Chapter Title: Asymmetric Information and Financial Crises: A Historical Perspective

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3   Asymmetric Information and Financial Crises: A Historical Perspective

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In recent years there has been a growing concern with the fragility of the financial system. Increasing defaults on junk bonds and the stock market crash of October 1987 have raised the specter of major financial crises which might inflict severe damage on the economy. Policymakers, particularly those in the central bank, are faced with the questions of what they should do to prevent financial crises and what their response should be when a financial crises appears imminent. In order to start providing intelligent answers to these questions, we must first understand the nature of financial crises and how they might affect the aggregate economy.

This paper seeks to understand the nature of financial crises by examining their history in the United States using the new and burgeoning literature on asymmetric information and financial structure, which has been excellently surveyed recently by Gertler (1988a). After describing how an asymmetric information approach helps to understand the nature of financial crises, the paper focuses on a historical examination of a series of financial crises in the United States, beginning with the panic of 1857 and ending with the stock market crash of 19 October 1987. The asymmetric information approach accounts for patterns in the data and many features of these crises which are

otherwise hard to explain. It also suggests why financial crises have had such important consequences for the aggregate economy over the past one hundred and fifty years,

3.1   The Nature of Financial Crises

There are two polar views of the nature of financial crises in the literature. Monetarists beginning with Friedman and Schwartz (1963) have associated 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, had led to severe contractions in aggregate economic activity in the United States. Their view of financial crisis leads monetarists to advocate a lender-of-last-resort role for the central bank, so that banking panics and the subsequent monetary instability will be prevented. Events in which there is a sharp drop in wealth but no potential for a banking panic and a resulting sharp decline in the money supply are not seen by monetarists as real financial crises that require any central bank intervention. Indeed, Schwartz (1986) characterizes these situations as "pseudo financial crises." Central bank intervention in a pseudo financial crises is viewed as unnecessary and, indeed, possibly harmful; that is, it may lead 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 held by Kindleberger (1978) and Minsky (1972), who have a much broader definition of what constitutes a real financial crisis than monetarists. They argue that financial crises involve either sharp declines in asset prices, failures of large financial and nonfinancial firms, deflations or disinflations, disruptions in foreign exchange markets, or some combination of all of these. Since they perceive any one of these disturbances as having potentially 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 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. At the other extreme, the monetarist view of financial crises is overly narrow because it focuses only on bank panics and their effect on the money supply. In contrast to both these views, the recent literature on asymmetric information and financial structure provides a broad definition of the nature of financial crises, while supplying a theory which does not automatically justify government interventions when there is a sharp drop in wealth.

The asymmetric information literature which looks at the impact of financial structure on economic activity focuses on the differences in information

available to different parties in a financial contract. Borrowers have an informational advantage over lenders because borrowers know more about the investment projects they want to undertake. This informational advantage results in adverse selection and the classic "lemons" problem first described by Akerlof (1970). A lemons problem occurs in the debt market because lenders have trouble determining whether a borrower 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). If the lender cannot distinguish between the borrowers of good quality and bad quality (the lemons), he will only make the loan at an interest rate that reflects the average quality of the good and bad borrowers. The result is that high-quality borrowers will be paying a higher interest rate than they should because low-quality borrowers pay a lower interest rate than they should. One result of this lemons problem is that some high-quality borrowers may drop out of the market, with what would have been profitable investment projects not being undertaken.[1]

Another result, as demonstrated by Stiglitz and Weiss (1981), is that information asymmetry can result in credit rationing in which some borrowers are arbitrarily denied loans. This occurs because a higher interest rate leads to even greater adverse selection: the borrowers with the riskiest investment projects will now be the likeliest to want to take out loans at the higher interest rate. If the lender cannot identify the borrowers with the riskier investment projects, he may want to cut down the number of loans he makes, which causes the supply of loans to decrease rather than increase with the higher interest rate.[2] Thus, even if there is an excess demand for loans, a higher interest rate will not equilibrate the market because additional increases in the interest rate will only decrease the supply of loans and worsen the excess demand for loans 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 possibly even a collapse in the market.

