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Working Paper No. 121
February 1988.

University of
Rochester

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Rochester Center for Economic Research
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May 1987

Revised: September 1987

February 1988

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This paper presents the results of research conducted as part of the American Enterprise Institute's project on financial services regulation. It will appear in a forthcoming volume providing a comprehensive review of financial regulatory policy entitled, Restructuring Banking and Financial Services in America.

INTRODUCTION

Financial deregulation is widely understood to have important economic benefits for microeconomic reasons. Since Adam Smith, economists have provided arguments and evidence that unfettered private markets yield outcomes that are superior to public sector alternatives. But financial regulations--specific rules and overall structures--are sometimes justified on macroeconomic grounds. Dividing the actions of the Federal Reserve into monetary and banking policy, this paper finds that financial regulation cannot readily be rationalized on the basis of macroeconomic benefits, especially those from monetary policy.

There is a consensus among professional economists, including academic analysts and Fed experts, that monetary policy can be executed without supporting financial regulations. This consensus reflects an understanding of the central role of open market operations. There is, of course, substantial disagreement among economists concerning the nature and magnitude of monetary policy's influence on the price level and real activity, but this should not mask agreement on the central role of open market operations in the management of high-powered money. Nor should it obscure the general agreement that there is an important, unique role for the public sector in the management of money.

Banking policy involves regular lending and emergency financial assistance to banks and other institutions. Many aspects of Fed lending resemble private sector behavior in borrowing-lending relationships. In particular, there is a useful analogy between private lines of credit and Fed discount window lending. Fed regulation and supervision support banking policy in much the same way as loan covenants and monitoring support private

lending. With regard to its central banking function, then, the value of Fed regulation and supervision depends on the need for banking policy. In the credit market, however, the Federal Reserve is only one of many competing entities--though a large and well-financed one--and demonstration of a desirable pattern of Fed intervention must involve evidence of a relative advantage for the public sector or a market failure deriving from inappropriate private incentives. Moreover, banking policy may influence outcomes in banking and financial markets by subsidizing certain economic activities, prompting the erosion of private arrangements for liquidity and encouraging risktaking. On these grounds, we conclude that it is difficult to make a case for central bank lending policy and supporting public financial regulation.

The organization of the paper is as follows. In section 1, we provide definitions of monetary and banking policy. In section 2, we consider financial deregulation and monetary policy, beginning by considering monetary policy in a fully deregulated environment and illustrating how a prominent feature of Fed monetary policy, interest rate smoothing, is undertaken in such an environment. We conclude by pointing out the irrelevance for monetary policy of a well-known financial regulation, reserve requirements, under the Fed's preferred interest rate monetary policy instrument.

We discuss deregulation and banking policy in Section 3. Again, we begin by considering a fully deregulated environment, outlining the character of private borrowing and lending transactions. Then, we discuss the provision of line of credit services through the Fed discount window. We conclude by developing the distinction between illiquidity and insolvency as a means of judging the appropriateness of public line of credit services.

In Section 4, we discuss how monetary and banking policy could react to system-wide disturbances, including banking crises. We conclude that monetary policy can effectively and desirably limit crises arising from a widespread demand to convert deposits into currency. Illustrating our point, we interpret Walter Bagehot's "lender of last resort" rule as an irregular interest rate smoothing policy. In contrast, banking policy can do little to influence such events. But we explore other potential roles for banking policy in response to system-wide disturbances.

In our concluding section, we raise a set of issues dealing with the institutional structure of the Federal Reserve. In particular, given that the Fed currently plays the twin roles of monetary authority--charged with execution of monetary policy--and central bank--charged with execution of banking policy--we note that there is potentially an important conflict between these roles. We discuss the potential benefits of restructuring the Fed so as to separate its monetary and banking responsibilities.

1. MONETARY AND BANKING POLICY

Our investigation requires that we distinguish between central bank monetary policy and banking policy actions. By monetary policy, we mean changes in the total volume of high-powered money (currency plus non-interest bearing bank reserves). Other central bank actions involve (i) changes in the composition of the asset side of the central bank's balance sheet, holding the total fixed, or (ii) regulatory and supervisory actions of the central bank.¹ In general, the other actions might be described as commercial policies. In the United States, however, central bank commercial policies concentrate largely on the banking sector, so we term them banking policy.²

When the Federal Reserve was established, the major goals of central banking in the United States were (i) the provision of sufficient liquidity for the needs of enterprise, so as to avoid banking crises and business fluctuations, (ii) the maintenance of liquid markets for bank assets, and (iii) the public supervision of banking. These goals are reflected in the preamble to the Federal Reserve Act, which states that the purposes of the Federal Reserve were "to furnish an elastic currency, to afford a means of rediscounting commercial paper, and to establish a more effective supervision of banking in the U.S." Broadly, we take the Federal Reserve Act as mandating that the central bank manage society's provision of liquidity, through its own actions and by influencing the choices of private agents.

These primitive objectives involve a mix of monetary policy and banking policy. The provision of an elastic currency is a monetary policy of sorts, since it involves the idea that the stock of currency should be varied in response to economic conditions. The other objectives fall into the category of banking policy. For example, by allowing its inventory of government securities to vary, a central bank can accommodate variations in discounting without any change in the stock of high-powered money.

The primitive objectives are of particular interest precisely because they are independent of the choice of the monetary standard. In particular, the primitive objectives were important under the gold standard, which was in force when the Federal Reserve was established. Other objectives for central banking such as management of the revenue from money creation, and stabilization policy aimed at the price level, are highly constrained under the gold standard. An additional rationale for central banking emerged with the Employment Act of 1946, which indirectly required the Federal Reserve to actively employ monetary policy to stabilize business conditions.

2. DEREGULATION AND MONETARY POLICY

Monetary policy involves the manipulation of high-powered money by the central bank to manage nominal variables like the price level, the inflation rate, and the nominal interest rate and possibly to temporarily influence outcomes for employment and output. Our approach is to begin in Section 2.1 by explaining why financial and banking regulations are inessential for its execution and effectiveness. Where such regulations exist, however, their effects must be taken into account in policy implementation.

In Section 2.2 we discuss interest rate smoothing, a major component of Federal Reserve monetary policy. We focus on interest rate smoothing for a number of reasons. First, we point out in Section 2.2.1 that it is descriptive of Fed monetary policy. Second, we see it as the means by which the Fed met its legislative mandate to provide a form of liquidity to the U.S. economy by means of an elastic currency. The definition and mechanics of interest rate smoothing are described in Section 2.2.2. We emphasize that interest rate smoothing is achieved by monetary policy and does not need financial regulations. Notably we also point out that Federal Reserve interest rate smoothing has made reserve requirements inessential for monetary policy, suggesting reserve requirements as a candidate for further deregulation.

The effect of financial deregulation on stabilization policy is discussed in Section 2.3. Once in place, it is argued that deregulation affects only minor details of the implementation of stabilization policy such as the timing and magnitude of open market operations.

2.1 Why Regulations Aren't Necessary

There is a mainstream professional consensus that monetary policy can be accomplished without supporting financial regulations, although there is not a professional consensus on the efficacy of monetary policy or on desirable patterns of behavior for the monetary authority. For practical purposes most economists think of a fully deregulated environment as being one in which the central bank has a monopoly on the issue of high-powered money, but in which private markets are otherwise unregulated.

This view is based on the notion that currency and bank deposits are not perfect substitutes for transactions in which they are employed. For example, costs of certain sorts lead individuals to treat deposits and currency as distinct assets. Notably, when payments are executed through bank deposits, there are costs incurred to determine that the sending depositor has wealth sufficient to cover the transaction. Also, there are costs incurred when securities are sold and purchased to complete the desired wealth transfer. Bankers specialize in providing these transactions services. In a deregulated, competitive system they have incentives to provide payment services at cost, and to pay interest on deposits that reflects the net return on assets.

By contrast, when payments are executed with currency, there is a relative saving on information and computation costs because the wealth value of currency is more easily verified than that of a check written against a bank deposit. The presumption is that there is a substantial set of payments for which the verification cost saving from using currency more than offsets the interest foregone by using deposits. The privacy provided by currency is an advantage for some transactions, since currency doesn't leave a paper trail.

The implication that deposits are imperfect substitutes for currency is important for two reasons. It means that the public has a determinate real stock demand for currency (C/P), where C is the aggregate nominal stock of currency supplied by the central bank and P is the currency price of goods (the price level).³ It follows that controlling the nominal stock of currency (C) and its growth rate is sufficient to control the price level (P), the inflation rate, and the level of the nominal interest rate (expected inflation plus the ex ante real rate).⁴ This, in turn, implies that the banking system can be completely deregulated without interfering with the ability of monetary policy to control nominal magnitudes. Open market operations are sufficient to accomplish monetary objectives.⁵

To emphasize why banking regulations are inessential for monetary policy, consider the following two policy actions. How does a central bank prevent a temporary increase in the real demand for currency from decreasing the price level? It simply acquires securities temporarily in the open market, providing sufficient nominal currency to satisfy the higher real demand without a price level fall. Alternatively, suppose a central bank wants to restore a lower price level after an inflationary period. It may do so by selling securities in the open market to reduce the stock of currency. The unchanged real demand for currency could only be satisfied at a lower price level; hence, the price level would fall.

The view that financial and banking regulations--or even the details of the structure of the banking system--are inessential to understanding the effectiveness of monetary policy is very widely held. This view is shared by major undergraduate and graduate macroeconomics texts.⁶ However, banking regulations in fact influence the magnitude, timing, and targets of open

market operations necessary for a specific objective, such as changing the price level to some specified target. Banking regulations could influence policy implementation since they affect both the supply and the demand for currency. For instance, reserve requirements on bank deposits could absorb high-powered money made available through open market operations, thereby influencing the effective quantity of currency supplied. Alternatively, by affecting the incentive to substitute between currency and bank deposits, a prohibition of interest on demand deposits would influence the magnitude of open market operations necessary to minimize price level effects of changes in market interest rates. In short, although banking regulations are inessential for the execution of monetary policy, where they exist a central bank must take them into account in policy implementation.

