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Is the Banking and Payments System Fragile?

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# Is the Banking and Payments System Fragile?

George J. Benston and George G. Kaufman\*

In his introduction to *The Risk of Economic Crisis*, a compilation of papers presented at a conference sponsored by the National Bureau of Economic Research (NBER), Martin Feldstein (1991, p. 1) recognizes that, despite the inability of less developed countries to service their debts, the massive collapse of savings and loan associations in the United States, wide swings in currency exchange rates, the increase in corporate and personal debt, and the stock market crash of 1987, we have not suffered an economic crisis in recent years. Nevertheless, he asserts (*ibid.*, pp. 1-2):

But the risk of such an economic collapse remains. As Charles Kindleberger's distinguished and fascinating book (*Manias, Panics and Crashes: A History of Financial Crises* [Basic Books, 1978]) has ably demonstrated, economic crises have been with us as long as the market economy. At some point, greed individual investors take greater risks in the pursuit of greater returns. A shock occurs and the market prices of assets begin to collapse. Bankruptcies of leveraged individuals and institutions follow. Banks and other financial institutions fail in these circumstances because they are inherently leveraged. The resulting failure of the payments mechanism and the inability to create credit bring on an economic collapse.

He goes on to conclude (*ibid.*, p. 2):

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The public interest in avoiding the failure of banks and other financial institutions argues strongly for government regulation and supervision of these institutions. Even Adam Smith explicitly advocated the regulation of banks because he recognized that their failure would have damaging effects on the economy more generally.

Feldstein explains further his argument for regulation, as follows (*ibid.*, p. 15):

The banking system as a whole is a "public good" that benefits the nation over and above the profits that it earns for the banks' shareholders. Systemic risks to the banking system are risks for the nation as a whole. Although the managements and shareholders of individual institutions are, of course, eager to protect the solvency of their own institutions, they do not adequately take into account the adverse effects to the nation of systemic failure. Banks left to themselves will accept more risk than is optimal from a systemic point of view. That is the basic case for government regulation of banking activity and the establishment of capital requirements.

These statements by a distinguished economist chair professor at Harvard, President and Chief Executive Officer of the NBER, and former chairman of the President's Council of Economic Advisers which are repeated in substance by many other economists, bankers, legislators, regulators, members of the general public, and in particular by central bankers, serve to motivate our paper. Is the banking and payments system unusually fragile? Are depository institutions (hereafter, simply called "banks") really prone to failure more than are other firms and, if so, is the failure of one or several banks contagious, giving rise to banking panics, the collapse of the financial system, and severe damage to the macroeconomy? Do losses suffered by depositors in bank failures have more adverse impact on either other banks or the macroeconomy than losses suffered by creditors in the failures of nonbank firms have on other firms in the same industry and beyond?

Furthermore, has banking become increasingly subject to international contagion? This concern was well expressed by the then president of the Federal Reserve Bank of New York to the Seventh International Conference of Banking Supervisors: "the speed, volume, value, and complexity of international banking transactions have introduced new linkages and interdependencies between markets and institutions that have the potential to

transmit problems and disruptions from place to place and institution to institution at almost breakneck speed" (Corrigan, 1992, p. 6.)

In section 1, we consider the theories that appear to underlie Feldstein's and many other observers' belief that the banking and payments system is inherently unstable and prone to failure. Fractional reserve banking, discussed in section 1.1, has long been identified as the primary reason for this instability. In such a banking system, when there is no central bank or when the central bank is ineffective, instability may arise from runs on banks. Such runs may result from unexpected withdrawals of demand deposits and bank-issued currency because of depositors' concerns about their banks' solvency or from exogenous outflows of reserves that threaten banks' solvency by forcing rapid liquidation of assets at fire-sale losses. The banking system also might suffer a contraction from bank insolvencies resulting from their lending practices. We then discuss the relevance of the banking instability to countries with deposit insurance or an effectively run central bank.

In section 1.2, we describe and analyze the sources of fragility in fractional reserve banking that may threaten the survival of the banking system as a whole. Four sources are identified, each of which implies somewhat different public policies: (1) excessive expansion of credit; (2) asymmetric information resulting in inability of depositors to value bank assets correctly, particularly when economic conditions worsen; (3) shocks originating outside the banking system that are independent of the financial condition of banks and either cause depositors to change their liquidity preferences or cause reductions in bank reserves (high-powered money); and (4) institutional and legal restrictions that weaken banks, making them unnecessarily prone to failure. In all of these scenarios, deposit withdrawals produce instability in the banking system only if they cause a reduction in aggregate bank reserves. If the withdrawals are redeposited at other banks, there may be costly churning and some deadweight losses, but no threat to the survival of the banking or payments system.

Following the explication and discussion of theories of banking and payments system instability in section 1, we review much of the empirical research on the sources of bank failures and banking panics in section 2. This review leads us to conclude that the primary causes of past failures has been reasons (3) and (4) exogenous withdrawals of bank reserves (largely gold), and institutional and legal restrictions (primarily on U.S. banks). Thus, we do not view banks and the banking system as inherently fragile. Nor, in the absence of poorly operating central banks or undue imprudent restrictions on bank

activities, do we find that bank failures are any more contagious or any more costly than failures in other important industries.

These conclusions do not hinge on the existence of credible deposit insurance. They hold equally well in a world without such insurance. Moreover, in most countries, at least de jure insurance is incomplete so that some depositors/creditors (those with accounts over \$100,000 in the United States) remain at risk and have incentives to run and ignite panics. The evidence on contagion is reviewed in Section 3.

Bank failures, though, might be costly, such that the benefits from preventing them with government action might be worth the cost. We examine these costs in section 4, and conclude that preventing individual or a small number of bank failures is likely to be more costly than allowing them to occur. In section 5, we discuss the role of the lender of last resort, either as a direct lender to individual banks experiencing liquidity problems or as a supplier of liquidity to the banking system.

From our review of the evidence on contagion and from our analysis of the means by which central banks and changes in legal restrictions can prevent the money supply and bank credit from declining, we conclude in section 6 that banking is not a "public good" and that the fragility of the banking and payments system should not be a public concern, other than for preventing actions, including those by the government, that either directly or indirectly increase the risk profile of banks or the potential losses from bank failure to other banks or the government (taxpayers). It is losses to non-contracting third parties (externalities) from bank failures, not bank failures per se, that is of primary public concern. These can be virtually eliminated by imposing a capital requirement on banks, made effective by a system of structured early intervention and resolution. Other restrictions on banks' activities should be removed, as these make the banking and payments system less efficient and individual bank failures more likely and more costly.

## 1. Theories of Banking and Payments System Instability

### 1.1. The Potential Instability of Fractional Reserve Banking

All firms might fail. Firms fail when they invest in products and processes that turn out through time to generate a smaller cash flow than the amount required to pay bills and service debt, so that eventually their net worth

declines below zero. Some failures are the result of frauds. For example, the promoters or managers of nonfinancial firms may claim that they have made potentially very profitable discoveries that do not, in fact, exist. Nonbank financial firms may practice a Ponzi scheme, where they pay early investors high returns to entice new investments which are used to pay the high returns, until the scheme collapses. None of these situations is new, and all continue to the present day and, most likely, will be with us in the future.<sup>1</sup>

Banks differ from other financial institutions and nonbank firms in several ways that make them more prone to failure. They are funded predominantly by short-term and demand debt (deposits) primarily to satisfy the demand for such par value securities by households and business firms. They usually hold assets that cannot be sold quickly except at substantial discounts from par (loans) or that have fixed-interest rates and longer maturities (bonds and mortgages). Because banks typically hold relatively low levels of capital, rapid withdrawals of deposits (runs) that force equally rapid liquidation of assets or declines in the value of assets for other reasons can render banks economically insolvent. Thus, banks are more fragile than financial or nonfinancial firms that are proportionately less funded by short-term debt and more funded by equity (less leveraged). Each of these sources of potential instability deposits and assets is considered in the next two sub-sections. The relevance of these concerns to countries with deposit insurance or an effectively run central bank is discussed in the third sub-section.

#### **1.1.1. Instability of Deposits and Bank Currency**

If banks are perceived to be generating losses that threaten their net worth, creditors (depositors) can withdraw their funds very quickly. In response, because banks operate on a fractional reserve basis, holding only small amounts of cash, they might have to sell assets quickly, even if they have made borrowing arrangements with other (correspondent) banks. To the extent that some of their assets are not highly liquid because they have longer maturities, lower credit quality, and are customized, fire-sale losses are likely to be incurred.<sup>2</sup> Because banks typically hold relatively small amounts of capital, these fire-sale losses may render them insolvent. Thus, a liquidity problem may turn into a solvency problem.

In the normal course of events, the holders of bank liabilities (henceforth, depositors) have no reason to fear that their demands for repayment would not be met; if they did, they would not have deposited their funds in the bank. However, if depositors believe that their bank has or even might experience a

loss in asset values that would be sufficient to render the bank insolvent, they have incentives to withdraw their funds immediately to run. Because fears of insolvency at one bank raise concerns about insolvency at other banks, runs are widely perceived as being contagious. When many depositors run on many banks at once, a "banking panic" is said to result .

It is depositors' ability and, perhaps, propensity to run that is the basis for many people believing that the banking system is fragile. Because banks' deposit liabilities frequently serve as the means of payment (bank notes in earlier times, demand and possibly savings and time deposits in the twentieth century), the presumed fragility of banks implies a concomitant fragility of the payments system.