The adverse selection–lemons analysis above indicates how a disruption can occur in financial markets that adversely affects aggregate economic activity. If market interest rates are driven up sufficiently because of increased demand for credit or because of a decline in the money supply, the adverse selection problem might dramatically worsen and there will be a significant decline in lending, which, in turn, results in a substantial decrease in investment and aggregate economic activity. In addition, if uncertainty increases in a financial market such that it becomes harder for lenders to screen out good borrowers from bad borrowers, the adverse selection problem would also increase dramatically and, again, could lead to a sharp decline in investment and aggregate activity.

These mechanisms suggest that an important manifestation of a financial crisis would be a large rise in interest rates to borrowers for whom there is substantial difficulty in obtaining reliable information about their characteristics; that is, for whom there is a serious asymmetric information problem. At

the same time, there would be a much smaller effect on interest rates to borrowers for whom almost no asymmetric information problem exists because information about their characteristics is easily obtainable. Since low-quality borrowers are more likely to be those 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 on low-quality versus high-quality bonds can provide information on when the adverse selection problem becomes more severe in debt markets.

One way that lenders can reduce the adverse selection problem in debt markets is to have the borrower provide collateral for the loan. Thus, if the borrower defaults on the loan, the lender can take title to the collateral and sell it to make up the loss. Note that if the collateral is of good enough quality, then it is no longer as important whether the borrower is of good or bad quality since the loss incurred by the lender if the loan is defaulted on is substantially reduced. With collateral, therefore, the fact that there is asymmetric information between the borrower and lender is no longer as important a factor in the market.

The importance of collateral for reducing the adverse selection problem in debt markets suggests another mechanism whereby financial disruption adversely affects aggregate economic activity. As emphasized by Calomiris and Hubbard (1990) and Greenwald and Stiglitz (1988), a sharp decrease in the valuation of firms' assets in a stock market crash lowers the value of collateral and thereby makes adverse selection a more important problem for lenders since the losses from loan defaults are now higher. Note that this decline in asset values could occur either 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 lemons problem analysis indicates that the increased importance of adverse selection will lead to a decline in lending and, therefore, a decline in investment and aggregate economic activity. Again, we would expect that this increase in the adverse selection problem would affect interest rates for lower-quality firms more than for higher-quality firms, about whose characteristics there is better information. Hence, the problem would be manifested by an increase in the interest-rate spread for high- versus low-quality borrowers.

Asymmetric information between borrowers and lenders also results in a moral hazard problem which affects the efficiency of financial markets. Because leaders have trouble ascertaining the quality of investment projects that borrowers wish to undertake, the borrower has incentives to engage in activities that may be personally beneficial but will increase the probability of default and thus harm the lender. For example, the borrower has incentives to cheat by misallocating funds for his own personal use, either through embezzlement or by spending on perquisites which do not lead to increased profits.[3] Also the borrower has incentives to undertake investment in unprofitable proj-

ects that increase his power or stature or to invest in projects with higher risk, in which the borrower does well if the project succeeds but the lender bears most of the loss if the project fails. In addition, the borrower has incentives to shirk and to just not work very hard. The conflict of interest between the borrower and lender (the agency problem) implies that lending and investment will be at suboptimal levels. Indeed, as indicated by Bernanke and Gertler (1989), a lower amount of a borrower's net worth increases the agency problem because the borrower has less to lose by engaging in moral hazard. Hence, a decline in borrowers' net worth leads to a decrease in lending, and thus a decline in investment and aggregate economic activity.