2.2 Interest Rate Smoothing

In the previous section we emphasized that open market operations are sufficient for a central bank to manage the price level, inflation, and nominal interest rates. Throughout its history the Federal Reserve has employed monetary policy to smooth nominal interest rates against routine seasonal and cyclical variations in the demand for money and credit. We begin by describing briefly the effect the Fed had on nominal rates. Next, we discuss the mechanism by which the Fed has managed nominal interest rates, pointing out among other things that interest rate smoothing may be interpreted as the means by which the Fed satisfied its mandate to routinely provide liquidity to the economy. We also note that although there are Fed policy procedures for which reserve requirements could play a monetary policy role, they have no such role with the Fed's interest rate procedures. We thereby suggest reserve requirements as a candidate for additional deregulation.

2.2.1 Evidence

Our purpose in this section is to describe briefly the extent to which the Federal Reserve succeeded in changing the character of nominal interest rate movements. Consider one measure of the short-term interest rate, the monthly average call money rate on short-term broker loans in New York.⁷ Prior to the advent of the Federal Reserve in 1914, the most notable characteristic of this short-term interest rate series is that it is punctuated from time to time by sharp, sudden and temporary increases. For example, in October of 1867, after remaining between 4.3 and 7.2 for the prior three years, the call money rate rises suddenly from 5.6 to 10.8 percent. Although this change seems large by post-war U.S. standards, similar episodes of at least this magnitude occurred 26 times during the period between the end of the Civil War and the founding of the Federal Reserve. Moreover, sudden changes of over ten percentage points occurred with surprising frequency, on 8 occasions during the same 49 year period. In September 1873, the call money rate jumped from 4.6 percent in August to 61.2 percent, falling back in October to 14.9 percent and to 5.5 percent by January 1874. Accompanying these sudden upward jumps in call money rates were similar, though much less severe, movements in sixty-to-ninety day commercial paper rates. These episodes were distinctly temporary, ranging from one to four months, with many lasting for no more than one month. Needless to say, such extreme temporary spikes are absent from interest rate behavior since the founding of the Fed.

Another distinctive feature of the period before the Federal Reserve was the large seasonal movement in short-term interest rates. For example, the average seasonal variation for the call money rate from 1890 to 1908 ranged from a peak of +4.6 percent in January to a trough of -1.39 percent in

June.⁸ Generally speaking rates were at their annual mean in the spring, below it in summer, gradually rising to their highs in the fall and winter. By the 1920s the prominent seasonal movements of interest rates had virtually disappeared.

2.2.2 Definition and Mechanics

As discussed above, broadly speaking the Federal Reserve may be said to have smoothed interest rates in two senses. First, it insulated nominal interest rates from regular seasonal movements in money and credit markets. Second, it removed temporary nominal interest rate spikes that were prompted by recurrent irregular tightness in money and credit markets. For purposes of this discussion, we may define interest rate smoothing as a deliberate effort by the Fed to reduce or eliminate temporary nominal interest rate fluctuations.⁹ We shall find the distinction between regular and irregular interest rate smoothing useful when we characterize Bagehot's lender of last resort rule in Section 4.2.

There has been considerable controversy about whether central bank interest rate smoothing is feasible when the public understands policy, i.e., when the public has rational expectations. We can see that it is possible by drawing on the simplest possible model.¹⁰ The model has three basic equations: (1) a money demand function, (2) a money supply function, and (3) an expression equating the expected real return on nominal securities, i.e., the nominal interest rate minus expected inflation, to the credit-market-clearing expected real rate.

The model embodies two principles that are key to understanding nominal interest rate smoothing. First, the price level is determined by a money supply rule, so there is a nominal anchor in the system. Second, the

nominal rate is affected by expected inflation, allowing a central bank to translate price level and inflation policy into interest rate policy.

Nominal interest rate smoothing works as follows. The money supply rule pins down the expected future nominal stock of money. Together with expected future real demand for money, this implies an anchor for the expected future price level. In practice, central banks have employed interest rate policy instruments to smooth interest rates.¹¹ This amounts to running an adjustable nominal interest rate peg, so we illustrate how a central bank smooths the nominal interest rate by pegging it. To see what happens, we consider below the response to two disturbances. In each case we first ask what happens when the stock of high-powered money remains constant, and then we see how high-powered money must change to be consistent with a nominal rate peg.

A temporary rise in real money demand. With high-powered money constant, the current price level would fall, raising both expected inflation and the nominal interest rate. By assumption, the required expected real yield on nominal securities is unchanged. Therefore, under a nominal rate peg expected inflation would remain unchanged, which means the current price level would remain equal to the expected future price level. The Fed would merely provide enough high-powered money, through open market purchases, to satisfy the initial rise in money demand.

A temporary rise in the credit-market-clearing real rate. With high-powered money constant, the nominal rate would rise, real money demand would fall, and the current price level would rise. Under a nominal rate peg the required increase in the expected real rate on nominal securities would be achieved by a matching expected deflation due to a temporarily high price

level. The Fed would merely provide enough nominal high-powered money to satisfy the unchanged demand for real money balances at the higher price level.¹²

A number of important points emerge from this theoretical discussion. First, nominal interest rate smoothing is monetary policy. This is so because the Fed's power to create or destroy high-powered money through open market operations is necessary and sufficient for it to smooth nominal interest rates. In particular, no financial or banking regulations are necessary. Second, interest rate smoothing is clearly feasible when the public understands policy, i.e., has rational expectations. Third, the mechanics of interest rate smoothing would be the same regardless of whether the disturbances are seasonal or irregular in nature. We will use this fact later in Section 4.2 to characterize Bagehot's "lender of last resort rule" as an irregular nominal interest rate smoothing policy. Fourth, since the nominal interest rate is the private opportunity cost of holding high-powered money (as currency for hand-to-hand transactions or as a bank reserve), the change in the seasonal and irregular pattern of nominal interest rates produces a corresponding change in the pattern of real money balances held by individuals and banks. Thus, we interpret interest rate smoothing as the means by which the Federal Reserve satisfied its statutory mandate to provide liquidity for the U.S. economy by means of an elastic currency.

Fifth, Federal Reserve interest rate smoothing has in practice made bank reserve requirements inessential for executing monetary policy. The conventional view is, of course, that reserve requirements help the Federal Reserve to better control the stock of money. This is the view implicit in the 1980 Monetary Control Act, which extended reserve requirements to all

depository institutions, whether Federal Reserve members or not. Essentially, the view is that reserve requirements function by stabilizing the money multiplier, thereby enabling the Federal Reserve to better control bank deposit money with a total reserve policy instrument.

It follows that if the Fed were to choose to operate with a total reserve policy instrument, reserve requirements could help determine how a change in high-powered money would influence the price level and the nominal interest rate. However, the Fed has chosen to operate with an interest rate policy instrument, i.e., running an adjustable rate peg. As should be clear from the examples discussed above, under even a temporary peg the current price level is determined by the chosen level of the nominal interest rate, the credit-market-clearing real rate, and the expected future price level. The Fed simply uses open market operations to satisfy current money demand at the current price level. Reserve requirements merely help determine the volume of open market operations that the Fed must do to provide the accommodation. Reserve requirements do not help determine the money stock or the price level.¹³

2.3 Financial Deregulation and Stabilization Policy

Since the Employment Act of 1946, the Federal Reserve has had a mandate to employ monetary policy to stabilize real economic activity. Thus, a major question about ongoing and prospective financial deregulation concerns its influence on stabilization policy.

While macroeconomic textbooks show broad agreement on issues concerning the nature of the demand for money, there is not a similar agreement on a number of central issues concerning monetary policy. Instead, there is a wide range of perspectives on the feasibility and desirability of monetary policy.

Traditional monetarist arguments--originating with Milton Friedman and Karl Brunner, as developed in texts by Michael Darby and William Poole--hold that monetary policy exerts a powerful influence over the course of the business cycle, but argue that in practice it has worked to exacerbate swings in economic activity.¹⁴ From this perspective, monetary policy leads to enhanced cyclical volatility because (i) its effects are subject to long and variable lags, which makes the timing of monetary policy actions difficult; (ii) it is difficult for policy-makers to promptly assess the state of economic activity, due to problems of inference about the dominant forces that drive the economy in a given period; and (iii) the policymaker's focus on smoothing nominal interest rates against cyclical changes in real rates generally leads monetary aggregates to be procyclical.

Rational expectations monetarist arguments--developed by Robert Lucas, Thomas Sargent and Robert Barro, as summarized in Barro's (1986) text--stress the distinction between unpredictable policy actions (shocks), which are taken to exert a powerful influence on real economic activity, and predictable policy responses, which are taken to exert no real effects.¹⁵ This group argues that systematic monetary policy cannot influence real activity, such as employment, real gross national product, and real interest rates, because private agents rationally anticipate the systematic component of monetary policy and take actions which neutralize its potential effects, leaving it to influence nominal variables only.

Real business cycle analysts--using a perspective initiated by Edward Prescott, John Long, and Charles Plosser, as summarized in Barro's text--deny any major influence of money, anticipated or unanticipated, on real economic activity.¹⁶ From the perspective of real business cycle analysis, variations

in real activity (arising from changes in technology, sectoral reallocations, energy shocks, taxes and government spending) drive the monetary sector, reversing the traditional macroeconomic perspective.

Modern Keynesian analysts--led by Stanley Fischer, Edmund Phelps, and John Taylor, as summarized in a number of recent texts, including one by Rudiger Dornbusch and Fischer as well as another by Robert Hall and Taylor--see a powerful role for monetary policy, even with rational private anticipations, because the Federal Reserve can act after private agents have entered into wage and price agreements. From this perspective, monetary policy is a powerful stabilization tool, which can offset potentially inefficient economic fluctuations arising from variations in the demand for money, autonomous changes in private spending, and supply shocks.

