire system with an eye no longer directed at the bottom line. The most prominent alternative to the self-regulated theory is that Strong occasionally used his leadership skills to induce Reserve banks to conduct open market operations in a way that first would facilitate Great Britain's entry onto the gold standard and later would insure the continued sustenance of that standard. In particular, in 1924 and 1927, Strong pushed for expanding open market operations beyond what could be expected from the individual Reserve banks acting independently, that is, competitively. And indeed, on this score, evidence supports the leadership theory over the self-regulated theory. The

self-regulated theory under-predicts government security holdings during 1924 and 1927.

But this is not the end of the story. The basic self-regulated theory under-predicts, not only in 1924 and 1927, but also in 1925 and 1928. When the basic theory is amended to take into account ongoing increases in the demand for—and, therefore, the relative price of—gold, as more and more nations adopt the worldwide gold standard, it predicts that bottom line–oriented Reserve banks will respond by increasing their government security holdings beyond competitive benchmark levels. Here, the evidence supports the self-regulated theory. Proxies for the relative price of gold, when added to the basic competitive regressions, turn out positive and statistically significant. The inference here is that Reserve banks were not so much kowtowed into submitting to the charm or wrath of an altruistically motivated Strong, but were self-interestingly responding to economic incentives.

To be sure, the occasional leadership theory could be more loosely interpreted to suggest that Strong, for the sake of the worldwide gold standard, successfully advocated for expansionary open market operations in 1925 and 1928 as well as in 1924 and 1927. Under this looser interpretation, the leadership theory is observationally equivalent to the self-regulated theory. Still, my inclination would be to chalk one up for the self-regulated theory in a head-to-head battle. For one thing, this looser interpretation, with its allowance for expansionary policy throughout the decade, contradicts a secondary tenet of the decisive leader hypothesis: that with Strong's illness and death in 1928, the Fed conducted an unusually tight monetary policy. In addition, if we do go with the looser interpretation then the *occasional* decisive leader theory morphs into the *persistent* decisive leader theory, or, in other words, a generic discretionary theory. And, as we indicated in chapter 6, generic discretionary theories do not fare well when pitted against the self-regulated theory. In particular, various theories positing ongoing discretion fail to come to terms with the scissors effect regarding seasonal movements in the components of Fed credit.

Yet, at this point, I am sympathetic to the reader who still needs convincing. The problem is that this chapter has relied on aggregate system-wide data in assessing the relative merits of the contending theories, and aggregate data can take the empirical economist only so far. By its very nature aggregate data are not conducive to uncovering overt signs of inter-Reserve bank rivalry, which is the hallmark of the self-regulated theory. The next chapter turns attention to data collected on an individual Reserve bank basis, in the hope that focusing on decision making at this micro level will shed more conclusive light on the question: Did Reserve banks *really* compete?

Chapter 9

Did Reserve Banks *Really* Compete?

1. Introduction

Economists have tidy stories about why regulation arises and how it subsequently evolves. According to a technocratic story line, regulatory bodies are borne in the aftermath of crisis, with a clear-cut intent of remedying some defect in the organization of the regulated industry. The regulatory body collects information from all interested parties and then issues a mandate that satisfies the economist's criteria of efficiency. A more cynical story line, while tending to agree with the *why* of regulation's birth, takes issue with the *how* of its subsequent evolution. After birth, the law of unintended consequences comes into play, with the original motivation morphing into an attempt by the regulated firms, or some other special interest group, to capture the regulatory body. The attempt proves successful, since the interested group stands to gain or lose the most from the regulatory agency's mandates and hence will be the ones most energized to influence the regulatory process. In the long run, the original regulatory intent is lost from collective memory. The implicit assumption, underlying both the technocratic and special interest stories, is that regulation is successful in thwarting the competitive urges of individual firms in the industry.

Traditionally speaking, the economics of the Open Market Investment Committee (OMIC) as a regulatory body has been situated within either the technocratic or special interest story lines. Monetarists are more inclined to interpret the OMIC as a technocratic body led by the master technocrat, Benjamin Strong. Austrians are more inclined to interpret the OMIC as a puppet whose strings were pulled by the adroit hands of Benjamin Strong whose hands, in turn, were connected to the brains of inflation-loving special interest groups.

But there is a third story line in the economic literature on regulation, where the regulator and the regulated firms are involved in a game of

"cat and mouse." The cat regulates and the mouse strategizes to avoid those regulations. Then the cat responds by adjusting regulations and the mouse responses by adjusting its avoidance techniques. In the extreme case, the series of adjustments is never-ending, with both sides declaring a stalemate.

With respect to the OMIC, this book rejects the Monetarist and Austrian story lines and instead finds sympathy with the cat and mouse regulatory analogy where the OMIC is the cat and the Reserve banks the mice. However, there is one important addendum to the analogy: the game does not end-up in a stalemate. Instead, Reserve banks win. Or, more accurately stated, competition wins.

All stories, whether old-style Austrian and Monetarist or the self-regulated alternative proposed in previous chapters, start with the supposition that the OMIC was borne in the aftermath of a crisis, WWI, with the intent of helping the Treasury solve a postwar financing problem; namely, how to prevent the Reserve banks from interfering with the Treasury's effort to retire (buyback) the wartime debt. And all three story lines express skepticism that the Treasury got its way, since there was no reliable mechanism in those early days that enabled the Reserve banks to coordinate their efforts.

The story lines start to diverge with the creation of a Special System Investment Account in late 1923. The Austrians and Monetarists herald the new account as a mechanism that would allow Benjamin Strong to coordinate open market operations across individual Reserve banks, thus ushering in a new era of effective management. The self-regulated view emphasizes that effective leadership presumes a legal framework that closes-off all competitive opportunities by the individual Reserve banks. But, as indicated in chapter 3, no such legal framework surrounded the formation of the OMIC. Individual Reserve banks retained the right to compete: to conduct their own open market operations. The OMIC is little more than window dressing, according to the self-regulated story line, with Benjamin Strong as mere figurehead, at least on the domestic policy front.

In the final analysis the difference between the conventional story lines and the one advanced in this book comes down to whether the Reserve banks are best modeled as comprising a centrally managed, unified system or a decentralized, self-regulated system. What is needed to resolve this issue is an empirical showdown. Previous chapters took us a significant way down this empirical path, providing much support for the decentralized model. But the closing section of the last chapter suggested one way that the evidence could be reconciled with the existence of an effectively managed Fed. Suppose, for instance, that Benjamin Strong, leader of a managed Fed, just happens to want what a decentralized system produces. In particular, Strong favors a policy of seasonally elastic Fed credit to smooth interest rates over the year and manages the Fed's system account to achieve smoothing. Moreover, Strong fully accommodates the demand for base money and orchestrates a

Fed switch from gold to Fed credit as nation-states adopt gold—not because the worldwide move toward gold makes gold relatively expensive for Reserve banks to acquire, but because of his concern to build and sustain the international gold standard. Here we get the competitive outcome without competition; that is, without inter-Reserve bank rivalry.

So how do we rule out the possibility that Strong was a decisive leader, but one who just happened to want the same type of Fed credit policy that a competitive, decentralized system would produce? One approach is to take the aggregate level of Fed credit as given, but then explore how government securities under the two basic systems—a centrally managed, unified system versus a competitive, decentralized system—would be distributed among the individual Reserve banks. In particular, I argue that a telltale indicator of competition is whether a change in discount loans in one Reserve district has spillover effects on the government security holdings of Reserve banks in other districts. A finding of this type of spillover, an inter-Reserve bank scissors, provides indirect evidence against the centrally managed, unified system and in favor of the competitive, decentralized system.

Later, I note that the scissors spillover can occur even if there are no overt signs of competition among Reserve banks; that is, even if Reserve banks are not conducting open market operations for their own accounts. This would be the case if threats of own account operations were enough to induce Strong to allocate securities from the system account in a way that replicated the competitive allocation. Here, Strong is a figurehead rather than a decisive leader/manager of open market operations. Still, we would have more confidence that the existence of a scissors spillover truly was indicative of a decentralized, self-regulated system if we did find evidence of overt competitive behavior. With this in mind, I empirically investigate Friedman and Schwartz's claim that open market operations conducted by individual Reserve banks "were generally small in amount" after 1923 (1971, 251n15). Were they? And, if so, how "small" is "small?"

Despite widespread acceptance of the decisive leader model of Fed policy during the 1920s, the preponderance of evidence presented in this chapter rejects this consensus. First, using individual Reserve bank data, I find that changes in discount loans at one Reserve bank are associated with a scissors spillover effect on government security holdings of other Reserve banks in the system. Second, I find that individual Reserve bank open market operations were significant after 1923 and, in fact, grew in importance over the decade, thereby tending to undermine the ability of Strong, as leader of the OMIC, to manage open market operations.

Finally, if Strong was little more than a figurehead, then what was the rationale of the OMIC and the Special System Investment Account? One answer is that government securities in the system account were distributed in a way that would provide individual Reserve banks with a type of insurance against bankruptcy. Forestalling bankruptcy of financially weak Reserve banks would seem to be in the interest of all Reserve banks, whether financially healthy or unhealthy; once Congress starts debating how to deal with

endangered Reserve banks, other issues may be placed on the legislative agenda, issues that threaten entrenched interests at Reserve banks throughout the system. Consistent with the insurance hypothesis, I find that, ceteris paribus, a Reserve bank on the brink of bankruptcy tends to receive a larger share of government securities from the system account.

2. INTER-RESERVE BANK SCISSORS

Industrial Organization

I begin by examining the industrial organization of the Federal Reserve and what different organizational types—autarkic, competitive, and centralized—imply about the spillover effects of a change in discount loans in one Reserve district on the government security holdings in other districts. Some organizational structures inhibit inter-Reserve bank rivalry. For this type, a change in discount loans at one Reserve bank affects the government security holdings of that Reserve bank, but not the holdings of other Reserve banks in the system: there is no scissors spillover. Other organizational structures foster inter-Reserve bank rivalry. For this type, a change in discount loans at one Reserve bank affects the government security holdings of that Reserve bank and the holdings of other Reserve banks in the system: there is a scissors spillover.

To keep things simple, for each of the three organizational structures considered, I assume the Federal Reserve System is divided into two districts each served by one of two Reserve banks, RB1 and RB2, and each inhabited by one of two member banks, B1 and B2. Initially, the balance sheets of RB1 and RB2 are identical, as are the balance sheets of B1 and B2. As depicted in table 9.1a, each Reserve bank has member bank reserves of \$5 and currency held by the public of \$55, matched on the asset side by \$50 of Fed credit—\$20 as discount loans and \$30 as government securities—and \$10 of gold. Each member bank has deposits of \$50 and discount loans of \$20, matched on the asset side by \$5 of reserves (implying a reserve requirement of 10%) and \$65 of loans supplied to the private market.

The cleanest illustration of the presence or absence of a scissors spillover starts with a change in the discount rate at one Reserve bank that changes discount loans at that Reserve bank while keeping the system-wide demand for Fed credit constant. In particular, assume an increase in the discount rate at RB1 that decreases the amount of discount loans that B1 requests from

Table 9.1a Balance sheets

RB1 and RB2		B1 and B2	
Assets	Liabilities	Assets	Liabilities
G = \$10	R = \$5	R = \$5	D = \$50
S_{RB} = \$30	C = \$55	L_B = \$65	L_{RB} = \$20
L_{RB} = \$20			

RB1 by $10 from $20 to $10. RB1 accommodates. The relevant question is "how will each Reserve bank's government security holdings change in response to the decrease in discount loans in district 1?"

Autarkic Reserve Banking

The first organizational type is one that by its very nature rules out the possibility of inter-Reserve bank rivalry. Reserve districts 1 and 2 are separated by a hard boundary such that each is essentially an autarkic independent fiefdom. Specifically, an autarkic system is defined as one where the following occurs:

- Reserve banks provide discount loans exclusively to member banks in the local district.
- Reserve banks conduct open market operations only with the public in the local district.
- There is no national private loan market; rather each district contains its own private loan market consisting of local borrowers and lenders.
- There is no national goods market; rather each district contains its own goods market consisting of local buyers and sellers.

Taken together, the four bullet points imply that the local bank (B1 or B2) and the local public hold only the dollars of the local Reserve bank (RB1 or RB2) as reserves and currency.

Returning to the example posed above, the member bank in district 1, who has just reduced borrowing from RB1 by $10, responds to the $10 loss in reserves by calling-in $10 of loans from the district 1 private loan market in order to shore up reserves (see chapter 4). Now, the district 1 public is holding less currency than it wants.[1] In an autarkic setting, they have only one place to turn: the only way they can remedy the currency shortage is by selling government securities to RB1, who is pleased to buy those securities in order to return Fed credit to the original level. RB1 continues to supply $50 of Fed credit, but with a new split of $10 in discount loans and $40 in

Table 9.1b Autarkic Reserve banking
The intra-Reserve bank scissors

RB1		B1	
Assets	Liabilities	Assets	Liabilities
$L_{RB} = -\$10$ $S_{RB} = +\$10$	No Change	$L_B = -\$10$	$L_{RB} = -\$10$

RB2		B2	
Assets	Liabilities	Assets	Liabilities
No Change	No Change	No Change	No Change

government securities. For RB1, table 9.1b shows that discount loans have decreased by $10 and government securities have increased by $10. For RB2, neither discount loans nor government securities have changed. The scissors effect can be treated as a purely intradistrict phenomenon in an autarkic system.

Competitive Reserve Banking

A competitive Reserve banking system replaces the hard boundaries of autarkic independent fiefdoms with soft boundaries. The easiest way to illustrate the implications of soft boundaries is to relax the second bullet point in the previous section. That is, assume that Reserve banks conduct open market operations with the public in all districts. Then, when B1 calls-in $10 of loans (in response to a $10 reduction in discount loans from RB1), the district 1 public has two places to turn: RB1 or RB2. The two Reserve banks will engage each other in an open market operation battle to supply the district 1 public with currency. RB2 does not say to itself, I have been spared the misfortune of a $10 drop in member bank borrowing so I, for the sake of fairness, should restrain myself in conducting open market operations. Instead, RB1 and RB2 acquire as many securities, and supply as much of their currencies, as the national market allows. The Nash equilibrium is where RB1 and RB2 split the government security market between themselves, each ending-up with $35 in government security holdings. While the size of each Reserve bank's government security holdings is larger, $35 instead of $30, each Reserve bank continues to evenly split the total, now $70 instead of $60.

Table 9.1c illustrates the scissors implications of a competitive system. RB1 finds that its government security holdings have risen by only $5 in response to a $10 fall in its discount loans for an *intra*district scissors effect of (+$5)/(–$10) = –0.5. RB2 finds that its government security holdings have risen by $5 in response to a $10 fall in the discount loans of RB1 for an *inter*district bank scissors effect of (+$5)/(–$10) = –0.5.[2] The competitive soft-border setting enables RB2 to take advantage of a dis-favorable swing in discount

Table 9.1c Competitive Reserve banking
The intra- and inter-Reserve bank scissors

RB1		B1	
Assets	Liabilities	Assets	Liabilities
$L_{RB} = -\$10$ $S_{RB} = +\$5$	$C = -\$5$	$L_{B} = -\$10$	$L_{RB} = -\$10$

RB2		B2	
Assets	Liabilities	Assets	Liabilities
$S_{RB} = +\$5$	$C = +\$5$	No Change	No Change

loans at RB1. On RB2's balance sheet, a $5 rise in currency outstanding is matched by a $5 rise in government securities. On RB1's balance sheet, a $5 fall in currency outstanding is matched by a $10 fall in discount loans and a $5 rise in government securities. Adding the district 1 intradistrict half-scissors with the district 2 interdistrict half-scissors gives an aggregate one-for-one full scissors. In contrast to the autarkic system, the scissors effect in a decentralized, competitive system cannot be treated as a purely intradistrict phenomenon.[3]

Centralized Reserve Banking

I characterize a centralized Reserve banking system as one with soft boundaries and centrally orchestrated open market operations. Here, a manager purchases government securities on behalf of the system and then allocates the securities to the individual Reserve banks according to some prespecified allocation scheme. The final distribution of government securities, and therefore whether an interdistrict scissors accompanies the intradistrict scissors, depends not only on that allocation scheme, but, also, on whether Reserve banks can (1) buy and sell securities for their own account and (2) opt-out of the central account allocation.

The first variant of the centralized system prohibits Reserve banks from buying or selling government securities on their own and from opting-out of the central account allocation. As indicated in table 9.2, I label this the *autocratically managed* Fed. Without giving more content to the autocrat's preferences, the outcome is indeterminate. An autocratically managed Fed could choose to mimic the autarkic outcome, distributing government securities to the individual Reserve banks strictly on the basis of local changes in discount loans. Alternatively, the manager could choose to distribute securities so as to replicate the competitive outcome. In the first instance the scissors effect can be treated as a purely intradistrict phenomenon, while in the second the scissors effect is subject to interdistrict spillovers.

Under a second version of a centralized Fed with soft borders, the *stalemated* Fed in table 9.2, Reserve banks again are prohibited from opting-out of the central account allocation, but now they do have the right to buy or sell government securities on their own. Taken together, the two conditions create something of a stalemate—a cat and mice game—between the central account manager on one side and the individual Reserve banks on the other. Neither side has final mover power with respect to open market operations.

Table 9.2 Centralized Reserve banking

	Autocratically Managed (Decisive Leader)	Stalemated	Nominally Managed (Figurehead)
Own Account	No	Yes	Yes
System Opt-Out	No	No	Yes

To illustrate the stalemate, return to the example posed above, but posit a central account manager who is intent on avoiding the competitive interdistrict scissors effect. When member banks in district 1 decrease discount borrowing by $10, the manager buys $10 of government securities on behalf of the central account and allocates the securities to RB1. Now there is no shrinking of the balance sheet for RB1 or enlargement of the balance sheet for RB2 as would be the case in an unmanaged, competitive system. Can the central manager's policy preferences be sustained? According to condition (2), RB2 must accept the central account assignment of securities: it cannot opt-out. But, under condition (1), RB2 has the power to undermine that assignment by buying securities for its own account. Here, we might have something akin to an open market operation arms race, with RB1 and RB2 each conducting open market operations for their own accounts in an attempt to win a larger share of system-wide government security holdings and, thereby, a larger share of the national currency market. At this point, despite the central manager's policy preferences, the open market outcome is the competitive Nash equilibrium.

But this need not be the end of the story. A persistent central manager can respond by using the central account to decrease the government security holdings of RB2 and crediting that amount to RB1. And a persistent RB2 can respond by repurchasing securities for its own account. The two sides, the central manager and the individual Reserve banks, are entangled in an infinite feedback loop. Thus, we arrive at our earlier conclusion that the two sides will be stalemated. The stalemate occurs because neither side has final mover rights. The final allocation of government securities, and whether interdistrict spillovers characterize the scissors effect, is indeterminate.