As banks increasingly process payments among depositors in countries around the world, concerns also have arisen about the vulnerability of domestic payments systems to bank failures in other countries. A foreign bank might fail, and thus not transmit payments for funds for which domestic banks already have given depositors or other banks credit as occurred in the failure of the Herstatt Bank in Germany in 1974. Conversely, the receiving banks might be unable to pay other banks with claims on them. At the least, a costly unraveling of claims might be required. Thus, a domestic payments system might be disrupted because a foreign bank failed.

### **1.1.2. Instability of Bank Lending and Losses on Bank Assets**

Banks that invest in long-term fixed-interest obligations subject themselves to interest-rate risk, to the extent that these obligations are funded with short-term and demand liabilities. Should interest rates increase, the value of the banks' assets will decline more than the value of their liabilities, and they could be rendered economically insolvent. Such was the situation for U.S. savings and loan associations and mutual savings banks in 1979-1981.

Some contemporary observers, such as Minsky (1972, 1977, 1991) and Kindleberger (1978), believe that commercial banking is inherently unstable because banks can and do fuel an euphoria-driven over expansion of credit (one that is bound to crash) and of money by holding lower ratios of reserves to deposits than is prudent. When (and if) some of the businesses or projects to which banks presumably over extended credit fail, banks' assets are reduced in value and knowledgeable depositors attempt to withdraw their funds (as described above). Such a run may be contagious, either because many banks overextended credit at the same time or because depositors cannot or do not

find it economic to distinguish among economically solvent and insolvent banks.

Kindleberger (1978) provides copious examples of financial collapses in one country that appear to have been transmitted to other countries, occasionally through the collapse of banks. Eichengreen and Portes (1987, pp. 11-12) suggest an international linkage running from the default of foreign debt to the failure of banks holding that debt, or depositor withdrawals in anticipation of a foreign exchange-rate devaluation.

### **1.1.3. The Relevance of Banking Instability to Countries With Deposit Insurance Or An Effectively Run Central Bank**

A fractional-reserve banking system is not unstable if depositors who withdraw their funds either redeposit in other banks or purchase safe securities, such as government obligations, and the sellers deposit the proceeds in banks. If the funds are redeposited, total bank reserves do not change, as the receiving banks' reserves are increased to the same extent that the losing bank's reserves are depleted. As long as banks have approximately the same voluntary or required ratios of reserves, the money supply is not affected. Nor is total lending affected, other than some deadweight losses from a possible reshuffling of bank-customer relationships. This conclusion holds even if depositors shift their funds to foreign banks, as the foreign banks now have deposits on the original or another domestic bank.

However, some depositors might "run to currency" and keep their deposits out of the banking system in the form of specie (gold and silver) in earlier times and government-produced currency in later times. Such a run to currency would reduce the reserves of the banking system, and some banks would be more likely to fail. Consequently, in the absence of actions by the central bank, if there were one, there could be a multiple contraction of the money supply. As Friedman and Schwartz (1963) demonstrate, when prices do not adjust quickly to the lower quantity of money the result usually is a business recession or depression. The situation is exacerbated when banks are forced to call in or forbear from renewing loans so that they can meet the decrease in deposits from decreases in assets (Bernanke, 1983).

However, central banks could and generally do offset the decrease in bank reserves with open market operations or direct (discount window) lending to banks. Thus, even a run to currency need not and should not result in a banking panic or general economic disaster in modern developed economies.



Furthermore, credible deposit insurance removes many depositors' incentives to run to currency, even if the bank were thought to be insolvent. Although uninsured depositors still have incentives to run, they are very likely to transfer their deposits to other, presumably safe banks. Almost all of these depositors with large deposit balances (over \$100,000 in the United States) must use checks or wire transfers rather than currency to pay their bills. Furthermore, keeping large amounts of funds in specie or currency risks loss through theft. Lastly, these depositors often have loan relationships with the bank which are valuable and costly to replicate elsewhere, and their outstanding bank loans can be used to offset deposit losses. Hence, a run to currency in the present day in most developed countries appears to be an unlikely event.

Nevertheless, those concerned with the expansion and sudden contraction of bank deposits and loans claim that banking is unstable whether or not total bank reserves or reserve ratios remain the same. These observers believe that, when demand for bank loans is high, banks shift from secondary reserves to loans and the central bank makes additional reserves available. In bad economic periods, even when depositors do not run to currency and even when the central bank offsets depletions in bank reserves, bank loans decline as some banks fail and other banks refuse to make or renew loans that appear to be risky. Thus, these observers believe that the banking system (and, therefore, also the payments system) is inherently unstable and cannot be controlled sufficiently well by a central bank to obviate difficulties in the rest of the economy.

### **1.2. The Sources of Instability in Fractional Reserve Banking**

It is important to distinguish among the sources of presumed past and possible future instability of the fractional reserve banking system as alternative explanations imply different public policies. Four alternatives are analyzed: (1) excessive expansion of bank credit (which calls for controls over bank lending practices); (2) asymmetric information resulting in the inability of depositors to value bank assets accurately, particularly when economic conditions worsen (which calls for greater disclosure, or effective "inside" monitoring arrangements); (3) shocks originating outside the banking system, independent of the financial condition of banks, that either cause depositors to change their liquidity preferences or cause reductions in bank reserves (which is no longer relevant for most counties, unless their central banks act inappropriately, or which necessitates the provision of credible deposit insurance, either of which offers strong reasons for believing that banking

panics should not occur); and (4) institutional and legal restrictions that weaken banks, making them unnecessarily prone to failure (some of these have been corrected and others can be corrected).

### **1.2.1. Excessive Expansion of Credit Followed by Forced Liquidation and Debt Deflation**

Fisher (1932, 1933), and contemporary writers, such as Minsky (1972, 1977, 1991) Kindleberger (1978), and Eichengreen and Portes (1987), see financial crises as emanating from or being exacerbated by over expansion of credit. Fisher describes business cycles as beginning with an exogenous event, such as a new invention or discovery, that encourages new investment. Output and prices increase, which encourages debt-financed additional investment and speculation in anticipation of capital gains. Banks expand loans by drawing down reserves, which increases the money supply and raises the price level. Higher prices both fuel additional optimism and reduce the real value of debt, thereby further encouraging additional borrowing. Eventually, a state of over indebtedness is reached, defined by Fisher (1932, p. 9) as "whatever degree of indebtedness multiplies unduly the chances of becoming insolvent." At this point, the economy is fragile and a crisis may be triggered by debtors' or creditors' errors of judgment. Debtors may be unable to repay their debts as scheduled, and creditors may refuse to refinance performing maturing debt. This leads to distress selling and asset-price deflation. Bank capital is depleted as bad loans are written off. Depositors run on banks that appear to be or might become insolvent, creating panics and further price declines, and reductions in output and employment. The process continues until widespread bankruptcy eliminates the over-indebtedness or a reflationary monetary policy is adopted.

Minsky (1972, 1977, 1991) presents a similar description. He posits that a fragile financial environment is due to an increase in debt finance, a shift from long-term to short-term debt, and shifts from debt that can be repaid fully from cash flows expected from the operation of the assets financed (hedge debt), to debt where not all the principal can be repaid without selling the assets (speculative finance), to a situation where additional debt will have to be obtained to meet expected obligations (Ponzi finance). Financial institutions' margins of safety are reduced as they finance lower-quality debt. A loss of confidence or reduced expectations can set off a refinancing crisis, business failures, runs on banks, bank failures, and economic depression. The crisis can spread internationally when banks lend internationally.

Kindleberger (1978) tells the story by means of many anecdotes from centuries of European and U.S. history. A speculative mania is fueled by bank money and increasing velocity. As euphoria takes over, interest rates increase and people shift increasingly from money to goods, resulting in "overtrading." Capital inflows from foreign purchases of goods and assets lead to inflows of specie which fuel monetary expansion and more credit. The crash comes when enough people realize that the debt cannot be repaid. For a more recent period, he concludes (Kindleberger, 1985, p. 28):

The bank failures . . . of 1974-86 . . . were brought on by booms in real estate, farm land, oil exploration and Third World lending that went to excess before they were cut short by recessions. . . . The bank failures . . . thus seemed to arise from an historical pattern of displacement, euphoria, boom in which many bankers lost sight of conventional and conservative standards of asset management, and in some cases crossed the line into violations of the law. The relaxation of standards produced loan and investment portfolios vulnerable to recession . . .

Kindleberger does not necessarily argue that this speculative over- expansion of bank credit ignites an economic downturn, but that it worsens the problem that is started by some other force. He describes a few notable bank failures of the 1930s, from which he concludes that they "fit precisely the Minsky-Kindleberger hypothesis of credit stretched taut in a positive feedback process" (Ibid., p. 17).

Minsky and Kindleberger emphasize the role of the lender of last resort in preventing or mitigating financial collapse. Indeed, Minsky (1991, p. 163-4) explains why a financial collapse has not happened in recent times as follows:

The combination of lender-of-last resort interventions, which abort the development of debt-deflation processes, the generalized increase in liquidity as the Federal Reserve reacts to an embryonic crisis, and the deficits that big government runs when income turns down explains why a serious, long-lasting and deep depression has not taken place up until now. Big government and a central bank that is willing and able to intervene explain why it has not happened yet.

Kindleberger (1978), who is more concerned with internationally transmitted financial disasters, calls for an international lender-of-last-resort. Guttentag

and Herring (1987, pp. 173-8) also conclude that an international lender-of-last resort would be desirable. However, they do not suggest creation of a single world central bank. Rather, they urge that each large bank with extensive international operations be "adopted" by a central bank, which would serve as its lender-of-last resort.