However, the disagreement about the feasibility and desirability of stabilization policy should not obscure a consensus that is apparent in all the current texts concerning the operation of monetary policy. Whether monetary policy influences real activity or only nominal variables, the prominent textbooks view it as involving manipulations of the stock of high-powered money. The major ongoing professional debates concerning monetary policy accept as common ground the perspective that open market operations are a necessary and sufficient policy instrument. Financial market regulations are not necessary for the conduct of the Federal Reserve's attempts at stabilization policy irrespective of how it winds up influencing the cyclical component of economic activity.

Not only is this the point of view in the textbooks, it is also a central component of the modern Federal Reserve policy perspective. In its early years the Fed relied extensively on the discount window as a means of

managing the high-powered money stock, but the Fed rapidly came to view the method by which it managed high-powered money as a tactical consideration of little fundamental importance. For example, in the early 1920s the Fed largely substituted open market security purchases for discount window loans as the primary means of adjusting high-powered money.

The magnitude of open market operations necessary to accomplish a specified variation in the price level or nominal national income will, however, clearly be influenced by the prevailing regulatory environment. A number of financial regulations influence the interest sensitivity of the demand for money, including reserve requirements and deposit interest ceilings as discussed above.¹⁷ In particular, consider a change in the high-powered money stock which is temporary, i.e., a change in the current level but not in the long run target path of high-powered money. Plausibly, this sort of policy action is appropriate when there is a temporary shock, to which policy seeks to respond, but when there is no long-run change in policy objectives. In the absence of a high-powered money response, most models imply that there will be a temporary change in the nominal interest rate, which will alter the quantity of money demanded by individuals. The magnitude of this change in money demand will depend on the interest sensitivity discussed above. A specified policy effect requires a variation in high-powered money that depends on the interest sensitivity and, hence, on prevailing financial regulations.

3. DEREGULATION AND BANKING POLICY

Banking policy, as we defined it above, has three dimensions. It involves changing the composition of central bank assets holding their total

(high-powered money) fixed. It involves financial regulation. And it involves bank supervision. When executing banking policy, a central bank basically functions like a private financial intermediary, in the sense that its actions neither create nor destroy high-powered money. Banking policy merely involves making loans to individual banks with funds acquired by selling off other assets, usually government securities. The primary dimension of banking policy is central bank provision of line of credit services to private banks. Regulatory and supervisory dimensions of banking policy may be understood in this regard. Private credit extension is accompanied by restrictions on the borrower to limit his ability to take risks and to protect the value of loan collateral. Private credit lines are accompanied by ongoing monitoring of borrowers by lenders. Efficient central bank line of credit provision likewise requires regulation and supervision of potential credit recipients.

The focus of this paper is deregulation. In Section 2 we found out that banking and financial regulations were inessential for the execution of monetary policy. Here we ask whether banking policy needs supporting regulation and supervision. The analogy between private and central bank credit extension drawn above, however, suggests that our inquiry about banking policy will be somewhat different. If a central bank provides line of credit services, the analogy suggests that it must follow up with supervision and regulation to safeguard its funds and make sure its commitment is not abused. Ultimately we must ask, therefore, whether central bank line of credit services to banks are really necessary and desirable in the first place.

Our analysis follows the strategy employed to discuss monetary policy in Section 2, by initially considering a deregulated environment. We begin in

Section 3.1 by motivating and describing restrictions voluntarily agreed to by borrowers in private credit markets. We motivate the demand for line of credit services in Section 3.2, emphasizing that by their very nature credit lines must be accompanied by ongoing monitoring and supervisory actions by their providers, the banks. We take up central bank lending in Section 3.3. Having discussed problems that arise with respect to lending in general, we discuss particular issues that arise for public lenders such as the Federal Reserve. To keep things concrete, we discuss this material in terms of Federal Reserve discount window lending practices. We emphasize how regulatory and supervisory actions taken by the Fed to safeguard its funds, and insure that its discount window facilities are not abused, parallel those taken in private credit markets.

The Federal Reserve discount window functions most importantly as a source of emergency credit assistance. It is a temporary source of funds, available on short notice, for financially troubled individual banks. No one argues that the discount window should be used to prevent insolvent banks from failing, only that the window be used to aid solvent banks. The distinction between illiquidity and insolvency is therefore crucial to the management of the discount window. First of all, the feasibility of such selective lending depends on the Federal Reserve having an operational and timely means of distinguishing insolvent from illiquid banks. Moreover, understanding the economic distinction between illiquidity and insolvency is necessary to decide whether discount window lending is desirable policy at all. We address these fundamental issues in Section 3.4.

As was the case in our initial treatment of monetary policy in Section 2, when we analyzed monetary responses to routine seasonal and

cyclical macroeconomic disturbances, we confine our initial treatment of banking policy here in Section 3 to routine circumstances, i.e., emergency credit assistance to individual troubled banks. We take up the feasibility and desirability of monetary and banking policy responses to system-wide banking and financial market crises in Section 4.

3.1 Private Lending and Private Regulation

Lenders face many potential problems that arise from the fact that borrowers can take actions to influence the likelihood that loans will not be repaid. Thus, borrowers and lenders agree on sets of rules and restrictions to accompany loans. For example, consider a car loan. The lender provides the borrower an initial amount of funds with which to purchase a car. The borrower agrees upon a regular pattern of loan repayments. But the car loan involves more than these financial flows. Typically, the car is collateral against the borrower's ability to pay back the loan. For this reason, as part of the contract, the borrower gives up the right to sell the car during the duration of the loan.¹⁸ Additional agreements may restrict other aspects of the borrower's behavior. For example, insurance against damage to the car may be required or the borrower may be prohibited from renting the car to others. These additional restrictions further protect the lender against damage to the loan collateral.

It is important to note that restrictions on the borrower's range of actions are ultimately in the borrower's interest, since they lower the cost of the loan. For example, suppose that one wanted to borrow funds for a vacation, and one owned a car without any encumbering car loan. Then it would generally be cheaper to borrow with the car as security for a loan, voluntarily accepting a set of restrictions on use or transfer of the car, rather than paying the higher rates on unsecured personal loans.

Issues concerning incentives for borrowers become far more important and sophisticated when corporate lending is considered. For this reason, corporate loans typically involve complex covenants (restrictive agreements) that limit the borrower's range of actions.¹⁹ Covenants which limit risk-taking are particularly important. For example, consider the naive policy of lending to a corporation that is engaged in a specific riskless line of business, using an appropriate rate of return for riskless loans, without any restrictions on how the funds are to be spent. Ultimately, the loan is a claim to the minimum of the stream of loan payments or the liquidation value of the corporation's assets if it fails. From the standpoint of its equity holders, the firm's taking on a risky project would thus be a good idea: if it is a success they will get the rewards; if it is a failure the losses will be the lender's, i.e., the bondholder's. Thus, with managers of the corporation responsive to equity holders, the firm has incentive to use the borrowed funds to take on risky projects. This difficulty could be circumvented with a covenant restricting types of projects that the company could initiate.

3.2 Private Lines of Credit

Efficient loan design involves the costly accumulation of detailed information about borrowers, both for the purpose of sorting borrowers into risk classes and for the purpose of designing covenants. Like many other economic activities, information production is highly costly when undertaken quickly without development of systems and experience. For this reason, lending is typically undertaken in the context of long-term relationships, in which information production can be undertaken in a less expensive manner.²⁰

One sort of long-term lending arrangement is commonly known as a line of credit. The demand for line of credit services arises because firms often

need funds suddenly, as a result of events that are difficult to predict. For example, a firm may discover a potentially lucrative investment opportunity which must be seized quickly to yield a high rate of return. The firm may not have a sufficient inventory of readily tradable assets such as U.S. Treasury bills from which to raise the necessary funds. Furthermore, the delay involved in making a public security offering may make that avenue of obtaining funds ineffective. In contrast, a line of credit arrangement is designed to make funds available on very short notice, possibly as a bridge loan until other arrangements can be made.

Alternatively, a firm might develop a sudden need for funds after suffering a bad shock. There might be a decline in sales requiring a sudden need for funds to finance inventory accumulation; or the unexpected failure of a project might cause a sudden cutoff of revenue. Credit lines, of course, are specifically designed to make funds immediately available in such circumstances too.

However, the extension of credit in response to bad outcomes is more troublesome for lenders. Bad outcomes might accompany information that a firm should be dissolved altogether, in which case the credit should not be extended. But credit lines are valuable precisely because they make funds immediately available. So lenders must protect themselves against such contingencies. For this reason, continual monitoring of potential borrowers is a particularly important feature of the provision of line of credit services.²¹

Lines of credit involve the payment of a facility fee either on the full amount of the line, or on the unused portion.²² The fee is paid during normal periods to cover the ongoing cost of monitoring incurred by the bank.

Often the fee is paid by holding a compensating balance, a bank deposit that pays a below market rate of interest. Because the compensating balance allows a bank to observe the borrower's financial transactions, it helps reduce monitoring costs. In return for the fee, the line of credit recipient acquires an option to borrow funds, up to the amount of the line, at a predetermined interest rate spread above a market reference rate. The size of the fee and the rate spread are lowest for top borrowers, ranging higher for worse credit risks. For reasons discussed above, credit lines are also accompanied by restrictions and covenants, as well as specification of allowable collateral, if any is required, should a loan actually be taken down. Of course, since attached conditions affect the riskiness of the credit line from the lender's point of view, they will influence the fee and spread as well. More restrictions accepted by the borrower will, generally speaking, enable him to pay less. Finally, borrowers will differ according to intrinsic ease of monitoring. Monitoring a mom and pop grocery store is relatively cheap compared to monitoring a firm with many employees, offices, and product lines. Higher monitoring costs would also be reflected in a higher fee and/or spread.²³

Before moving on, we should point out how individual banks position themselves to fund their credit lines. Most importantly, they maintain good credit ratings themselves so they can attract funds in the certificate of deposit market in a timely fashion and at relatively low cost.²⁴ To a lesser extent they hold inventories of readily marketable securities such as U.S. Treasury bills, which they can sell to acquire funds on short notice.²⁵ If the need for funds is expected to be particularly short-lived, borrowing Federal funds may be the most economical way to go.²⁶

3.3 Discount Window Lending²⁷

Discount window lending is central bank provision of line of credit services. As such there are important similarities between discount window operations and private lines of credit. There is, however, a potentially important difference because a central bank's liabilities are high-powered money. We develop these points below by describing discount window procedures actually followed by the Federal Reserve. In particular, we explain that while the discount window is unnecessary for monetary policy, it plays an essential role in the execution of banking policy. We also indicate why, by analogy to private credit lines, Federal Reserve regulation and supervision of eligible borrowers must be tied to discounting. We save our inquiry into the desirability of banking policy, executed through discount window lending, until Section 3.4.