A third version of a centralized Fed with soft borders, the *nominally managed* Fed in table 9.2, promises a way out of the stalemate. Like the stalemated Fed, nominally managed Reserve banks can buy and sell government securities on their own. The difference is that Reserve banks also have the ability to opt-out of the central account, which essentially gives them final mover rights vis-à-vis the central manager. With the manager's power thus negated, the Reserve banks are left to compete among themselves using own account open market operations. The outcome is the same as the competitive outcome, with both intradistrict and interdistrict scissors effects.

The focus on final mover rights poses an interesting question for the manager of a nominally managed system. If, indeed, individual Reserve banks have final mover rights then how should you, as manager of the central account, allocate government securities to the individual Reserve banks in the first place? You could choose to deviate from the competitive allocation, for instance, by using the central account to fully offset changes in a Reserve bank's discount loans. But the question must enter your mind: "Won't the individual Reserve banks use their final mover rights to undermine the chosen allocation scheme?" And since the answer is *yes*, you realize there is no future in deviating from the competitive allocation: any such deviation simply induces Reserve banks to incur the unnecessary costs of conducting open

market operations on their own. Therefore, the first impulse of the central account manager, at least a cost-conscious manager, in a nominally managed system is to allocate securities in a way that replicates the competitive outcome, such that no Reserve bank feels compelled to conduct open market operations on its own.

3. Decisive Leader versus Figurehead

The empirical question of interest is which of the five industrial organizations—autarkic, competitive, autocratically managed, stalemated, or nominally managed—characterized the Fed of the 1920s? Several of the generic types can be quickly eliminated as not empirically relevant. Begin at the top with the autarkic Fed system. The supposition that the Federal Reserve could be carved up into distinct independent, hard-border fiefdoms is one that was not seriously entertained by any careful observer of the early Fed. As a representative case in point, consider Lester Chandler's observations about the state of the Fed credit market in the opening years of the system and how the Reserve bank heads (governors) viewed the scope, purely regional or national, of that market:

> The governors also faced problems of working out relations among themselves. If some started with the naïve belief that each Reserve Bank could independently regulate conditions in its own district without affecting other districts or being affected by others, experience soon disillusioned them. The interregional mobility of credit was far from perfect but still extensive. This quickly became evident as the Reserve Banks began to buy and sell municipal warrants, acceptances, and government securities in the open market (Chandler 1958, 76).

Abandoning the hard-border view of the Fed leaves us with soft-border alternatives. First, the competitive system: How seriously should we take it as an apt characterization of the 1920s Fed? Viewed from one perspective that is what this book has been about, developing a competitive model of the early Fed that can stand aside more conventional views. The amount of space devoted to this development would indicate that I, for one, take such a model seriously. But viewed from another perspective, the competitive characterization does not faithfully replicate the facts at hand: it belies the emergence of a management infrastructure within the Fed. There was an OMIC headed by a central manager, Benjamin Strong, who did buy and sell government securities for the entire system, allocating those securities to the individual Reserve banks. That such a system existed in and of itself implies management. The only question left is management of what type?

While the autocratically managed system has a certain appeal—after all, a central motif of Friedman and Schwartz's "High Tide" chapter was the Fed as benevolent dictator—it too does not hold up under factual scrutiny. Most significantly, Reserve banks did have the right to buy and sell government securities for their own account. That such a right existed and, as we shall see

later, *was exercised*, undermines the view of the Fed as autocratically directed from the center.

Now we seem to be down to two soft-border views: the stalemated and the nominally managed Fed. And the choice between these is not going to be quick and easy. To be sure, the pure version of the stalemated Fed, with indeterminacy as its defining feature, is a nonstarter that cannot be taken seriously as empirically representative of the early Fed. In that pure version, nothing gets resolved due to the unending feedback loop between the central manager and the Reserve banks. The unmistakable reality of the 1920s Reserve banking system, however, is that things did get resolved. In one fashion or another, decisions were made about the size of Fed credit and the compositional division between discount loans and government security holdings, belying the theoretical construct of an endlessly vacillating Fed.

Does this leave us with the nominally managed Fed, or what might be called the figurehead model, as the only contender? At first blush, it might seem so. When push comes to shove, every serious scholar of the early Fed recognizes that the institutional rules surrounding the conduct of open market operations, at least on paper, gave individual Reserve banks the right to buy and sell on their own and to opt-out of the central account. Nevertheless, there is a strong consensus that the OMIC had real, effective powers enabling it to deflect the system from the competitive outcome. While this consensus has historical roots in the work of monetary scholars contemporary to the 1920s, the consensus has become even stronger in recent times with the monumental and authoritative works of Milton Friedman and Anna Schwartz (1971) and Allan Meltzer (2003). Those works cannot be read without sensing the conviction of those scholars that the Fed of the 1920s quickly evolved into a system that was managed in a way that ultimately left little scope for independent adjustment on the part of the individual Reserve banks. The OMIC, in this mindset, had more than just figurehead powers.

I suggest that one way of making sense of this consensus is to view the system as one that has the formal structure of a nominally managed Fed, but where in practice the central manager exercises final mover rights. Perhaps the central manager wielded informal, extralegal mechanisms that allowed him to undermine attempts by the individual Reserve banks to compete on the basis of open market operations. As Friedman and Schwartz have forcefully argued with regard to the so-called "High Tide of the Reserve System," perhaps the sheer force of Benjamin Strong's leadership powers, aided by an allocation scheme that blunted the incentive for individual Reserve banks to independently adjust, was enough to give him final mover rights. The prime example of an incentive-blunting scheme would be where Strong, as central manager, systematically adjusted each Reserve bank's allocation from the system account to offset changes in that bank's own account holdings as well as changes in its discount loans. With this allocation scheme, Reserve banks are not harmed, their earning assets do not fall, by unfavorable decreases in discount loans, and they do not benefit from own account purchases of

government securities. If, indeed, individual Reserve banks are disinclined to go it alone, then Strong could effectively determine both the size and the distribution of government securities. Of course, this version of the autocratically managed Fed is none other than the decisive leader model highlighted in the last chapter.

Strictly speaking, the decisive leader model does not require an allocation scheme that *completely* offsets discount loans; that is, one that results in a one-for-one intra-Reserve bank scissors and the absence of an inter-Reserve bank scissors. The OMIC, for instance, could only partially offset decreases in discount loans and then rely on the strength of Strong's personality to appease those Reserve banks that are unhappy about the drop in their earning assets. Under these more general circumstances, the decisive leader model implies the existence of an interdistrict scissors but one that is smaller than the intradistrict scissors.

In the final analysis we are left with two types of Fed systems occupying the empirical center stage: the decisive leader and the figurehead models. The first is an example of an autocratically managed Fed and the second of a nominally managed Fed. How shall we proceed? The next section consults the historical narrative to confirm that indeed the decisive leader and the figurehead models of the Fed represent the only plausible accounts explaining the conduct of open market operations in the 1920s. Then we move on to the critical test of the two models by posing the question, "Was there an inter-Reserve bank as well as an intra-Reserve bank scissors?" We supplement the critical scissors tests with data on each bank's participation in the central account allocation and the extent, if any, to which each conducted open market operations on its own. Finally, I offer evidence that sheds light on the rationale of the OMIC and the system account.

4. Open Market Operations: The Historical Narrative

The first empirical task in testing the decisive leader versus figurehead Fed is to consult the historical narrative for an account of how the pro forma rules surrounding the conduct of open market operations evolved. Proponents of the two Feds have different stories that they would like the narrative to tell. The figurehead story line is that the individual Reserve banks had dual rights to opt-out of the system account and to conduct open market operations for their own accounts. The existence of those rights rendered ineffective any attempts by the OMIC to manage the system. In contrast, the decisive leader story line contends that cataloguing the pro forma rights of the individual Reserve banks is the beginning, not the end of the story. The sheer strength of Benjamin Strong's leadership powers, aided by an allocation formula from the central account that blunted the incentive for individual Reserve banks to independently adjust, was sufficient to give Strong final mover rights, enabling him to effectively manage open market operations.

To explore the plausibility of these contrasting story lines we begin with the events leading up to the creation of the system account, the Special System Investment Account, used to manage open market operations. While the system account was created in December 1923, how government securities would/should be allocated among the Reserve banks was a topic of discussion from the very beginning of the Fed's existence. The ongoing debate centered on the issue of whether the individual Reserve banks would/should be allowed to compete; that is, vary their government security holdings in a way that would enhance their bottom-line. Here, there was recognition that while the market for discount loans was essentially a local one, with each Reserve bank supplying reserves to member banks in its district, the market for government securities was a national one, with the base money created through open market purchases ending up as currency in the hands of members of the general public scattered across Federal Reserve districts.

Those seeking to discourage competition wanted to make government security allocations from a central account contingent on the amount of member bank borrowing in a Reserve bank's district, as well as on the amount of securities that the Reserve bank purchased for its own account. Holding system-wide Fed credit constant, if regional discount loans fell, or own account purchases fell, then a Reserve bank should be allocated enough government securities from the central account to prevent its total earning assets from falling. But if regional discount loans rose, or own account purchases rose, then a Reserve bank's allocation should be reduced to prevent total earning assets from rising. Such an allocation scheme would effectively blunt the incentive of individual Reserve banks to conduct open market operations for the purpose of increasing earnings.

Those on the other side of the debate tended to be Reserve banks whose discount loans were high and rising at the time. They realized that a centralized allocation scheme designed to offset earning assets acquired by lending to member banks or by purchasing independently in the open market would be disadvantageous to them. Why, they asked, should Reserve banks not be allowed to benefit from favorable conditions (i.e., member banks anxious to borrow from the district Reserve bank) arising in the local district?

Lester Chandler, biographer of Benjamin Strong, recounts an early (1916) exchange between J. B. McDougal, governor of the Chicago Reserve bank, and Benjamin Strong that highlights the tension between the two sides. The particular issue was whether individual Reserve banks' shares of system-wide government security purchases, executed on behalf of the system by the New York Reserve bank, should be determined on the basis "of their volume of earning assets acquired by lending to their member banks or by purchasing independently in the open market" (Chandler 1958, 79). McDougal strongly opposed this allocation formula, arguing that "each district should be entitled to the benefits that are available to it in its own district, that which comes from the open market" (Chandler 1958, 79). But "Strong was much annoyed by this attitude, especially when the New York Bank was sharing its

purchases at the expense of its own earnings" (Chandler 1958, 79). Quoting Strong:

> It is manifestly absurd that the Federal Reserve Bank of New York should be in a position where, by this division arrangement, it has less of its money invested than Boston or Chicago. It is too absurd for anything, and I cannot conscientiously permit the arrangement to continue on that basis and justify it to our board of directors...
>
> This plan means that New York always divides and no one else does, except by courtesy—Boston does when they are pretty well fixed up—and I do not care a rap about this thing except to see it satisfactory to you fellows; but if it is not going to be satisfactory to any of you, let us abandon the whole shooting match and go it alone. Do not let us have ten banks bound to an understanding and two not. I think that is a very silly and foolish way to do business (Chandler 1958, 79).

This early exchange between McDougal and Strong came to symbolize the ongoing struggle between those who wanted to preserve the opportunity for individual Reserve banks to enhance their earning assets through own account operations and those who wanted to close off such opportunities by fine-tuning the allocation of government securities from the system account.

The debate between the two sides intensified in the months leading up to the December 1923 creation of the Special System Investment Account. Consider, for instance, an April 1923 meeting of the OMIC where the details of how to structure a future allocation scheme were under debate:

> A way must be devised that will permit some of the [Reserve] banks to participate regularly in purchases when their loanable funds are not seasonally employed in serving the requirements of their member banks, but will relieve them of such participation when their local demands are heavy; at such times their proportionate participation should be assumed by the other [Reserve] banks and appropriate adjustments made. It is suggested that to accomplish this ratios of participation in general purchases in the principal markets be worked out so as to make an equitable distribution among all twelve banks at times when the reserves of all permit, and that appropriate ratios be worked out that would be applicable to the purchases of such times as there are a smaller number of participants. The base for these ratios is a matter for consideration and mutual agreement. In as much as the development of local markets by the regional bank is incumbent upon each bank, its local purchases should not be discontinued but should operate to reduce its allotment from the general purchases made elsewhere, and it is suggested that this might be accomplished by each bank regularly advising the Committee of its local purchases, as has recently been the practice in transactions in Government securities (Excerpts from the Federal Open Market Investment Committee 1923, 5–6).[4]

This excerpt reveals much about the early thinking of the OMIC in terms of how securities might be allocated in the future. One thing to note is the

flexible nature of any allocation scheme; the criterion was to be "a matter for consideration and mutual agreement." But the excerpt does provide specific guidance. "When their loanable funds are not seasonally employed in serving the requirements of their member banks," that is, when Reserve banks' discount loans to their member banks decrease, then "a way must be devised that will permit some of the [Reserve] banks to participate regularly in purchases," that is, the amount of centrally purchased government securities allotted to those Reserve banks must increase. "When their local demands are heavy," that is, when Reserve banks' discount loans to their member banks increase, then "their proportionate participation should be assumed by the other [Reserve] banks," that is, the amount of centrally purchased government securities allotted to those Reserve banks must decrease. Also, each Reserve bank is to be encouraged to purchase securities in its local market, outside the confines of the centrally managed account. These "local purchases . . . should operate to reduce its allotment from the general purchases."

So here the OMIC central allocation scheme begins to take shape. The manager's job would be to track the discount loans of each Reserve bank as well as the government securities that each acquires for its own account. Increases in discount loans and own account purchases would reduce the Reserve bank's allotment from the system account. Decreases in discount loans and own account purchases would increase the system account allotment. Put succinctly, if a Reserve bank's discount loans or own securities increased or decreased then the above excerpt suggests that its allocation from the central account would be reduced or raised accordingly, presumably with the intent of preventing overall earning assets from significantly changing.

Note the hint in this passage that the OMIC was aware that the success of the allocation scheme depended on the OMIC's possession of final mover rights. Reserve banks were encouraged to regularly advise the committee of its local purchases. Presumably, such a reporting requirement would shine a bright light on individual purchases, making more obvious, if not more difficult, participation by Reserve banks in what I have referred to above as an open market operation arms race.

But it would be misleading to conclude that the criterion that was to govern the distribution of securities from the system account could be reduced to one simple factor such as prevent undue changes in earning assets. If that were true—that is, if final mover rights empowered the OMIC to enforce a criterion designed to insulate a Reserve bank's total earning assets from its own account operations—then case closed. Individual Reserve banks would have no incentive to compete, and management through the system account would be effective. An inspection of the minutes from OMIC meetings throughout the decade, however, is sufficient to convince even the casual reader that there would be no hard and fast rule for allocating securities from the system account. Commenting on the creation of the Special System Investment Account in December 1923, Randolph Burgess gives an apt characterization of the eclectic nature of the allocation scheme: "The holdings in

the special investment account were to be prorated among the several Reserve Banks with due regard to the size of the different banks, their holdings of *other earning assets*, etc." (Burgess 1946, 242; italics added). The add-on, "etc.," says it all; whatever the OMIC intent, it is an open question whether, in practice, the holdings of *other earning assets* were the only, or at least the primary, factor determining the distribution of government securities from the centrally managed account. An affirmative answer provides support for the Reserve banking system of the 1920s as an effectively managed, decisive leader system: one that blunts the incentive for individual Reserve banks to conduct own account open market operations. A negative answer opens the door for the nominally managed Fed led by a figurehead who, rather than stifling the competitive urges of individual Reserve banks, has little choice but to allocate securities in a way that replicates the outcome that would have been forthcoming under competition.

5. Was There an Inter-Reserve Bank Scissors?

How do we decide whether the OMIC allocation of government securities in the 1920s was indicative of an effectively managed, decisive leader Fed or a nominally managed, figurehead Fed? As suggested in the last section, a detailed recounting of the historical narrative is unlikely to be conclusive. That narrative is too loose. Depending on one's priors, one could glean evidence consistent with an effectively or a nominally managed system.

This section offers an indirect way of getting at the issue. Instead of relying on what officials may or may not have said at the time, I focus on how they acted. Did the OMIC effectively manage government securities, through the decisive leadership of Benjamin Strong who manipulated system account allocations to offset changes in discount loans and own account security holdings of individual Reserve banks? If so, then a particular scissors effect pattern should emerge, a pattern characterized by an intra-Reserve bank scissors, but no inter-Reserve bank spillovers. Here, since the aggregate scissors is simply the intra-Reserve bank scissors scaled up, the scissors effect measured at the individual Reserve bank level should be just as strong as the effect measured at the aggregate level. Alternatively, did the OMIC, with Strong serving as a figurehead, only nominally manage government securities? If so, then a different, competitive-type scissors effect pattern should emerge, a pattern whose distinctive feature is that the scissors effect is subject to interregional spillovers. Here, the existence of an inter-Reserve bank scissors creates a wedge between the measured scissors effect using aggregate data and the measured scissors effect using individual Reserve bank data. The more potent the inter-Reserve bank scissors, the weaker will be the scissors measured at the individual (intra-) Reserve bank level.

Using monthly data reported in various issues of the Annual Report of the Federal Reserve Board, figures 9.1 through 9.12 show government securities and discount loans for each of the 12 Reserve banks from 1922 to 1928.[5] For

many of the Reserve banks, a scissors correlation between securities and discount loans seems loose if not altogether absent. The most striking outliers are Richmond and Atlanta. While discount loans show substantial variation, government security holdings are relatively flat for each of these Reserve banks.