The agency and adverse-selection problems provide additional mechanisms for financial crises to affect the aggregate economy. An unanticipated deflation or a disinflation redistributes wealth from debtors to creditors by increasing the real value of debt, and thereby reducing borrowers' net worth. The resulting increase in adverse selection and agency problems causes a decline in investment and economic activity.[4] The presence of asymmetric information thus provides a rationale for Irving Fisher's (1933) debt-deflation analysis of depressions which points to a decreasing price level and increased real indebtedness as a major source of the economic contraction during the Great Depression. In a multiperiod context, Gertler (1988b) shows that the concept of a borrower's net worth can be broadened to include the discounted value of future profits. Thus a stock market crash which represents a decreased valuation of firms' discounted future profits also increases adverse selection and agency problems and can lead to a decline in investment and a business-cycle contraction.

Firms with high net worth and a high value of discounted future profits—that is, high-quality firms—are much less likely to have greatly increased agency costs (costs due to asymmetric information in the market) when a stock market crash or a deflationary shock occurs, than low-quality firms with low net worth and a low value of discounted future profits. An increase in agency costs stemming from either disinflation or a stock market crash, therefore, should also be reflected in a rise in the interest-rate spread for high-versus low-quality borrowers.

An important feature of the recent literature on asymmetric information and financial structure is that it suggests why banks play a prominent role in financial markets. Banks are eminently well suited to solve many of the adverse selection and moral hazard problems inherent in credit markets. They have expertise in collecting information about firms, and thus are better able to screen good borrowers from bad borrowers at a low cost. This is especially true because they are not as subject to the free-rider problem which exists for individual purchasers of marketable securities who can costlessly take advantage of information that other purchasers of marketable securities produce. The advantages of banks 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. In addition, they can engage in lower-cost monitoring than individuals, as is demonstrated in Diamond (1984), and have advantages in enforcement of restrictive covenants, both of which reduce the potential for moral hazard by borrowers.[5] The existence of asymmetric information in credit markets provides a compelling rationale for the importance of banks in getting funds from savers to borrowers who have the most attractive investment opportunities, thereby enhancing economic efficiency.

The importance of asymmetric information provides another mechanism by which financial crises reduce economic activity. The analysis above indicates that banks perform an important role in generating productive investment for the economy. Thus, as is described in Bernanke (1983), disturbances in financial markets that reduce the amount of financial intermediation that can be undertaken by banks will lead to a reduction in lending to borrowers with profitable investment opportunities, resulting in a contraction of economic activity.

Bank panics are clearly one major way for banks to find themselves unable to fully perform their intermediation role.[6] 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. Here, again, an asymmetric information problem is at the source of the financial crisis 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. The net result is that a bank panic reduces the funds available to banks to make loans, and thus the cost of financial intermediation rises, causing a reduction in investment and a decline in aggregate economic activity.

A bank panic also has the feature of decreasing liquidity, which will lead to higher interest rates. As we have seen before, the rise in interest rates directly increases adverse selection problems in credit markets and 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, they lead to economic contraction through these channels as well. We should then expect to see that bank panics are also associated with a larger interest-rate spread between higher- and lower-quality debt instruments.

The monetarist literature on the role of bank panics in economic contractions offers an additional channel by which financial crises affect 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 are then seen as being responsible for substantial declines in economic activity and the price level.

The recent literature on the impact of asymmetric information on aggregate economic activity provides a view complementary to that of the monetarists on the importance of bank panics. Indeed, the asymmetric information approach supplies a transmission mechanism for a decline in the money supply to lead to a decline in aggregate economic activity. The deflation that stems from a decline in the money supply increases adverse selection and agency problems, which then cause a decline in investment and aggregate economic activity. However, the asymmetric information approach suggests that 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.