Discount window lending is the extension of credit, usually secured by collateral, from a central bank to a private institution. In the U.S., it is lending by Federal Reserve Banks through their discount windows to individual banks or other depository institutions in their respective districts. Reserve banks can finance discount window credit with high-powered money or with funds obtained from securities sold in the open market. We define discount window lending that is deliberately allowed to create high-powered money as unsterilized. Under our definition, unsterilized discount window operations are, in part, monetary policy. We say that discount window lending is sterilized when it is accompanied by an open market sale of equal value. Sterilized discount window operations are thus pure banking policy, with no monetary policy implications, since they leave high-powered money unchanged. In this case there is only a substitution of

bank paper, i.e., the loan collateral, for government paper on the books of the central bank, with no change in total central bank liabilities, i.e., high-powered money.

As we made clear in Section 2, open market operations are sufficient for the execution of monetary policy. It follows that unsterilized discount window lending is redundant as a monetary policy tool.²⁸ In contrast, sterilized discount window lending plays a distinctive policy role apart from monetary policy. It allows a central bank to lend selectively to individual banks without affecting aggregate monetary conditions. In other words, it enables a central bank to offer line of credit services to individual banks in much the same way as private banks provide credit lines to their customers.

The 1984 report of the Bush commission on financial regulation put the rationale for Federal Reserve provision of discount window services as follows:

Operation of the FRB's discount window is a vital element in the public "safety net" supporting stability of the banking system. Particularly in the event of difficulties affecting a large financial institution, the FRB must remain available to provide potentially extremely large amounts of liquidity on extremely short notice, and it is the only government agency that is in a position to provide this type of support to the financial system. (Blueprint for Reform: The Report of the Task Group on Regulation of Financial Services, p. 49.)

Earlier a 1971 Federal Reserve report reappraising the discount window stated:

Under present conditions, sophisticated open market operations enable the System to head off general liquidity crises, but such operations are less appropriate when the System is confronted with serious financial strains among individual firms or specialized groups of institutions. At times such pressures may be inherent in the nature of monetary restraint, (which often has) excessively harsh impacts on particular sectors of the economy. At other times underlying economic conditions may change in unforeseen ways, to the detriment of a particular financial substructure.

And, of course, the possibility of local calamities or management failure affecting individual institutions or small groups of institutions is ever-present. It is in connection with these limited crises that the discount window can play an effective role...(Reappraisal of the Federal Reserve Discount Mechanism, volume 1, p. 19.)

The Federal Reserve discount window is understood and valued as a line of credit facility. Open market operations are seen as capable of handling aggregate monetary conditions. Implicitly, it is sterilized discount window lending that is valued for its ability to direct potentially large quantities of funds, on very short notice, to individually troubled firms. Based on our discussion of private lending above, we would expect the Fed in its role as public provider of line of credit services to impose restrictions on potential borrowers and engage in monitoring as well. It does. In the public sector, however, these activities are known as regulation and supervision.

As is the case for private lenders, the Fed too is concerned about pricing its loans according to risk.²⁹ First of all, the basic borrowing privilege, i.e., the size of the temporary loan that is permitted, depends on the capital stock and surplus or, for Fed member banks, on a bank's required purchases of Federal Reserve stock. Then, according to Regulation A, the Fed classifies discount window loans into short-term adjustment credit, seasonal credit, and emergency credit assistance. Adjustment credit is, from time-to-time, temporarily employed by banks basically in good financial condition.³⁰ Seasonal credit is employed on a seasonal basis primarily by banks in agricultural areas. Its use is also rather routine. In contrast, emergency credit is the designation given to funds borrowed by troubled banks on what might be a rather protracted basis.³¹ The discount rates on adjustment and seasonal credit are lower than for emergency credit because the riskiness of a loan is generally lower on the former than the latter.

The riskiness of a discount window loan also depends critically on the collateral. The Fed has considerable latitude as to what it will accept and the haircut it will take.³² The better the security, the lower the lending rate. However, fully collateralizing a loan with prime paper such as U.S. Treasury bills would make the value of the Fed's line of credit minimal. A bank could simply borrow privately on such collateral with no trouble. The Fed could still make its credit line attractive, however, by charging below market rates or taking less than a market haircut. At any rate, whatever the Fed might do in practice, the point of the current discussion is to analyze how a central bank providing meaningful line of credit services, based on imperfect collateral, would operate.

In addition to setting the terms upon which a loan can be taken down, our discussion of private lines of credit emphasized the need for ongoing monitoring of potential borrowers by the lender. This is no less necessary for public provision of line of credit services by the Fed. A 1983 Federal Reserve position paper on financial regulation stated:

Central banking responsibilities for financial stability are supported by discount window facilities -- historically a key function of a central bank -- through which the banking system, and in a crisis, the economy more generally, can be supported. But effective use of that critically important tool of crisis management is itself dependent on intimate familiarity with the operations of banks, and to a degree other financial institutions, of the kind that can only be derived from continuing the operational supervisory responsibilities... ("Federal Reserve Position on Restructuring of Financial Regulation Responsibilities," in U.S. Congress. House. Committee on Government Operations, House of Representatives, 99th Congress, 1985, p. 235.)

By "effective use" in the above quote we interpret the Fed as requiring that it be able to, on short notice, reasonably discern the financial position of a bank requesting funds. Especially with respect to

emergency credit assistance, such information is necessary to price loans appropriately, and even more important, to be sure that the borrower is still viable. If the Fed is too lax--in the sense of lending to excessively weak borrowers--then it will be taken advantage of, possibly supporting banks that should be dissolved. To be too stingy would cause the Fed not to support temporarily troubled but fundamentally sound banks, possibly causing them to fail unnecessarily. Only by continually supervising banks to which it has credit commitments can the Fed hope to lend funds efficiently on short notice.³³

Along with designating the terms upon which it is prepared to lend, and the associated supervisory requirements, the Fed needs to set eligibility rules. Unlike a private firm, it is not free to simply choose who it wishes to serve. The logic of the quotes presented above suggests that the Fed ought to provide line of credit services to the entire economy, non-financial as well as financial firms to say nothing of banks. To do so, however, would require the devotion of resources for regulation and supervision on a scale which society could not accept. Hence, the Fed has had to choose a rather arbitrary rule to limit its commitment. Currently, only Federal Reserve member banks or depository institutions holding transaction accounts or nonpersonal time deposits are entitled to basic discount window borrowing privileges. This group corresponds closely to those institutions holding reserves at Federal Reserve banks. Indeed, society's recognition of the need to limit the Fed's line of credit commitment is indicated by the choice of "central bank" rather than "credit market authority" to describe its functions.

If we take this logic one step further we can better understand the concerns of Fed policymakers such as Gerald Corrigan for maintaining some form of separation between banking and commerce and for limiting access to the payments system.³⁴ We interpret their argument with regard to banking and commerce as recognizing the need to limit the Fed's line of credit commitments, and the regulation and supervision that must accompany them, to a manageable subset of the economy, namely, depository institutions. Blurring the line between banking and commerce would make it difficult for the Fed to do that. Without a reasonable limit, the Fed would tend to be drawn into additional implicit commitments that it could not keep. What's worse, without the regulatory and supervisory resources to safeguard its funds, the Fed might have to withdraw from providing line of credit services entirely.

The argument for limiting access to the payments system is similar. In the process of making payments over its electronic funds transfer network, Fedwire, the Federal Reserve grants intraday credit to depository institutions in the form of daylight overdrafts on their reserve accounts.³⁵ Because they are imperfectly collateralized, daylight overdrafts create problems for the Fed analogous to those associated with discount window lending. Though quantitatively much less significant, Federal Reserve float generated in the process of clearing checks creates similar problems.³⁶ Hence, the Fed needs to limit access to protect its funds. Of course, in principle it would be possible for the Fed to protect its funds by not granting credit in the process of making payments. Such would be good policy only if any inefficiencies from completely eliminating or perfectly collateralizing daylight overdrafts and float did not offset the savings in regulatory and supervisory costs. Of course, the Fed could privatize the payments system

entirely. Flannery (1987) discusses privatization of the payments system and arguments for public involvement.

In summary, it is not because the Fed is selfish in wanting to protect its funds that banking policy must be accompanied by regulation and supervision. We saw for the case of private lines of credit that restrictions on borrowers were in their own self-interest because they lowered borrowing costs. That would be true here too. Efficient borrowing necessarily involves restrictions whether private or public in nature. If banking policy in the form of discount window lending and the production of payments system credit is necessary, then it should be accompanied by central bank regulation and supervision in both society's and the Fed's interest.

3.3 Illiquidity and Emergency Credit Assistance

The preceding discussion makes clear that the Federal Reserve discount window is most important as an immediately available source of emergency credit assistance for individual banks. As we noted above, no one argues that the discount window should be used to rescue insolvent banks, only that the window be used to aid temporarily illiquid banks. The familiar rule of thumb--lend only to illiquid but solvent banks--both protects public funds and safeguards the freedom to fail, which is vital to the efficiency of our economy.³⁷ The purpose of this section is to evaluate the rule of thumb in two senses. We ask whether it can be feasibly implemented. And we ask whether it provides a rationale for the public provision of line of credit services through the discount window. The value of central bank regulation and supervision of banking and financial markets hinges critically on the answer to this last question.