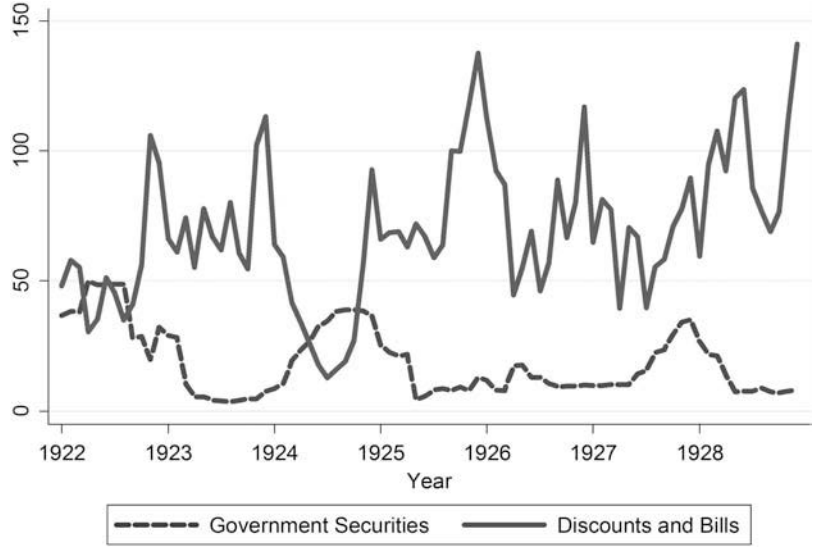


Figure 9.1 FRB Boston scissors

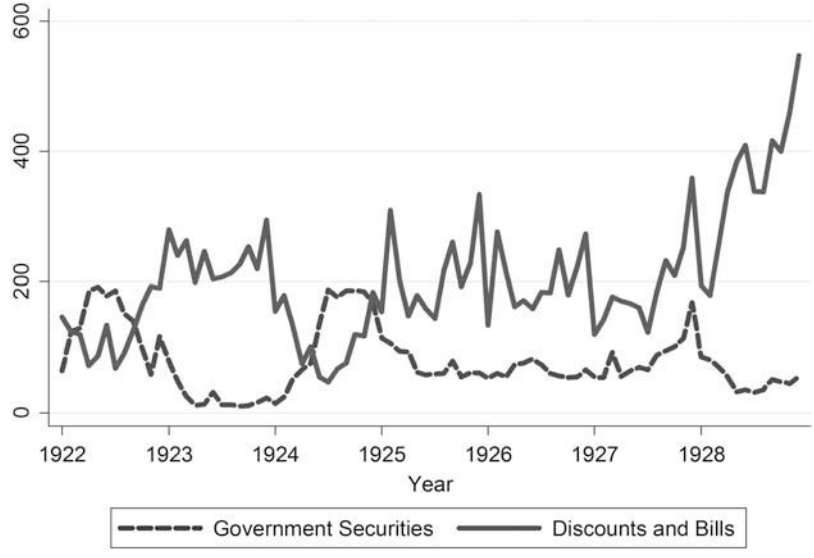


Figure 9.2 FRB New York scissors

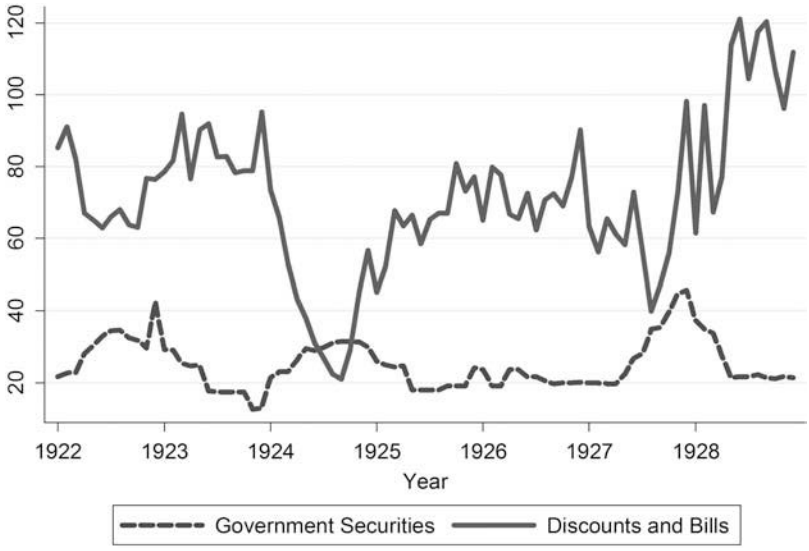


Figure 9.3 FRB Philadelphia scissors

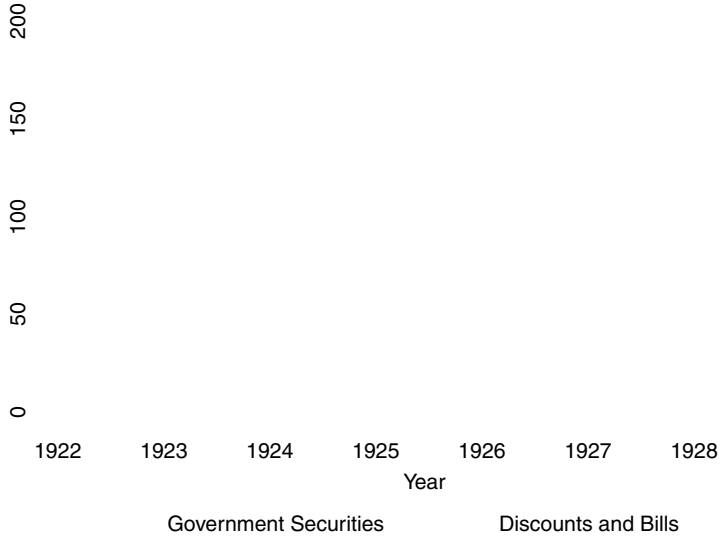


Figure 9.4 FRB Cleveland scissors

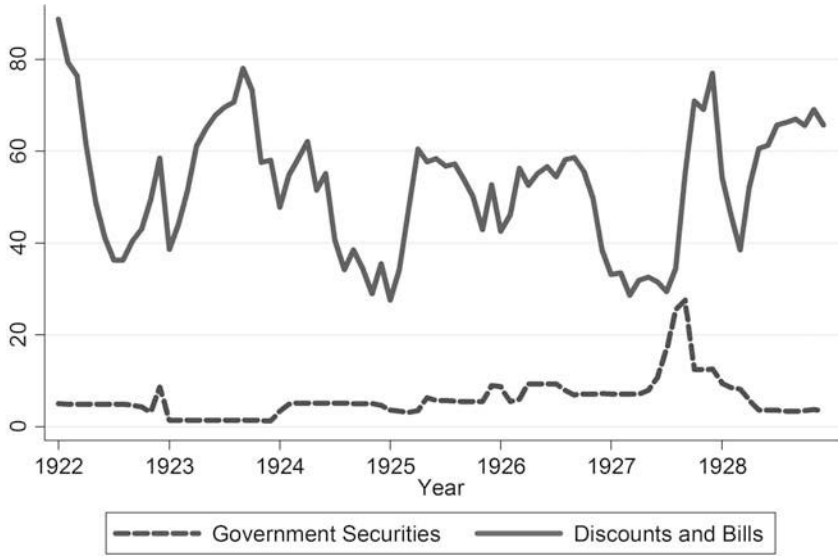


Figure 9.5 FRB Richmond scissors

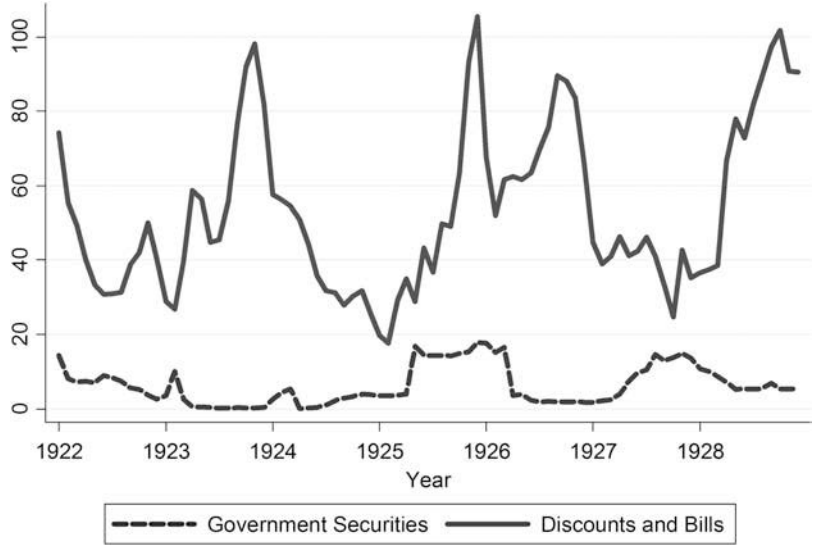


Figure 9.6 FRB Atlanta scissors

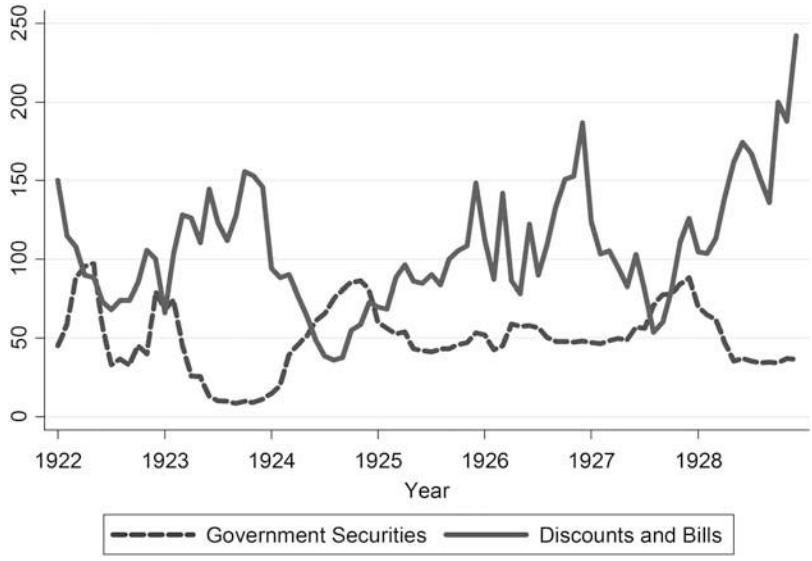


Figure 9.7 FRB Chicago scissors

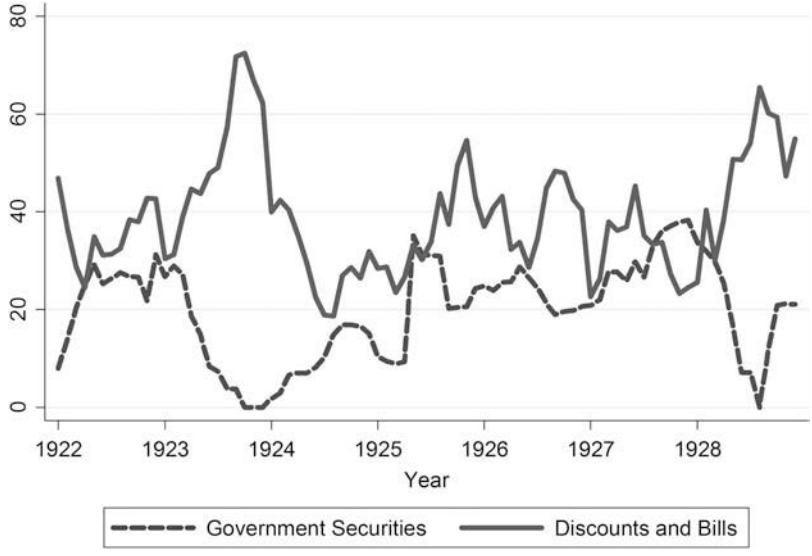


Figure 9.8 FRB St. Louis scissors

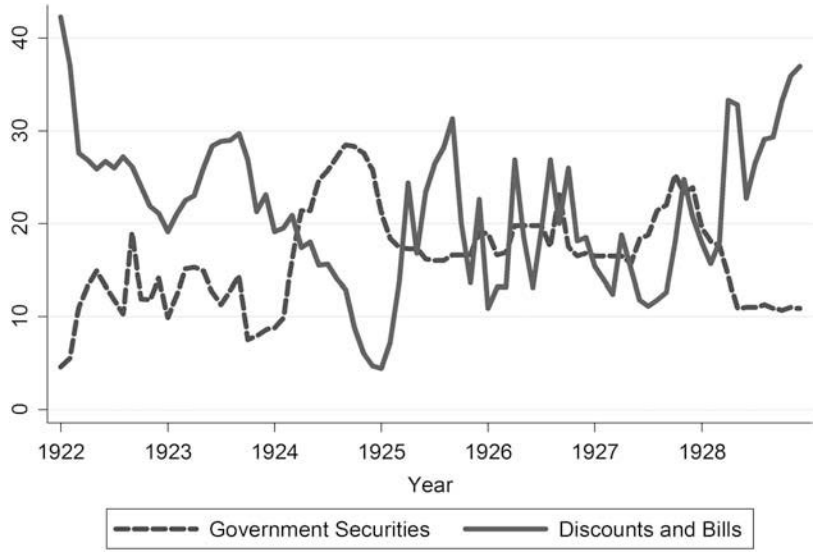


Figure 9.9 FRB Minneapolis scissors

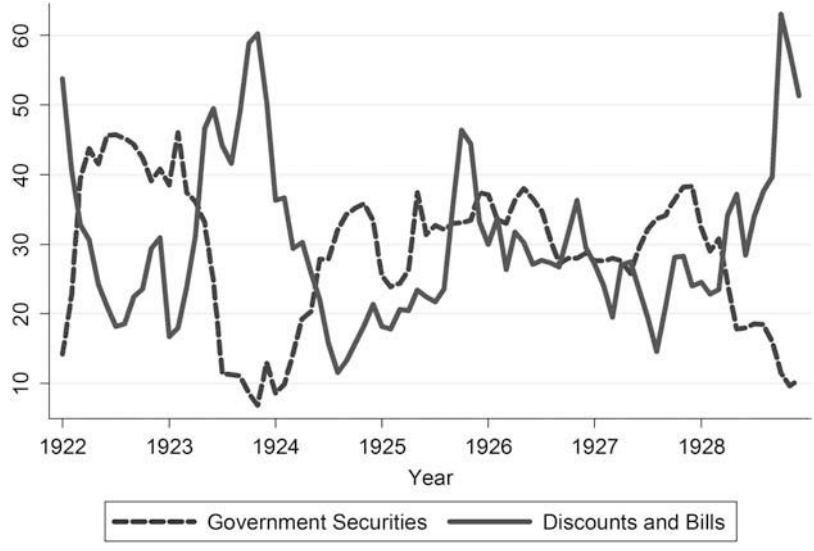


Figure 9.10 FRB Kansas City scissors

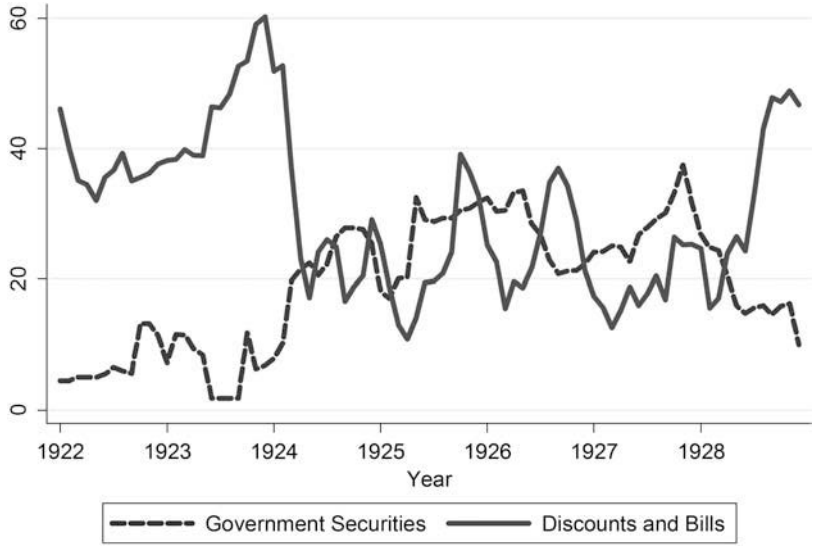


Figure 9.11 FRB Dallas scissors

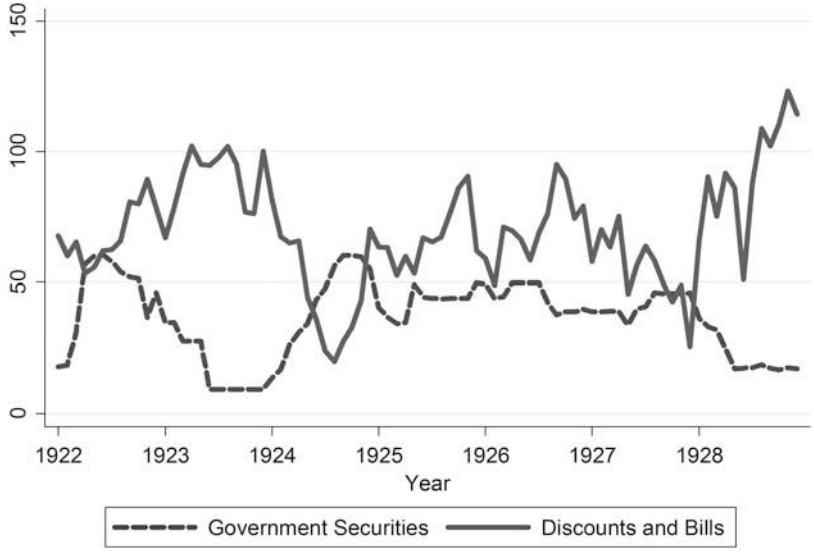


Figure 9.12 FRB San Francisco scissors

To get a feel of the strength of the individual Reserve bank scissors relative to the aggregate Reserve bank scissors, I estimate, over various subperiods, the aggregate and cross-sectional time series test equations

$$\Delta(S_{RBt}) \quad a \quad b\Delta(L_{RBt}) + \sum_{i=1}^{11} \alpha_i D_i + \varepsilon_t \tag{9.1a}$$

and

$$\Delta(S_{RBjt}) \quad c \quad d\Delta(L_{RBjt}) + \sum_{i=1}^{11} \alpha_i D_i + \varepsilon_{jt}, \tag{9.1b}$$

where individual Reserve banks are indexed by j (j = 1,...,12) and time t; S_{RBt} is the sum of individual Reserve bank security holdings, S_{RBjt}, at t; L_{RBt} is the sum of individual Reserve bank discount loans, L_{RBjt}, at t; D_i represents 11 monthly dummies and ε is the error term.[6]

Table 9.3 reports the results from estimating (9.1a) and (9.1b). Columns (1) and (2) give the aggregate and individual (cross-sectional) scissors effects over the entire sample period, 1922–28. The contrast is striking. Consistent with the aggregate results presented in chapter 6, there is a statistically significant partial (b = -0.48) aggregate scissors effect when monthly dummies are used to control for seasonal movements in Fed credit. The overall explanatory power of the aggregate regression equation, as measured by the R^2-statistic, is 0.619. At the individual Reserve bank level, however, the scissors

Table 9.3 Tests of the relative strength of the individual and aggregate scissors effect

$\Delta(S_{RBt}) = a + b\Delta(L_{RBt}) + \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 D_6 + \alpha_7 D_7 + \alpha_8 D_8 + \alpha_9 D_9 + \alpha_{10} D_{10} + \alpha_{11} D_{11} + \varepsilon_t$

$\Delta(S_{RBjt}) = c + d\Delta(L_{RBjt}) + \alpha_1 D_1 + \alpha_2 D_2 + \alpha_3 D_3 + \alpha_4 D_4 + \alpha_5 D_5 + \alpha_6 D_6 + \alpha_7 D_7 + \alpha_8 D_8 + \alpha_9 D_9 + \alpha_{10} D_{10} + \alpha_{11} D_{11} + \varepsilon_{jt}$

	Δ(Government Securities)					
	1922–28		1922–23		1924–28	
	Aggregate* (1)	Individual* (2)	Aggregate* (3)	Individual* (4)	Aggregate* (5)	Individual* (6)
Constant	94.84	2.93	117.99	7.91	81.82	0.62
	(23.58)	(3.18)	(27.54)	(3.90)	(18.69)	(0.66)
Δ(Discounts)	–0.48	–0.01	–0.82	–0.22	–0.42	0.03
	(–33.95)	(–1.11)	(–37.36)	(–5.78)	(–27.58)	(2.77)
R^2	0.619	0.048	0.915	0.225	0.631	0.072

Source: Federal Reserve Board (1922–28).
Notes: t-statistic is in parentheses. * Seasonal monthly dummies controlled.

effect is all but nonexistent. The scissors coefficient reported in column (2) is only –0.01 and is not statistically significant, with the R^2-statistic falling to 0.048.[7]

Next, I directly test for the existence of intradistrict and interdistrict scissors effects by running the following cross-sectional time series regression equation:

$$\left(S_{RBjt}\right) \quad e \quad \left(FC_t\right) + f\Delta\left(\quad _{RBjt}\right) \quad g\Delta\left[\left(L_{RBt}\right) - \left(L_{RBjt}\right)\right] + \varepsilon_{jt}, \tag{9.2}$$

where FC_t is aggregate Fed credit at t and $[(L_{RBt}) - (L_{RBjt})]$ is aggregate discount loans net the discount loans of Reserve bank j at t. Since aggregate Fed credit is simply the sum of aggregate government security holdings and aggregate discount loans, the inclusion of aggregate Fed credit as a right-side control variable in a system with 12 Reserve banks imposes the restrictions that e = 1/12 (a $1 increase in aggregate Fed credit increases the government security holdings of an individual Reserve bank by $1/12) and that f + 11g = 1 (the scissors effect at the aggregate level is one-for-one).

