ANATOMY OF A FINANCIAL CRISIS

Frederic S. Mishkin

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ABSTRACT

This paper provides an asymmetric information framework for understanding the nature of financial crises. It provides the following precise definition of a financial crisis: A financial crisis is a disruption to financial markets in which adverse selection and moral hazard problems become much worse, so that financial markets are unable to efficiently channel funds to those who have the most productive investment opportunities. As a result, a financial crisis can drive the economy away from an equilibrium with high output in which financial markets perform well to one in which output declines sharply. The asymmetric information framework explains the patterns in the data and many features of these crises which are otherwise hard to explain. It indicates that financial crises have effects over and above those resulting from bank panics and therefore provides a rationale for an expanded lender-of-last resort role for the central bank in which the central bank uses the discount window to provide liquidity to sectors outside of the banking system.

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Introduction

A healthy and vibrant economy requires a financial system that moves funds to economic agents who have the most productive investment opportunities. Financial crises interfere with this process because they can drive the economy away from an equilibrium with high output in which financial markets perform well to one in which output declines sharply because the financial system is unable to channel funds to those with the best investment opportunities. This paper shows how this occurs by outlining an asymmetric information framework for understanding the precise nature of financial crises.

Earlier Views of Financial Crises

Up until recently, views of financial crises in the literature have split into two polar camps, those associated with monetarists versus a more eclectic view put forward by Charles Kindleberger and Hyman Minsky. Monetarists beginning with Friedman and Schwartz (1963) have linked financial crises with banking panics. They stress the importance of banking panics because they view them as a major source of contractions in the money supply which, in turn, have lead to severe contractions in aggregate economic activity in the United States. Monetarists do not view as real financial crises events in which, despite a sharp decline in asset prices and a rise in business failures, there is no potential for a banking panic and a resulting sharp decline in the money supply. Indeed, Schwartz (1986) characterizes these situations as "pseudo financial crises". Government intervention in a pseudo-financial crisis is unnecessary and can indeed be harmful since it leads to a decrease in economic efficiency because firms that deserve to fail are bailed out or because it results in excessive money growth that stimulates inflation.

An opposite view of financial crises is outlined by Kindleberger (1978) and Minsky (1972) who have a much broader definition of what constitutes a real financial crisis than monetarists. In their view, financial crises either involve sharp declines in asset prices, failures of both large financial and nonfinancial firms, deflations or disinflations, disruptions in foreign exchange markets, or some combination of all of these. Since they perceive any of these disturbances as

having potential serious consequences for the aggregate economy, they advocate a much expanded role for government intervention when a financial crisis, broadly defined, occurs.

One problem with the Kindleberger-Minsky view of financial crises is that it does not supply a rigorous theory of what characterizes a financial crisis, and it thus lends itself to being used too broadly as a justification for government interventions that might not be beneficial for the economy. Indeed, this is the basis of Schwartz's (1986) attack on the Kindleberger-Minsky view. On the other hand, the monetarist view of financial crises is extremely narrow because it only focuses on bank panics and their affect on the money supply.

Asymmetric Information and Financial Structure

The recent literature on asymmetric information and financial structure, which has been excellently surveyed recently by Gertler (1988a), on the other hand does provide a broader view of the nature of financial crises, but it supplies a theory which does not automatically justify government interventions when there is a sharp drop in wealth as the Kindleberger-Minsky view might. The review of the literature here provides a framework which can be used to understand financial crises in the following section.

Transactions that take place in financial markets are subject to asymmetric information in which one party often does not know all that he or she needs to know about the other party to make correct decisions. For example, a borrower who takes out a loan usually has better information about the potential returns and risk associated with the investment projects he plans to undertake than does the lender. Asymmetric information creates problems in the financial system in two basic ways: before the transaction is entered into (adverse selection) and after the transaction is entered into (moral hazard).

Adverse selection in financial markets occurs when the potential borrowers who are the most likely to produce an undesirable (adverse) outcome -- the bad credit risks -- are the ones most likely to be selected. Since adverse selection makes it more likely that loans might be made to bad credit risks, lenders may

decide not to make any loans even though there are good credit risks in the marketplace. This outcome is a feature of the classic "lemons problem" analysis first described by Ackerloff (1970). As pointed out by Myers and Majluf (1984) and Greenwald, Stiglitz and Weiss (1984), a lemons problem occurs in the debt and equity markets when lenders have trouble determining whether a lender is a good risk (he has good investment opportunities with low risk) or, alternatively, is a bad risk (he has poorer investment projects with high risk). In this situation, a lender will only be willing to pay a price for a security that reflects the average quality of firms issuing the securities -- a price below fair market value for high-quality firms, but above fair market value for low-quality firms. The owners or managers of a high-quality firm that know their quality then also know that their securities are undervalued and will not want to sell them in the market. On the other hand, the only firms willing to sell their securities will be low-quality firms because they know that the price of their securities is greater than their value. Since asymmetric information prevents investors from determining whether some firms are high quality, these firms will not issue securities and credit markets will not work well since many projects with a positive net present value will not be undertaken.