### **1.2.2. Asymmetric Information Resulting in Depositors' Inability to Value Bank Assets and Banks' Inability to Assess Borrower Quality**

Banks specialize in making and holding loans that are not readily marketable, in large measure because other investors cannot determine the risk posed by these loans as readily or as cheaply (Diamond, 1984). Banks can utilize economies of scale and specialization to reduce the transactions cost of determining the probability that a borrower will not repay a loan as promised, to monitor the borrower's performance and circumstances, and to take effective actions to reduce the probability and cost of defaults (Benston and Smith, 1976). Thus, banks have information about the value of loans that depositors and other outside investors do not have. This asymmetric information situation gives rise to a moral hazard that reduces the amount banks might get should they attempt to sell or securitize their loans.<sup>3</sup>

Several financial economists have suggested that bank panics are a consequence of information asymmetry that makes bank loans difficult for outsiders to value; when adverse economic events occur, depositors have reason to question the value of loans. Calomiris and Gorton (1991, p. 125), for example, give the following summary of this theory: "banking panics are essentially due to revision of the perceived risk of bank debt in an environment where there is asymmetric information about bank asset portfolios."<sup>4</sup> Mishkin (1991, p. 74) further explains: "depositors rush to make withdrawals from solvent as well as insolvent banks since they cannot distinguish between them." Indeed, some students of banking argue that many depositors want deposits redeemable on demand at par in order to exert pressure on bankers to manage their risks appropriately (Calomiris and Kahn, 1991 and Flannery, 1994). They expect to withdraw these funds without loss if they have reason to question the bankers' abilities or probity. This demand supplements the demand for a medium of exchange.

Thus, banking panics are seen as an inherent source of bank instability that is tipped off by economic events that are perceived to reduce asset values and endanger the value of deposits, such as the failure of large or important firms, unexpectedly large seasonal fluctuations, or major recessions (Gorton, 1988,

754-5). This theory should be distinguished from the "excessive expansion of credit" theory, which sees banks as a prime culprits or facilitators rather than victims of business collapse.

The asymmetric information hypothesis also focuses on the inability of banks to differentiate among their potential borrowers, particularly in periods of rising uncertainty and higher interest rates. As a result, banks are likely both to charge higher quality borrowers higher rates than otherwise, encouraging them to cut back on their loan demands and reduce their investment projects, and to reduce lending to all borrowers, thereby reducing spending across-the-board. In this scenario, the banks transmit and possibly amplify disruptions in financial markets that adversely affect economic activity.

### **1.2.3. Exogenous Deposit and Reserve Withdrawals**

Deposit runs may also be started by events that may not be perceived as reducing bank asset values, such as increased demand for assets that serve as bank reserves emanating from adverse pressures on exchange rates and the balance of payments. This would result in *ceteris paribus* outflows of gold during a gold-standard period. Given the necessity of banks' offering depositors currency and deposits that are redeemable in specie on demand and at par, an unexpected exogenous withdrawal of specie from a country will result in a reduction in the banking system's reserves that may cause a multiple collapse of the money supply and a liquidity crisis. A similar situation can occur when central banks destroy high powered money through their open market and other policy operations. Thus, this hypothesis posits that bank panics could occur before central banks were established (e.g., the United States in the national banking period) or when they did not neutralize an exogenous outflow of reserves from the banking system.

In a related but different approach, Diamond and Dybvig (1983) construct a self-contained model in which changes in some depositors' liquidity preferences ignite a run by encouraging other depositors to withdraw their funds rather than suffer losses should the value of the bank's illiquid assets be insufficient to repay them in full. Depositors are assumed to redeem their claims only in the sequence they are received. Thus, a run causes queuing at the bank, which is observed by other depositors who then increase their demand for liquidity in order to be more safe than sorry. Diamond and Dybvig declare: "A bank run in our model is caused by a shift in expectations, which could depend on almost anything, consistent with the apparently irrational observed behavior of people running on banks" (*Ibid.*, p.

404). Such a shift may result from "a random earnings report, a commonly observed run at some other bank, a negative government forecast, or even sunspots" (ibid., p. 410). They conclude that a lender of last resort can help alleviate this situation, but that government deposit insurance is the superior solution.

#### **1.2.4. Institutional and Legal Restrictions that Weaken Banks**

Because of the basic unit banking structure in the United States, banks in the pre-Federal Reserve years developed and heavily used correspondent banking arrangements to deal with both expected and unexpected withdrawals of deposits and demands for loans. In the national banking period (1863-1914), reserves were concentrated in the New York banks, and legal and cartel restrictions hindered New York banks from using interest rate adjustments to retain those deposits during periods of heavy withdrawal demand. At the same time, the banks were (and still are) restricted from diversifying their assets and deposits.

Some of the earliest analysts of bank failures (particularly Sprague (1910)) point to restrictions on branching as the cause of the much greater number of banking panics in the United States than were experienced elsewhere. During the Great Depression, a common observation was that the United States's restrictions on branching resulted in thousands of bank failures, in comparison with Canada's nationwide branching system, which experienced no bank closures. However, Canadian banks closed many branches, and there is reason to believe that, although Canadian banks remained open, many were economically insolvent (Kryzanowski and Roberts, 1993). Thus, although branch banking can reduce failures that result from regional collapses, it cannot insulate a banking system against national or international shocks that adversely affect the entire economy or the nation's money supply.

## **2. Empirical Research on the Sources of Bank Failures and Banking Panics**

A number of studies provide evidence on the four hypotheses that attempt to explain why banking and the payments system are inherently unstable. These hypotheses are: (2.1) overexpansion of credit by banks and nonbanks caused banking and economic collapse; (2.2) bank runs, suspensions, and failures were caused by asymmetric information ; (2.3) exogenous deposit and reserve withdrawals are responsible for bank failures and banking panics; and

(2.4) bank runs, suspensions, and failures were caused by government-instituted restrictions that weakened banks. Our review of the evidence leads us to reject the "overexpansion" hypothesis and models based on exogenous deposit withdrawals. However, we find persuasive the evidence that banks failed because of exogenous outflows of reserves. The evidence also is consistent with a version of the asymmetric information hypothesis, and with the hypothesis that government-instituted regulations weakened banks.

### **2.1. Overexpansion of Credit by Banks and Nonbanks Caused Banking and Economic Collapse**

There is not much evidence supporting the hypothesis that overexpansion of credit by both nonbanks and banks caused a banking collapse and then an economic collapse, although there is some reason to believe that banks fueled some local unsustainable business expansions (such as the Texas and New England real-estate booms in the 1980s).<sup>5</sup> There is considerable evidence, though, that business failures often preceded banking panics. Thus, it appears that banking panics or collapses did not cause economic downturns, although they did exacerbate them.

Kindleberger (1978) briefly describes (and gives references to in-depth economic studies) dozens of events that illustrate the overexpansion theory.<sup>6</sup> He also presents a table listing thirty-seven financial crises that occurred between 1720 and 1976. His text and table descriptions appear to support his thesis. He states that most of the crises were brought under control by an effective lender of last resort. Unfortunately, he does not distinguish clearly between financial expansions that were fueled by bank lending from those driven by increases in base money or by discoveries and inventions. Nor does he clearly identify crises that were caused or exacerbated by exogenous changes in the domestic gold supply, by depositor runs on solvent banks, or those that were due to institutional constraints or fraud. Nor does he contrast his narrative with examples of important business failures that were not accompanied by financial crises (with one exception), or bank failures that were not followed by financial crises or economic contractions. Hence, although many of his examples seem plausible, they do not appear to support the case for causal relationships.

Schwartz (1986, 1988) subjects Kindleberger's theory to empirical test. First, she distinguishes between "real" and "pseudo" financial crises. A real financial crisis, she says (1986, p. 11), "is fuelled by fears that means of payment will be unobtainable at any price and, in a fractional-reserve banking

system, leads to a scramble for high-powered money. . . . The essence of a financial crisis is that it is short-lived, ending with a slackening of the public's demand for additional currency." A pseudo-financial crisis, on the other hand, may involve only a loss of wealth as previously glowing expectations are replaced by uncertainty. "But a loss of wealth is not synonymous with a financial crisis" (*ibid.*, p. 23). In her 1986 article, Schwartz gives many examples to illustrate her distinction between real and pseudo crises. In her 1988 article, she catalogues the incidence of banking panics between 1890 and 1929 in seventeen countries. She finds (1988, p. 39) that, "[i]n contrast to the frequency of bank failures, before 1930 banking panics in which all depositors attempt to withdraw their deposits in currency were uncommon." "Bank failures," she reports, "occurred in a variety of circumstances, the causes including fraud, mismanagement, banking structure, and relative price change or general price level instability. In some years of bank failures, there were runs, but no panics. Panics sometimes occurred in conditions of general price level instability, but most countries had learned by the end of the nineteenth century what actions were necessary to avert panics" (*Ibid.*, pp. 35-36). She concludes: "Clearly, bank failures do not betoken either runs or the onset of panics" (*ibid.*, p. 40).

Schwartz (1988) argues that those, such as Kindleberger, who hypothesize that banks are inherently unstable because economic agents inherently act in unstable ways, fail to recognize the detrimental effect on banks of unexpected changes in price levels and of dysfunctional incentives faced by bank managers. She points out that banks' risk profiles and the stability of the banking system would be enhanced by greater macro price-level stability and by a policy of resolving bank failures before their capital turned negative.