Coefficients f and g give the intra- and inter-Reserve bank scissors effects, showing how changes in a Reserve bank's discount loans and changes in discount loans for the rest of the system will affect that Reserve bank's government security holdings. In the simplest version of the decisive leader model, individual Reserve banks see their government security holdings rise one-for-one with a decrease in their discount loans. There are no spillover effects from the discount loans of other Reserve banks. Accordingly, the decisive leader prediction is f = –1 and g = 0. Holding FC constant, a $1 decrease in a Reserve bank's discount loans is associated with a $1 increase in its government security holdings. A $1 decrease in discount loans at some other Reserve bank is associated with no change in the government security holdings of the original Reserve bank in question. Since the allocation of government securities to each Reserve bank insures that movements in that Reserve bank's discount loans will be fully offset, there is no harm to a Reserve bank when its discount loans fall and others do not: its earning assets are unchanged.

In a figurehead system, the intra- and inter-Reserve bank scissors are of equal strength. That is, individual Reserve banks see their government security holdings rise by 1/nth the decrease in the discount loans of any Reserve bank in the system, including their own discount loans. In a 12 Reserve bank system, the figurehead prediction is f = g = –(1/12) = –0.0833. Holding FC constant, a $1 decrease in a Reserve bank's discount loans, or in the discount loans of any other Reserve bank in the system, is associated with a $(1/12) increase in its government security holdings. So when discount loans of all Reserve banks are decreasing by $1, the government security holdings of any one Reserve bank tend to rise by $1. But when only one Reserve bank suffers a $1 decrease in discount loans, then that Reserve bank's government security holdings rise by only $(1/12), with a net *fall* in earning assets of

$(11/12); each of the other Reserve banks in the system experiences a rise in government security holdings of $(1/12), representing a net *rise* in earning assets of $(1/12).

Table 9.4, column (1) reports the results for 1922–28. The intra-Reserve bank scissors coefficient is –0.055 and is significantly different from zero, with a 95 percent confidence interval of –.0774 to –.0319. The inter-Reserve bank scissors coefficient is –0.086 and is statistically different from zero, with a 95 percent confidence interval of –.0950 to –.0770. The results, while rejecting the hypothesis that government securities were effectively managed by a decisive leader, are broadly consistent with the figurehead hypothesis. Most importantly, the results point to an inter-Reserve bank scissors roughly of the magnitude predicted by the soft-border, competitive model. There is also an intra-Reserve bank scissors, though, in absolute value, the point estimate of –0.055, as well as the 95 percent confidence lower bound of –0.077, indicates that the strength of the measured effect is less than the predicted effect, –0.083.

Columns (2) and (3) show results for the subperiods 1922–23 and 1924–28, the first representing the consensus competitive period and the second representing, in the conventional story line, the period of decisive leadership. In both subperiods there are statistically significant inter-Reserve bank scissors effects. The 95 percent confidence bounds for the inter-Reserve bank coefficient, g, are -0.0874 to -0.0523 and -0.0993 to -0.0784 for the 1922–23 and 1924–28 regressions, consistent with the figurehead point prediction, g = –0.0833, and inconsistent with the decisive leader point prediction, g = 0.

The intra-Reserve bank scissors results are also inconsistent with the hypothesis of a Reserve system effectively managed by a decisive leader. While effective management implies f = –1, the 1922–23 and 1924–28 confidence bounds are –0.3002 to –0.1625 and –0.0447 to –0.0006. Interestingly, the results indicate that during the consensus competitive period, 1922–23, the

Table 9.4 Tests of the intra- and inter-Reserve bank scissors effect

$$\Delta(S_{RBjt}) = e\Delta(FC_t) + f\Delta(L_{RBjt}) + g\Delta[(L_{RBt}) - (L_{RBjt})] + \varepsilon_{jt}$$

	Δ(Government Securities)		
	1922–28 (1)	1922–23 (2)	1924–28 (3)
$\Delta(FC_t)$	0.0833	0.0833	0.0833
	(19.09)	(8.82)	(16.67)
$\Delta(L_{RBjt})$	–0.055	–0.231	–0.023
	(–4.71)	(–6.62)	(–2.02)
$\Delta[(L_{RBt}) - (L_{RBjt})]$	–0.086	–0.070	–0.089
	(–18.66)	(–7.84)	(–16.66)
R^2	0.277	0.321	0.306

Source: Federal Reserve Board (1922–28).
Notes: t-statistic is in parentheses.

government security holdings of an individual Reserve bank responded more strongly to own discount loans than to the discount loans of other Reserve banks in the system, while during 1924–28 the opposite was true: the inter-Reserve bank scissors was stronger than the intra-Reserve bank scissors. Interpreted within the context of the figurehead model, the intra-Reserve (inter-Reserve) bank scissors was somewhat larger (smaller) than predicted in 1922–23 and somewhat smaller (larger) than predicted in 1924–28. These results, however, provide little comfort for the decisive leader model. The simplest version of this model entails the absence of an inter-Reserve bank scissors, that a Reserve bank's government securities rise one-for-one with a fall in its discount loans for 1924–28. More generally, the decisive leader model requires that the intra-Reserve bank scissors exceed the inter-Reserve bank scissors for 1924–28. That the intra-Reserve bank coefficient falls and the inter-Reserve bank coefficient rises in moving from the consensus competitive period to the alleged managed period, with the intra-coefficient ending-up below the inter-coefficient, directly contradicts this more general decisive leader prediction.

6. DID RESERVE BANKS CONDUCT OWN ACCOUNT OPERATIONS?

The weight of the evidence to this point has been on the side of a nominally managed Reserve banking system and against the hypothesis that the central manager was able to exercise effective management powers. This raises the question: "What renders the powers of the central manager ineffective?" First and foremost, individual Reserve banks must have the right to conduct open market operations for their own accounts and the central manager must not possess final-mover powers. Note that individual Reserve banks need not actually exercise those rights. The mere knowledge that Reserve banks have the power to go it alone is sufficient to induce the central manager to cave-in to competitive pressures. Put differently, decisive leadership is undermined by a contestable Reserve banking market, where individual Reserve banks stand ready to conduct open market operations when a profit opportunity arises.

Still, we would have more confidence in the nominally managed, figurehead model, and therefore less in the decisive leader model, if we actually observed instances of own account operations. Indeed, I think that much of the resistance to the hypothesis that Reserve banks competed after 1923 comes from a conviction that instances of independent open market operations, while real, were too infrequent and, in the words of Friedman and Schwartz, "generally small in amount" (1971, 251n15).

While Allan Meltzer largely agrees with the tone of Friedman and Schwartz's view regarding the insignificance of independent operations, his *A History of the Federal Reserve* (2003) provides the reader with a rich, anecdotal rendering of Reserve bank rivalry that tends to undermine the theme of peaceful

policy coordination. Despite what conventional wisdom preaches, earnings considerations were not silenced with the creation of the system account at the end of 1923. Rather, as Meltzer illustrates with numerous examples, the bottom-line was never far below the surface of the policy debates among members of the Board of Governors' Conference and the OMIC.[8]

To be sure, much of what Meltzer documents are threats by individual Reserve banks to conduct independent open market operations. But he does point out instances where Reserve banks moved beyond threats to actual independent operations. My interest in this section is to establish the significance of these operations. Were they, as suggested by Friedman and Schwartz, "small in amount?" Or did Reserve banks supplement threats with nontrivial amounts of independent open market activity after 1923?

The first issue to address is the meaning of "small in amount." One index would be the size of own account holdings relative to system account government security holdings. I use data presented by the individual Reserve banks at a 1931 congressional hearing to construct an aggregate, system-wide series on own account and system account holdings, 1922–28.[9] Figure 9.13 shows the end-of-the-month level of own account and total government security holdings for the period, 1924–28, with system account holdings comprising the difference between the two.[10] On average, own account holdings represent 30.1 percent of total holdings and 43.0 percent of system account holdings: the means of own account, system account, and total holdings are $106.2 million, $247.2 million, and $353.3 million respectively. But comparing average percentages is misleading as an indicator of the importance of independent operations. While at any point in time own account holdings are sizeable in relation to system account and total holdings, the degree to which the own account varies month-to-month is relatively small. For instance, total holdings surged and plunged in 1924, due to a surge and plunge in system account holdings, while own account holdings were relatively flat.

A better indicator of the degree to which individual Reserve banks actively participated in independent operations focuses on changes, rather than on levels, in aggregate, system-wide own account and system account holdings. Figure 9.14 depicts the first differences of each series. The surges and plunges in the system account in 1924, mentioned above, show up here as large positive and negative first differences. The crucial question is how do changes, either positive or negative, in system account holdings compare to changes in own account holdings. To get at this question, I focus on the absolute value of the monthly change in each series. For the entire period, 1924–28, absolute own account changes represent 12.7 percent of absolute system account changes (mean absolute own account and system account changes are $3.51 million and $27.74 million). While changes in own account holdings were not *large in amount* relative to changes in system account holdings, the 12.7 percent figure suggests that independent

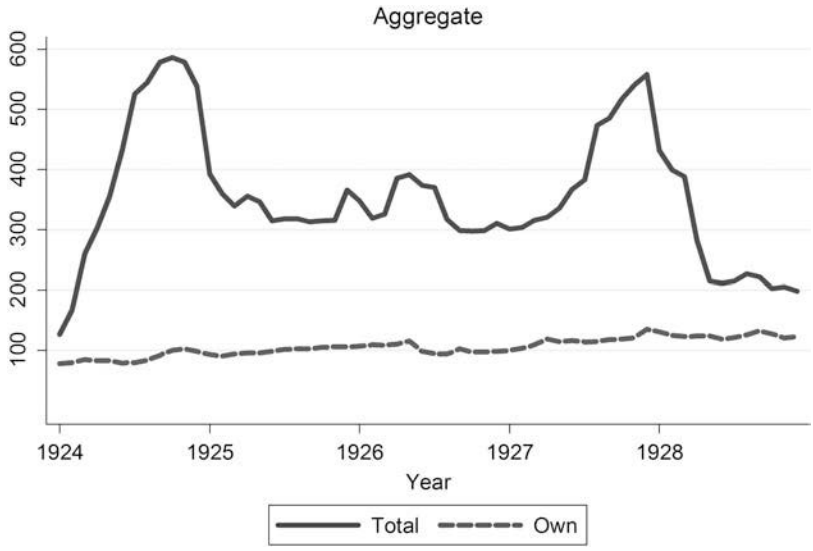


Figure 9.13 Total and own government security holdings

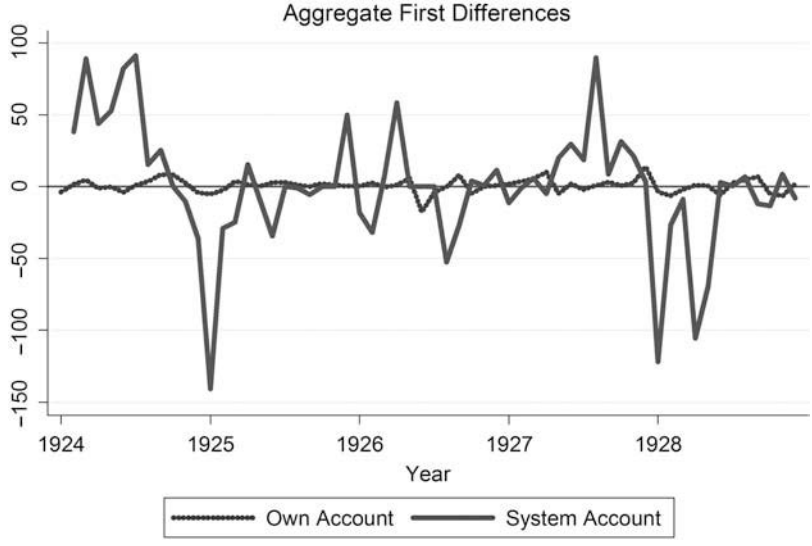


Figure 9.14 Own account and system account holdings

open market operations were modestly significant, arguably constituting more than just an idle threat.

But even the 12.7 percent figure does not give the full picture. The aggregate data hides the possibility that some Reserve banks might be actively engaged in independent operations while others might be completely passive. Even worse, what if own account operations of the individual Reserve banks cancelled each other out, with some of the banks buying and some selling. Here, individual Reserve banks would be actively engaged even though the aggregate data suggests otherwise.

Figures 9.15–9.26 show each Reserve bank's own account and system account holdings. Some Reserve banks—most notably, Atlanta, Dallas, and St. Louis—were actively engaged in independent open market operations, while others—most notably, Richmond and San Francisco—were inactive. For a more precise indicator of activity, I calculated an engagement index for each Reserve bank, equal to the mean absolute value of own account changes divided by the mean absolute value of system account changes over the period, 1924–28. Table 9.5 shows that the engagement index for the Reserve banks ranged from a low of 0.002 to a high of 0.87. Richmond, the least active Reserve bank, altered its own account holdings only one time over the 60-month period. San Francisco was almost as inactive. At the other end of the spectrum, Atlanta, the most active Reserve bank, altered its own account holdings in 53 of the 60 months, with its monthly own account changes comprising 87 percent of its monthly system account changes in absolute value terms, suggesting that for Atlanta own account holdings were nearly as important as system account holdings. Joining Atlanta as highly active Reserve banks are Dallas and St. Louis, and, to a lesser extent, Kansas City and Minneapolis. Another noteworthy feature of the table is that the five members of the OMIC, designated by an asterisk, are clustered together, with engagement indexes below the 0.213 mean, ranging from 0.06 to 0.21. With the notable exceptions of Richmond and San Francisco, nonmembers of the OMIC appear more engaged in independent open market operations than members.

The engagement index can also be used to explore another piece of conventional wisdom—that open market operations became increasingly more centralized over time. The contention here is that early on, say 1924 and 1925, there may have been episodic instances of independent adjustment as holdovers from the competitive years, 1922 and 1923. But by 1927 and 1928, the mission was accomplished and these episodes would be all but eliminated. Table 9.6 explores this wisdom by calculating a system-wide engagement index for each year. The index for the years 1924 and 1925 is actually less than the mean of 0.213 and for the subsequent years it is higher than the mean, reaching 0.30 by 1928. Contrary to the conventional wisdom, open market operations, as measured by the engagement index, seem to have become less centralized and more competitive over time.