First of all, we require an operational means of distinguishing between illiquid and insolvent banks. This distinction appears meaningful only in the presence of incomplete and costly information about the character of bank assets. If information were freely available about these assets, then private markets would stand ready to lend any bank the present value of the income streams from its assets, discounted at a rate appropriate for the risk. Thus, any bank would always be fully liquid, able to pay all claimants, as long as it was also solvent, meaning it had non-negative economic net worth.

If information is incomplete and costly to obtain, then it becomes possible to imagine the following situation, which could be described as involving an illiquid but solvent bank.³⁸ Suppose that a disturbance arises which adversely affects the returns to some existing bank loans. There are a large number of banks, some of which have made poor loans that will yield little revenue. If the private market cannot distinguish between good and bad banks, then it will lend to any individual bank at a rate which is appropriate for the pool of borrowing banks. For any good bank needing to borrow funds, then, the private market will charge a higher rate under incomplete information than under complete information because the rate impounds a probability that the bank is bad, even though it may not be. Faced with a need for funds, a good bank may find itself in a jam--its loans are capable of supporting a borrowing rate under full information, but it cannot meet the higher market rate prevailing under incomplete information. That is, at the full information borrowing rate, the bank has positive economic net worth, but the private market is only willing to lend at a higher rate, at which the bank's net worth is negative. We would describe this bank as illiquid but solvent. The higher rate that prevails in the market is an outcome of costly

information--it could either be a result of pooling diverse risk groups as discussed above or a result of an actual cost of auditing the underlying assets of the firm. Timely auditing over very short periods could be highly costly, sufficiently so that individual banks would not find it feasible to engage in "last minute" auditing as a part of a program for raising funds.

To avoid this situation, private line of credit arrangements provide banks with the option to borrow funds on short notice. As described in detail above, these would involve an ongoing relationship, with periodic credit evaluation so that the lender could sort good risks from bad in the event of a request for funds. This ongoing relationship develops because the overall costs of evaluation are lower, as with many other economic activities, when they are distributed over time rather than conducted on a "last minute" basis. Again as described above, a line of credit would involve a commitment to lend funds at a fixed rate or a fixed rate spread, with a bank obtaining funds on its own initiative if it is a good credit risk, with knowledge of that fact made possible through ongoing evaluation.

In operating a discount window, the government faces the same general type of problem as a private lender when there is incomplete and costly information. It has the same range of choices. It can lend to a pool of undifferentiated risks. If it pursues this strategy, then to break even it must lend at a penalty rate equal to the private market pooled rate. However, if the discount window has to compete with private lines of credit, such a pricing policy would only attract bad banks. In fact, whatever rate it set would tend to attract unprofitable risks, including insolvent banks. Hence, indiscriminate lending would be undesirable.

Alternatively, a central bank could supervise, i.e., evaluate, banks and selectively lend based on the information that supervision actually generates, lending to the banks that would face pooled private market prices which left them illiquid but not insolvent. Distinguishing between banks on this basis, a central bank selectively aids illiquid banks, but it incurs supervision costs to discriminate between types of banks. From this perspective, it is not an accident that discount window lending and bank supervision are jointly included in the primitive rationales for the Federal Reserve. If these supervision costs are taken into account and they are at least as great as those of the private sector, then this banking policy breaks even or subsidizes illiquid banks. It could not penalize illiquid banks who have the option of using competitive private credit lines.

As with many other areas of government intervention, then, the efficacy of discount window lending turns on the relative efficiency of the government and the private sector in undertaking a productive activity. We know of no analyses that document the relative advantage of the Federal Reserve in this area. Plausibly, the private market is superior because it is difficult for the government to actually lend only to illiquid but not insolvent banks, rather than succumbing to political pressure to support powerful banks.³⁹ From this perspective, selective discount window lending and necessary supervision of banks fulfill the second objective of the framers of the Federal Reserve Act. But it is unclear that this is an appropriate government intervention, in contrast to the provision of elastic currency.

We are finally in a position to answer more completely the question of whether regulation and supervision are essential for central banking. We emphasized in Section 2 that regulations were inessential for the execution of

monetary policy. In sharp contrast, we saw in Section 3 that banking policy needed supporting regulation and supervision.⁴⁰ The reason for the sharp difference is that monetary policy can be carried out with open market operations in riskless government securities. By its very nature, however, banking policy involves a swap of government securities for claims on individual banks. Just as private lenders must restrict and monitor individual borrowers, so must a central bank. However, though we admit that more research needs to be done on it, we know of no compelling rationale for public provision of line of credit services to individual banks through a central bank discount window. The fiat monetary system we currently have requires central bank management of high-powered money. But today's financial markets provide a highly efficient means of allocating credit privately. Since central bank loan commitments do not appear to be necessary, neither does the supporting regulation and supervision.

We must, however, qualify our conclusion in two ways. First, it is beyond the scope of our paper to analyze the benefits of Federal Reserve credit generated in the process of making payments. Provision of imperfectly collateralized daylight overdrafts and float requires regulation and supervision too. Second, we have so far only discussed banking policy with respect to individually troubled banks. We ask whether banking policy has a useful role to play in response to aggregate, i.e., system-wide, disturbances in Section 4.

4. SYSTEM-WIDE BANKING AND FINANCIAL MARKET CRISES

Drawing a sharp distinction between monetary and banking policy, the previous two sections of the paper have analyzed central bank policy in

routine circumstances. Policy was analyzed as it might be undertaken in response to the normal course of macroeconomic seasonal and cyclical disturbances and in response to individual bank problems. Here we address questions concerning central bank policy with respect to system-wide banking and financial crises.

We begin our discussion in Section 4.1 by describing the nature of banking crises in the U.S. before the establishment of the Federal Reserve, paying particular attention to the measures taken privately by clearinghouses to protect the banking system. In Section 4.2 we use the discussion to motivate the idea that monetary policy, i.e., provision of high-powered money, and not banking policy, i.e., provision of sterilized discount window loans, is both necessary and sufficient for a central bank to protect the banking system against such crises. We proceed to characterize Walter Bagehot's famous lender of last resort policy prescription as an irregular nominal interest rate smoothing policy. We show how Bagehot's rule could automatically trigger high-powered money responses to protect against the sort of banking system crises experienced before the establishment of the Federal Reserve. Finally, we compare Bagehot's proposed rule to regular interest rate smoothing procedures practiced by the Fed.

Having pointed out that monetary policy has an important role to play in response to system-wide banking or financial crises, in Section 4.3 we turn to the question of whether banking policy has a useful role to play in such circumstances. Here we reason by analogy. As we will illustrate below, monetary policy is valuable during potential banking crises because it can supply currency elastically to depositors who may doubt the banking system's ability to do so. However, since banking policy does not change high-powered

money, it cannot do that. Banking policy is a swap of one sort of credit for another, as when a central bank makes a discount window loan financed by a sale of U.S. Treasury debt. Hence, we ask what sort of aggregate credit market disturbances banking policy might address. We are particularly interested in assessing the costs and benefits of pursuing an aggregate banking policy in comparison with those of monetary policy, drawing crucial distinctions between the two.

4.1 Banking Crises Before the Federal Reserve

In his History of Crises under the National Banking System, O.M.W. Sprague identified five banking crises between the end of the Civil War and the advent of the Federal Reserve.⁴¹ Sprague's crises occur in 1873, 1884, 1890, 1893 and 1907. Each of these crises was accompanied by interest rate spikes of the sort described above, though, not all interest rate spikes were associated with banking crises.

All of these banking crises involved an incipient, widespread desire on the part of the public to convert bank liabilities into currency. They were also accompanied by a defensive effort on the part of banks by which they built up their reserve-deposit ratios.⁴² Under the fractional reserve system without a central bank, this widespread demand for currency could not be satisfied. Organized around clearinghouses, the banking system responded in two ways.⁴³ Clearinghouses were associations of commercial banks initially established to clear checks and settle accounts among member banks. Given their central position in the clearing process, they subsequently assumed responsibility for overseeing individual banks and protecting the banking system as a whole. In times of crises, clearinghouses did two things. First, clearinghouses coordinated general restrictions of convertability of deposits

into currency, while maintaining banks' ability to settle deposit accounts among themselves and undertake lending. Second, clearinghouses issued temporary substitutes for cash, known as clearinghouse loan certificates. These notes were issued against acceptable collateral, as clearinghouse liabilities rather than individual bank liabilities. In that way, clearinghouse certificates facilitated the settlement of accounts among banks mutually suspicious of each other. The clearinghouse certificates were issued in each of the crisis discussed by Sprague, and remained outstanding for as little as four months in 1890 and as long as six months in 1907. Restrictions, however, accompanied the issue of clearinghouse certificates only in 1873, 1893 and 1907.

Because restrictions thwarted an increased demand to convert deposits into currency at par value, they involved temporary periods in which currency sold at a premium relative to deposits. For example, during the restriction in 1907, the premium on currency over deposits ranged as high as 4 percent. Taken together, the actions of the clearinghouse allowed member banks both to accommodate a higher private demand for currency--by using certificates in place of currency for clearing purposes--and frustrated it--via increases in the relative price of currency to deposits. At unchanged relative prices and without accommodation, the increased private demand for currency would have resulted in larger outflows of reserves from banks than actually arose.

How well did these measures contain the harmful effects of banking crises? As calculated from data reported in Historical Statistics of the United States for the period 1875 to 1914, the mean annual bank failure rate was less than 1 percent. Moreover, it was comparable to a nonbank business failure rate which was only slightly higher. The annual bank failure rate

exceeded 2 percent in only three years, 1877, 1878, and 1893. It exceeded 4 percent only in 1893, when it was 5.8 percent. Notably, the failure rate was 1.7 in the 1884 crises year, and only .5 and .4 percent in the 1890 and 1907 crises years reflectively.

The 1940 Annual Report of the Federal Deposit Insurance Corporation reports data on losses to bank depositors over the period 1868 to 1940. The estimated average rate of loss on assets borne by depositors in closed banks was \$.06 from 1865 to 1920, \$.19 from 1865 to 1880, \$.12 from 1881 to 1900, and \$.04 from 1901 to 1920, per year per \$100 of deposits.