Cagan (1965) analyzed the role of banking panics in his study of the determinants of the U.S. money supply. He associates panics with the prior failure of prominent financial institutions or railroads. However, he also finds that panics all followed peaks in economic activity, from which he concludes that they did not precipitate economic downturns. However, he finds that panics were important in reducing money supply growth, which converted mild contractions into severe contractions. But, because two severe economic downturns (1920-21 and 1937-38) and two mild downturns (1890 and 1914) were not associated with banking panics, Cagan concludes that panics were neither necessary nor sufficient for such downturns to occur.

Bordo (1986) examines evidence from six countries—the United States, Great Britain, France, Germany, Sweden, and Canada—on the relationship between



the incidence of financial panics and declines in economic activity that might have resulted from overexpansion and monetary contraction. Over the period 1870-1933 in the countries studied, Bordo finds: "First, severe declines in economic activity in all countries are associated with (prior) declines in monetary growth. Second, most severe cyclical contractions in all the countries examined are associated with stock market crashes, but not, with the exception of the US, with banking crises" (ibid., pp. 229-230).<sup>7</sup>

Finally, Eichengreen and Portes (1987) compare international financial crises in the 1930s with those in the 1980s. They are particularly interested in describing "the singular importance of linkages running from debt defaults and exchange market disturbances to the instability of banking systems" (ibid., p. 18). In the prior decades, they say "foreign lending was associated with expanding trade and rosy prospects at least in the short run" (ibid., p. 15). They find that "[m]acroeconomic events, rather than disturbances limited to financial markets, played a leading role in the onset of the debt crisis" of the 1930s (ibid., p. 21). The defaults did not greatly affect foreign banks, as the debts were a relatively small proportion of their assets. However, domestic banks, which held proportionately more of the debt of the same borrowers, were more severely hurt. Furthermore, Eichengreen and Portes conclude that "shocks with the potential to destabilize the banking system did not lead to generalized collapse because central banks acted in lender-of-last resort capacity and simply did not permit this to happen" (ibid., p. 26). The same, they state, cannot be said for the United States. (Kindleberger, 1978, and Minsky, 1991, reach a similar conclusion.)

Eichengreen and Portes (1987) describe the 1980s as characterized by a "density of international interbank relationships [that] now is incomparably greater [than the earlier period]" (ibid., p. 33). Exchange rates have exhibited unexpectedly high volatility without (surprisingly, they say) exchange-market collapse or any overall drift towards controls (ibid., p. 36). Foreign debt exposure has grown. But there have been no serious financial crises. Eichengreen and Portes conclude: "The main dangers lie not in disturbances originating in financial markets but in malfunctions of the real economy" (ibid., p. 50).

## **2.2. Bank Runs, Suspensions, and Failures Were Caused by Asymmetric Information**

Studies testing the asymmetric information hypothesis provide evidence supporting the version that posits that bank failures and panics are caused by

business failures, rather than the reverse. Presumably, because it is difficult for depositors to value banks' assets, depositors run on banks because their experience with business collapse causes them to believe that banks also may also be insolvent. However, the studies do not distinguish between bank failures caused by actual reductions in the value of banks' assets and failures caused by runs on solvent banks that were perceived to be insolvent.

Calomiris and Gorton (1991) tested the asymmetric-information and the random-withdrawal hypotheses with data from the national banking period. They examined measures of bank liquidity (reserve ratios and changes in deposits) in the weeks before the six episodes that they identify as banking panics because clearing-house certificates were issued or authorized: 1873, 1884, 1890, 1893, 1896, and 1907. They also examine the data for unusually large seasonal shocks and business failures. Adverse general economic conditions are measured by unusually large changes in stock prices. They find that the data "do not support the notion that panics were preceded by unusually large seasonal shocks or that panics resulted from tripping a threshold of bank liquidity" (*ibid.*, p. 133). They also find that "the timing of panics (with the possible exception of the Panic of 1873) places them after weeks of seasonal shocks associated with planting and harvesting" (*ibid.*, p. 138, emphasis in original). Thus, they reject the agricultural seasonal explanation for panics.

However, Calomiris and Gorton (1991) find that unusually adverse movement in stock prices characterized the pre-panic periods. "[L]arge withdrawals [by country banks from New York banks]", they state, "only threatened the banking system when they were accompanied by (perhaps precipitated by) real disturbances" (*ibid.*, p. 143). They find that "panics are associated with a threshold level of news receipt concerning the growth of liabilities of failed businesses, which is a leading indicator of recession" (*ibid.*, p. 148). Because the news receipt induces a sudden but rational downgrading by depositors of the financial health of their banks, Calomiris and Gorton conclude that the asymmetrical-information theory of banking panics is supported.

In addition, they examine analyses published in the annual reports of the Comptroller of the Currency of the causes of the 116 bank failures that occurred in the roughly six months around the panics. They report: "in the overwhelming majority of cases (91 of the 116), failure was not attributed to panic-induced stringency in the money market. Furthermore, the fact that the Comptroller only attributed one failure to a bank run per se shows that the direct link between bank runs and bank failures during panics was not

important" (*ibid.*, p. 154, emphasis in original). In addition, they find a regional pattern of failures that is "incompatible with the withdrawal risk view of panics" (*ibid.*, p. 158).

Calomiris and Gorton's (1991) findings, based on tables of data, confirms Gorton's (1988) earlier econometrically based study. Gorton examined the variables associated with the deposit/currency ratio in periods characterized and not characterized by banking panics during the national banking period. Using quarterly call-date data, he finds that changes in business conditions and risk (proxied by the liabilities of failed businesses and changes in pig iron production) peak at the same time as banking panics, and concludes that "panics seem to have resulted from changes in perceived risk predictable on the basis of prior information" (*ibid.*, p. 778). Furthermore, he finds that the equations fitted with data from the nonpanic periods explain the panic periods well. He also analyses the banking panics of 1930, 1931, and 1933, and finds that they occurred well after the business cycle peak. His analysis causes him to reject the Diamond/Dybvig "depositor instability" and Minsky/Kindleberger "loan contraction" theories: "the mechanism of causality running from depositors withdrawing currency from 'illiquid' banks and causing businesses to fail is not present, at least when all [panic] dates are examined. Second, the response of banks to panics was not to liquidate loans, but to issue circulating private money which insured depositors against the failures of individual banks" (*ibid.*, pp. 778-779).

Donaldson (1992) uses weekly data from 1867 through 1933 to test Gorton's (1988) finding that panics and nonpanics are generated by similar responses to changing perceptions of deposit risk, and the inference that changed economic conditions caused banking panics, rather than the reverse. Donaldson uses the (brokers') call-loan interest rate as the dependent variable.<sup>8</sup> Using a dummy variable structure to measure the effect of panics, he finds that, while call-loan interest rates increase generally when bank reserves and deposits decrease, there is a larger-than-normal increase during bank panics. Also, a stock-market index variable is not significantly related to call-loan interest rates in nonpanic weeks, but is significantly negatively related in panic weeks lower stock prices are associated with higher interest rates during panics. Thus, Donaldson's shorter-period weekly data reveal that brokers' call-loan interest rates are higher during panics, but that the relationship between panics and interest rates is played out within a quarter. We believe that his findings are consistent with Gorton's view that negative economic events as measured by stock prices caused or are associated with banking panics.

Mishkin (1991) examined banking panics over the period 1857 through 1988, primarily by charting stock prices and the spread between high-grade commercial paper and brokers' call loans monthly in periods around banking and financial panics. He also gives a narrative discussion of each panic, pointing out the specific business failures that preceded the panics. He finds (*ibid.*, p. 96) that:

1. with one exception in 1873, financial panics always occurred after the onset of recession;
2. with the same exception in 1873, stock prices declined and the spread between interest rates on low- and high-quality bonds rose before the onset of the panic;
3. many panics seem to have features of a liquidity crisis in which there are substantial increases in interest rates before the panic;
4. the onset of many panics followed a major failure of a financial institution, not necessarily a bank. Furthermore, this failure was often the result of financial difficulties experienced by a nonfinancial corporation;
5. the rise in the interest spread associated with a panic was typically soon followed by a decline . . . [followed, in 1873, 1907, and the Great Depression, by an increase] when there was deflation and a severe recession;
6. the most severe financial crises were associated with severe economic contractions . . .;
7. although stock market crashes often appear to be a major factor in creating a financial crisis, this was not always the case.

Mishkin (1991, p. 97) concludes that his findings are consistent with the asymmetric-information theory: "Rather than starting with bank panics, most of the financial crises began with a rise in interest rates, a stock market decline, and the widening of the interest rate spread." He rejects the deposit-withdrawal theory of financial panics because it cannot explain why banking panics occurred when they did (*ibid.*, p. 97).<sup>9</sup>

Park (1991) discusses the panics of 1873, 1884, 1893, and 1907 and the nationwide bank holiday in 1933. From his narrative descriptions, he concludes that "[l]iquidity risk . . . does not by itself invite systemwide bank runs. The other necessary ingredient is a lack of bank-specific information on solvency" (ibid., p. 285). He does, though, consider exogenous reductions in bank reserves as a causal factor.<sup>10</sup>

### **2.3. Exogenous Deposit and Reserve Withdrawals**

Several studies provide strong evidence leading to the conclusion that exogenous outflows of bank reserves (primarily gold before 1934) that were not attributable to actual or perceived weaknesses in bank asset values resulted in shortages of liquidity and banking panics. This situation affected primarily the United States, as it did not have an effective lender of last resort. The findings reviewed are consistent with the hypothesis that banking panics are due to actions or inactions of central banks, rather than to an inherent instability of banking.