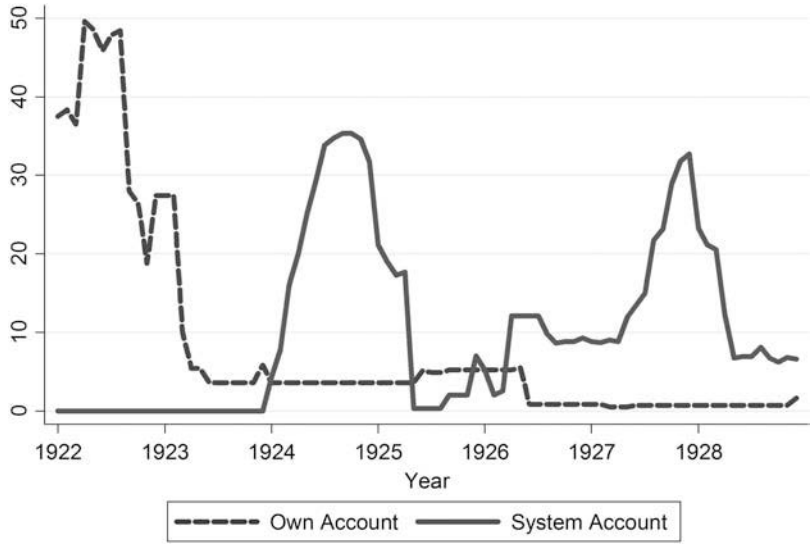


Figure 9.15 FRB Boston securities

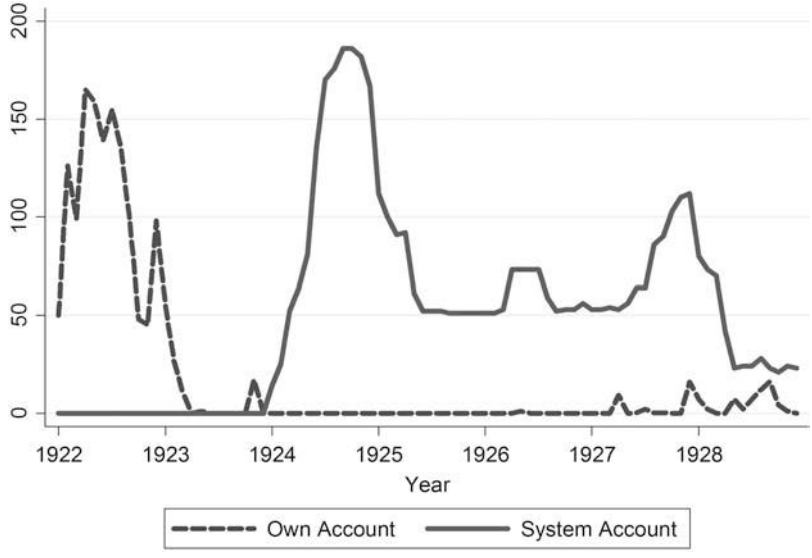


Figure 9.16 FRB New York securities

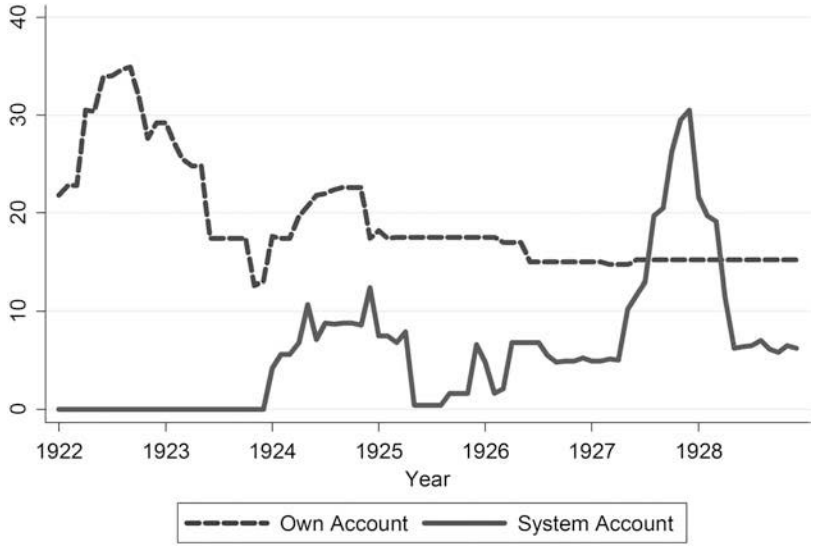


Figure 9.17 FRB Philadelphia securities

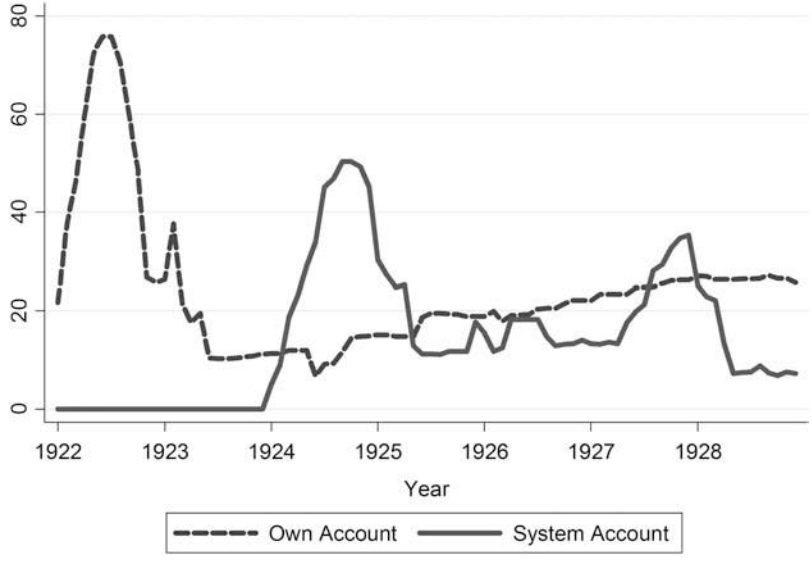


Figure 9.18 FRB Cleveland securities

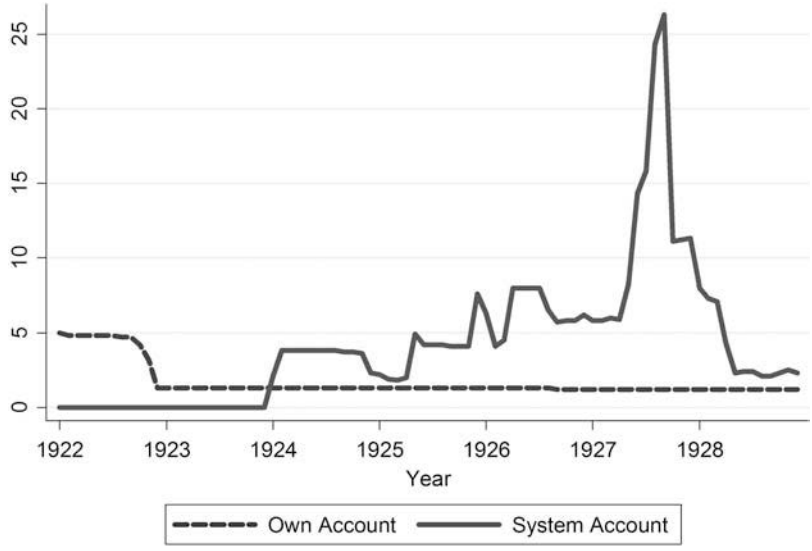


Figure 9.19 FRB Richmond securities

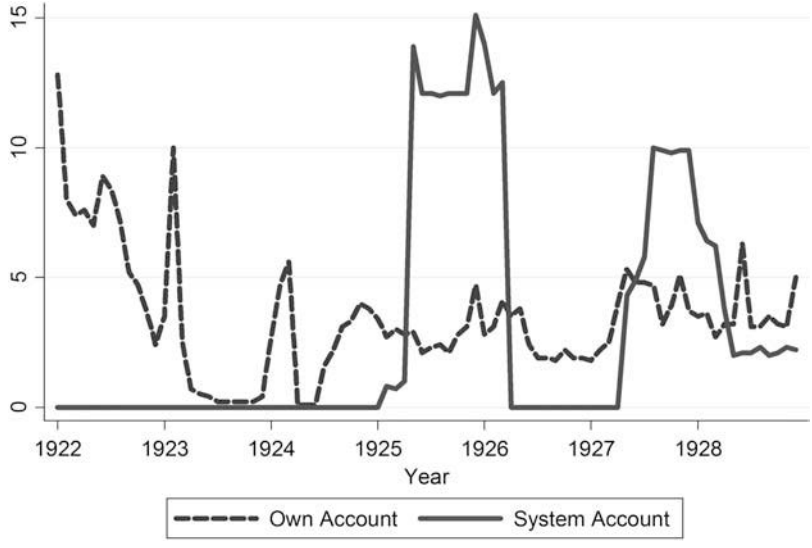


Figure 9.20 FRB Atlanta securities

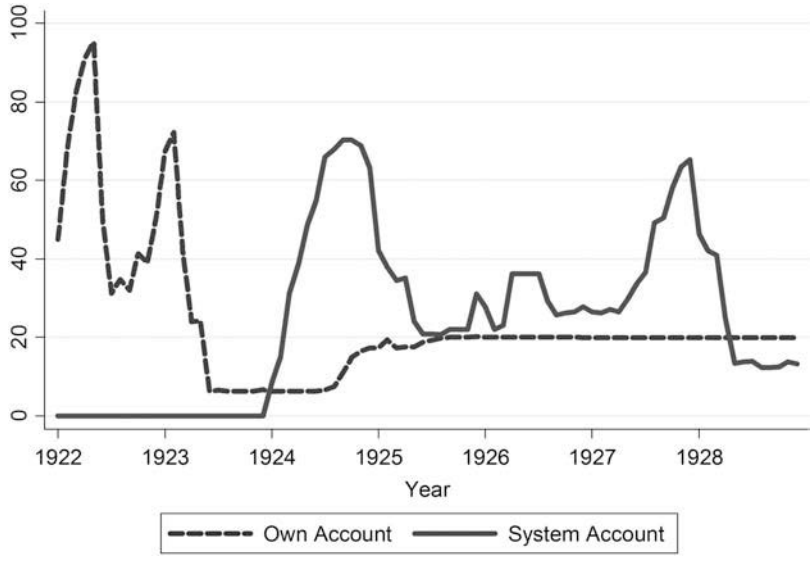


Figure 9.21 FRB Chicago securities

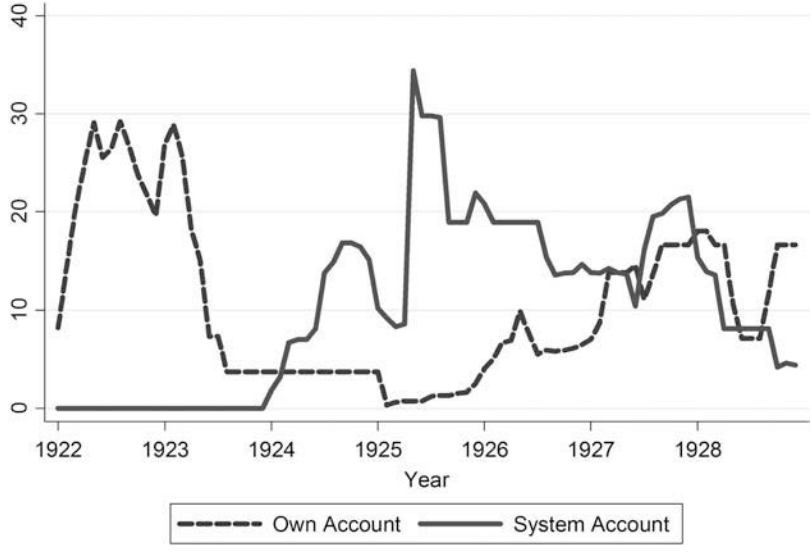


Figure 9.22 FRB St. Louis securities

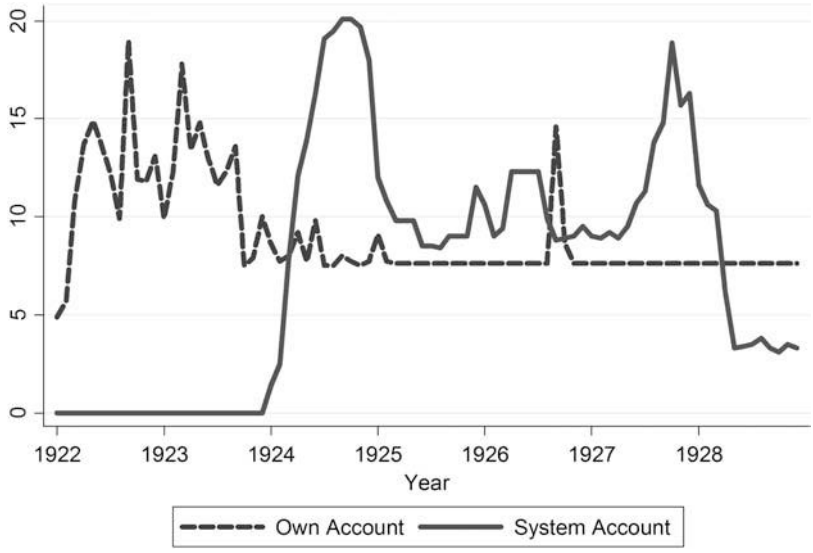


Figure 9.23 FRB Minneapolis securities

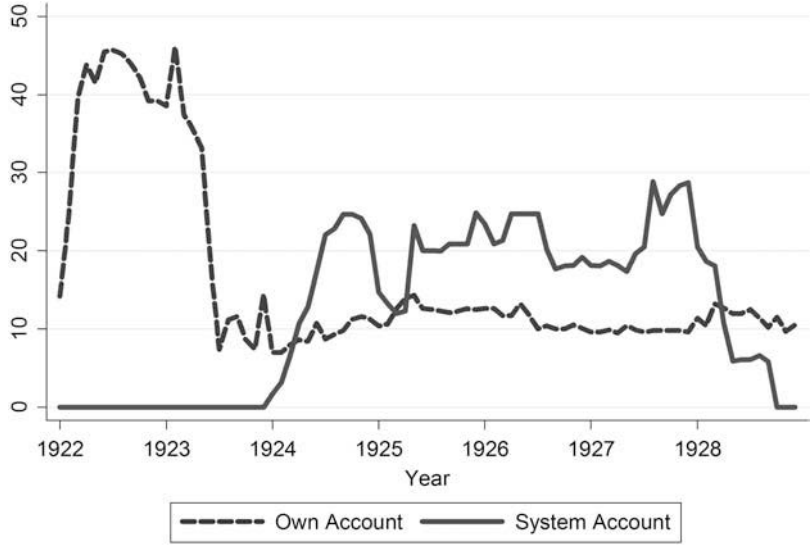


Figure 9.24 FRB Kansas City securities

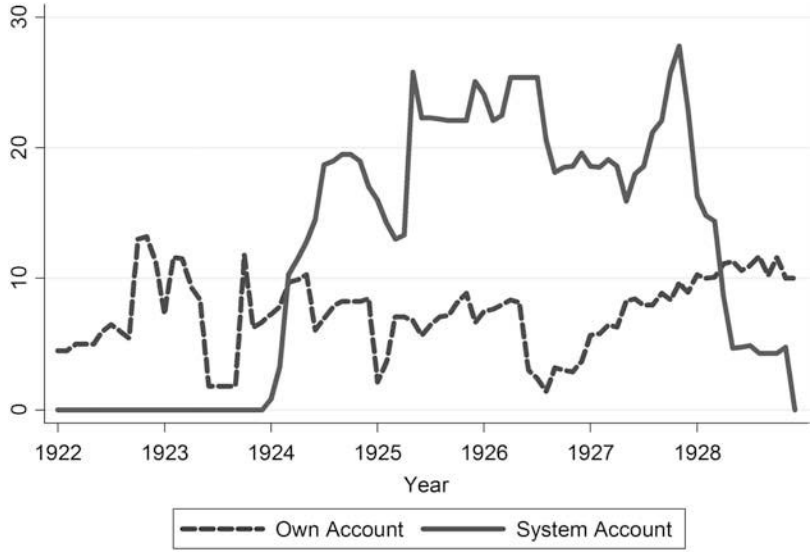


Figure 9.25 FRB Dallas securities

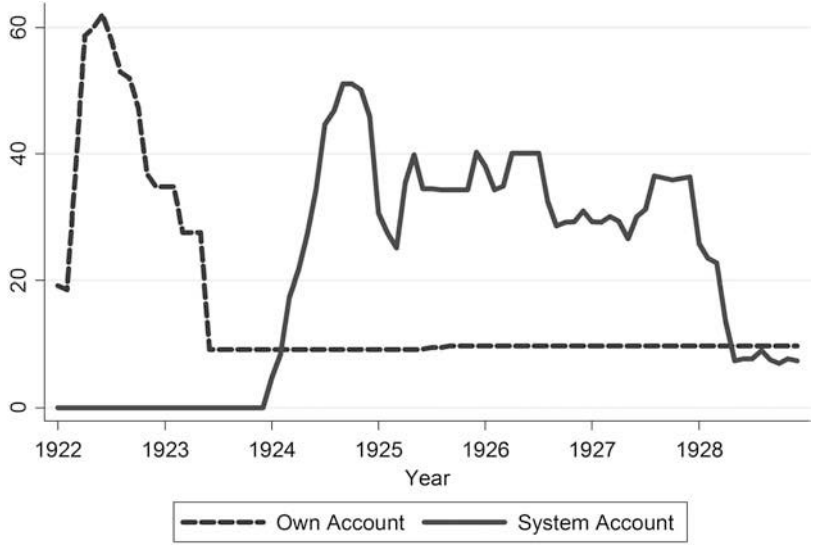


Figure 9.26 FRB San Francisco securities

Table 9.5 Reserve bank engagement index 1924–28

Reserve Bank	Own** (1)	System** (2)	Engagement Index (1)/(2) (3)
Atlanta	0.78	0.90	0.87
Dallas	0.97	1.78	0.54
St. Louis	0.96	1.89	0.51
Kansas City	0.81	2.10	0.39
Minneapolis	0.46	1.25	0.37
Mean	**0.58**	**2.72**	**0.213**
Cleveland*	0.59	2.87	0.21
Philadelphia*	0.34	1.78	0.19
New York*	1.63	8.98	0.18
Chicago*	0.31	4.42	0.07
Boston*	0.14	2.51	0.06
San Francisco	.008	3.00	0.003
Richmond	.002	1.17	0.002

Source: Operation of the National and Federal Reserve Banking Systems. Hearings before a Subcommittee of the Committee on Banking and Currency, United States Senate, Appendix part 6 (January 31, 1931, 824–40).
*OMIC members.

** Mean absolute value of monthly changes in millions of dollars.

Table 9.6 System-wide engagement index 1924–28

Year	Own* (1)	System* (2)	Engagement Index (1)/(2) (3)
1924	0.65	3.81	0.17
1925	0.40	3.23	0.12
1926	0.48	1.64	0.29
1927	0.57	2.22	0.26
1928	0.82	2.71	0.30

Source: Operation of the National and Federal Reserve Banking Systems. Hearings before a Subcommittee of the Committee on Banking and Currency, United States Senate, Appendix part 6 (January 31, 1931, 824–40).
* Mean absolute value of monthly changes in millions of dollars.

7. How Was the System Account Allocated?

The last section pointed to differences between OMIC members and nonmembers in their engagement in independent open market operations. Here we turn our attention to the system account. Are the differences between member and nonmember independent operations mirrored in differences in member and nonmember system account operations? More generally, how were holdings from the system account allocated? Can we identify the key factors that determine movements in the individual Reserve bank shares of system account holdings from 1924 to 1928?

With respect to the first question, we should not be too surprised to find that, just as Reserve banks can be divided into two groups, OMIC members and nonmembers, on the basis of their own account holdings, they can be divided into two groups, OMIC members and nonmembers, on the basis of their system account holdings. Given the way the engagement index was defined in the last section, high engagement in own account operations necessarily implies low engagement in system account operations. Accordingly, to say that nonmembers of the OMIC share the quality of being relatively highly engaged in independent operations goes hand-in-hand with saying that they share the quality of being relatively little engaged in system account operations.

Figure 9.27 shows the shares of system account holdings for each member of the OMIC and figure 9.28 shows the shares for each nonmember. The two figures point to key differences in the two groups, with shares among members appearing to be more highly correlated than shares among nonmembers.[11] The relatively low degree of correlation within the nonmember group reflects the eclectic nature of nonmembers' participation in the system account with some consistently choosing to accept all their system account allocations, some consistently choosing to accept none, and some highly flexible in their willingness to participate in the system account—sometimes opting-out of and sometimes opting-into the allocation assigned them by the OMIC. In contrast, members tended to more consistently accept their assigned allocations.