The relatively small losses borne by depositors reflected, in part, the high capital-asset ratios of banks, which cushioned depositors against loss in the event of a bank failure. Lindow (1963, p. 2) reports a ratio of total bank capital to risk assets from 1863 to 1963. The ratio falls from a high of 60 percent in 1880 to approximately 20 percent at the turn of the century, then rises to about 30 percent in the 1930s and 40s, and falls to under 10 percent by the 1960s.⁴⁴

In summary, this discussion is not meant to suggest that bank failures before the advent of the Fed were not potentially very harmful to those involved. However, it does suggest that even at their worst they were roughly of the same order of magnitude as nonbank business failures. Their aggregate effects appear to have been reasonably well contained by the private provision of bank capital and, most of all, by the collective protective behavior of the banking system by clearinghouses.

4.2 Banking Crises, Monetary Policy, and the Lender of Last Resort

Our reading of the banking crises prior to the Fed, and the clearinghouses' response to them, suggests these important lessons. From a

system-wide point of view, banking crises were dangerous because they were accompanied by a widespread demand to convert deposits into currency that could not be satisfied under the fractional reserve system without a central bank. The clearinghouses responded in two ways. They made more currency available to the nonbank public by using certificates in place of currency for clearing purposes; and they organized restrictions on cash payments which reduced the quantity of currency demanded by temporarily raising its price in terms of deposits. The measures taken were clearly monetary in the sense that they responded to temporarily high real demands for currency with policy actions influencing conditions upon which currency was supplied to the nonbank public. We take the evidence documented above, that the aggregate effects of banking crises appear to have been relatively small, as supportive of the view that the aggregate difficulties were monetary in nature, since policies focusing on currency supply seem to have been sufficient to contain them.

The preceding remarks motivate our view that central bank monetary policy would have been both necessary and sufficient to prevent the pre-Fed banking crises; banking policy, on the other hand, would have been neither necessary nor sufficient. Why? The policy problem was to satisfy a temporary increase in currency demand, and only monetary policy could do that. Importantly, the effectiveness of monetary policy in this regard does not depend on whether the Fed makes high-powered money available by accepting bank assets as collateral at the discount window or by purchasing securities in the open market. By extension, it is clear that the Fed's power to create currency remains sufficient today to contain any aggregate disturbances due to sudden sharp increases in currency demand, whether they result from banking or other difficulties.

We can make this point more concrete by using it to interpret Walter Bagehot's famous recommendation that a central bank should behave as a lender of last resort.⁴⁵ Bagehot's (1873) policy prescription--summarized as lend freely at a high rate--may be understood as advocating that the discount rate or simply a rate for buying designated classes of securities in the open market be kept fixed suitably above the normal range of market rates. That rate would provide an interest rate ceiling and therefore an asset price floor to allow banks, in the event of crises, to liquidate their assets while remaining solvent. The proposal amounts to providing a completely elastic supply of currency at the fixed ceiling rate. Put still another way, it amounts to a suggestion for irregular use of nominal interest rate smoothing, in the event that market rates reach a certain height.

An important point about "lender of last resort" policy in banking crises is that in our nomenclature it is not banking policy at all. It is monetary policy because it works by providing an elastic supply of high-powered money to accommodate precautionary demands to convert deposits into currency. Furthermore, lending, in the sense of advancing funds to particular institutions, is not even essential to the policy since it can be executed by buying securities outright.

One aspect of Bagehot's rule deserves some additional comment. He argued that the last resort lending rate should be kept fixed above normal market rates, making borrowing generally unprofitable to minimize any government subsidies that might accrue to individual banks. He counted on nominal interest rate spikes accompanying banking crises to hit the ceiling rate and thereby automatically trigger the injection of currency into the economy.

In this regard, Bagehot's advice has not been followed by the Fed. Rather, as discussed in Section 2.2 above the Fed has chosen to regularly smooth interest rates. It has done so either by using a Federal funds rate policy instrument directly, or by using unsterilized borrowed reserve objectives together with discount rate adjustments to achieve a desired Federal funds rate path.⁴⁶ It is important to point out, however, that regular interest rate smoothing could still satisfy Bagehot's concerns. First, it could be free of subsidies to individual banks if carried out by purchases and sales of securities in the open market. Second, it provides lender of last resort services which are automatically triggered at the current central bank interest rate. If an increased demand for currency were generated by an incipient banking crises, we might want to think of the Fed's provision of currency as last resort lending. But routine seasonal and cyclical increases in currency demand are also accommodated at the same rate.

Thus Federal Reserve practice makes particularly clear that lender of last resort policy and the routine provision of an elastic currency are essentially the same. Both are directed at insulating the nominal interest rate from disturbances to the demand for currency. Both are executed by using open market operations to create and destroy high-powered money. Since both are monetary policy we may extend our conclusion from Section 2.1 to make the point that banking and financial regulations are neither necessary or sufficient for a central bank to pursue effective last resort lending.

4.3 Banking Policy and Credit Market Crises

In Section 3.4 we described how banking policy could provide line of credit services to enable illiquid but solvent banks to remain operating. Implicitly, we assumed that the source of the trouble was limited. At worst

only a few banks were insolvent, so when line of credit services sorted the good banks from the bad, there was a negligible effect on the interest rate. During general credit market crises associated with aggregate economic activity, however, interest rates will rise. If banking policy is to have a role it will be in response to real interest rates, since banking policy is clearly an inappropriate response to monetary disturbances including nominal interest rate spikes. Our analysis is in two parts. In Section 4.3.1 we ask what banking policy can accomplish in response to real rate disturbances. We conclude, in Section 4.3.2, by contrasting the radically different incentive effects and desirability of monetary and banking policy in response to aggregate disturbances.

4.3.1 How Banking Policy Can Address Credit Market Disturbances

For purposes of this discussion, the important effects of credit market disturbances are summarized by changes in the real rate of interest applicable to bank assets. This real rate is determined by macroeconomic conditions, including anticipated changes in the state of the economy and uncertainty in future prospects. It adjusts to equate aggregate supply and demand for output, or what is the same thing, to equate the aggregate supply and demand for credit. For example, an increase in future prospects which raises current consumption demand will induce a rise in the real rate to induce consumers both to save more out of a given income and to produce more, thereby restoring goods market equilibrium. Likewise, an increase in investment resulting from a perceived increased profit opportunity would induce a real rate rise to cut back on desired investment some and induce additional saving. When individuals become more uncertain about the outcomes of investment projects, then the expected returns required of the projects also rise.

To investigate whether there is a role for banking policy we consider an unexpected rise in the real interest rate. Even a temporarily high real rate could cause previously profitable investment projects to become unprofitable.⁴⁷ This, in turn, would generate a rise in non-performing bank loans, which could create insolvencies. The role for banking market intervention in such circumstances is usually formulated as "lend only to illiquid but solvent banks," as we discussed in Section 3.4 above. But we argued there that illiquidity arises only when financial markets cannot readily determine the status of a particular financial institution. However, an interest rate rise is observable in financial markets, unlike firm or bank-specific shocks, which are costly to uncover. If firms were alike on one hand and banks alike on the other, the distinction between illiquidity and insolvency would surely be irrelevant for real interest rate shocks. A real interest rate spike per se could not make banks illiquid unless it also made them insolvent. Of course, in so far as its effects were distributed unevenly across firms and banks, a real rate rise could cause some individual banks to be illiquid but solvent.

Thus aggregate disturbances can affect individual bank liquidity in addition to factors that were specific to a bank. But the fact that an aggregate disturbance is the source of the trouble does not alter the relative advantages of the central bank and private markets in providing liquidity. Central banks and private markets continue to face problems of screening good from bad banks that we discussed in Section 3.4. Practically, the rule of thumb, "lend only to illiquid but solvent banks," could rule out the use of banking policy entirely. But if banking policy did not respect this rule, then it could well have important negative effects by subsidizing risktaking.

Then, our conclusion must be that banking policy should not attempt to mitigate credit market disturbances, to avoid producing greater incentives for crises to occur.

We feel a bit uneasy about the implications of our result. While we think the familiar rule of thumb makes sense, we wonder whether discount window lending could be rationalized under an additional criterion: to protect against system-wide banking crises in response to temporary real interest rate spikes. We motivate the additional criterion by noting that if the consequent disruption costs associated with widespread temporary insolvencies were large enough, temporary transfers to the banking system that could avoid such costs could be in society's interest. We should point out, however, that a similar argument could be made for avoiding disruption costs of temporary insolvencies anywhere in the economy. Therefore, acceptance of the criterion for banking policy alone would need to be based on a demonstration that disruption costs are much larger in the financial industry than elsewhere.

At any rate, having no effect on goods supply or demand, banking policy could not reverse a real rate rise. Of course, a central bank's interest income could change as a result of banking policy, i.e., exchanging government securities for claims on private banks. But that fiscal effect, per se, would have no implications for the real interest rate.⁴⁸

What banking policy could do is support otherwise insolvent banks by temporarily swapping government securities for non-performing bank loans. If the disturbance were temporary, and the loans earned nothing for the central bank, then the size of its subsidy would be the lost interest on government securities that now goes to bank depositors. Alternatively, if the loans proved to be permanently bad, the subsidy would be the entire face value of

the loans purchased by the central bank. The government Treasury, in turn, would have to finance the revenue loss by cutting back goods purchases, raising current taxes, or borrowing, i.e., raising future taxes. Banking policy of this sort is clearly redistributive in nature, a contingent tax and transfer fiscal policy. However, it need not represent a subsidy to the banking system as a whole if banks are taxed during normal times to finance any transfers during periods of high real rates. Importantly, to be effective at reducing insolvency risk, the tax and transfer policy needs supporting regulations. Otherwise banks might simply restore the risk of insolvency to its initially optimal level by reducing capital accordingly, or by restructuring contingent liabilities to offset the transfers.⁴⁹ Thus we have another example of how banking policy needs supporting regulation and supervision to be effective.