As noted, Donaldson (1992) examined the relationship between call-loan interest rates, bank reserves, deposits, stock-market prices, and banking panics from 1914 (after the creation of the Federal Reserve) through 1934. He finds higher interest rates associated with panics but not with the other variables. Miron (1986) found that the Federal Reserve was able to reduce the magnitude of seasonal interest rate changes, compared to the national banking period before it was established. However, he also found "that the Fed accommodated the seasonal demand in financial markets to a lesser extent during the 1929-33 period than it had previously. This means that the frequency of the panics should have increased, as it did." (Ibid., p. 136, emphasis in original.) Donaldson (1992) conducted further tests showing that banking panics are characterized by the inability of the money supply to expand rapidly during economic crises. Even though panics may be "special events," he concludes that "panics can be stopped by allowing banks to turn nonliquid assets into cash by printing new banknotes during times of crisis" (ibid., p. 295). These findings are consistent with the hypothesis that exogenous outflows of bank reserves or gold, or ineffective actions by the central bank cause banking panics. (They also are consistent with the asymmetric-information hypothesis.)

Donaldson (1992) confirms Gorton's (1988) finding that the panic of 1933 would have been more serious had the Fed not (belatedly) injected new money in that year. Donaldson also reports that gold reserves at the Fed fell

prior to the onset of the panic, which he notes, supports Wigmore's (1987) hypotheses that the March 1933 bank holiday was caused by reductions in the money supply as people hoarded gold in anticipation of the devaluation of the dollar.

As noted above, Cagan (1965) and Bordo (1986, 1992) find that banking panics and economic downturns are associated with declines in the monetary gold stock and high-powered money. Huffman and Lothian (1984) examine the international transmission of economic fluctuations under the pre-1933 gold standard. They find that, between 1830 and 1934, gold outflows played the most important role in reducing the domestic money stock in both the United States and Great Britain. Furthermore, because they find banking panics in but three of twelve common cycles, they conclude that panics have little importance as a means by which economic fluctuations are transmitted internationally.

Tallman and Moen (1994) investigate whether exogenous outflows of the gold stock were key in starting a banking panic during the national banking period. At that time, gold comprised the principal portion of banks' reserves that actually changed. They describe the causes of gold outflows from the United States, such as the Bank of England's raising the discount rate from 2.5 to 6.0 percent in 1882 and the European central banks raising their discount rates in 1890. The United States did not have a central bank that could neutralized these actions with offsetting increases in discount rates. Using statistical techniques, Tallman and Moen distinguish between expected and unexpected gold flows. They find that panics are due primarily to unexpected exogenous gold shocks (outflows). These outflows preceded stock market declines, interest-rate increases (spikes), and output contractions.

Wigmore (1987) provides strong evidence indicating that the banking panic of 1933 was caused by a run on the dollar, rather than a loss of confidence in the solvency of banks. The run was precipitated by indications that President Roosevelt would devalue the dollar once he took office (which, at the time, was not until March 4th). The prospect of substantial returns from holding gold resulted in a drain of gold from commercial banks and the Federal Reserve banks, particularly the Federal Reserve Bank of New York. Closing all banks until the reserves could be replaced (as gold was purchased by the Treasury at \$35 an ounce, compared to its previous market price of \$21 an ounce), as Roosevelt did in the Bank Holiday of March 1933, was an effective way to deal with this government-caused crisis.

Much of the academic criticism of the Diamond/Dybvig (1983) model has been concerned with the restrictiveness of their assumptions. Calomiris and Gorton (1991) present an excellent review of much of this literature.<sup>11</sup> Some of these articles point out that panics would not occur if depositors' demands did not have to be met sequentially. Others argue that the implications would be different if allowance was made for multiple banks rather than a single bank and the banks could take cooperative protective actions against runs. "Thus," Calomiris and Gorton (1991, p. 123) point out, "panics were not inherent to banking, but were linked to a particular institutional structure, namely, unit banking and reserve pyramiding." Nevertheless, Diamond and Dybvig's model predicts that banking panics would occur at random times and in a wide variety of institutional arrangements. Hence, its basic prediction appears to be contradicted by even a casual examination of the data.

Furthermore, by assuming a monopoly bank, Diamond and Dybvig automatically assume that a run on one bank is equivalent to a run on the banking system and do not take account of the protective arrangements banks might make in a multiple bank system. These include cooperative actions, such as correspondent banking arrangements and clearing house agreements, to mitigate bank runs.<sup>12</sup> At the same time, Diamond and Dybvig cannot take account of competitive actions by banks in a multiple bank system to assure depositors that they have, or can get, the funds depositors might demand. They also take no account of actions by central banks to maintain bank reserves should depositors remove their funds from the banking system (or from the monopoly bank) and keep the funds in currency or specie.

Calomiris and Gorton (1991) subjected the "random depositor-withdrawal" hypothesis to rigorous tests using data from the U.S. national banking period. These tests provide no support for the hypothesis that depositor instability was a cause of banking runs, suspensions or failures. Furthermore, Schwartz's (1988) finding that banking panics were unusual events (except in the United States) is inconsistent with the random depositor-withdrawal hypothesis. Hence, we conclude that the policy implications of the Diamond and Dybvig model are not very useful for understanding the workings of the extant banking and payments system.

#### **2.4. Bank Runs, Suspensions, and Failures Were Caused by Legally Instituted Restrictions that Weaken Banks**

Many empirical studies (including those discussed above) indicate that the United States experienced bank panics in large measure because of the

weaknesses of the national banking system and restrictions on branching. These findings are important, because they provide reason to believe that banking panics can be reduced in frequency, if not avoided altogether, by a banking system that permits diversification through branching and in which bank reserves are controlled appropriately by a central bank.

Sprague (1910) analyzes five of the six U.S. banking panics in the national bank period associated with serious economic downturns 1873, 1884, 1890, 1893, and 1907. (The sixth occurred in 1914.) He notes that the panics occurred in either spring or fall, and that they usually were preceded by the failure of a large business or financial firm. The seasonal movement of funds between agricultural areas and financial centers put strains on banks' reserve positions, making them vulnerable to an unexpected shock, such as the failure of an important firm or an unexpectedly large harvest or a natural disaster. Without a central bank to replenish reserves, some banks had to suspend the convertibility of bank notes to specie as note holders and depositors attempted to run to what they saw as "good" money, and some banks failed.

Smith's (1991, p. 233) narrative description of banking panics during the national banking period indicates that "panic related withdrawal demands (on New York banks) came heavily from interior [country] correspondent banks. And restrictions on payments by New York (and other money center) banks fell much more heavily on correspondent banks than on non-bank depositors." This finding is consistent with the hypothesis that institutional and legal constraints caused or exacerbated banking panics.

Bordo (1986) finds that monetary contractions associated with financial contractions were more severe in the United States than in the other five countries he studied. "One explanation," he says, "is the greater instability, compared to that of the five other countries, of the US banking system—a system composed largely of unit fractional reserve banks with reserves pyramided in the New York money market. . . . In contrast with the U.S. experience, the five other countries in the same period all developed nationwide branch banking systems consolidated into a few very large banks" (ibid., p. 230). (His second reason is the absence of an effective lender of last resort.)



## **2.5 Conclusions from the Empirical Research on the Sources of Bank Failures and Banking Panics**

The empirical research reviewed leads us to reject the hypotheses that bank panics have been caused by or related to over-expansion by banks and nonbanks or to random runs by depositors. The evidence is consistent with the strand of the asymmetric-information hypothesis which posits that depositors tend to run on banks when adverse economic conditions (such as a stock market crash or the failure of well-known, important companies) leads them to doubt the value of banks' assets, although the evidence does not distinguish between runs on insolvent and solvent banks. The evidence does support the hypothesis that banks were rendered more likely to fail when adverse shocks were experienced because of existing government restrictions on their ability to diversify risks and institutional weaknesses of the U.S. national banking system. We find persuasive the data supporting the hypothesis that bank panics were caused by liquidity crises that were the result of exogenous withdrawals of bank reserves. These withdrawals took the form of exports of specie and depositors' runs to specie and currency. These reserve depletions can be offset by actions taken by the central bank. Hence, we conclude that the private banking and payments systems are not inherently unstable.

Central bankers (and others), though, often express fears that runs on banks could be contagious, spreading before the central bankers can take effective measures to neutralize reserve withdrawals. Furthermore, they are concerned that contagious bank panics could result in the failure of many banks, thereby reducing the supply of bank credit in some areas and causing considerable economic distress. Hence, we turn now to evidence on contagious runs on banks.

### **3. Contagion of Bank Runs, Suspensions, and Failures**

Runs on banks have been a subject of fascination by finance professionals, regulators, the press, and the general public for many years. Runs, like all financial panics and doomsday scenarios, make "good press," in part because banking is not well understood and thus any perceived breakdown is frightening to the public. One of us has reviewed thoroughly the literature on bank runs in a recent article (Kaufman, 1994A). The empirical evidence on bank runs is clear; except for speed, runs on banks that lead creditors to withdraw their funding are not much different than customer and creditor

responses to other industries' products that are perceived to be dangerous, e.g., contaminated soft drinks or medication, airplane crashes, and nuclear power plant accidents. The evidence suggests clearly that depositors run on particular banks for specific, well-documented reasons (e.g., large losses on LDC and real-estate loans relative to a bank's capital or fraud), and they run on other banks that appear to have similar problems because of similarities in their balance sheets, borrower characteristics, or market areas. However, depositors do not run on banks that are not so perceived. That is, runs are bank-specific and information based, not industry-wide and rumor based. This is true even in the few periods in U.S. history in which there were serious runs to currency because depositors doubted the solvency of many banks,<sup>13</sup> e.g., 1893 and 1929-1933 (Calomiris and Mason, 1994).