A closer examination of the two figures points to particular months when share allocations among the Reserve banks changed significantly. In June 1924, the system account share of the New York Reserve bank jumped from

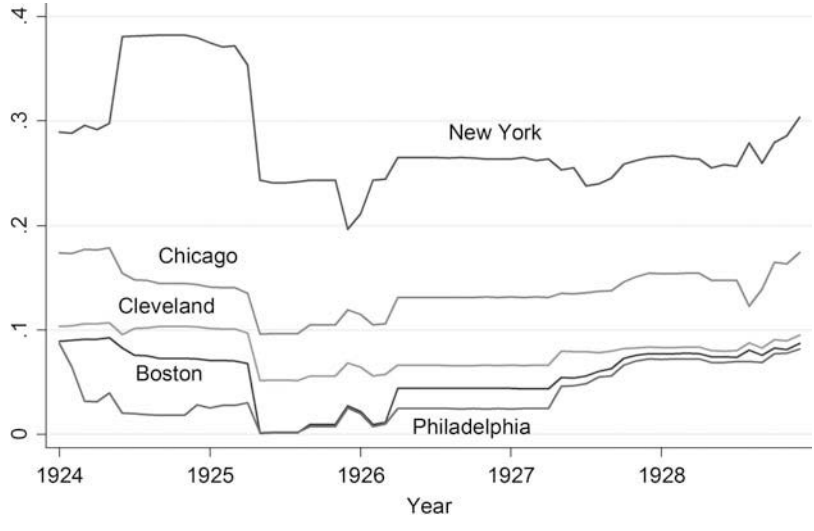


Figure 9.27 Shares of system account for omic members, 1924–1928

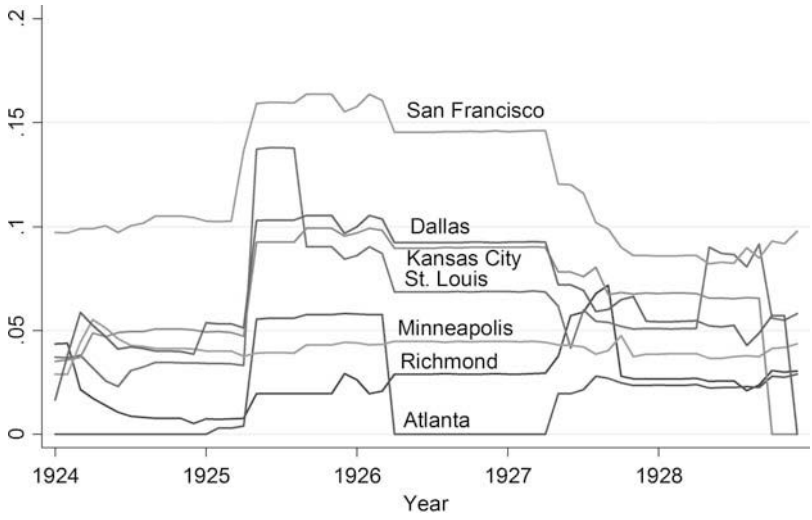


Figure 9.28 Shares of system account for non-omic members, 1924–1928

just under 30 percent to just under 40 percent. Shares of other OMIC members and most nonmembers fell, with the exception of Atlanta where shares stayed the same and Kansas City where shares rose. In May 1925, the system account shares of most OMIC members fell and the shares of most OMIC nonmembers rose. These episodes, along with more minor episodes later in the decade, raise the second set of questions posed above: "What key factors determine movements in the shares of system account holdings?"

On the one hand, we should dampen our expectations about the prospects of discovering the one key factor that might be deemed the holy grail. We know from our earlier findings, rejecting the decisive leader model, that one plausible factor—changes in the distribution of discount loans across Reserve banks—was not decisive in explaining changes in the distribution of security holdings across Reserve banks. Instead the evidence supported the figurehead model where the effect of a change in discount loans at one Reserve bank tends to be spread among the government security holdings of Reserve banks throughout the system leaving security shares largely unaffected. The figurehead model also suggests that changes in own account holdings are unlikely to be informative. To conserve transaction costs, a figurehead tries to anticipate the competitive allocation and then distribute securities accordingly, thus diluting a Reserve bank's incentive to conduct own account operations in the first place. Of course, mistakes may be made and a Reserve bank may judge that it will be better off buying and selling for its own account, in lieu of, or to supplement its system account allocation. If the figurehead is perfect at her job then she does not miscalculate and Reserve banks will not be inclined to conduct own account operations. If the figurehead is merely good at her job then miscalculations do occur but they should be random. In

any event, without more information, it is difficult to draw any firm conclusions with respect to a possible connection between own account shares and system account shares.

Still, Allan Meltzer's detailed narrative of OMIC decision making in his *History* offers important insights on factors that might drive system account shares. The context of the 1924 and 1925 reallocation episodes was an ongoing difficulty, due in large part to balance sheet changes in 1923, among a number of Reserve banks in the system to earn enough to pay dividends to member banks. Reserve bank government security holdings declined throughout 1923 from $354 million in January 1923 to $126 million in January 1924. Over the same period, total earning assets declined from $1174 million to $972 million. Entering 1924, a number of Reserve banks faced the prospect of earnings that would not be sufficient to cover operating expenses and dividends payments to member banks. The possibility of an earnings shortfall, and with it the chance of bankruptcy, turned real. Out of the 12 Reserve banks, 6 dipped into their surplus to cover expenses and dividend payments to member banks in 1924. The New York Reserve bank was one of those in dire straits in 1924. As recounted by Meltzer this prompted a revision in the OMIC's allocation criteria:

> In May, the OMIC revised the allocation formula to reflect the projected earnings positions. New York took 51 percent of purchases in June (instead of its previous 29 percent), and Chicago took 10 percent. Thereafter, allocations changed monthly (Meltzer 2003, 202).

An interesting question, that we will return to shortly, is why the New York Reserve bank was singled out for special attention in this episode. Even though it was not the only Reserve bank facing financial difficulty, and arguably was not the one facing the most difficulty, its allocation was the one that jumped up so much in June 1924.

In early 1925, financial problems continued to be a subject of intense debate in OMIC policy deliberations, in part due to a sell-off of government securities from the system account from November 1924 to March 1925. At an April 30, 1925, OMIC meeting, "Strong defused pressure for purchases of long-term securities by agreeing to reapportion $83 million of the existing portfolio to increase the earnings at reserve banks with losses" (Meltzer 2003, 207). Meltzer points out the raw interests behind this decision:

> The incident brings out the concern of many governors for their earnings and the pressure on Strong to accede to these demands in the interest of maintaining a System policy. The pressure came mainly from the reserve banks in the South and West. In March, Dallas had made purchases for its own account until March 26, when the Board ordered it to stop. Governor Lynn P. Talley of Dallas replied that the Board had approved purchases in October 1923 and never revoked the authority. Chicago, Kansas City, and Minneapolis made small purchases also. At the time, Dallas and some of the others were probably below

> efficient size. They owed their existence to the decision to establish twelve reserve banks rather than eight (Meltzer, 2003, 207n116).

Here, Meltzer calls attention to own account purchases by Reserve banks in the "South and West." Most notably, Dallas made own account purchases, prior to the April 30th meeting, until the board expressed its displeasure. Meltzer additionally mentions that Chicago, Kansas City, and Minneapolis "made small purchases also." Further examination indicates that the Kansas City purchases occurred before May, while the Chicago purchases occurred after May. Finally, though Meltzer fails to mention, Boston and Cleveland joined Chicago in adding to their own account holdings after May.

Instead of Meltzer's division of Reserve banks into the categories "South and West" versus the rest ("North and East?"), I would like to suggest a more informative split: OMIC members versus nonmembers. Two nonmembers—Dallas and Kansas City—made own account purchases in March and April, and in May enjoyed increases in their system account shares. Three members—Chicago, Boston, and Cleveland—suffered decreases in their system account shares in May, and in June and July made own account purchases.

In this episode we see differences emerging between members and nonmembers with respect to the relationship between system account shares and own account holdings. First, for members there is an inverse relationship between system account shares and own account holdings. System account shares fall and own account holdings rise. For nonmembers there is a positive relationship. System account shares rise and own account holdings also rise. Second, the timing between changes in system account shares and own account holdings differs for members and nonmembers. For nonmembers, own account holdings change and, subsequently, system account shares change. For members, the temporal ordering is reversed. System account shares change and, subsequently, own account holdings change.

Two questions arise with Meltzer's descriptive accounts of the 1924 and 1925 episodes. First, can we generalize the patterns identified in 1924 and 1925 to the longer period, 1924–28, or are they simply anecdotal examples? Second, if more than just anecdotes, is there any rhyme or reason to the patterns?

I take up the second question, the rhyme or reason question, first. A puzzle emerges immediately, in trying to apply the figurehead model to the 1924 and 1925 episodes: if, according to the figurehead thesis, the system account was allocated so as to reproduce the competitive outcome, both in terms of the aggregate amount of and the distribution of government securities, then why a system account in the first place. Here, I explore the possibility of a distributional rationale; namely, that it is the mutual interest of all involved parties, and in particular members of the OMIC, to prevent any single Reserve bank from going bankrupt. Why? Bankruptcy would entail

opening-up the system to a legislative Pandora's box. Once Congress starts debating how to deal with endangered Reserve banks then other issues might be placed on the legislative table. In this light, the system account can be interpreted as a tool designed to forestall this possibility. Periodically, system account shares are reallocated to those Reserve banks that are on the brink of bankruptcy, those that experience an excess of operating expenses over revenues. For these financially "unhealthy" Reserve banks, shares of system account holdings rise and for financially "healthy" Reserve banks, shares fall. The bottom line, here, is that the danger of bankruptcy is one factor, arguably the key factor, that would deflect system account shares away from the default competitive allocation.

There is a loophole in this remedy for bankruptcy, however. If financially "healthy" Reserve banks have the opportunity to conduct open market operations for their own accounts then they can undo any OMIC-crafted allocation scheme. And legally speaking we know that in the policy environment of the 1920s they did have that opportunity. By threatening to conduct open market operations for their own accounts—or even better, by actually conducting open market operations for their own accounts—individual Reserve banks can twist the final distribution of security holdings, own and system account, toward themselves and away from those financially unhealthy Reserve banks that the OMIC may be attempting to aid.

Practically speaking, breaking ranks with the OMIC allocation scheme tends to be a less viable option for members as compared to nonmembers of the OMIC. To illustrate why, suppose that you and other members, all of which are healthy, have just voted to reapportion shares so that nonmembers, all of which are unhealthy, get larger shares and members get smaller shares. Now you and the other members are legally in the clear to purchase government securities for your own accounts in an attempt to win back your shares. But such an attempt would seem to be impolitic to say the least. You, as an OMIC member, officially are charged with the task of managing the size and the allocation of the system account presumably in a way that would mitigate the need for own account operations. Conducting own account operations is a bit two-faced in that it renders moot your official "on-record" OMIC policy position. This is not to suggest that members never undertake own account operations. As we indicate in a moment, members do, in particular, those who disagree with the OMIC-selected allocation scheme. But becoming a member does shine a bright light on own account activity effectively raising the cost of such activity and thereby reducing the extent of such activity. Indeed, the empirical finding that OMIC members tend to be less engaged in independent open market operations lends support to this bright light interpretation. As a result, appointment to the OMIC imposes a certain discipline on its members, increasing the likelihood that the OMIC allocation scheme will be effective.

But what of nonmembers, in particular, healthy nonmembers who the OMIC has just assigned a smaller share of the system account so that the unhealthy Reserve banks can receive a larger share? Will not the healthy nonmembers, who do not face the charge of two-facedness, have an incentive to

break ranks with the OMIC allocation scheme by conducting own account operations? The answer is a qualified, *yes.* That is, a disgruntled nonmember will have more of an incentive than a disgruntled member of the OMIC. But even here the propensity to break ranks will be limited. The disgruntled head of a nonmember Reserve bank must consider that she is one of a relatively small number of nonmember heads, in the Reserve banking system of the 1920s, one out of seven. Accordingly, independent open market operations will not go unnoticed. So the disgruntled nonmember weighs two options: (1) stand pat and accept your system account allocation, or (2) independently adjust recognizing that others are prone to respond in like manner such that the final outcome devolves to the competitive equilibrium, an equilibrium where some Reserve banks are on the brink of bankruptcy. The bottom line is yes, an OMIC nonmember head is more likely than her member counterpart to independently adjust. But even so, her propensity to break ranks with the OMIC allocation scheme will be circumscriptive. She does so only if the system-account allocation depresses her Reserve bank's profits by a large amount relative to the competitive outcome: an amount so large that it outweighs the fact that competition opens the door to the above mentioned legislative Pandora's box.

Another way to frame the conclusion that breaking ranks with the OMIC allocation scheme is a more viable option for nonmembers compared to members is in terms of Albert Hirschman's (1970) "voice versus exit" options. Reserve banks that are members of the OMIC have essentially two ways of influencing their final share of system-wide government securities. They can "voice" their preferences at OMIC meetings or they can "exit" the committee decision-making process and conduct independent open market operations. For members "voice" is the first resort option and "exit" the last resort option, exercised only after voicing fails to advance their preferences. In contrast, nonmembers have only one way of influencing OMIC deliberations: the threat of, or actual conduct of, independent operations. For nonmembers exit is the first resort option.

What does all of this imply about the saliency of bankruptcy as a key factor determining system account shares? Consider members who find themselves in financial trouble. First and foremost, they will turn to their system account holdings as a bailout device; that is, they will use their voice option in an attempt to tilt the OMIC-determined shares in their favor. Only if the voice option fails will they turn to independent open market operations. In contrast, financially troubled nonmembers are less reliant on their system account allocation: own account operations complement system account holdings as a safety valve. The upshot is that changes in system account allocations should be more strongly tied to financial problems for members compared to nonmembers.

This may help explain, why in June 1924 only the New York Reserve bank experienced a significant jump in its system account allocation even though it was one of several facing financial difficulty. At the time, New York, as the most important member of the OMIC, was unique in relying

almost exclusively on system account holdings. Note in this regard that its own account holdings equaled zero for all but one month from January 1924 to June 1927. Accordingly, New York would be the one Reserve bank, more than any other, whose system account share would tend to rise when faced with the danger of bankruptcy.

A Reserve bank's OMIC membership status also helps explain Meltzer's observations about the idiosyncratic own account operations of Reserve banks in the 1925 episode: first, why own account operations tended to be negatively related to system account shares for members and positively related for nonmembers; second, why changes in own account holdings tended to precede changes in system account shares for nonmembers, but tended to follow for members. Both phenomena can be linked to the voice versus exit options available to each side.

Nonmembers are less able to effectively voice. To influence OMIC deliberations they must exercise, or threaten to exercise, the exit option in the form of own account operations. Disgruntled nonmembers, therefore, will tend to conduct own account operations in advance of an OMIC decision to allocate system account shares. In particular, a nonmember seeking a larger share will tend to buy government securities for its own account in the months preceding an OMIC decision. To the extent that such influence-peddling activities are successful, own account holdings and system account shares will be positively related.

Members can voice and exit. To influence OMIC deliberations they will voice as a first option. If voice fails then exit in the form of own account operations will be used as a last resort option. Disgruntled members, those whose voice falls on deaf OMIC ears, will tend to conduct own account operations after an OMIC decision to allocate system account shares. In particular, a disgruntled member, who finds its share reduced, will tend to buy government securities for its own account in the months following an OMIC decision. Own account holdings and system account shares will be negatively related.

After this long discourse, we are now in a position to turn to the evidence. Empirically, do the factors that we have identified as being potentially important in determining system account shares have explanatory power for the Reserve banking system, 1924–1928? To summarize, the analysis of this section suggests:

1. The likelihood of bankruptcy is an important factor influencing a Reserve bank's share of system account holdings. Ceteris paribus, the larger the likelihood of bankruptcy the larger the share of system account holdings.
2. The bankruptcy factor will be relatively more important for members as compared to nonmembers. Accordingly, bankruptcy should be more strongly positively related to system account shares for members.
3. System account shares also will be correlated with own account shares. For members the correlation will be negative and for nonmembers the correlation will be positive.
4. In addition, the temporal ordering between movements in system account shares and own account shares will differ between member

and nonmember Reserve banks. For members, changes in own account shares tend to follow changes in system account shares and for nonmembers, changes in own account shares tend to precede changes in system account shares.

The first task is to construct a measure for the danger that a Reserve bank will go bankrupt. A Reserve bank that is on the margin of bankruptcy would find that its earnings are insufficient to cover outlays. The Federal Reserve Act specifies that Reserve banks must use earnings to finance operating expenses, dividend payments, additions to surplus account, and, finally, any leftover earnings must be transferred to the Treasury's general account in the form of a so-called franchise tax. Table 9.7 shows the financial condition of each Reserve bank from 1924 to 1928. An "X" in the Surp (-) box indicates the Reserve bank is not generating enough revenue to cover operating expenses and so it must dip into its surplus account that year: the change in the surplus account is negative. An "X" in the Tax (+) box indicates that the Reserve bank is generating more than enough revenue to cover both operating expenses and contributions to the surplus account, with the extra funds representing a positive franchise tax payment to the Treasury.

According to this measure, three OMIC members, Boston, New York, and Cleveland, and three nonmembers, St. Louis, Kansas City, and San Francisco, were financially "unhealthy" in 1924. Two nonmembers, Atlanta and St. Louis, were financially "unhealthy" in 1925. No Reserve banks were financially "unhealthy" for the remaining years, 1926–28. At the other extreme, the Reserve bank of Minneapolis generated enough revenue to pay a franchise tax to the Treasury each year from 1924 to 1928. Chicago and Philadelphia represent intermediate cases: they neither dipped into their surplus account nor transferred revenue to the Treasury over the period, 1924–28.

Table 9.7 Reserve bank financial conditions 1924–28

Reserve Bank	1924		1925		1926		1927		1928	
	Surp (–)	Tax (+)	Surp (–)	Tax (+)	Surp (–)	Tax (+)	Surp (–)	Tax (+)	Surp (–)	Tax (+)
Boston	X					X				
New York	X									
Philadelphia										
Cleveland	X									
Richmond						X				X
Atlanta			X							X
Chicago										
St. Louis	X		X							X
Minneapolis		X		X		X		X		X
Kansas City	X			X		X		X		X
Dallas										X
San Francisco	X									

Source: Federal Reserve Board (1924–28).

The bankruptcy variable, $BANKRUP_{jt}$, is constructed from table 9.7. For each month of each year, a Reserve bank is assigned a value of –1, 0, or 1 depending on the Reserve bank's financial condition that year. If a Reserve bank is financially "unhealthy" (must dip into its surplus account) during a particular year, then, for that Reserve bank, $BANKRUP_{jt} = 1$ for each month of the year. If a Reserve bank is financially "healthy" (is able to transfer funds to the Treasury), then, for that Reserve bank, $BANKRUP_{jt} = -1$ for each month of the year. Finally, if a Reserve bank is neither "unhealthy" nor "healthy" (neither dips into its surplus account nor transfers funds to the Treasury), then, for that Reserve bank, $BANKRUP_{jt} = 0$. An increase in the value of $BANKRUP_{jt}$, therefore, signifies an increased likelihood that the Reserve bank will go bankrupt.