As demonstrated by Stiglitz and Weiss (1981), asymmetric information and the resulting adverse selection problem also leads to credit rationing in which some borrowers are denied loans even when they are willing to pay a higher interest rate. This occurs because individuals and firms with the riskiest investment projects are exactly those who are willing to pay the highest interest rates since if the high-risk investment succeeds, they will be the main beneficiaries. Thus a higher interest rate leads to even greater adverse selection; that is, it increases the likelihood that the bank is lending to a bad credit risk. If the lender cannot discriminate who are the borrowers with the riskier investment projects, it may want to cut down the number of loans it makes, which causes the supply of loans to decrease with the higher interest rate rather than decrease. Thus, even if there is an excess demand for loans, a higher interest rate will not be able to equilibrate the market because additional increases in the interest rate will only decrease the supply of loans and make the excess demand for loans increase even further. Indeed, as Mankiw (1986) has demonstrated, a small rise in the riskless interest

rate can lead to a very large decrease in lending and even a possible collapse in the market.[1]

Moral hazard in financial markets occurs after a loan is extended when the lender is subjected to the hazard that the borrower might engage in activities that are undesirable (immoral) from the lender's point of view, because they increase the probability of default. Moral hazard arises as a result of asymmetric information since the lender's lack of knowledge about the borrower's activities enables the borrower to engage in moral hazard. However, asymmetric information is not the only source of the moral hazard problem. Moral hazard can also occur because high enforcement costs might make it too costly for the lender to prevent moral hazard even when the lender is fully informed about the borrower's activities.

Moral hazard occurs because the borrower has incentives to invest in projects with high risk in which the borrower does well if the project succeeds but the lender bears most of the loss if the project fails. Also the borrower has incentives to misallocate funds for his own personal use, to shirk and just not work very hard, or to undertake investment in unprofitable projects that increase his power or stature. The conflict of interest between the borrower and lender stemming from moral hazard (the agency problem) implies that many lenders will decide that they would rather not make loans, so that lending and investment will be at suboptimal levels.

One way that financial markets can solve the problems created by asymmetric information is the use of collateral. Collateral reduces the consequences of adverse selection or moral hazard because it reduces the lender's losses in the case of a default. If a borrower defaults on a loan, the lender can take title to the collateral and sell it to make up for the losses on the loan. Thus if the collateral is of good enough quality, then the fact that there is asymmetric information between borrower and lender is no longer as important since the loss incurred by the lender if the loan defaults is substantially reduced.

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[1]Jaffee and Russell (1976) have demonstrated a second type of credit rationing in which lenders make loans but limit their size to less than the borrower may want. This occurs because the larger the loan, the greater are moral hazard incentives for the borrower to engage in activities that make it less likely that the loan will be repaid.

Net worth performs a similar role to collateral since if a firm has high net worth, then even if it defaults on its debt payments as a result of poor investments, the lender can take title to the firm's net worth, sell it off, and use the proceeds to recoup some of the losses from the loan. (Note that in a multi-period context, Gertler (1988b) shows that the concept of a borrower's net worth can be broadened to include the discounted value of future profits which is reflected in the market value of the borrowing firm.) In addition, the more net worth a firm has in the first place, the less likely it is to default because the firm has a cushion of assets that it can use to pay off its loans. High net worth also directly decreases the incentives for borrowers to commit moral hazard because they now have more at stake, and thus more to lose, if they default on their loans. Hence, when firms seeking credit have high net worth, the consequences of adverse selection and moral hazard are less important and lenders will be more willing to make loans.

Another way that financial markets can solve asymmetric information problems is through the private production and sale of information that allows lenders to have full information about the individuals or firms who need to finance their investment activities. However, the free-rider problem, in which people who do not pay for information can take advantage (free-ride off) of the information that others pay for, suggests that the private sale of information will only be a partial solution to the adverse selection and moral hazard problems. If some investors pay for information that tells them which securities are undervalued and therefore buy their securities, other investors who have not paid for this information can buy right along with the well-informed investors. If enough free-riding investors do this, the increased demand for the undervalued securities will cause their low price to be bid up immediately to reflect the securities' true value. As a result of all these free riders, investors who have paid for information will no longer be able to buy the securities for less than their true value. Once these investors realize that they cannot earn extra returns by purchasing this information, they will no longer be willing to purchase it. The weakened ability of private firms to profit from selling information will mean that less information is produced in the financial markets and so the adverse selection problem will continue to be severe.

The free-rider problem also makes it less likely that securities markets can

reduce moral hazard in financial markets. Monitoring and enforcement of restrictive covenants (provisions in debt contracts that restrict and specify certain activities of the borrower) is one method for reducing moral hazard. By monitoring a borrower's activities to see whether he is complying with the restrictive covenants and enforcing the covenants if he is not, lenders can prevent borrowers from taking on risk at their expense. However, because monitoring and enforcement of restrictive covenants are costly, the free-rider problem discourages this kind of activity in bond markets. If some investors know that other bond holders are monitoring and enforcing the restrictive covenants, then they can free ride on the other bond holders' monitoring and enforcement. Once these other bond holders realize that they can do the same thing, they also may stop their monitoring and enforcement activities, with the result that not enough resources are devoted to monitoring and enforcement. The outcome is that moral hazard continues to be a severe problem for marketable debt.