Moreover, the evidence shows that runs were not a major cause of bank failures. Runs may have caused liquidity problems, but the "fire-sale" losses were rarely great enough to render a bank insolvent. Rather, solvency problems caused by other factors led to runs that caused liquidity problems that worsened a bank's solvency problems. Thus, depositors appear capable of differentiating between solvent and insolvent banks, just as they can differentiate between tampered and untampered drug and soft drink products, and dangerous and safer modes of transportation.

The evidence suggests that bank runs and failures rarely conform to the process described in many academic models. Runs are initially ignited by specific, observable events affecting special banks rather than an exogenous shift in depositor liquidity preferences affecting all banks. Solvent banks experiencing sudden deposit withdrawals can sell assets to or borrow funds quickly from other banks to restore their deposit losses at reasonably low cost. Only banks known to other banks to be insolvent or nearly so would experience difficulties in recycling funds and face closure. Consequently, the likelihood of runs on most or all banks, which is a prerequisite for a run to currency, is small. Except for fraud, bank insolvencies are not sudden nor occur overnight. As discussed earlier, this casts doubt on the usefulness of models that assume only one bank so that a run on a bank and on the banking system are one and the same, such as the model constructed by Diamond and Dybvig (1983).

Even if there were a run to currency, the potential damage could be avoided if the central bank offset the reserve drain from banks by increasing its reserve provision through open market operations or discount window lending by amounts equal to the reserve loss. In the absence of central banks, banks

typically undertook cooperative actions through clearing house associations that limited reserve losses through temporary suspensions of convertibility, in early days of bank notes for specie and in later days of deposits for currency. Clearinghouses also issued loan certificates that banks used to clear checks, thereby allowing them to operate with lower levels of reserves (Dwyer and Gilbert, 1989, and Tallman, 1988). Thus, as documented by Schwartz (1988), except in the United States, banking panics caused by bank runs have been rare in the last century.

## 4. Costs of Bank Failures, Runs, and Panics

The consequences of a bank failure and a banking panic can be severe. First (in section 4.1), we consider the cost of the failure of or run on a single bank and then (in section 4.2) the cost of the failure of several banks. In section 4.3, we discuss the risks to the payments system of bank failures and panics. Because derivatives have come into increasing use recently and are potentially a source of large losses, we consider the risks associated with these financial instruments in section 4.4.

### 4.1. The Cost of the Failure of a Single Bank

Bank customers (particularly borrowers) who made investments in bank-specific information and for whom making alternative arrangements are costly, might be hurt should their bank fail or have to reduce the extent or scope of its operations as a result of a run. However, it is important to note that other banks offer very similar services and products, and most bank customers have accounts with more than one bank.<sup>14</sup> Furthermore, other firms offer close substitutes to almost all of the products and services offered by banks. Many nonbank financial companies make loans, including installment loans made by consumer and sales finance companies, mortgages by mortgage bankers, and commercial loans by nonbank lenders such as General Electric Capital Corporation, and loans in the form of accounts receivable by many companies. Checking is the only important possible exception, and this service is offered, to a limited extent, by brokerage houses and money market mutual funds, who let their customers use their bank accounts. These other financial institutions also offer employment opportunities for the employees of a closed bank. Nevertheless, some private information known only to the bank providing the loan or other financial service may be costly to transfer quickly and some bank customers are likely to suffer transition costs.

Stockholders, depositors with partially uninsured balances, nondeposit creditors, and perhaps some senior bank managers and other employees at a failed bank might suffer losses. But, this possibility provides an important incentive for these parties to take actions that would avoid or mitigate losses. Moreover, except when liquidated, failed banks do not disappear. As long as there is an unmet demand for banking services in the service area, failed banks usually are acquired by or merged with an existing bank or sold to new owners. Thus, most employees are likely to keep their jobs, although not perhaps their exact positions.

Losses to uninsured depositors and other creditors depend on the magnitude of the bank's economic negative net worth when the bank is resolved. This, in turn, depends on how quickly a bank is resolved after its net worth is fully depleted. If it is resolved before that time, as is contemplated by the structured early intervention and resolution provision of the FDIC Improvement Act of 1991, little if any losses would accrue to these claimants.

Should there be runs on solvent banks that are incorrectly thought to be insolvent (perhaps because apparently similar banks failed), "innocent" bank owners, nondeposit creditors, and senior managers might be hurt. But, the possibility of such runs can be negated by actions taken by banks to convince depositors that their funds are safe. Such actions include holding sufficient capital to absorb possible losses and disclosure of information about the bank's operations to obviate misperceptions. Moreover, even if such runs occur, bankers also can (and do) establish cooperative ventures, such as correspondent relationships, mutual insurance associations, and clearinghouses, to stop or reduce substantially the cost of the run. As Gorton (1985) and Gorton and Mullineaux (1987) show, these cooperative relationships were effective in mitigating the effect of banking panics on solvent banks.

Legal restrictions on branching, though, can hamper insolvent or weak banks from being acquired by other solvent banks. Even when banks can branch without restriction, laws that prohibit non-banking firms from owning banks also reduce the set of potential purchasers of weak banks. Such laws also restrict banks from diversifying optimally and from achieving economies of scope, and tend to protect ineffective bank managers from the discipline of the market for corporate control. Thus, the probability and costs of individual bank failure are increased as a result of restrictive laws.

The costs of a bank failure to stakeholders other than stockholders might be compared to the costs of the failure of other firms as an aid to assessing the relative importance of bank failures. As Horvitz (1965) observes: "The failure of the textile mill in the one-mill New England town is almost certainly a greater community disaster than the failure of the local bank in a one-bank town." The failure of a manufacturer of special purpose or unique equipment (such as milling machines and computers) would be costly to owners of that equipment who need parts and service, and to employees who had product-specific skills. In contrast, banks produce standardized products, such as checking accounts, and individualized products, such as loans, for which there are many close substitutes and alternative suppliers. Thus, there is reason to believe that bank failures are less disruptive than are business failures generally.

Benefits from bank failures and runs also should be considered. As noted above, the possibility or threat of runs gives bank managers and owners incentives to manage their banks prudently so that they can avoid and survive any run. The potential failure of banks, as with other firms, is desirable for an economic system to achieve efficiency. Actual failure also is an almost inevitable and necessary outcome of beneficial risk taking.<sup>15</sup>

Consequently, we conclude that there are relatively few direct costs and almost no costly externalities from individual bank failures, and there can be substantial benefits. On balance, then, individual bank failures, as such, should not be prevented. They are not a source of instability in the banking and, hence, of instability in the payments system.

#### **4.2. The Failure of Several Banks**

Bank failures are widely perceived as more harmful than the failure of other types of firms, particularly nonfinancial firms, because they are believed to occur faster, spread more broadly throughout the industry, result in larger numbers of failures of similar firms, impose larger losses on creditors (depositors), and are more likely to affect other sectors of the economy and the macroeconomy as a whole. The evidence on each of these reasons is summarized next.<sup>16</sup>

Because deposits, particularly demand deposits, can be removed faster from a bank than maturity debt from other financial and nonbank firms, and faster than reductions in sales can drive firms into insolvency, the "greater speed" hypothesis is true, almost by definition. However, faster failures are not

necessary more harmful failures. Indeed, if a firm has failed because of poor management, its creditors generally benefit from its expeditious closure. Ex ante, bank managers' concerns about runs by depositors serve to motivate the managers to operate their banks so that depositors do not perceive the need to run.<sup>17</sup>

Bank failures are believed to affect other banks more broadly than the failures of nonbanks affect other firms in the industry, both because depositors are assumed to be less able to differentiate the products or financial health of banks than of other firms, and because banks are directly connected through interbank balances (particularly in the United States, where branching is limited), so that the failure of one bank may impose losses on other banks. But, as noted in section 3, the evidence is overwhelming that failures and runs have been bank specific and that depositors have been able, at the margin, to differentiate between good and bad banks both before and after the introduction of the FDIC in 1934. Even anecdotal descriptions focus on a few institutions during panics, although most intermediaries faced large withdrawals. Moreover, the fact that banks have credit relationships with each other does not imply that they do not act to protect themselves from this exposure. For example, although the Continental Illinois Bank had deposit or Fed funds relationships with over 2,000 banks at the time of its failure in 1984, its failure did not directly cause the failure of any other bank. Indeed, had Continental's creditors not been protected by the FDIC, only two Continental-related banks would have suffered losses as large as fifty percent of their capital when Continental failed (Staff Report, 1991).

Although bank failures generally receive greater attention than other failures, the average annual rate of bank failures has been about the same as for nonfinancial firms. This is true even before the introduction of federal deposit insurance, particularly before the establishment of the Federal Reserve in 1913, when the average rate of bank failures was actually lower than that of nonbanks. But the annual variability rate for bank failures has been greater. To a considerable extent, the relatively high failure rate for banks in the United States reflects their inability to reduce their risks effectively by freely diversifying geographically or product-wise because of legally imposed restrictions (White, 1983 and Benston, 1990).

Similarly, although depositors are widely perceived to experience substantial losses in bank failures, the evidence suggests that their losses have been considerably smaller on average than those suffered by bondholders and other creditors in the bankruptcy of nonbanks (Kaufman, 1994A). The actuality is

due, primarily, to the faster bank resolution process, even in the 1930s and 1980s, than the bankruptcy process applied to nonbank firms. These lower resolution costs help explain the substantially lower capital ratios maintained by banks relative to nonbanking firms, both before and after the establishment of the FDIC.