3.2   A Historical Analysis of Pre–World War II Financial Crises

To obtain evidence on how we should characterize financial crises, I examine a series of episodes in the 1857–1941 period in which it is generally agreed that financial crises occurred. Then in section 3.3, I examine two postwar episodes in which there was Federal Reserve intervention to prevent a financial crisis. The analysis in the previous section suggests that a critical variable for assessing the nature of a particular financial crisis is the spread between interest rates for high- and low-quality borrowers. For the period beginning in 1919, the analysis uses the spread between Moody's Baa corporate bond rate and the long-term Treasury bond rate averaged over the month, the same spread variable used by Bernanke (1983). However, since this series is not available prior to 1919, an alternative measure must be used before that date. Macaulay (1938) provides monthly yield data for high-grade railroad bonds from 1857 to 1935 which are essentially averages over the month—they are calculated from the average of the high and low bond price for that month. The spread measure was constructed from this data by subtracting the average yield on the best one-fourth of the bonds from the average yield on the worst one-fourth of the bonds (i.e., three bonds in the best and worst categories were used for 1857–66, five bonds for 1867–81, eight bonds for 1882–87, and ten bonds for 1888–1935).[7] One-fourth as the fraction of bonds in the best and worst categories were chosen because this fraction led to the highest correlation of the Macaulay spread variable with the Bernanke spread variable in the 1919–35 period, when the two series overlap. However, the choice of the fraction of bonds to include in each category is not crucial. The correlation coefficient between Macaulay spread variables using a different choice for the number of bonds in each category is always above .95 in the 1857–1918 period, and the conclusions for each episode studied are not affected by a different choice for the number of bonds in each category.

The Macaulay spread variable has several problems in comparison with the Bernanke spread variable. First, there is no guarantee using the Macaulay variable that the worst or the best bonds remain in the same rating class

throughout the time period studied. This cannot be helped because ratings for these bonds are not available. It should be noted that the Bernanke spread variable is not perfect on these grounds either, because, as Temin (1976) points out, during periods when default risk was changing rapidly, it is not clear that the Moody's ratings continued to have the same meaning. Another potential problem is that the Macaulay bonds are all of fairly high grade: for the 1919–35 period, the worst Macaulay bond still has an interest rate below the Moody's Baa corporate bond rate, while the best bond has a rate below the Aaa corporate bond rate. There is a possibility that the Macaulay bonds might not have a sufficient difference in their grades to pick up the changes in the interest rates for high- and low-quality borrowers.

Despite these limitations, the Macaulay measure seems to perform well. The Macaulay spread variable, denoted as SPREADM, is plotted for 1857–1918 in figure 3.1, panel A. Panel B plots the Bernanke spread variable, SPREADB, over the 1919–88 period along with the Macaulay variable from 1919 to 1935. As is evident in panel B, the Macaulay variable is highly correlated with the Bernanke variable: the correlation coefficient between the two variables during 1919–35 is 0.88. Both variables tell similar stories in that period—they rise during the 1920–21 recession, decline thereafter to a low point in the late twenties, climb dramatically with the onset of the banking panics in late 1930, and then fall to substantially lower levels by the end of 1935. Furthermore, as we will see, the Macaulay spread variable seems to have a consistent relationship with stock market and commercial-paper-rate variables in the pre-1919 episodes studied below, adding further confidence in its validity.

The analysis of the nature of financial crises in the previous section also suggests that we should look at stock prices and interest rates when we analyze individual episodes of financial crisis. The level of stock prices, denoted as STOCK, is constructed as the cumulative geometric sum of the stock-market-return series from Wilson, Sylla, and Jones (1990),[8] and is thus meant to be an end-of-month series. However, the earlier data in the stock market series (up until the 1920s) are monthly averages or the averages of the high and low stock prices for the month. Thus, even though the stock price series used here is meant to be thought of as an end-of-month series, it is actually closer to a monthly average, up until the 1920s. Furthermore, before 1890, the stock price series is primarily from railroad stocks.