An important feature of financial markets that helps reduce the free-rider problem so that asymmetric information problems are reduced is the existence of financial intermediaries that make private loans, the most important of which are banks. Banks help reduce adverse selection problems in financial markets by becoming experts in the production of information about firms so that they can sort out good credit risks from bad ones. Then they can acquire funds from depositors and lend them to good firms. Banks' advantages in information collection activities are also enhanced by their ability to engage in long-term customer relationships and to issue loans using lines of credit arrangements. Because the bank is able to lend mostly to good firms, it is able to earn a higher return on its loans than the interest it has to pay its depositors. As a result, the bank is able to earn a profit, which allows it to engage in the information production activity. An important element in the ability of a bank to profit from the information it produces is that it avoids the free-rider problem by primarily making private loans. Because a private loan is not traded, other investors cannot free ride off the bank and bid up the loan's price, thus preventing the bank from profiting from its information production activities.

Because financial intermediaries such as banks primarily make private loans, no one else can free ride off their monitoring and enforcement activities. The

intermediary making private loans thus receives the benefits of monitoring and enforcement of restrictive covenants and will work to shrink the moral hazard problem inherent in debt contracts. Banks also have advantages in reducing moral hazard because, as demonstrated by Diamond (1984), they can engage in lower cost monitoring than individuals, and because, as pointed out by Stiglitz and Weiss (1983), they have advantages in enforcement of restrictive covenants since they can use the threat of cutting off lending in the future to improve borrower's behavior. The existence of the free-rider problem and banks' natural advantages in reducing moral hazard explain why banks have such an important role in financial markets of channelling funds to those with productive investment opportunities.

Understanding Financial Crises

The asymmetric information analysis outlined here provides a framework for understanding how a disruption in financial markets can cause a downturn in aggregate economic activity. It also provides the following more precise definition of what a financial crisis is. <u>A financial crisis is a disruption to financial markets in which adverse selection and moral hazard problems become much worse, so that financial markets are unable to efficiently channel funds to those who have the most productive investment opportunities.</u> A financial crisis thus results in the inability of financial markets to function efficiently, which leads to a sharp contraction in economic activity. Now we will take a more detailed look at how a financial crisis comes about and causes a decline in economic activity.

Factors Causing Financial Crises

Five factors in the economic environment can lead to substantial worsening of adverse selection and moral hazard in financial markets, which then cause a financial crisis and shift the economy from an equilibrium with high output to one with low output because the financial system is unable to channel funds to those with the best investment opportunities. The factors causing financial crises are:

(1) increases in interest rates, (2) stock market declines, (3) increases in uncertainty, (4) bank panics, and (5) unanticipated declines in the aggregate price level.

Increases in Interest Rates. As we have seen, individuals and firms with the riskiest investment projects are exactly those who are willing to pay the highest interest rates. If market interest rates are driven up sufficiently, because of increased demand for credit or because of a decline in the money supply, good credit risks are less likely to want to borrow while bad credit risks are still willing to borrow. Because of the resulting increase in adverse selection, lenders will no longer want to make loans, possibly leading to a steep decline in lending which will lead to a substantial decline in investment and aggregate economic activity.

Stock Market Declines. As emphasized by Greenwald and Stiglitz (1988), Bernanke and Gertler (1989), and Calomiris and Hubbard (1990), a sharp decline in the stock market, as in a stock market crash, can increase adverse selection and moral hazard problems in financial markets because it leads to a large decline in the market value of firms' net worth. (Note that this decline in asset values could either occur because of expectations of lower future income streams from these assets or because of a rise in market interest rates which lowers the present discounted value of future income streams.) The decline in net worth as a result of a stock market decline makes lenders less willing to lend because, as we have seen, the net worth of firms has a similar role to collateral, and when the value of collateral declines, it provides less protection to lenders so that losses from loans are likely to be more severe. Because lenders are now less protected against the consequences of adverse selection, they decrease their lending, which in turn causes investment and aggregate output to decline.

In addition, the decline in corporate net worth as a result of a stock market decline increases moral hazard incentives for borrowing firms to make risky investments because these firms now have less to lose if their investments go sour. The resulting increase in moral hazard makes lending less attractive, providing another reason why a stock market decline and hence a decline in net worth leads

to decreased lending and economic activity.

Increases in Uncertainty. A dramatic increase in uncertainty in financial markets, due perhaps to the failure of a prominent financial or non-financial institution, a recession, or a stock market crash, makes it harder for lenders to screen out good from bad credit risks. The resulting inability of lenders to solve the adverse selection problem, makes them less willing to lend, leading to a decline in lending, investment and aggregate activity.

Bank Panics. As we have seen, banks perform an important financial intermediation role by engaging in information producing activities that facilitate productive investment for the economy. Thus as described by Bernanke (1983), a financial crisis which results in a bank panic, the simultaneous failure of many banks, reduces the amount of financial intermediation undertaken by banks, and will thus lead to a decline in investment and aggregate economic activity.