We must emphasize that we are by no means advocating the use of banking policy to rescue insolvent banks or, more generally, the use of tax and transfer policies to rescue insolvent firms in other industries. In fact, we think there are serious problems with such a policy. It requires costly regulation and supervision. It opens the door to bank rescues, which would be extremely difficult to limit in practice. It would be difficult to choose when to intervene. And there would be political pressure to abuse the policy. Moreover, it is far from clear that disruption costs associated with widespread temporary insolvencies are large. Last, we are worried about perverse incentive effects of systematic banking policies. Designed to promote financial market stability, they encourage risktaking and lead to the deterioration of private liquidity provision. Thus, they are likely to lead to much more severe financial market crises, particularly if there are limits

to the extent of central bank loans and guarantees, or political conditions arise under which anticipated public provision of financial support does not materialize.

4.3.2 Why Banking and Monetary Policy Differ

It is perhaps puzzling that we are led to such different conclusions concerning banking and monetary policy. Monetary policy can play an important role in banking crises by managing the stock of high-powered money to smooth nominal interest rates. Moreover, it can do so without costly regulation and supervision. Banking policy, on the other hand, directly influences neither high-powered money nor the aggregate supply and demand for goods. So banking policy cannot influence either nominal or real interest rates. A role for banking policy in preventing banking crises arises, however, in response to real interest rate spikes, which can cause widespread insolvencies against which monetary policy is ineffective. Such banking policy actions might have social value if the temporary disruption costs associated with widespread insolvency are large. But central bank transfers to troubled financial institutions redistribute wealth between different classes of citizens at best; inappropriate incentives for risktaking and liquidity management may lead to more severe and frequent financial crises at worst. Most importantly however, banking policy needs costly supporting regulation and supervision. What is the source of this radically different set of conclusions?

Monetary policy involves changes in the stock of an asset, high-powered money, for whom the Federal Reserve is the only issuer. By changing the quantity of this asset, the monetary authority can affect its real value, i.e., the inverse of the price level. Changing its growth rate affects expected inflation and, hence, the nominal interest rate. Monetary policy can

be accomplished in a manner that is anonymous--it is not necessary to identify the individuals that will choose to trade securities for high-powered money in order to determine how the price level, etc. will change.

Banking policy, then, differs from monetary policy principally because the former involves contingent transfers to particular banks, to which they have incentive to respond by altering the package of portfolio and capital decisions that they make. In turn, banking policy must be supported by extensive regulation and supervision not to be abused. Monetary policy has no such incentive effects for specific banks, but merely acts on economy-wide prices and interest rates, and therefore needs no supporting regulation and supervision.

CONCLUDING REMARKS

The Federal Reserve serves two very different functions. First, it acts as the U.S. monetary authority, managing the stock of high-powered money to influence the price level and real activity. Second, it acts as a central bank, engaging in regular and emergency lending to banks and other financial institutions.

In our analysis of these two activities, we used an analytical method that is worth stressing. We began by providing a detailed account of how a minimally regulated system would operate and then investigated the consequences of various forms of public intervention. Our analysis drew on contemporary economic knowledge in the areas of finance, monetary economics, and macroeconomics.

Our conclusions were radically different with respect to the relationship between financial regulation, on the one hand, and monetary or

banking policy on the other. The preceding analysis stressed that the job of the monetary authority can be accomplished without supporting financial regulation. Further, virtually all economists agree that there is an unambiguously important role for public authority in managing the nation's high-powered money.

By contrast, central banking activities require financial regulation and supervision; but there is little evidence that public lending to particular institutions is either necessary or appropriate. Even if central bank lending served a useful purpose earlier in the century, today's credit markets have become highly efficient. We think it is important to begin to ask whether central bank lending, either through the discount window or through the payments system, is still necessary. If it is not, the Federal Reserve could greatly curtail its costly regulatory and supervisory activities.

In the meantime, is it desirable that both monetary and banking policy responsibilities be housed under the same institutional roof? We are not sure. But we wonder whether the Federal Reserve's potential performance as a monetary authority would not be enhanced by shedding of its central banking functions. The tension between these two roles seems most evident in times of financial crises or distress. Consider, for example, the tensions that arose during the 1930s. The Fed's concern with the impact of its lending policies on the provision of speculative credit to the banking and financial system may have played an important role in its lack of willingness to expand high-powered money during a massive currency drain. Today, it is not too farfetched to imagine the Fed being caught between a central banking problem that required massive lending--for example, widespread default on interna-

tional debt--and a desire to avoid renewed inflation. Although we have stressed that monetary and banking policy can be analyzed as separate creatures, a tension arises because very large amounts of lending--greater than the value of the Fed's portfolio--necessitates that loans be made with high-powered money.

Potentially, too, the Fed's focus on monetary policy could be sharpened during more normal times, when considerable portions of its institutional resources are devoted to issues involving central banking.

This paper cannot address these issues of institutional design. But, ultimately, the separation of banking and commerce in private financial institutions may be less important than the separation of monetary and banking policy in the public sector.

ENDNOTES

1. One can easily imagine central bank actions that combine both monetary and banking policy. An increase in bank reserve requirements, coupled with an increase in high-powered money sufficient for banks to finance it, is one important example. The possibility of combination policies in no way diminishes the usefulness of our distinction.

2. Hodgman (1976) is a good survey of commercial policies executed by foreign central banks. In the U.S., commercial policies executed through the credit market are extensive. See, for example, Bennett and DiLorenzo (1983), Government Credit Allocation: Where Do We Go From Here? (1975), and U.S. Congress. Federal Credit Activities (1984), and "The Federally Sponsored Credit Agencies," in Cook and Rowe (1986). Federal deposit insurance, farm credit programs, and pension guarantees also fall into this category. In contrast to the other credit market activities, Federal Reserve banking policy emphasizes availability on very short notice, through line of credit services at the discount window and through daylight overdrafts and float extended in the payments system.

3. A brief survey of money demand theory may be found in McCallum and Goodfriend (1987).

4. This argument is due to Patinkin (1961). It was later emphasized by Fama (1980, 1983).

Patinkin pointed out that a central bank must fix both a nominal interest rate and a nominal quantity to make the price level determinate. These conditions are met if a central bank pays no interest on currency and controls its aggregate nominal quantity. The price level is determined as follows. Because currency earns zero nominal interest, the opportunity cost of holding it is the nominal interest rate on securities. It is efficient for people to hold a real stock of currency for which the marginal service yield just equals the interest rate. For a diminishing marginal service yield on currency with a sufficiently high initial threshold, there is a determinate real stock demand for currency and a determinate price level, that is, for any given nominal interest rate on securities. The nominal interest rate on securities is the sum of expected inflation plus a real interest rate component. The central bank can control inflation and thereby expected inflation by choosing a desired rate of currency growth. For example, it can choose zero currency growth and zero inflation, so that the nominal interest rate is simply the real rate, and the price level is constant.

5. Notably, this point was emphasized by Friedman (1960). Related discussions may be found in Fama (1980, 1983) and McCallum (1985).

6. These include Barro (1986), Darby (1976), Dornbusch and Fischer (1984), Gordon (1987), Hall and Taylor (1985), and Sargent (1979, 1987). A notable exception is the view emphasized by Wallace (1983) and Sargent and Smith (1987). McCallum (1983), who emphasizes the medium-of-exchange services of money, and King and Plosser (1986), who emphasize verification costs, may be read as responses to the arguments of Wallace, Sargent, and Smith.

7. This series is reported in Macaulay (1938).
8. These numbers come from Miron (1986). See Clark (1986) and Kemmerer (1910) for particularly useful related material.
9. There are actually a number of ways that one can define a nominal interest rate smoothing policy. It can mean eliminating deterministic seasonals, as emphasized by the authors listed in note 8 above. It can mean minimizing interest rate surprises, as studied by Goodfriend (1987a). Or it can mean using monetary policy to maintain expected constancy in interest rates as studied by Barro (1987). Regardless of what nominal interest rate policy is followed, however, the theoretical mechanism by which it works is basically as described in the text.
10. We are drawing on Goodfriend (1987a) for this discussion.
11. The method by which the Federal Reserve smooths interest rates has varied over the years. In the 1920's the Federal Reserve forced the banking system to be "in the window" for a portion of high-powered money demanded. Since there was relatively little non-price rationing, the discount rate tended to provide a ceiling to interest rates. The discount rate was raised and lowered to adjust the level of interest rates, with appropriate adjustments to nonborrowed reserves to keep banks marginally borrowing reserves. In the 1930's nominal rates were near their floor at zero, and in the 1940's they were pegged. In the 1950's and 60's the Fed used procedures similar to those it used in the 20's. See Brunner and Meltzer (1964). Explicit Federal funds rate targeting was used in the 1970s. Likewise, the nonborrowed reserve operating procedure employed from October 1979 to the fall of 1982 was in effect a noisy week-by-week funds rate peg. See Goodfriend (1987b), pp.40-1. Since then the Fed has employed a mixture of borrowed reserve and Federal funds rate targeting.
- Goodfriend (1987b) contains theoretical, institutional, and historical discussion of the Federal Reserve's use of an interest rate policy instrument. For an analysis under rational expectations, see McCallum (1981) and "A Weekly Rational Expectations Model of the Nonborrowed Reserve Operating Procedure," in Goodfriend (1987b).
12. Empirical evidence on the high-powered money and inflation response associated with the elimination of nominal interest rate seasonals around 1914 may be found in Barro (1987) and Barsky et. al. (1987).
13. See "A Historical Assessment of the Rationals and Functions of Reserve Requirements," in Goodfriend (1987b). Notably, this was true even under the Fed's post-October 1979 nonborrowed reserve operating procedure, see pages 40-1.
14. See Darby (1976), Friedman and Schwartz (1963), and Poole (1978).
15. See Lucas and Sargent (1980).
16. See King and Plosser (1986) for a discussion of the relationship between money, credit and real activity in a real business cycle model.