Having constructed the bankruptcy measure, I turn my attention to testing the predictions embodied in the summary statements listed above. Statements (1)–(3) suggest the following cross sectional time series test equation:

$$\begin{aligned} SYSSHARE_{jt} \quad & a + b\left(BANKRUP_{jt}\right) \quad c\left(OWNSHARE_{jt}\right) \\ & + d\left(OMIC_{j}\right) \quad e\left(OMICBANKRUP_{jt}\right) \\ & + f\left(OMICOWNSHARE_{jt}\right) + \varepsilon_{jt}, \end{aligned} \tag{9.3}$$

where $SYSSHARE_{jt}$ is Reserve bank j's share of system account holdings in t, $BANKRUP_{jt}$ is defined above, $OWNSHARE_{jt}$ is Reserve bank j's share of own account holdings in t, $OMIC_j$ is a dummy that equals 1 if Reserve bank j is a member of the OMIC and 0 if it is a nonmember, and, finally $OMICBANKRUP_{jt}$ and $OMICOWNSHARE_{jt}$ are interactive dummies. Summary statements (1)–(3) imply $b > 0$, $c > 0$, $e > 0$, $f < 0$, and $c + f < 0$. In addition, $d > 0$ due to the larger balance sheets of OMIC members.

Table 9.8 presents the results from three system account test regressions. Regression (1) and (2) do not separate OMIC members from nonmembers. The first indicates that, for the system as a whole, an increase in a Reserve bank's system account share is negatively related to its share of own account holdings. Regression (2) adds the bankruptcy variable as an independent variable. As predicted, an increase in the danger of bankruptcy increases a Reserve bank's system account share.

Regression (3) is the test equation of most interest, using dummies to segregate OMIC members from nonmembers. The results indicate that member and nonmember system shares respond differently to bankruptcy. Both members and nonmembers find that their shares of system account holdings rise with the likelihood of bankruptcy. But for members the strength of the effect is stronger: the statistically significant coefficient, e, on OMICBANKRUP indicates that a unit increase in the bankruptcy measure for an OMIC member causes its system account share to increase by 0.04 more than the share increase for a nonmember in response to a unit increase

Table 9.8 System account regressions

$$SYSSHARE_{jt} = a + b(BANKRUP_{jt}) + c(OWNSHARE_{jt}) + d(OMIC_j) + e(OMICBANKRUP_{jt}) + f(OMICOWNSHARE_{jt}) + \varepsilon_{jt}$$

	System Account Share (SYSSHARE)		
	(1)	(2)	(3)
Constant	0.09	0.10	0.03
	(20.99)	(22.37)	(4.91)
BANKRUP		0.03	0.01
		(7.07)	(3.08)
OWNSHARE	–0.12	–0.12	0.53
	(–2.86)	(–2.95)	(7.00)
OMIC			0.14
			(18.39)
OMICBANKRUP			0.04
			(4.76)
OMICOWNSHARE			–1.06
			(–12.34)
OWNSHARE + OMICOWNSHARE = 0			F(1,714) = 102.49 Prob > F = 0.0000
R^2	0.011	0.076	0.406

Sources: Federal Reserve Board (1924–28) and Operation of the National and Federal Reserve Banking Systems. Hearings before a Subcommittee of the Committee on Banking and Currency, United States Senate, Appendix part 6 (January 31, 1931, 824–40).
Notes: t-statistic is in parentheses.

in the bankruptcy measure. These results are consistent with summary statements (1) and (2).

The results also indicate that members and nonmembers respond differently to a change in own account shares. For nonmembers, an increase in own account shares is associated with an increase in system account shares; that is, c = 0.53 and the hypothesis that c = 0 can be rejected at the 0.05 significance level. For members, an increase in own account shares is associated with a decrease in system account shares; that is, the sum of the coefficients, c and f, is 0.53 + (–1.06) = – 0.53 and the hypothesis that c + f = 0 can be rejected at the 0.05 significance level. These results are consistent with summary statement (3).

Finally, I tested summary statement (4) by adding various leads and lags to OWNSHARE and OMICOWNSHARE. Here the results (not reported) were negative. None of the leads or lags turned out to be statistically significant, implying that the system account share and own account share relationships for members and nonmembers discussed in the previous paragraph are contemporaneous. This test does not conclusively rule out that leads and lags are important in the way suggested by (4); for instance, *monthly* data does not allow for the possibility that member banks might react in the *weeks* following an OMIC decision, while nonmembers might act in the *weeks* prior to an OMIC allocation decision. The data simply are not fine-grained (high-frequency) enough to address this possibility.

8. The Atlanta Fed: A Special Challenge

Much of the empirical work presented in this chapter has documented how decision making by OMIC nonmembers stands out as distinct from that of members. That, in itself, casts a shadow of doubt on the leadership hypothesis that Strong, through the strength of his personality, was able to enforce a system-wide policy. But recent work has singled out the Atlanta Federal Reserve bank as special in pursuing a relatively accommodative monetary policy during the Depression years, 1929–33. In particular, Gary Richardson and William Troost (2009) and Mark Carlson, Kris James Mitchener, and Gary Richardson (2011) provide evidence that the Atlanta Fed liberally extended credit to member banks through the discount window during times of crisis. They also argue that the Atlanta Fed laid the foundation for this accommodative Depression policy during the decade of the 1920s. According to this line of research, there was no change in policy regime in moving from the 1920s to the 1930s. Atlanta's Depression-era policy was a natural outgrowth of its 1920s policy of monetary expansion.

This recent line of work presents something of a challenge to the self-regulated model. During the 1920s, Strong tended to be an advocate for monetary expansion, aggressive open market operations, particularly during 1924 and 1927. The supposition that Atlanta also favored monetary ease supports the decisive leader model, that during the 1920s the Atlanta Fed, though positioned outside the OMIC, was a team player in a Benjamin Strong leadership game. This brand of team play, of course, would be diametrically opposed to the self-regulated model, which generally posits intense rivalry among the individual Reserve banks and specifically posits a disinclination of self-interested Reserve banks to adapt to the monetary wishes of Benjamin Strong, except when their interests happen to coincide with his wishes.

A recap of the empirical work presented in this chapter sheds light on the team player hypothesis. First, note that, if indeed, the Atlanta Fed was a team player, then we might expect it to mimic the behavior of an *ideal* OMIC member, willingly accepting its system account allocation and, moreover, either refusing to conduct own account operations or using the own account to reinforce the system account. But we have already made a big deal of the finding that Atlanta was something of an outlier. It was the Reserve bank most engaged in own account open market operations and least engaged in system account open market operations. Indeed, inspection of figure 9.20 shows that for 1924 and much of 1926, Atlanta refused to participate in the system account. No other Reserve bank refused participation for such extended periods of time.[12]

Engagement in own account and disengagement from system account operations is not necessarily an indictment of the team player hypothesis, however. Conceivably, Atlanta could have been using own account operations in support of Strong's system account policy, rather than competitively to augment its own earnings. One sign of team support would be if Atlanta's own account holdings, or more generally the sum of Atlanta's own and

system account holdings, rose and fell with aggregate system account holdings. Here, we would want to pay attention to the possibility that Atlanta was particularly aggressive in expanding security holdings in 1924 and 1927 when Strong was focused on his international agenda.

In figure 9.20, we can see that own account holdings fall from around $5 million to zero early in 1924, and then rise for most of the rest of the year, but do not recover their early high. The fact that system account holdings were zero throughout the year implies that Atlanta's total government security holdings (the sum of own and system account holdings) failed to recover fully, even though discount loans fell precipitously and total security holdings at other Reserve banks (see figures 9.1–9.12), particularly OMIC members, surged during 1924. Turning to 1927, Atlanta's system account holdings did rise throughout much of 1927, but own account holdings show modest declines over the second part of the year. Overall, total holdings rise but this rise does not appear to be out of line with the rise in security holdings of other Reserve banks. More formally, I included an Atlanta intercept dummy and (discount loan) slope dummy in equation (9.1b) to test the hypothesis that the Atlanta Reserve bank was unusually accommodative in conducting open market operations over the entire period, 1922–28. Neither the intercept nor the slope dummies was statistically significant.

Overall, the evidence points to the conclusion that Atlanta, in actively engaging in own account open market operations, either seemed to be working at cross-purposes with Strong, or at least was not particularly receptive to Strong's leadership agenda. In this sense, recent scholarship, highlighting the specialness of the Atlanta Fed during the Depression-era, fails to undermine the self-regulated model of the 1920s Federal Reserve System; in particular, it fails to do damage to the view of the Atlanta Reserve bank as one of a network of Reserve banks engaged in open market operation rivalry. Whether Atlanta, during the Depression, was special in pursuing a policy that Strong would have wanted it to pursue is an open question. But there is little evidence that it was special in pursuing a Strong-friendly accommodative policy in the 1920s.

9. CONCLUSION

The goal of this chapter has been to address the question, "Did Reserve banks *really* compete?" by shining a bright light on the open market operations of individual Reserve banks in the system. Most directly, we have documented the extent to which individual Reserve banks independently adjusted; that is, conducted open market operations for their own accounts outside the confines of the special system account. Going against conventional wisdom, I find that own account operations were not "small in amount" and, indeed, they grew in significance over the course of the decade.

In addition, I exploited the implication that the final distribution of government securities among Reserve banks tends to differ depending on whether the system is better modeled as a managed system or as a network of

competing Reserve banks. The simplest version of the decisive leader model implies that securities in the system account would be distributed to insulate the total magnitude of each Reserve bank's earning assets from changes in its discount loans. In fact, much of the debate leading up to the creation of the OMIC explicitly called for some such allocation criteria. Testing for intra- and inter-Reserve bank scissors effects provided little evidence for this type of criteria, belying the hypothesis of Strong as a potent, decisive leader who at times is able to manipulate the system account to induce Reserve banks to passively cooperate with his leadership agenda.

Finally, the preponderance of evidence against the decisive leader model and in favor of the figurehead model raises the question of the rationale behind the OMIC and the system account. I find that financial weakness of a Reserve bank tends to increase its share of system account government securities, serving as a type of insurance against bankruptcy. This type of insurance would be of benefit to all Reserve banks, healthy or unhealthy, since the prospect of one or more Reserve banks on the brink of bankruptcy is an invitation to Congress to revisit the question of the appropriate number of Reserve banks in the system. The fear here is that once this issue is on the legislative table, other proposals, perhaps inimical to the interests of existing Reserve bank decision makers, would also be entertained by Congress. So "Did Reserve banks *really* compete?" Yes, with the qualification that the OMIC existed to provide individual Reserve banks with a bankruptcy safety net.

Chapter 10

The Seductiveness of the Decisive Leader View

The decade of the 1920s has earned its reputation as representing the high tide of the Federal Reserve System. During the years 1922–28 the system performed admirably in fulfilling the mission outlined in the preamble of the Federal Reserve Act: "to furnish an elastic currency." Currency elasticity was associated with a smoothing of nominal interest rates and a reduction in the frequency of financial panics.

All of this is familiar territory. As Friedman and Schwartz have noted in their exhaustive survey of the decade, "the System took—and perhaps even more was given—credit for the generally stable conditions that prevailed, and high hopes were placed in the potency of monetary policy as then administered" (1971, 240). This success was later formalized by Jeffrey Miron (1986) in a model that posited a central bank, the Fed, which conducted an open market operation policy that produced seasonal movements in Fed credit. The policy implication of this modern consensus, withstanding a notable objection lodged by the Austrian side, is that appropriately timed monetary discretion was necessary and sufficient to solve the financial crisis problem that had existed under the National Banking System.

The central figure in this Federal Reserve success story was Benjamin Strong, governor of the Federal Reserve bank of New York. Friedman and Schwartz build a persuasive case, that if not for Strong's leadership skills, decision making at the Fed would have remained fragmented throughout the decade due to a relatively weak Federal Reserve Board and the fact that the Federal Reserve Act distributed monetary powers among the 12 Reserve banks. Two policy outcomes were likely to emerge absent the decisive leadership of Strong, neither of which was desirable from an economic stability perspective. Either the individual Reserve banks would be unduly preoccupied with their bottom-line, using open market operations to enhance their earnings, or they would be rudderless, drifting where political winds blew.

The circumstantial evidence for Friedman and Schwartz's decisive leader view seems compelling and indeed the consensus that has formed around their position seemingly has grown stronger over the decades since the publication of their *Monetary History*. After all, interest rates were smoother after creation of the Federal Reserve and that smoothness was accompanied by a seasonal pattern in Fed credit that was exactly what an economic technician, Benjamin Strong, would prescribe in order to remedy a defective pre-Fed monetary environment. Moreover, Strong was not a simple technician blindly following a policy of month-to-month interest rate smoothing. Nor was he a parochial leader, narrowly focused on domestic stability. When the good of the international economy called for decisive leadership, Strong was willing and able, orchestrating an open market operation policy of monetary ease in 1924 and 1927, the two years when such ease was critical for the return to and the sustenance of the international gold standard.

A final piece of evidence that seems to clinch the case for Friedman and Schwartz's decisive leader view is the emergence of a central body, the Open Market Investment Committee (OMIC), to manage open market operations for the entire Federal Reserve System. To be sure, Reserve banks still conducted open market operations on their own after the OMIC's creation in 1923. But, in Friedman and Schwartz's words these operations were "small in amount," presumably so small that they represented no more than a nuisance that did little to interfere with Strong's leadership plans.

This is the seductiveness of the decisive leader view. We humans see an ordered outcome—in this case stable economic conditions—and tend to attribute the order to good planning by a top-level decision maker. Even the economically literate reader, who appreciates the spontaneous order produced by what we refer to as the *market*, is capable of being seduced, particularly when the activity in question, the production of money, is one where private supply in a market setting is but a distant memory.

Given this seductiveness, the challenge is to answer the question: How, if not by decisive leadership, was the high tide of the Federal Reserve produced? If we drop what I consider to be the fiction of an all-informed, well-intentioned, decisive leader then good outcomes require good rules of the game. The high tide in other words required a well-designed monetary constitution. The Federal Reserve Act was intended to serve this role. The founders of the Federal Reserve explicitly designed a decentralized, self-regulated system that would eliminate the need for a central decision-making authority. One key element was a gold anchor. By requiring that Reserve banks redeem their outstanding Federal Reserve notes into gold and by making it relatively easy for the note-holding public to do so, the gold anchor guarded against overissue. But the truly novel element was competition. By requiring that individual Reserve banks face a bottom-line and by giving them the power to conduct open market operations on their own, competition among Reserve banks guarded against underissue. With these two elements, the total amount of Fed money would be demand-determined; that is, Reserve banks would not control the monetary base.

To be sure, Reserve banks could be viewed as having the power to choose their assets, the composition of the base between gold and Fed credit. But this was not a planned outcome produced by a decisive leader. Instead, according to the self-regulated view, it was an unintended by-product of the uncoordinated decisions of the individual Reserve banks, each seeking to protect their bottom-line and each seeking to enhance their bureaucratic spending opportunities. Moreover, under the supposition that the total was demand-determined, the compositional subdivision of the base into gold versus Fed credit, while important for Reserve bank earnings, was not important in a monetary policy sense.

The core chapters of this book have built the case for the self-regulated model by showing that it can account for the empirical phenomena that we generally associate with the decisive leader view. Competition drives bottom-line motivated Reserve banks to do the following:

- Produce seasonal movements in Fed credit, increasing during the fall harvest season and decreasing during the nonharvest season. The mechanism here was the harvest time tendency for currency demand to increase, a demand that Reserve banks willingly accommodated.
- Increase Fed credit and decrease gold holdings during certain subperiods, most notably, 1924 and 1927. The mechanism here was a relatively large increase in the worldwide demand for gold that, according to an amended version of the self-regulated model, served to increase the relative price to Reserve banks of holding gold.

But if this was the entirety of what the self-regulated model delivered, there would be little reason to switch from the decisive leader consensus. The two views would be observationally equivalent with anecdotal evidence—for example, few signs of overt competition among Reserve banks in the 1920s—favoring the decisive leader model.

There are, however, a host of corollary implications of the two theories that allow us to break the observational equivalence stalemate. The self-regulated model implies the following:

- Discount loans will be seasonal, increasing during the fall harvest season and decreasing during the nonharvest season, while government security holdings generally are not seasonal.
- The monetary base, when adjusted for population changes, will be stationary.
- Movements in Reserve bank gold holdings will exhibit economies of scale with respect to the monetary base and Fed credit will be positively related to the interest rate on government bonds.
- A scissors effect exists between Fed government security holdings and discount loans. The scissors effect will be one-for-one, after controlling for variables predicted to move Fed credit.

- Changes in discount loans at one Reserve bank will have spillover effects on government security holdings at other Reserve banks.

While the evidence for the 1920s does not perfectly match-up with all of these implications, overall the self-regulated model gives a closer fit than the leading discretionary alternative, the decisive leader theory. Moreover, the last chapter presented micro-level data supporting the hypothesis that "Reserve banks really did compete."

Finally, the self-regulated theory has an empirical advantage with respect to the so-called easy money implication shared by both theories, that after 1923 the Fed would expand Fed credit in response to international conditions. The decisive leader theory posits that in 1924 and 1927, Strong exercised his leadership skills by orchestrating an increase in Fed government security holdings in order to help countries throughout the world, particularly Great Britain, return to the international gold standard. The competitive theory also predicts an increase in government security holdings in 1924 and 1927; those are years when the worldwide demand for gold increased, making gold more expensive to acquire, and securities less so, in the profit calculus of individual Reserve banks. But the competitive theory appears more robust in that a proxy for worldwide gold demand is a statistically significant factor explaining government security holdings not just for 1924 and 1927, but also throughout the decade. So in the end, the seductiveness of the view of Benjamin Strong as decisive leader is just that—seductive, but not a compelling account of the frequently intense rivalry that existed among the individual Reserve banks during the 1920s.

Epilogue

1. The Haunted Legacy of the Great Depression

The ghost of the twentieth-century Great Depression has hovered over the twenty-first century Great Recession. Benjamin Strong is the ghost returned to scare us away from the mistakes of the onset of the earlier "Great." But we citizens of the modern world do not need a ghost—a disembodied spiritual guru—for we have the real thing, our own Ben, who is the intellectual heir apparent to the 1920s Benjamin. Our Ben has earned his academic stripes at the feet of Milton Friedman and Anna Schwartz. While modern Ben is certainly no unquestioning disciple, he does firmly buy-in to what he perceives to be the major policy lesson of Friedman and Schwartz's Great Depression legacy. Namely, the Fed should not make the mistake of omission committed by those who assumed the leadership role upon the death of the twentieth-century Benjamin. Fed leaders should be decisive, not passive. On the first signs of economic downturn pump up the money supply—buy government bonds—and continue to do so until you see sure signs of economic recovery.