The source of a bank panic is again asymmetric information. In a panic depositors, fearing the safety of their deposits, withdraw them from the banking system, causing a contraction in loans and a multiple contraction in deposits, which then causes banks to fail. Asymmetric information is critical to this process because depositors rush to make withdrawals from solvent as well as insolvent banks since they cannot distinguish between them. Furthermore, banks' desire to protect themselves from possible deposit outflows leads them to increase their reserves relative to deposits, which also produces a contraction in loans and deposits and promotes other bank failures. The net result is that a bank panic reduces the funds available to banks to make loans and the cost of financial intermediation rises, causing a reduction in investment and a decline in aggregate economic activity.

A bank panic also can lead to higher interest rates because the panic results in decreasing liquidity since the supply of funds to borrowers has been curtailed. As we have seen, this rise in interest rates directly increases adverse selection problems in credit markets and also can reduce the value of firms' net worth, which also increases adverse selection as well as agency problems. Thus, since

bank panics have the secondary effect of increasing adverse selection and agency problems in financial markets, bank panics lead to economic contraction through these channels as well.

Unanticipated Declines in the Price Level   Unanticipated declines in the price level also decrease the net worth of firms. Because debt payments are contractually fixed in nominal terms, an unanticipated decline in the price level raises the value of firms' liabilities in real terms (increases the burden of the debt), but does not raise the real value of firms' assets. The result is that net worth in real terms declines. A sharp drop in the price level, therefore causes a substantial decline in real net worth and an increase in adverse selection and moral hazard problems facing lenders. The resulting increase in adverse selection and agency problems causes a decline in investment and economic activity.[2]
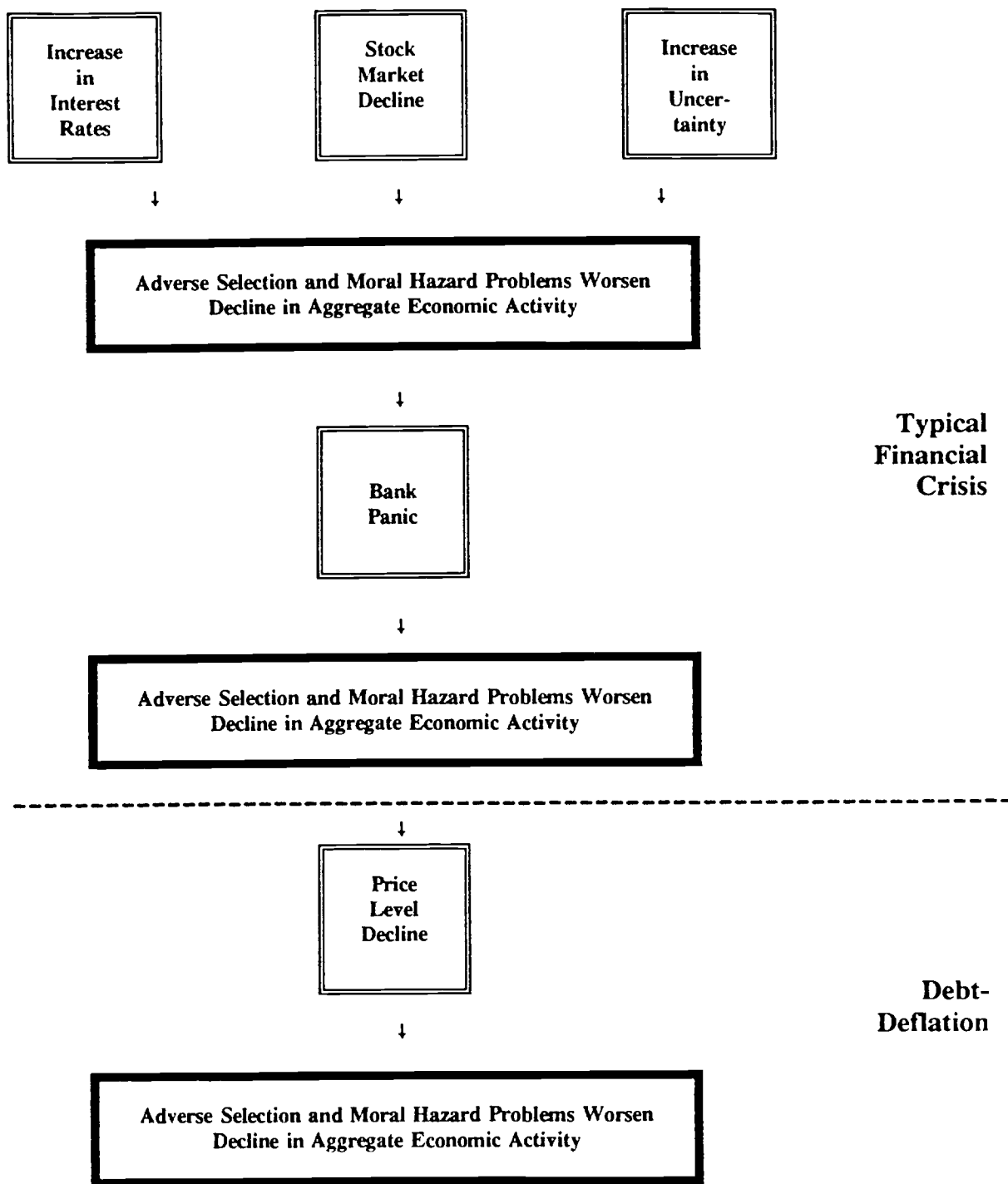
Anatomy of a Financial Crisis

Now that we have examined the five factors above that can interfere with the efficient functioning of financial markets, we are ready to describe the anatomy of a financial crisis. Figure 1 provides a diagrammatic exposition of the sequence of events that occur during a financial crisis, which are outlined below.