Lastly, bank runs and failures are perceived to spill over beyond the banking sector to other financial sectors and the macroeconomy, primarily through runs into currency that result in a reduction in money aggregate and bank credit and through abrupt reductions in lending. But, as already discussed, with only rare exceptions, large-scale bank failures occurred after downturns in the national economy, not before. Thus, the stronger direction of causation appears to run from the real economy to banking, rather than the other way around. Loans that turned bad from bad economic conditions cause bank failures, rather than bad loans from over-expansion in a healthy economy cause bank failures and a turnabout in the economy.

#### **4.3 Risks to The Payments System**

As noted earlier, bank failures are viewed particularly adversely because banks' major liabilities (demand deposits) serve as the major part of the money supply and, at least in the United States, banks operate the interbank funds clearing system. An efficient payments system, in which transferability of claims is effected in full and on time, is a prerequisite for an efficient macroeconomy. Similarly, disruptions in the payments system result in disruptions in aggregate economic activity. To some observers, instability in the payments system is more threatening than instability in deposits. This fear appears to reflect the larger dollar volume of daily payments, the speedy movement of the funds, and unfamiliarity with the clearing process.

For an individual bank, the large volume of settlements nets out within a day. Checks and other interbank transfers through clearing houses (including the Federal Reserve) are not necessarily received and paid simultaneously during a day. Rather, within the day, banks frequently pay large claims on themselves (such as securities purchases by customers) before receiving payment from the customer. Such "daylight" overdrafts usually are settled at the close of the business day. A potential for default exists if the expected payments to the bank do not materialize in full and on a timely basis. Consequently, the paying bank may be unable to pay the receiving bank. In such a scenario, the previous payments need to be reversed or unwound. This may be complex and time consuming and cause "gridlock" in the payments

system that interrupts the smooth flow of trade. Moreover, if the losses to the paying bank from customer defaults were large enough to drive it into insolvency, the receiving banks would experience losses, which might be sufficient to drive them to insolvency if these losses exceed their capital.

But, these interruptions and losses occur because payment is not in "good funds" and daylight overdrafts are not priced correctly and, until recently in the United States, not priced at all if the transfers were conducted on the Federal Reserve's Fedwire. Indeed, to the extent the Federal Reserve guaranteed final payment on Fedwire, any losses would accrue to the Fed rather than to banks and daylight overdrafts would be implicitly encouraged. Thus, the existence of substantial amounts of daylight overdrafts on Fedwire reflects poor regulation, not an inherent weakness in the system (Flannery, 1988, Gilbert, 1989, and Eisenbeis, 1995). Without a government-provided guarantee, overdrafts are a credit-risk problem, basically similar to the credit-risk problems banks incur in their daily lending activities which they have learned to evaluate, monitor, and charge for.

#### **4.4 Banks' Activities in Derivative Financial Instruments**

Recently, attention has shifted to potential instability from the activities of banks and others in derivatives. Much of this concern is due to the observation that the notional value of these instruments is much larger than either that of deposits or the payments system, that transactions and payments occur quickly, and that the design of some of these instruments is highly complex, causing them to be mysterious to and misunderstood by many. Although most of the risks are credit- and interest-rate risks that are similar to those on other securities, some other risks may be greater, as the institutional framework is newer, probably less efficient, and not yet thoroughly tested by experience. These risks include settlement, operational (control systems), valuation (pricing), and legal (netting and bankruptcy) (GAO, 1994). Nevertheless, there appears to be no evidence that derivatives involve any greater threat to the stability of banking or the payments systems than do deposits or loans which is to say, no threat if banks maintain sufficient capital (as required by the market) and if the central bank acts effectively as a lender of last resort to keep the money supply from contracting.

Furthermore, there is reason to believe that derivatives are used primarily to reduce risks to banks and their clients. Interest-rate futures, forwards, swaps, and options are effective for reducing duration gaps at banks that fund long-term assets with short-term liabilities. Foreign currency futures, forwards,



swaps, and options can hedge the risks banks undertake in providing services to their customers. Those customers also benefit from banks' services in arranging interest-rate swaps and in making a market for financial derivatives. Over-regulation that prevents optimal use of derivatives to reduce risk, therefore, might increase the risk and cost of bank failures, and increase costs to banks' customers. Losses from unwise use of derivatives, like losses from unwise use of other assets, may be kept from damaging the banking system by having banks maintain sufficient capital to absorb possible losses and by resolving insolvencies in a timely manner. Excessive regulation may also prevent end-users from hedging adequately. Losses and even failure of nonbank dealers or end-users is of little public policy concern. Failure of banks that use derivatives is of greater concern due to the government's provision of deposit insurance. But, the dangers of large losses and contagion is reduced by the system of prompt corrective action and least-cost resolution of seriously undercapitalized banks, as described in section 6.

## 5. Lender of Last Resort

### 5.1 Domestic Lender of Last Resort

As argued above, bank panics or runs to currency should not cause bank failures in economies with central banks if the central bank performs its duties as lender of last resort to restore reserves lost to currency drains. The bank may do so either through its discount window or through open market operations. Discount window assistance has been the traditional technique used by central banks, particularly in economies in which the financial markets were not fully developed and able to transfer funds from surplus to deficit areas quickly and cheaply. In theory, banks experiencing runs could borrow from the central bank, which would lend to them as long as they believed the institution to be solvent. That is, the central bank provided liquidity assistance, not solvency assistance. To discourage banks from making unjustified use of such support, Bagehot (1873), Meltzer (1986), Schwartz (1992), and others recommended that the support be made available only at a penalty interest rate. But recent evidence, at least in the United States, suggests that the Federal Reserve did not provide such support only at penalty rates or only to illiquid but solvent institutions (Kaufman, 1991). As a result, many banks received liquidity support at subsidized rates. A study by the House Banking Committee reported that 90 percent of the more than 400 banks that received extended credit from the Federal Reserve discount window in recent years subsequently failed. (U.S. House of Representatives,

1991.) It is doubtful whether most or any of the banks, including large banks such as the Continental Illinois, New England National, M Corp, and First Republic, were solvent at the time they received assistance. Although the Federal Reserve may have better information about the financial condition of banks experiencing liquidity problems than the market and other banks, past experience does not indicate that it can use this information to restrict its lending only to solvent institutions. The Fed can lend to insolvent institutions with little concern, as it requires all loans to be fully collateralized. Losses from bank insolvency are borne by others—uninsured depositors, creditors, and the FDIC.<sup>18</sup> To the extent that Fed discount-window lending to insolvent or near-insolvent banks resulted in their generating larger losses than otherwise, the cost of these failures to the ultimate bearers of the losses was increased.

In an economy with a well developed financial market, the central bank need not determine the correct interest rate that it should charge or have to differentiate between solvent and insolvent illiquid banks. The bank could provide liquidity support only through open market operations, and permit the market to allocate the funds to individual banks. Market participants, whose own funds are at risk, are more likely to distinguish between banks experiencing only liquidity problems and those that are insolvent, and have incentives to determine the appropriate loan rate to charge than is a central bank, such as the Federal Reserve. Indeed, Schwartz (1988) notes that the Federal Reserve frequently confuses financial distress (individual bank problems) with financial crisis (banking system problems). Thus, the lender of last resort should provide liquidity to the banking system as a whole through open-market operations (macro-liquidity), rather than directly to individual banks through the discount window (micro-liquidity) (Goodfriend and King, 1988, and Kaufman, 1991).

## **5.2 International Lender of Last Resort**

Kindleberger (1978), Eichengreen and Portes (1987), and Guttentag and Herring (1987), among others, call for the establishment of an international lender of last resort, as a means of preventing banking panics from spreading from country to country. However, as we discuss above, there is no reason to believe that the banking and payments systems of individual countries cannot be protected fully by these countries' domestic lenders of last resort. Furthermore, there is no international money supply. Hence, there cannot be a multiple contraction of money and credit should depositors who fear the collapse of one or more banks run to currency.

Although the failure of a bank can cause disruptions in the operations of its customers and correspondents headquartered in other countries, the costs imposed on these parties are no different than the costs imposed as a result of the failure of other firms. Nor is there any reason to believe that banks, as well as nonbanks, would not act to protect themselves from such failures. Consequently, we see no role for an international lender of last resort, although international cooperation and the prompt sharing of relevant data would be beneficial.<sup>19</sup>

## 6. Conclusions and Policy Recommendations

Primarily because of the short-term nature of its liabilities and low capital ratios, banking is fragile. Banks can and do fail. But so do firms in other industries. Nor is the failure rate for banks significantly greater than that for nonbanks. We delineate and examine several proposed explanations for near simultaneous multiple failures of banks that have occurred in the past, particularly in the United States. These explanations include excessive expansion of credit, runs caused by depositors' inability to value banks' assets when the economy turns down or important firms fail (asymmetric information), exogenous withdrawals of reserves that are unrelated to weaknesses in bank asset values, and institutional and legal restrictions that weaken banks. From our review of the theory and evidence, we conclude that past multiple bank failures are consistent with the asymmetric information hypothesis, but were due primarily to the last two reasons—unexpected declines of aggregate bank reserves and institutional and regulatory restrictions. We find little evidence supporting the hypothesis that banking is inherently unstable.