The interest rates examined are those on high-grade commercial paper, RCP, and those on call loans to stock and bond brokers in New York, RCALL. For 1857–1918, the commercial-paper-rate series is choice 60- to 90-day, two-name paper from Macaulay (1938), while after this date it is the rate on 4- to 6-month commercial paper obtained from *Banking and Monetary Statistics, 1914–1940* and *1941–1970*, published by the Board of Governors of the Federal Reserve System, and from the *Federal Reserve Bulletin*, various years. The call-loan-rate series is taken from Wilson, Sylla, and Jones (1990), and it, along with the commercial-paper-rate series, are monthly averages of daily

Panel A: 1857–1918

Panel B: 1919–1988
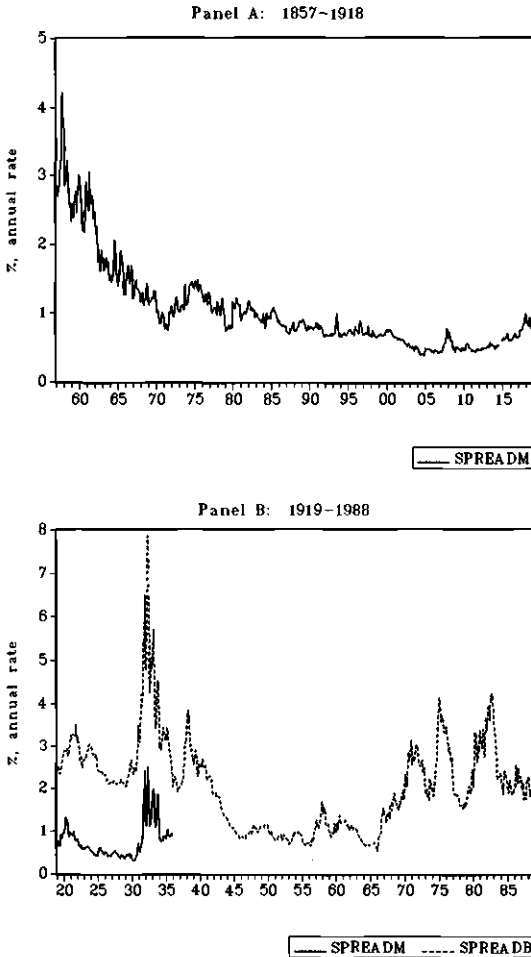
Fig. 3.1   Interest rate spreads

rates. In the following analysis of financial crises, more attention will be focused on the commercial paper rate when discussing interest rate movements. This makes sense because commercial paper rates should be closer to the interest rates that affect business firms' decisions to invest, while call loan rates are influenced by peculiarities of events in the stock market.

There are clearly many other variables that we might want to examine in order to better understand what is going on during financial crises—for example, business failures, the price level, commodity prices, and industrial production. However, in this paper I will be conducting a more preliminary analysis and will only be examining financial market variables. In future work, I hope to be able to use such data to engage in a fuller treatment of the financial crisis phenomenon.

Now that we understand the data we are looking at, we can turn to discussion of particular episodes of financial crisis. I will focus especially on the timing of events and financial variables during these episodes, because the timing will enable us to distinguish between different views of the nature of financial crises. The crises I will examine first are the pre-World War II episodes that are most prominent in discussions by Sprague (1910), Kindleberger (1978), Bordo (1986), Gorton (1988) and Schwert (1989a).[9] Historical descriptions of these episodes are found in Sprague (1910), Collman (1931), Smith and Cole (1935), Friedman and Schwartz (1963), and Sobel (1968).

3.2.1   The Panic of 1857

The stock price, interest-rate-spread, and commercial-paper-rate data for the two-year period surrounding the panic in October 1857 are reported in figure 3.2. Panel A plots the Macaulay interest-rate-spread variable, SPREADM, and the stock price index, STOCK. The left-hand vertical axis corresponds to the spread variable, while the right-hand vertical axis corresponds to the stock price index. The stock price index is normalized to equal 100 at its peak value. Panel B plots the commercial paper rate, RCP, and the call rate, RCALL. In both panels, the date set by the National Bureau of Economic Research for the beginning of the 1857–58 recession, July 1857, is marked on the horizontal axis with an R, while the October 1857 date for the banking panic is marked by a P. This general format is used in the figures for the other episodes discussed later.