Most financial crises in the U.S. have begun with a sharp rise in interest rates, a stock market crash and an increase in uncertainty resulting from a failure of major financial or non-financial firms (the Ohio Life Insurance & Trust Co. in 1857, the Northern Pacific Railroad and Jay Cooke & Co. in 1873, Grant & Ward in 1884, the National Cordage Co. in 1893, the Knickerbocker Trust Company in 1907, and the Bank of United States in 1930.) During these crises the increase in uncertainty, the rise in interest rates and the stock market crash increased the severity of adverse selection problems in credit markets, while the decline in net worth stemming from the stock market crash also increased moral hazard

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[2]Calomiris and Hubbard (1989) emphasize this mechanism in their econometric analysis of the 1894-1909 period.

Increase in Interest Rates	Stock Market Decline	Increase in Uncer-tainty

↓ ↓ ↓

**Adverse Selection and Moral Hazard Problems Worsen
Decline in Aggregate Economic Activity**

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**Bank
Panic**

**Typical
Financial
Crisis**

↓

**Adverse Selection and Moral Hazard Problems Worsen
Decline in Aggregate Economic Activity**

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↓

**Price
Level
Decline**

**Debt-
Deflation**

↓

**Adverse Selection and Moral Hazard Problems Worsen
Decline in Aggregate Economic Activity**

Figure 1
Sequence of Events in a Financial Crisis

The sequence of events above the dashed line are those that occur in almost all financial crises, while the events below the dashed line occur if a financial crisis develops into a debt-deflation.

problems. The increase in adverse selection and moral hazard problems made it less attractive for lenders to lend and led to a decline in investment and aggregate economic activity.

Because of the worsening business conditions and uncertainty about their bank's health, depositors now began to withdraw their funds from banks because they worried that the banks might go broke. The resulting bank panic, in which the number of banks declined, raised interest rates even further and decreased the amount of financial intermediation by banks. The resulting worsening of the problems created by adverse selection and moral hazard led to further economic contraction.

Finally, there would be a sorting out of insolvent (truly bankrupt) firms from healthy firms by bankruptcy proceedings and the 'same process would occur for banks, often with the help of public and private authorities. Once this sorting out was complete, uncertainty in financial markets would decline, the stock market would undergo a recovery, and interest rates would fall. The result would then be a diminution in adverse selection and moral hazard problems and the financial crisis would subside. With the financial markets able to operate well again, the stage would be set for the recovery of the economy.

If, however, the economic downturn led to a sharp decline in prices, the recovery process might get short-circuited. In this situation described by Irving Fisher (1933) as a debt-deflation, the substantial decline in the price level leads to a further deterioration in firms' net worth because of the increased burden of indebtedness. If debt-deflation sets in, as occurred for example during the Great Depression, the adverse selection and moral hazard problems continue to increase so that lending, investment spending and aggregate economic activity remain depressed for a long time.

The monetarist literature adds an additional channel for how financial crises that involve bank panics could lead to a severe downturn in the aggregate economy. Friedman and Schwartz (1963) document how bank panics in the United States led to sharp contractions in the money supply as a result of depositors movement out of deposits into currency and banks movement out of loans into reserves. These contractions in the money supply then are seen as being responsible for substantial declines in economic activity and the price level.

The asymmetric information view of financial crises outlined here is complementary to the monetarist view of the importance of bank panics to contractions in economic activity. Indeed, the asymmetric information approach provides a transmission mechanism for how a decline in the money supply leads to a decline in aggregate economic activity. The debt-deflation that stems from a decline in the money supply increases adverse selection and moral hazard problems which cause a decline in investment and aggregate economic activity. However, the asymmetric information approach suggests that the impact of a decline in the money supply as a result of a financial crisis is not the whole story of why financial crises affect the aggregate economy. Instead it takes a much broader view of what a financial crisis is and puts a very different light on when a financial crisis is real rather than a pseudo-crisis.

Historical Evidence

In examining the historical evidence on financial crisis, our analysis suggests that we should look at stock prices, interest rates, instances of major failures of financial and nonfinancial institutions, and the aggregate price level when we analyze individual episodes of financial crisis. Asymmetric information analysis suggests an additional piece of information that can help us assess the nature of a particular financial crisis: the spread between interest rates for low and high-quality borrowers. When adverse selection increases in financial markets during a financial crisis there should be a large rise in interest rates to borrowers for which there is substantial difficulty in obtaining reliable information about their characteristics, that is, for which there is a serious asymmetric information problem. On the other hand, there would be a much smaller effect on interest rates to borrowers for which there is almost no asymmetric information problem because it is easy to obtain information about their characteristics. Since low-quality borrowers are more likely to be firms for which information about their characteristics is difficult to obtain, while high-quality borrowers are more likely to be ones for which the asymmetric information problem is least severe, a rise in the spread between interest rates for low and high-quality borrowers can provide

information on when the adverse selection problem becomes more severe in debt markets.