We have been haunted by this interpretation of Friedman and Schwartz's Great Depression legacy. If there is any policy lesson to be learned from this book it is that there is little truth to the consensus view championed by economists of many flavors—not just modern-day *market* monetarists—that the onset of the Great Depression was caused by too little money. The founders of the Federal Reserve were fully aware of the dangers posed by too little money. Their experience under the National Banking System put them on full alert. Accordingly, they created a competitive, self-regulated network of Reserve banking where currency elasticity was built into the very foundation of the new system. The result was a high tide for the economy and, by implication, for the Federal Reserve. To attribute this high tide to the wisdom of discretionary, fine-tuning decision makers, who cleverly crafted a policy of appropriately timed monetary ease, would be a mistake, just as would attributing the onset of the Depression to an ill-timed policy of monetary tightness. Yes, we do have a monetary lesson to learn. But that lesson is, *do not be led astray by those who would preach that the monetary legacy of the onset of the twentieth-century Great Depression is to be ever vigilant against the prospect of monetary dearth.* While we can have an honest debate about whether undue

tightness is the policy problem of today, it was not the problem of yesterday with respect to the onset of the Great Depression.

2. WHAT HAPPENED?

We end with the question, "What happened?" What accounts for the onset of the Great Depression if not mismanagement of the money supply by a discretionary Federal Reserve? While the question does take us beyond the scope of this book, it seems too compelling a query to let die untouched. I have given it some thought. The answer, I would suggest, in some sense does resurrect the Friedman and Schwartz *Monetary History* hypothesis on the onset of the Great Depression. But to be clear, it does not entail a resurrection or reformulation of the decisive leader hypothesis. Just as Benjamin Strong bears little responsibility for the high tide, his death has little to do with the onset of the Great Depression. The hero worship implied by the decisive leader view is too naive, too uneconomic—incentive ignorant, if you will—for my tastes. Instead, I would argue that there is another view of the onset that is faithful to a more careful, nuanced reading of *Monetary History.* The Friedman and Schwartz hypothesis, properly rendered, is that the onset of the Great Depression was due to the failure of the Federal Reserve to fulfill its lender-of-last-resort responsibilities. Significantly, this was a failure in economic incentives rather than in human character.

The thrust of this "What happened?" argument takes us back to the preface, where there I suggested that the key event triggering the Depression's onset was a February 1929 Federal Reserve Board announcement warning Reserve banks that, in recent years, they had been too liberal in extending discount loans to member banks. The problem, in the board's thinking, was that member banks re-lent these funds to private investors who used the money to purchase stock, thereby driving stock prices to unsustainable heights. Whatever the merits of the board's concern—and I would argue that the concern was generally groundless—the announcement represented a trust-destroying negative shock to the economy. It destroyed trust in the decentralized network of Reserve banks; trust that the individual Reserve banks had established throughout the 1920s as reliable lenders of last resort in the eyes of their member banks. Those members responded in rational fashion, cutting back on loans and building up liquid reserves. The build-up, however, did not fully compensate for the loss of confidence in Reserve banks and, with a smaller safety cushion, the financial system was more fragile, in the sense that a liquidity event that in more normal times would have been more or less routine, could now trigger a financial crisis. That liquidity event was the early phase of the October 1929 stock market crash triggering the onset of the Great Depression.

To flesh out my "What happened?" answer in more convincing detail will require a redirection of analytic style—a focus away from the microeconomics of Reserve banking, where the Federal Reserve Board was a bit player, toward a setting where the board now takes center stage. And to understand

the behavior of the board will require that we do not limit ourselves to the toolkit of the typical economist. First and foremost, the board was an organization embedded in a hierarchical principal-agent governmental setting, largely immune from the competitive pressures shaping individual Reserve banks in the 1920s. To understand board behavior, therefore, will require modeling the board as a standard bureaucratic firm, beholden to an upper level government sponsor; that is, we must substitute bureaucratic payoffs and penalties for microeconomic revenues and costs. We will get much mileage in understanding why the board engaged in trust-destroying behavior in 1929 by noting that the board, as a bureau, is rewarded only when it produces something of value that can be metered and thus reported to its sponsor. Trust, as a credible lender of last resort, is one of those attributes of monetary policy that cannot be readily metered and reported and hence will tend to be undersupplied by the board. To answer the "What happened?" question at its deepest level, therefore, requires that we pose a follow-up question: "Why did the Federal Reserve Board's undersupply bias, which was latent throughout most of the 1920s, breakout at a particular moment in Fed history—early 1929?" This turns out to be a *big* question, one that I intend to take-up another day.

Appendix

The basic self-regulated model assumes fixed supply and demand conditions in the world market for gold, implying a constant purchasing power of gold. Here, we relax this assumption and show how changes in the purchasing power of gold affect the competitive Reserve bank equilibrium.

Begin with a restatement of the nominal balance sheet constraint facing Reserve banks:

$$G \quad (R + C) - (L_{RB} + S_{RB}), \tag{A.1}$$

where G is the dollar amount of Reserve bank gold, R is the dollar amount of bank reserves, C is the dollar amount of the public's currency, L_{RB} is the dollar amount of Reserve bank discount loans, and S_{RB} is the dollar amount of Reserve bank government security holdings. To convert the nominal balance sheet into a real (output) balance sheet, divide both sides of (A.1) by the general price level, P:

$$g \quad b - (l_{RB} \quad s_{RB}), \tag{A.2}$$

where g is real Reserve bank gold, b = (R + C)/P is the real monetary base, l_{RB} is real discount loans, and s_{RB} is real Reserve bank government security holdings. The representative Reserve bank's task is to choose the level of real government security holdings, s_{RB}, to maximize expected real (discretionary) profits

$$\text{Max } E(\pi_{RB}/P) \quad d(l_{RB}) \quad r(s_{RB}) \quad (\quad /2)[(g \quad b) - 1]^2, \tag{A.3}$$

subject to (A.2), where d is the discount rate, r is the government bond rate, and s^2 is the variance of gold redemptions. The open market operation solution satisfies the first-order condition

$$r \quad s^2 (l_{RB} + s_{RB})/b^2 = s\ (fc)/b^2, \tag{A.4}$$

where fc is real Fed credit.

Equation (A.4) can be rearranged to give

$$fc = rb^2/s^2, \tag{A.5}$$

or in nominal terms,

$$FC = rB^2/Ps = rB^2(P_M)/s^2, \tag{A.6}$$

where P_M (= 1/P) is the purchasing power of money. Using (A.2), (A.5) can be rearranged to give

$$g \quad b\left[1 \quad (rb \quad)\right], \tag{A.7}$$

or in nominal terms,

$$G \quad B\left[1 \quad (rBP_M \quad)\right]. \tag{A.8}$$

Chapter 8 empirically investigates how an increase in the purchasing power of gold, P_G, which under a gold standard is the same as the purchasing power of money (i.e., $P_G = P_M$), affects nominal Fed credit, FC, and Reserve bank gold holdings, G, when holding constant the nominal monetary base, B. Taking the derivatives of (A.6) and (A.8) with respect to $P_G = P_M$, gives

$$\partial(\quad)/\partial(\quad) = rB^2/s^2 > 0, \tag{A.9}$$

$$\partial(\quad)/\partial(\quad) = -rB^2/s^2 < 0. \tag{A.10}$$

Holding the nominal base constant, an increase in the purchasing power of gold causes Reserve banks, as holders of gold, to substitute out of gold into Fed credit—specifically, the government security component of Fed credit, since member bank-driven discount loans would not have changed.

For completeness consider a second exercise: the purchasing power of gold, P_G, increases holding constant the real monetary base, b. How will FC and G change? Using $B = b/P_M$, the derivatives of (A.6) and (A.8) with respect to P_G are

$$\partial(\quad)/\partial(\quad) = -rb^2/(\quad)^2 s^2 < 0, \tag{A.11}$$

$$\partial(\quad)/\partial(\quad) = -b\left[1-(rb/\quad^2)\right]/(P_G)^2 < \quad , \tag{A.12}$$

where the b-subscripts indicate that FC and G are now stated in terms of b. An increase in the purchasing power of gold, holding constant the real base (which implies the nominal base must be falling proportionately with the increase in the purchasing power of gold), causes Reserve banks to reduce both nominal Fed credit (government security holdings) and nominal gold holdings.

Notes

1 Monetary Policy as Scapegoat

1. This is an argument with historical roots going back to Gustav Cassel and Ralph Hawtrey (Batchelder and Glasner 2013) and more recently advanced by Barry Eichengreen (1992) in a somewhat different form.
2. The sidestep "works" if one assumes that the public perceives that Strong's discretionary interventions would be reversed in the long run; in this case, selective intervention would not provoke the public to redeem currency for gold.

2 Founding of the Federal Reserve System

* This chapter is a slightly revised version of my chapter "Founding of the Federal Reserve System" appearing in *The Routledge Handbook of Major Events in Economic History*, edited by Randall Parker and Robert Whaples, 67–76 (London: Routledge, 2013).

1. But for a contrary view, see Selgin and White (1994).

3 Beyond the Founders' Vision: Benjamin Strong as Decisive Leader or Figurehead?

1. The qualifier "largely" is needed here, since the Federal Reserve Board was given supervisory powers over discount loans.
2. This interpretation of Rothbard may not be completely fair. After all, Rothbard does maintain that Strong's open market policies in 1924 and 1927 were a continuation of the inflationary, earnings-motivated operations of Reserve banks in 1922. So, under this interpretation, Reserve banks followed Strong in 1924 and 1927 because his policies coincided with what they would have chosen if left to their own devices.
3. Meltzer also makes this point (2003, 145n11).
4. See Chandler (1958, chapter 7) for a strong defense of the position that Strong and most other worldwide central bankers "acted with the knowledge and approval of their governments" (1958, 249).

4 Modeling Discretion and Self-Regulation

1. Interest rate smoothing is an unintended by-product of individual Reserve bank decision making; whether it was unintended by the founders in designing the Federal Reserve is another issue.

2. For clarity, I substitute L_B for Miron's bank loan variable, L.
3. Chapter 6 formally documents the existence of a scissors effect in the 1920s.
4. Empirical work by Toma (1989, 99) and Wheelock (1991, 21–29) disputes the contention that the government security component of Fed credit sterilized gold. Rather their findings point to offsetting movements in discount loans.

5 THE RIEFLER-BURGESS DOCTRINE

1. For the purposes of studying the scissors effect, I follow Burgess here and in the rest of the book by dividing Fed credit into two categories, "government security holdings" versus "discounts and bills," where the latter is a residual category that measures Fed credit net of government securities. Discounts and bills are alike in that the Fed sets the price and then passively buys and sells what the market bears (Board of Governors 1943, 326). For convenience, I will sometimes refer to the category "discounts and bills" as simply "discounts."
2. As indicated later, explanations of the scissors effect differ according to which component initiates and which component responds.
3. Taken literally, Burgess's account of the scissors effect implies that a member bank's willingness to supply loans does not depend on the market rate of interest, resulting in a vertical loan supply curve. Under these circumstances, shifts in the demand for credit will cause a corresponding change in the rate of interest but not in the equilibrium amount of loans.
4. Riefler (1930, 140–42) also mentions gold flows as an important factor that determines member bank indebtedness. A decrease in the monetary gold stock, for instance, drains reserves from the banking system and banks respond by borrowing from the Fed to replenish reserves. I downplay gold in the text because my ultimate concern is to explain the scissors effect, which tends to be triggered by a seasonal factor. Unlike movements in currency, movements in gold were not seasonal during the 1920s (Toma 1989).
5. Also note in the Miron-plus model, as in the RB Doctrine, changes in the base and in Fed credit may persist over time.

6 COMING TO TERMS WITH THE SCISSORS EFFECT

1. As explained in the previous chapter (note 1), I divide Fed credit into two categories, "government security holdings" and "discounts and bills," where the latter is a residual category that measures Fed credit net of government securities. For convenience, I refer to the category "discounts and bills" as simply "discounts."
2. As noted in chapter 4, Holland and Toma (1991) point out that deposits need not fall during the harvest season if the Fed serves as a credible lender of last resort.
3. As indicated in note 1, the category discounts includes bills bought as well as discount loans. The regression results in table 6.4 are not significantly affected by substituting the narrower measure "discount loans" for "discount loans and bills." Also note that the results reported in table 6.4 are consistent with earlier work by R. C. Turner in analyzing discount policy in the 1930s. He found that there was a close correlation between member bank borrowing and the profit spread between the discount rate and the rate on three market

interest rates: the call rate, the time loan rate, and the commercial paper rate (Turner 1938).

4. Following Miron, I assumed a simple form for a Reserve bank's liquidity costs: $(s^2/2)\{(G/B) - 1\}^2$.
5. The Miron-like cost function can be written more generally as
   $(s^2/x)\{(G/B) - 1\}^y$,
   where x,y > 0. Under these circumstances, the first-order condition is
   $FC = (xrB^y/s^2y)^{1/(y-1)}$.
   If y = 2, then we get Miron's result of an elasticity equal to 2. Economies of scale in gold reserves require only that y > 1.
6. Miron emphasized that the basic results of his model did not depend on the seasonality of the variance of deposit withdrawals from private banks. But if the public has rational expectations they will tend to perceive a relatively high likelihood of financial crisis during the harvest season. Under these circumstances, it seems reasonable to posit that the variance of deposit withdrawals from private banks as well as the variance of gold redemptions from the Fed will be seasonally high during the harvest season.
7. One other factor comes into play before reaching any final assessment of how successfully the self-regulated theory "comes to terms with the scissors effect." The basic self-regulated model, which we have used as the nondiscretionary standard in this chapter, presupposes a constant purchasing power of gold. But if the basic model is twisted to allow, say, an increase in the purchasing power of gold (see chapter 4), then competitive Reserve banks respond by economizing gold and increasing Fed credit. Failure to control for a gold price-induced increase in Fed credit would bias the scissors result, from an equation (6.5)-type regression, toward a less than full scissors. The possibility that this is indeed the case will be formally explored in chapter 8.
8. As suggested in the previous note, there may be an opposing force at work here. If the demand for gold increases, then the price level falls and, to maintain real balances, nominal money falls.

7 Austrian and Monetarist Theories of the Onset of the Great Depression

1. Hamilton's econometric text, *Time Series Analysis* (1994), is justly recognized as one of the leading graduate texts in the field.
2. Interestingly, Hamilton gives an account of the scissors effect that is much in the spirit of the Riefler-Burgess Doctrine. Bank loans do not appear to be profit driven and bank indebtedness at Reserve banks is relatively insensitive to the discount rate.

8 Coming to Terms with Benjamin Strong

1. Again, this is under the proviso that the factors driving Fed credit remain constant.
2. Alternatively, I could substitute predicted Fed credit into scissors equation (8.2) and, post-estimation, generate a series for predicted government securities, with much the same results as the procedure outlined in the text.
3. Here, I do not mean to imply that Batchelder and Glasner viewed the early Federal Reserve System as competitive: they did not. Rather, both theories

maintain that the US price level will change only if conditions in the world-wide market for gold change.

4. The US CPI does suggest a change in the time series characteristics of the US price level in the 1920s. The index rose from the beginning of 1923 to the end of 1925, interrupted by a relatively brief period of falling prices in early 1924. Then, at the turn of the year 1925 to 1926, the CPI switched from generally rising to generally falling. The deflationary period persisted to the end of 1927, followed by a year, 1928, of relatively stable prices. The bottom line is that late-1925 appears to be a transition period when modest inflation, as measured by the CPI, turned to modest deflation.
5. The source for the gold held by national governments is Board of Governors (1943, 544–55, table 160).
6. This is not to deny that an *unconstrained* New York Federal Reserve bank (or an unconstrained OMIC) could affect the price of gold. Indeed, as noted in the text, the gold holdings of the Federal Reserve System comprised roughly 40 percent of world central bank holdings during the 1920s. The self-regulated model contends that individual Reserve banks *were constrained*—by competition.

9 DID RESERVE BANKS *REALLY* COMPETE?

1. The story line here is that the public pays back the loan with (RB1) currency.
2. The security holding results for RB1 and RB2 are only close approximations, based on unchanging gold holdings. Technically, since each bank's monetary liabilities change, liquidity costs change, which, according to the self-regulated model, would have second-order effects on gold holdings.
3. Similarly, if we relax either the third or fourth bullet point from the previous section, then there will be a mixing of RB1 and RB2 currencies in the economy-wide public. In the limit, the probability that an individual member of the public will hold a dollar of RB1 currency is the same as the probability that she will hold a dollar of RB2 currency. Again, we get the contrast with the autarkic system: the scissors effect in a competitive system cannot be treated as a purely intradistrict phenomenon.
4. FRASER, Federal Reserve Bank of St. Louis, http://fraser.stlouisfed.org/docs/historical/openmarket/OMIC/omic1923/1923.pdf.
5. Thanks to Mattie Toma for her expert help in constructing the figures for this chapter.
6. The aggregate measures, (S_{RBt}) and (L_{RBt}), in (9.1a) differ somewhat from the aggregate measures used in chapter 6. The chapter 6 aggregates were compiled on an end-of-the month basis, whereas here the individual Reserve bank data, (S_{RBjt}) and (L_{RBjt}), upon which the aggregates in this chapter are derived, are available only on a last-Wednesday-of-the-month basis. Also, the (S_{RBt}) measure used in chapter 6 includes an "all other" category that is not a component of the individual Reserve bank government security measure. The correlation coefficient between the two (chapter 6 and chapter 9) (S_{RBt}) measures is 0.995 and between the two (L_{RBt}) measures is 0.983.
7. For comparison, columns (3)–(6) in table 9.3 give the aggregate and individual results for the subperiods 1922–23 and 1924–28. As with the 1922–28 results, the individual scissors is substantially weaker than the aggregate scissors for both subperiods.

8. In her study of the early Fed, D'Arista (1994) also provides numerous examples of Reserve bank open market operation rivalry. Unlike Meltzer, she shares the perspective of this chapter, treating these independent operations not as a mere sideshow, but as deeply emblematic of a competitive Reserve banking system.
9. Operation of the National and Federal Reserve Banking Systems. Hearings before a Subcommittee of the Committee on Banking and Currency, United States Senate, Appendix part 6 (January 31, 1931, 824–40).
10. This data is not directly comparable to the government security data used earlier in this chapter.
11. Formal statistical analysis confirms what inspection of figures 9.27 and 9.28 suggests. Both factor analysis and Cronbach's alpha conclude that share movements among Reserve banks in the member group are more highly correlated than share movements among Reserve banks in the nonmember group, although the New York Federal Reserve bank stands out as the Reserve bank that is least correlated with others in the member group. The nonmember group is apparently not one group. Five of the Reserve banks—Atlanta, St. Louis, Kansas City, Dallas, and San Francisco—are somewhat associated, while Richmond and Minneapolis are weakly correlated with any of the other Reserve banks in the nonmember group. Thanks go to J. S. Butler for the statistical analysis.
12. It would be misleading to make too much of Atlanta's outlier status. Formal empirical analysis of system account shares indicates that Atlanta is at least somewhat aligned with four of the other six nonmembers of the OMIC; those five Reserve banks—Atlanta, St. Louis, Kansas City, Dallas, and San Francisco—form a loose grouping that is distinct from the OMIC grouping. See note 11.

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