The interest-rate-spread variable, along with the commercial paper rate, begins to climb in July 1857, three months before the banking panic, while the stock market is falling from the beginning of the year. On August 25, the Ohio Life Insurance & Trust Company, a major financial institution with substantial investments in western land and railroads as well as in commodity futures, failed. This was followed by a major stock market crash in September and October. The market returns of -14.46% in September and -15.26% in October were the tenth and eleventh worst monthly returns tabulated by Wilson, Sylla, and Jones (1990) for their entire sample period of January 1834–August 1988. With the failure of the Ohio Life & Trust Co., reserves began to be pulled from New York, and the first bank failures there occurred in September. Interest rates shot through the roof, with the commercial paper rate rising to 18% in September and a peak of 24% in October. Thinly capitalized railroads, such as the Delaware, Lackawanna & Western, the Fond du Lac, and several smaller railroads, went bankrupt in September. Major runs on the New York banks began in October, finally culminating in a suspension of specie payments in mid October, and bank panics spread throughout the country. Failures of major railroads, such as the Erie & Pittsburgh, the Fort Wayne & Chicago, the Reading, and Illinois Central, occurred in October. The outcome was a severe recession which ended in December 1858.

The timing of events in the panic of 1857 seem to fit an asymmetric infor-

Panel A: Stock Prices and the Interest Rate Spread

Panel B: Interest Rates
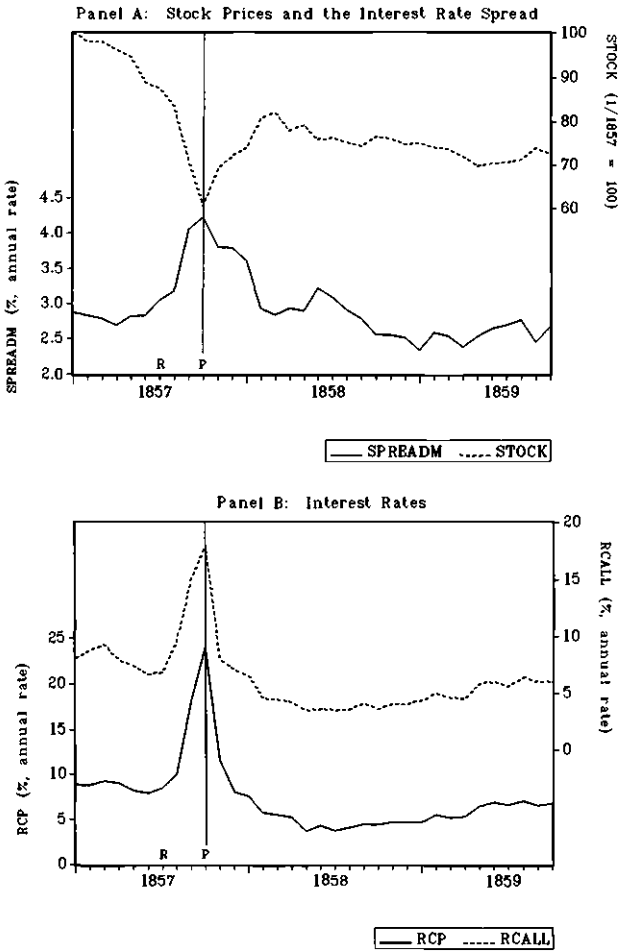
Fig. 3.2   The panic of 1857

mation interpretation of the financial crisis. Rather than starting with the bank panic in October 1857, the disturbance to the financial markets seems to arise several months earlier with the rise in interest rates, the stock market decline, the major failure of a financial firm, and the widening of the interest rate spread. The asymmetric information story provides an explanation of how the financial crisis could have led to a severe economic downturn. The rise in interest rates and the stock market decline, along with the failure of Ohio Life & Trust Co. which increased uncertainty, would magnify the adverse selection and agency problems in the credit markets. Indeed, the stock market crash might be linked to the general rise in interest rates which would have lowered the present discounted value of future income streams. In this case, the panic of 1857 can be viewed as a liquidity crisis. The net result from the increase in

adverse selection and agency problems is that investment activity and aggregate economic activity would decline, causing expectations of further economic contraction and business failures.