The spread between interest rates for low and high-quality borrowers can also provide information about whether moral hazard problems in financial markets are increasing during a financial crisis. High-quality borrowers with initially high net worth are much less likely to engage in moral hazard when a stock market crash or a deflationary shock occurs because they still will have sufficient net worth so that they continue to have much to lose if they default on their debts. On the other hand, when a stock market crash or a deflationary shock occurs, low-quality borrowers with initially low net worth will now have so little net worth left that their incentives to commit moral hazard will be greatly increased. The outcome is that a deflationary shock or a stock market crash which increases moral hazard problems in debt markets should result in a greater increase in interest rates for low-quality borrowers than for high-quality borrowers. An increase in the interest rate spread for low versus high-quality borrowers thus suggests that moral hazard as well as adverse selection problems are increasing in financial markets.

Mishkin (1991) examines the spread between interest rates on low and high-quality borrowers as well as the other variables mentioned above for episodes of financial crises from 1857 to 1940 in the United States and the following facts emerge.

1. With the same exception in 1873, stock prices decline and the spread between interest rates for low and high-quality borrowers rises before the onset of the panic.
2. Many panics seem to have features of a liquidity crisis in which there are substantial increases in interest rates before the panic.
3. The onset of many panics follows a major failure of a financial institution, not necessarily a bank. Furthermore this failure is often the result of financial difficulties experienced by a nonfinancial corporation.
4. With one exception in 1873, financial panics always occurred after the onset of a recession.
5. The rise in the interest rate spread associated with a panic is typically soon followed by a decline. However, in several cases, most notably

after the 1873 panic, the 1907 panic and the Great Depression, the interest rate spread rises again when there is deflation and a severe recession.

6. The most severe financial crises are associated with severe economic contractions. The most severe panic episodes are in 1857, 1873, 1893, 1907 and 1930-33, while 1857-58, 1873-79, 1893-94, 1907-08, and 1929-33 are all considered to be among the most severe economic contractions.

7. Although stock market crashes often appear to be a major factor in creating a financial crisis, this is not always the case. Both the stock market crash in October 1929 and in May 1940 did not have appreciable effects on the interest rate spread. Therefore, the evidence that there was a serious disruption in financial markets after these crashes is weak.

There are several conclusions that can be drawn from the facts listed above. The timing and the pattern of the data in the episodes studied here seem to fit an asymmetric information interpretation of financial crises. Rather than starting with bank panics, most of the financial crises begin with a rise in interest rates, a stock market crash and the widening of the interest rate spread. Furthermore, a financial panic frequently is immediately preceded by a major failure of a financial firm and the beginning of the recession which increases uncertainty in the marketplace. The increase in uncertainty and the rise in interest rates magnify the adverse selection problem in the credit markets, while the decline in the stock market increases adverse selection and moral hazard problems, both of which are reflected in the rise in the spread between interest rates for low and high-quality borrowers. The increase in adverse selection and moral hazard problems would then lead to a decline in investment activity and aggregate economic activity.

Only after these problems have manifested themselves in financial markets do we find that a bank panic occurs. The bank panic raises interest rates further, causes the stock market to decline even more and worsens adverse selection and moral hazard as manifested by a further widening of the spread between interest rates for low versus high-quality borrowers.

Finally, the sorting out of solvent from insolvent firms and banks occurs,

the crisis would then subside, the stock market undergoes a recovery, interest rates would fall, and if economic uncertainty and deflation were not too severe, adverse selection and agency problems would diminish, leading to a decline in the interest rate spread between low and high-quality borrowers. In episodes in which a substantial deflation does not occur we then expect and do see a rapid decline in the spread between interest rates for low versus high-quality borrowers.

However, in episodes in which a substantial deflation sets in, we see evidence of a debt-deflation process in which there is a prolonged continuation of a large spread between interest rates for low and high-quality borrowers. It is exactly in these episodes that we see aggregate economic activity depressed for a prolonged period of time.

The asymmetric information analysis of financial crises explains the events and their timing in these episodes more effectively than the monetarist view because a monetarist view does not explain why the spread between interest rates for low and high-quality borrowers rises dramatically before the panic and then declines quickly after the panic subsides. However, the asymmetric information story does not rule out important consequences on aggregate economic activity from the decline in the money supply that a banking panic produces. It just suggests that there is more to the story of a financial crisis than its affects on the money supply.

A monetarist explanation of financial crises is also not able to explain the timing of banking panics, that is, why they occurred when they did. An asymmetric information analysis, on the other hand, sees bank panics as a consequence of high interest rates, a major failure of a corporation, or weak business conditions stemming from a recession which makes depositors nervous about the health of banks that hold their deposits. Since depositors cannot easily screen out good from bad banks, when this adverse aggregate information appears, they worry about potential losses on their deposits and withdraw funds from the banking system, precipitating a panic. The facts about the crisis episodes discussed in Mishkin (1991) are thus entirely consistent with Gorton's (1987) view that bank panics are predictable.