Indeed, banking appears no more unstable than most other industries, whose failure rate is no less than that of banks, despite the fact that, at least in the United States, banks have been prevented by regulation from reducing risk more effectively through geographic and product diversification. Bank managers, owners, creditors and the market appear to be aware of the risks faced by banks and their greater fragility. Assuming that bank owners' and creditors' investments are at risk, there is no reason to believe that bank managers will not pursue effective risk management and control procedures to maintain profitability and solvency, much as do managers of nonbanking firms. As with other fragile objects, breakage need not be greater if appropriate care is taken, and bankers appear to have taken such care in the absence of government-imposed incentives to the contrary.

Bank failures are widely perceived to be contagious to other banks. Thus, bank failures are viewed as potential economic catastrophes. But there is little, if any, empirical evidence in support of this doomsday scenario. History indicates that, at the margin, bank customers have been able to distinguish good from bad banks and almost all runs have been bank specific. Although funding might be withdrawn quickly from insolvent banks, it is generally redeposited equally quickly at solvent banks, so that runs into currency or banking panics stemming from bank failures have been rare. When such runs have threatened, banks have been reasonably successful in taking collective action to limit the impact, both in terms of spill over to other sectors and in terms of duration. Little if any evidence suggests that bank failures, runs, and even panics ignited downturns in aggregate economic activity. Rather, the evidence strongly suggests that exogenous reductions in bank reserves that are not replaced by the central bank and serious downturns in the economy ignite banking problems. (Banking problems, though, may, worsen conditions in the rest of the economy.)

Moreover, the potential for all bank panics is reduced almost to zero when central banks act intelligently and restore aggregate reserves (not individual bank reserves) that would be reduced in runs to currency or do not prevent banks from taking their own corrective actions (both actions that the Federal Reserve failed to do in the early 1930s). Furthermore, credible deposit insurance exists on small deposits that can practically be converted into currency. Hence, there is little reason to expect a destabilizing run to currency.

The cost of individual bank failures is relatively small and not greatly different from the failure of any nonbank firm of comparable importance in its community. In fact, on average, the societal cost of preventing insolvent banks from failing is considerably greater, as such actions make excessive risk taking by banks more likely to occur. The simultaneous failure of large numbers of banks could be more costly if the credit and payments systems were disrupted. However, we emphasize that such failures can be prevented both by the central bank's acting as a lender of last resort that provides macro-liquidity to the banking system, and by governments not offering mispriced guarantees that encourage banks to assume greater risks than otherwise. Loans to individual banks are neither necessary nor cost effective. Similarly, we see no role for an international lender of last resort.

The policy solutions for preventing potential breakdowns from becoming actual breakdowns are straightforward and clear cut. Government should

remove restrictions that prevent banks from voluntary risk reduction (e.g., geographic and product restrictions for banks and appropriate use of derivatives), should provide incentives for clearing in good funds for the payments system, and be prepared to replace fully any aggregate reserves lost from currency runs. Government should be no more concerned with the failure of individual banks than with the failure of any other individual firms in any industry.

The solution to greater safety is to enhance efficiency and accountability in banking and bank regulation rather than decreasing either or both. We have outlined elsewhere what we believe to be an appropriate and feasible way of accomplishing these goals aggregate reserves lost from currency runs. Government should be no more concerned with the failure of individual banks than with the failure of any other individual firms in any industry.

The solution to greater safety is to enhance efficiency and accountability in banking and bank regulation rather than decreasing either or both. We have outlined elsewhere what we believe to be an appropriate and feasible way to accomplishing these goals within the restrictions of the existing federal government deposit insurance structure. Evidence from both this country and nearly all other major countries suggests that primarily for political reasons this structure is unlikely to be scaled back dramatically so that the federal government retains a direct interest in the financial well being of insured depository institutions. To minimize its potential losses, the government needs to reduce if not eliminate the now well recognized moral hazard problem for banks and principal-agent problem for regulators. (Benston and Kaufman, 1988). In brief, this may be achieved by requiring insured institutions to hold higher amounts of capital than they have held since the introduction of deposit insurance, amounts the market would deem in the absence of deposit insurance to be sufficient to absorb most losses that might incur. Capital should be measured in terms of the market values of banks' assets and liabilities. If capital were defined to include subordinated debentures that cannot be redeemed and that have a remaining maturity of at least two years, this higher capital requirement would not impose higher tax or other costs on banks, except for the effective removal of a deposit-insurance subsidy. The capital requirement would be enforced by a system of structured early intervention and resolution (SEIR) by regulators to make it more effective in discouraging poor and opportunistic management.

As a bank's capital-to-assets ratio declined through pre-specified tranches or "trigger points," the banking regulatory authorities first could and then would

have to impose restrictions on dividends and interest payments on subordinated debentures, expansion, fund transfers to affiliates, etc. Supervision and field examinations of banks would be conducted to ascertain that banks were reporting their capital correctly and were not engaged in extremely risky, illegal, or grossly incompetently managed activities. Banks with higher capital levels would be permitted to engage in a wider range of activities and be subject to less intense prudential regulation. Such carrots are as important as the sanction sticks. This structure is designed to mimic the sanctions the private market imposes on troubled noninsured firms and thus minimizes dead weight losses relative to other regulatory alternatives proposed (Benston and Kaufman, 1988).

A somewhat weaker version of SEIR was adopted in the FDIC Improvement Act of 1991.<sup>20</sup> Although the capital ratio defining the tranches are lower, and regulatory discretion is broader than we would prefer, the act appears to be working well in reducing the number and cost of bank failures and in producing a healthier industry.<sup>21</sup> If it were enacted fully and administered rigorously, we see no reason for banks to be regulated prudentially with respect to where they can operate, the products they can afford to offer consumers, the assets they can own, or their ownership by nonbank firms.

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#### Footnotes

<sup>1</sup>Kindleberger (1978) describes numerous examples of all sorts, stretching over several centuries and many countries. A recent example of a Ponzi scheme (named for a 1920s Boston promoter) is what once was Russia's largest investment company, the MMM stock fund. Despite presenting no information on how it generated earnings, and repeated warnings by the government against purchasing the stock, the price of MMM shares rocketed from about a dollar in February to \$50 in July, 1994, as the company drove up the price by repurchasing shares at higher and higher prices. The scheme collapsed when the government acted to close it down. (New York Times, July 30, 1994, pp. A1 and A4.)

<sup>2</sup>See Benston, et. al (1986), pp. 42-45 for a more extensive discussion.

<sup>3</sup>See Benston (1992) for an analysis of the effects of moral hazard in reducing the value to banks of securitizing commercial loans.

<sup>4</sup>They reference eight earlier works that make this point, dating back to 1987.

<sup>5</sup> See Horvitz (1990) for Texas and Randall (1993) for New England.

<sup>6</sup>Minsky's (1972) extensive description of his theory, or his subsequent discussions (1977, 1991) do not provide specific examples or studies that illustrate or support his theory. He does state (ibid., 1977, p. 139) that "the incipient financial crises of 1966, 1969-1970, and 1974-1975 were neither accidents nor the result of policy errors, but the result of the normal functioning of our particular economy." These dates appear to be associated with increases in credit; otherwise, he offers no explanation as to why he identifies them as "incipient financial crises." In his 1991 "clarification" he does not give examples or cite any studies. Neither does he mention the fact that the massive failure of savings and loan associations and the large number of bank failures experienced in the late 1980s did not give rise to or were associated with financial crises.

<sup>7</sup>Bordo's paper was published before the world-wide stock market crash of 1987. That crash did not result in financial crises in any country, which is inconsistent with the international-transmission-of-financial-crises hypothesis.

<sup>8</sup>He states (ibid., note 4, p. 285) "One could use the deposit/currency ratio instead of the interest rate as the dependent variable in our tests with similar results." Presumably, he actually did this test and found similar results.

<sup>9</sup>Mishkin calls this the "monetarist" explanation. Because he does not consider exogenous outflows of high-powered money, we prefer not to use this label.

<sup>10</sup>For example, he concludes that "the Roosevelt administration terminated the nationwide bank panic by successfully conveying information about the soundness of individual banks" following the March 1933 bank holiday. Park does not consider Wigmore's (1987) explanation that the bank holiday was necessitated by a run on gold, which was ended when the Roosevelt administration de-monetized gold.

<sup>11</sup>See Calomiris and Gorton (1991, pp. 121 - 124) for descriptions of and references to nine such articles.

<sup>12</sup>See Gorton (1985) and Park (1991), Gorton and Calomiris (1991, section 4.3), Tallman (1988) and Dwyer and Gilbert (1989).

<sup>13</sup>Such periods are defined as bank panics by Schwartz (1988).

<sup>14</sup>See Benston, et. al (1986), p. 39 for references to studies.

<sup>15</sup>See Tussig (1967) for an early explication of the benefits of bank failure, and Kaufman (1988) for an more extensive discussion.

<sup>16</sup>The evidence is reviewed more completely in Kaufman (1994A), which includes references to the research from which the conclusions are drawn.

<sup>17</sup>Flannery (1994) argues that banks issue demandable debt in part as a means of insuring creditors that their funds are likely to be safe from loss.

<sup>18</sup>Under the Federal Deposit Insurance Corporation Improvement Act of 1991 (FDICIA), the Federal Reserve would lose the interest on loans it made to banks that failed.

<sup>19</sup>See Benston (1994) for a more extensive analysis.

<sup>20</sup>See Benston and Kaufman (1994) for a description of the provisions included in FDICIA and an analysis of the differences with SEIR as proposed by Benston and Kaufman (1988) and others.

<sup>21</sup>Kaufman (1994B).

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