17. See Mehra (1986).

18. If the individual could sell the car without permission from the lender, then there would be no effective difference between car loans and an unsecured personal loan to be used, for example, to finance a vacation. In general, without the security provided by the physical asset (car), there would need to be a higher interest rate, reflecting the lender's lessened probability of receiving loan payments or the resale value of the car.

19. See Smith and Warner (1979).

20. For example, Benston and Smith (1976) discuss why bundling of financial products can be efficient in a world of costly information. Haubrich (1986) provides a recent formal description of one set of gains from long-term relationships in financial intermediation.

21. A number of authors in recent years have emphasized monitoring as a key function of banks. See, for example, Diamond (1984), Fama (1985), Gorton and Haubrich (forthcoming), and Haubrich (1986).

22. Berlin (1986), Crane (1973), Hanweck (1986), and Summers (1975) provide descriptions of various aspects of the market for lines of credit. Berlin documents substantial growth in use of bank loan commitments since 1977.

23. Hawkins (1982), and Melnik and Plaut (1986a, 1986b) contain theoretical analyses of the economics of bank loan commitments.

24. See the chapter on certificates of deposit in Cook and Rowe (1986), as well as the chapter on repurchase agreements, a related bank funding source.

25. In recent years loan sales have apparently become more common. See Gorton and Haubrich (1987), Pavel (1986), and Pennacchi (1986). Though it is not clear whether they are being used as a funding source on short notice.

26. See the chapter on Federal funds in Cook and Rowe (1986).

27. The name of the discount window arose from the following historical circumstances. In the 18th and 19th centuries, much of international and interregional trade was financed with bills of exchange, which were short-term securities without explicit interest. When sold or used as collateral, a security was discounted--or valued at less than its face value--to permit a return to its holder. The discount window thus took its name from the fact that its primary function was establishing a discount rate for securities purchased or used as collateral. Hackley (1973) contains a thorough discussion of the legal history of Federal Reserve lending. For many years virtually all Federal Reserve lending has taken the form of advances rather than discounts. Hackley describes the shift, as well as the evolution of other aspects of discounting such as eligible paper, and the size of the basic borrowing privilege, i.e., the amount of a temporary discount window loan that is permitted.

28. Nevertheless, over the years the Fed has extensively employed unsterilized discount window lending, together with discount rate adjustments, in the execution of monetary policy. See note 11. Though it remains puzzling, use of the discount window this way seems to be connected with the use of secrecy or ambiguity in monetary policy. See Cukierman and Meltzer (1987) and Goodfriend (1986). In a similar vein, Cook and Hahn (1986) provide extensive evidence that the discount rate has served as a monetary policy signal, signalling permanent changes in the Federal funds rate.

29. Notably, though the Monetary Control Act of 1980 directed the Fed to price many of its services, the discount window was exempted. There are some superficial similarities between Fed practices and private line of credit pricing. For instance, the non-interest earning required reserves at the Fed are like compensating balances. But there is little evidence that the Fed prices line of credit services efficiently according to each bank's circumstances with respect to supervision cost, risk of insolvency, or collateral.

30. Since the early 1960's, the Fed has allowed the Federal funds rate to move above the discount rate for long periods of time. To limit borrowing the Fed has imposed a non-interest cost which rises with the level and the duration of borrowing. In practice, higher and longer duration borrowing increases the likelihood of triggering costly Federal Reserve consultations with bank officials. See Goodfriend (1983, 1987b) for discussions of how this means of administering the window has been employed in monetary policy.

31. For example, Continental Illinois Bank borrowed extensively at the Fed discount window from May 1984 to February 1985. It was in the window for over 4 billion dollars during much of that period. See Benston et. al., pages 120-24.

32. Hackley (1973) documents the declining importance of legal collateral requirements in discount window lending. However, although the Fed has wide discretion in what it can take, it has generally required very good collateral on its loans.

A haircut is a margin that is subtracted off the market or face value of a security for purposes of calculating its value as collateral in a loan transaction. For example a 10% haircut off face value of a \$100 security would value it as \$90 for purposes of collateral.

33. Continental Illinois National Bank: Report of An Inquiry into its Federal Supervision and Assistance, contains a good discussion of the difficulties of government supervision of banks.

34. See Corrigan (1987).

35. Mengle, Humphrey, and Summers (1987, p. 3) describe the creation of daylight overdrafts as follows:

On Fedwire, transfers take place by debiting the reserve account of the sending bank and crediting the reserve account of the receiving bank. However, the sending bank is not

required to have funds in its reserve account sufficient to cover the transfer at the time it is made. Rather, the transfer must be covered by the end of the day. Allowing reserve balances to become negative during the day leads to "daylight overdrafts," and it is these overdrafts that are the major source of risk to Federal Reserve Banks from Fedwire. Since a Fedwire transfer becomes final when the receiving institution is notified of the transfer, the Federal Reserve could not revoke the transfer if the sending institution failed to cover its overdraft by the end of the day. Thus, the receiving institution would have its funds while the Fed would be left with the task of collecting the payment from the defaulting sending bank. Credit risk in this case is borne by the Reserve Banks and possibly by the public.

Mengle, Humphrey, and Summers, page 12, report total funds transfer daylight overdrafts of 76 billion dollars per day. This is an enormous number when one considers that total reserve balances with Reserve Banks are around 35 billion dollars. Daylight overdrafts are currently not priced. They are interest free loans. Therefore, depository institutions have little incentive to economize on their use. To limit somewhat the use of intraday credit the Fed monitors depository institutions according to "caps" and relatively informal guidelines, resorting to consultations with bank officials when necessary. This is reminiscent of administration of the discount window. See note 30.

36. Checks sent to Reserve Banks for collection are credited to the depositing institution's reserve or clearing account automatically, according to a schedule which allows time for the checks to be presented to the depository institutions on which they are drawn. The maximum deferral is two business days. The depository institution's account is credited regardless of whether the checks have reached the banks on which they are drawn. Because it may take longer than two days to process and collect some checks presented for collection, depository institutions receive credit to their accounts for those checks before the institutions on which the checks are drawn lose reserves. This "extra" amount of reserves in the banking system is called Federal Reserve float. The effect of float on high-powered money is usually sterilized, however, by offsetting open market operations.

The Monetary Control Act of 1980 mandated that the Fed charge fees to recover the cost of providing check clearing and other services. In particular, the Fed was directed to charge for Federal Reserve float at the Federal funds rate. Consequently, check float has fallen from 7.4 billion dollars in the first half of 1979 to under 1 billion dollars today. See "The Tug-of-War Over Float," (1983), U.S. Congress. The Role of the Federal Reserve in Check Clearing and the Nation's Payments System (1983), and Young (1986).

37. Todd (1987) documents in detail the establishment of the principle that the central bank should lend only to illiquid but not to insolvent institutions.

38. Our analysis here involves the substantial work on private information economies stimulated by Rothschild and Stiglitz (1976). However, since we consider costly evaluation, our treatment of private information economies is closer to Boyd and Prescott (1986).

39. Sprague (1986) and Todd (1987) report numerous instances of government support for insolvent institutions. The Fed minimizes the risk of supporting insolvent banks by making discount window loans only on the best collateral. However, by doing so it greatly reduces the value of its line of credit services too. For example, it took the best collateral when lending to Continental Illinois Bank in 1984-85, although it probably lent at below market rates. See note 31.

There is an additional reason why government emergency credit assistance might be necessary. Private markets would only make arrangements to protect themselves against liquidity problems if they believed that the government would not offer such services. Yet it might be impossible for the government to make credible its intention not to intervene in future crises. To do so, the government would have to precommit itself not to provide emergency credit assistance. The worst possible case would be one where the government announced its intention not to provide emergency credit assistance in the future, but the banks believed that in fact it would. Then if a liquidity problem arose banks, would not have prepared for it by holding sufficient capital and by arranging lines of credit. If the government remained true to its policy, then widespread insolvency could prevail. Bulow and Rogoff (1986) provide an interesting analysis of this sort of problem with respect to international debt.

40. If the Fed always perfectly collateralized its banking policy loans, then in principle it could need very little supporting regulation and supervision. However, if it lent at below market rates, it would still need regulation and supervision to see that its policy was not abused.

41. Kemmerer (1910), pp. 222-23, contains a more extensive classification of financial panics including more moderate episodes.

42. See Cagan (1965).

43. In addition to O.M.W. Sprague (1910), see Cannon (1908), Gorton and Mullineaux (forthcoming), and Timberlake (1978, 1984) on the behavior of clearinghouses.

44. The measure of total capital here is generally defined to include total equity, reserves for losses on loans and securities, and subordinated notes and debentures. Risk assets are defined as total assets, less cash, less government securities issued by the U.S. Treasury Department.

45. Humphrey and Keleher (1984) provide a historical perspective on the concept of the lender of last resort.

46. See notes 11 and 28.

47. Many investment projects involve the purchase of inputs--fuel, intermediate goods, and labor--today, but only yield output in the future. Production is profitable if the current value of future output discounted back to the present at the real interest rate is greater than the current cost of inputs. By pushing the present discounted value of output below its cost of production, even a temporarily high real interest rate could cause a project to be shut down temporarily.

48. If a central bank's remittances to the government Treasury changed as well, and the Treasury adjusted its goods purchases accordingly, then there could be a goods market effect. But that would involve more than banking policy.

49. This argument is analagous to those that arise in consideration of the "Ricardian Equivalence Proposition," which states that under certain situations a substitution of public debt for taxation will have no effects on prices or quantities. Robert Barro's Macroeconomics (1986) provides an accessible introduction to Ricardian analysis. Chan (1983) provides a proof of Ricardian neutrality under conditions of uncertainty, stressing the analogy to Modigliani-Miller propositions in finance.

The ineffectiveness of credit policy, of which banking policy is an example, is well-illustrated by the student loan program. Student loans need not result in increased expenditure on education. A loan may reduce the extent to which families draw down their own financial saving or sacrifice expenditure on other goods and services to pay for a student's education. Because loan funds are fungible, they cannot assure a net increase in expenditure in the targeted area. The targeted effect would require provisions in the program to prevent substitution for private outlays and to restrict access to other credit sources.

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