Implications for Policymaking

An important issue for monetary policymakers is when they should engage in a lender-of-last-resort role. The traditional lender-of-last-resort role, as originally developed by Thornton (1802) and Bagehot (1873), requires the central bank to lend freely to banks at a penalty rate when a bank panic is in the offing. In recent years the Federal Reserve System has engaged in activities that go well beyond the traditional role of a lender of last resort. The Federal Reserve's perception that the financial system is more fragile in recent years because of increased leverage in both the financial and nonfinancial sectors has encouraged it to provide liquidity to the economy in the face of financial disturbances outside of the banking system, as occurred in the commercial paper market immediately after the Penn Central bankruptcy in June of 1970 or after the "Black Monday" stock market crash in 1987. Is this expanded lender-of-last-resort role beneficial for the economy? Under what conditions should the central bank stand ready to be a lender of last resort and how should it perform this role?

A monetarist view of financial disturbances sees them as important only if they produce banking panics which leads to a decline in the money supply. With this view, the lender of last resort role should be very a narrow one: the central bank should only lend freely to banks when there is a sudden desire on the part of depositors to withdraw their funds from banks. To lend freely at other times will only lead to inefficiency because firms that deserve to fail are bailed out, or because it results in excessive money growth that stimulates inflation. Indeed, the monetarist position suggests that if the central bank is able to keep monetary aggregates growing at appropriate rates, it is unlikely that a lender-of-last-resort role is even needed to promote the health of the economy. For example, McCallum (1988) takes the position that monetary policy only needs to concern itself with adherence to a monetarist-like rule which adjusts monetary base growth for past changes in velocity. In a more recent paper, McCallum (1989) suggests that pursuance of such a rule would have been enough to prevent the Great

Depression.[3]

A corollary of the monetarist view is that the operation of the discount window may be unnecessary. Open market operations are sufficient to keep the money supply on its target path and this is all that is needed to keep the economy functioning well. Using this reasoning, Friedman (1958) advocated abolishment of the Federal Reserve's discounting operation and more recently Goodfriend and King (1988) seem to come to a similar conclusion. Goodfriend and King (1988) dichotomize the activities of the central bank into "monetary policy", i.e., changes in the total volume of high powered money which can be entirely carried out with open market operations, and "banking policy", which involves regular lending and emergency financial assistance to individual banks and institutions along with regulatory and supervisory actions. Because they see financial crises as being essentially monetary in nature, they do not see the need for "banking policy" and discount lending. Since they consider the regulatory and supervisory activities that become necessary when there is discount lending by the central bank to be costly, they lean to elimination of Federal Reserve discount lending.[4]

The analysis of financial crises in this paper provides some evidence that the asymmetric information view of financial crises gives a better explanation of the facts than does the monetarist view. An asymmetric information view of financial crises, although it sees an important role for bank panics, does not see them as the only financial disturbances that can have serious adverse effects on the aggregate economy. Financial crises have effects over and above those resulting from banking panics, and analysis of such episodes as the stock market collapse in the 1937-38 period suggests that a financial crisis which has serious adverse consequences for the economy can develop even if there is no threat to the banking

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[3]Although I am critical here of McCallum's position that monetary policy only needs to concern itself with adherence to a monetarist-like rule in order to promote economic health, there are features of McCallum's rule that I find attractive. My criticism is that McCallum's rule does not specify when the Federal Reserve may need to engage in a lender-of-last-resort role.

[4]They do hedge their position, however, for they "wonder whether discount lending could be rationalized under a different criterion: to prevent the disruption costs of widespread insolvencies associated with temporary interest rate spikes." (Goodfriend and King (1988) p. 18.) The argument in this paper that disruption costs may indeed be high from widespread insolvencies provides a rationale for "banking policy" even in their framework.

system. The asymmetric information analysis thus suggests that a lender-of-last-resort role may be necessary to provide liquidity to nonbanking sectors of the financial system in which asymmetric information problems have developed. Furthermore, it suggests that financial disturbances outside of the banking system in the postwar period have had the potential to have serious adverse effects on the aggregate economy, and that these adverse consequences have in fact been prevented only by quick actions of the Federal Reserve to pursue an expanded role as a lender of last resort.

The asymmetric information interpretation of financial crises given in this paper thus provides a strong rationale for the following proposition eloquently stated by Andrew F. Brimmer, a former member of the Board of Governors of the Federal Reserve System: "the Federal Reserve System, as the nation's central bank, has a major responsibility in the containment of those types of risks which threaten to disrupt the fabric of the financial system which is so vital to the economy at large." (Brimmer (1989) p. 15.)