As pointed out in Gorton (1988), depositors would now want to withdraw their funds from the banking system, because the bleak business conditions would lead them to expect losses on deposits left in the banks and this would be especially undesirable at a time when their consumption might be falling owing to the economic downturn. The outcome of the process would be a run on the banks, and the resulting panic would raise interest rates further, cause the stock market to decline even more, and worsen agency and adverse selection problems in the credit markets. That a severe economic contraction would develop is a logical outcome of this process.

Finally, after suspension of specie payments, the intervention of clearing-house associations, as noted in Gorton (1985) would help to separate solvent from insolvent banks.[10] The banking panic would then subside and, with the restoration of liquidity in the banking system, interest rates would fall, the stock market might undergo a recovery, and, if economic uncertainty and deflation were not too severe, agency and adverse selection problems would diminish, leading to a decline in the interest-rate-spread variable and setting the stage for an eventual recovery of the economy. This scenario seems to describe the data and the events in 1857–58 quite well.

A monetarist interpretation cannot explain these events as effectively because it does not explain the timing of the events and the financial variables, that is, it does not explain why the banking panic occurred when it did and why the spread between interest rates for high- and low-quality borrowers rises dramatically before the panic and then declines after the panic subsides. The asymmetric information story does not rule out important effects 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 effects on the money supply.

3.2.2   The Panic of 1873

The data for the period surrounding the banking panic of September 1873 is found in panels A and B of figure 3.3. (the format is identical to that in fig. 3.2). Compared to all of the other panics studied in this paper, the panic of 1873 is somewhat unusual. First, it occurs before the business-cycle peak, as can be seen in figure 3.3, and second, it was apparently quite unanticipated since it was not preceded by a rise in the interest rate spread.

The initial disturbance for the panic seems to have originated with the financial difficulties of the railroad sector. On 8 September 1873, the New York Warehouse & Security Company, which had made substantial loans to the Missouri, Kansas & Texas Railroad as well on grain and produce, suspended. This suspension was soon followed by the failure of the banking house of Kenyon, Cox & Co. as a result of endorsements on $1.5 million of paper

Panel A: Stock Prices and the Interest Rate Spread

Panel B: Interest Rates
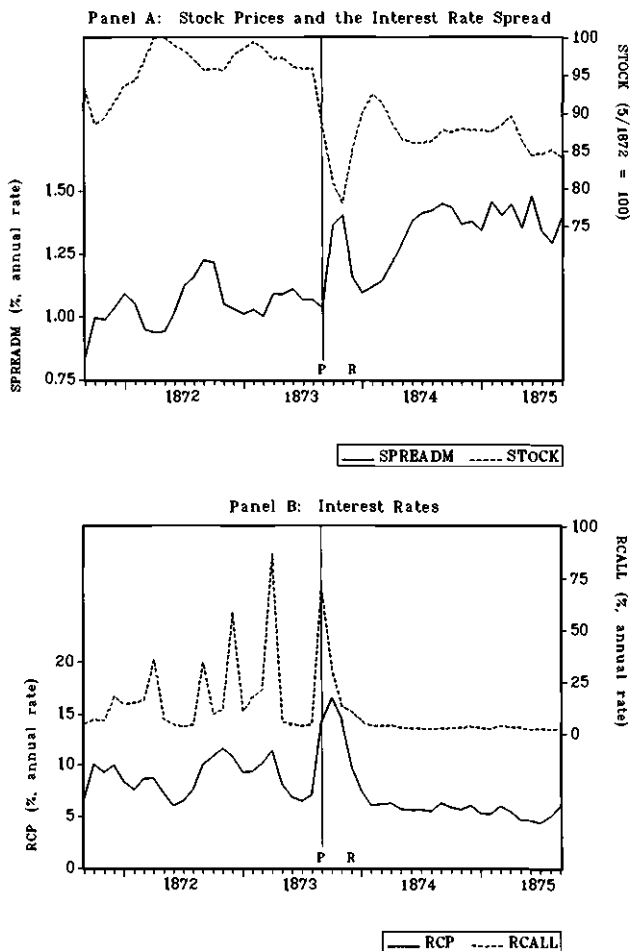
Fig. 3.3   The panic of 1873