The asymmetric information interpretation of financial crises also provides a strong rationale for the operation of the discount window. As the analysis of the Penn Central bankruptcy, the stock market crash of October 1987, and the stock market crash of October 1929 in Mishkin (1991) indicates, the Federal Reserve can use the discount window to channel liquidity directly to the sector that is most in need of it. Without the discount window, the Federal Reserve can only provide liquidity to a specific sector by providing it to the overall economy using open market operations. Because this provision of liquidity might be very indirect, a larger infusion of liquidity may be needed to prevent the financial disturbance from creating severe asymmetric information problems. Consequently, in order for the central bank to achieve its objectives it may have to put so much liquidity into the economy that it would produce substantial inflationary pressure. Having the discount window at its disposal provides the central bank with a delicate tool that enables it to cope with financial disturbances without promoting inflationary tendencies.

The operation of the discount window also provides the central bank with another major advantage in dealing with potential financial crises. Government bailouts of individual firms have the significant disadvantage that it is likely to

keep inefficient firms in operation and also encourages excessive risk taking on the part of firms that expect to be bailed out. In essence, the problem is again one of asymmetric information because the government is unlikely to be able to separate out insolvent from temporarily illiquid firms. In addition, political pressures may influence bailout decisions to the detriment of economic efficiency.[5] Thus the Federal Reserve had justification for not lending directly to Penn Central to prevent its bankruptcy in June of 1970, even though the Fed was put under strong pressure to do so by the Nixon Administration.

On the other hand, discount lending enables the central bank to encourage lending to a sector of the financial system in which asymmetric information has become a serious problem and yet minimizes some of the efficiency losses from this lending. Using the discount window enables the central bank to take advantage of the monitoring and information collection expertise inherent in individual banks so that lending is likely to be made only to solvent business enterprises. In other words, the central bank is making use of the banks as delegated monitors on its behalf.

It is noteworthy that when the Federal Reserve advanced discount loans to banks lending to customers who needed to role over their commercial paper in the aftermath of the Penn Central bankruptcy, the banks were told that they would be responsible for the credit risk involved in this lending.[6] The Fed was making it clear to the banks that they would provide liquidity to prevent systemic risk, but would not be responsible for idiosyncratic risk. Similarly, when the Fed made discount advances in order for banks to extend additional loans to their brokerage firm customers after the stock market crash in 1987, it was made clear that these customers would have to be considered creditworthy by the banks. The burden of screening out good from bad borrowers was thus left to individual banks, who have the expertise to do this properly.[7]

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[5] The sad saga of the Savings and Loans mess bears this out.

[6] See Brimmer (1989), page 6.

[7] The discussion above illustrates why I think that the following statement by Goodfriend and King (1988) is misguided. On page 18 immediately following the quote in footnote 5 they state, "If such aggregate disruption cost were large enough, temporary transfers to the banking system

The use of banks as delegated monitors for the central bank during a financial crisis suggests that the traditional recommendation that the central bank should lend at a penalty rate when it performs its lender-of-last-resort role might be problematic. In order to provide banks with the incentives to act as the central bank's delegated monitor, banks must be able to profit from this activity. Thus there is a case for subsidizing banks by setting the discount rate below the interest rate they earn on their loans during a financial crisis. Without this subsidy, the banks might not be willing to make the necessary loans. The need for delegated monitors during a financial crisis might thus explain why central banks typically set their discount rate below market interest rates, which requires them to ration discount lending. Although monetary economists[8] have typically criticized central banks for setting the discount rate too low and engaging in rationing of discount loans, there is a partial rationale for this policy. However, it is not clear why central banks would not obtain the full benefits from banks acting as delegated monitors by setting the discount rate below market rates only during a financial crisis and not in more normal times.

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that could avoid such costs might be in society's interest. It should be pointed out, however, that a similar argument could be made for avoiding disruption costs of temporary insolvencies anywhere in the economy. Therefore, acceptance of the criterion for banking policy alone would need to be based on a demonstration that disruption costs are much larger in the banking sector than elsewhere." I disagree particularly with the last sentence. Use of the discount window (banking policy) is especially valuable if disruption costs are larger in the nonbanking sector than in the banking sector. Use of discounting to lend to banks who, in turn, lend to the sector in financial difficulty minimizes the adverse selection problem facing a central bank lending directly to that sector because it delegates information collection and monitoring to individual banks who have incentives to do this effectively. Thus discounting helps the central bank to deal with systemic risks and not idiosyncratic risks. Bernanke and Gertler (1990) also point out that advantages of using financial intermediaries who have information capital to make loans to a troubled sector of the economy.

[8]I have also been in this group. See Mishkin (1992), Chapter 19.

Conclusion

The asymmetric information analysis of financial crises explains many features of these crises which are otherwise hard to explain and shows why financial crises can have such important consequences for the economy. The asymmetric information approach indicates that financial crises have effects over and above those resulting from banking panics. It therefore provides a rationale for an expanded lender-of-last-resort role which provides liquidity to the financial system to avoid harmful financial disturbances, even when these disturbances originate outside of the banking system. It also supports the usefulness of a central bank having a discounting facility to enable it to efficiently provide liquidity to financial sectors that most need it. Indeed, it could be appropriate for the central bank to subsidize discount lending during a financial crisis by setting the discount rate below market interest rates. However, there are costs to such an expanded lender-of-last resort role for central banks since it might encourage more risk taking than is socially optimal. These costs need to be weighed against the benefits of an expanded lender-of-last resort role in designing appropriate rules for central bank policymaking.

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