issued by the Canada Southern Railroad. At the time, neither of these failures
was considered to be of major importance, but they were followed on Septem-
ber 18 by the suspension of Jay Cooke & Co., one of the most respected and
important financial institutions in the United States, and by the suspension of
Fisk & Hatch the next day. The collapse of Jay Cooke & Co. also stemmed
from financial difficulties in the railroad sector, specifically, problems with its
loans to Northern Pacific Railroad, which Jay Cooke & Co., controlled. With
the announcement of the Jay Cooke & Co. failure, the stock market went into
a nose dive, with the result that 18 September 1873 was dubbed "Black Thurs-
day" and the decline in stock prices was over 7% in the month of September.
Immediately, runs began on the Fourth National Bank and the Union Trust
Company. By Saturday, September 20, both the Union Trust Company and the

National Bank of the Commonwealth had failed and a major banking panic was in full swing. On the same day the New York Stock Exchange took the unprecedented step of closing, not to reopen until September 30. On September 20, the New York Clearing House began to issue clearing-house loan certificates to its member banks, and the decision to suspend specie payments was made on September 24. Over the next several days, suspension of specie payments spread nationwide. It was not until the end of October that banks almost fully resumed specie payments to depositors.

In figure 3.3, panel A, we see that the spread between interest rates on high- and low-quality borrowers jumped in the month immediately following the banking panic and stock market crash. We also see in panel B that interest rates began to rise one month before the crash, and thus the higher interest rates may have been one source of increased adverse selection and agency problems that helped cause the panic. However, the abruptness of the panic suggests that major failures of financial firms such as Jay Cooke & Co. may have increased informational uncertainty, depressed the value of net worth relative to liabilities, and thereby increased adverse selection and agency costs. The runs on banks which occurred immediately after the failure of Jay Cooke & Co. reduced the ability of the banks to perform their intermediation role and are another potential factor in inducing an investment decline and a general economic contraction, which began, according to the NBER dating, in November 1873.

Again, the process of sorting insolvent from solvent banks and insolvent from solvent business firms after the panic would reduce informational uncertainty. The decline in interest rates and the recovery of the stock market after November 1873 would also help reduce adverse selection and agency problems. Consistent with this view, the spread variable does decline immediately after November 1873; however, in contrast to the 1857 episode, the spread variable begins to rise in 1874 and, for the last half of 1874 and all of 1875, is at levels near the peak value reached in October and November of 1873. The high values of the interest-rate spread in 1874 and 1875 are explained by the substantial deflation that sets in after the 1873 panic. As we have seen, a sharp deflation transfers wealth from borrowers to creditors, causing a deterioration in business firms' net worth. The resulting increase in asymmetric information problems, which is reflected in the rise in the interest rate spread, can thus be a major propagation mechanism during the recession.[11] The recession which began in November 1873 was especially long lived and, according to NBER dating, did not end until March 1879. It is often considered to be one of the more severe economic contractions in U.S. history and by some writers is categorized as being the second most severe, only to be outdone by the Great Contraction of 1929–33.

The data in figure 3.3 are quite consistent with an asymmetric information interpretation of the 1873 panic and the severe recession following. However, it gives a prominent role to the banking panic and effects on the economy from

declines in the money supply. As Friedman and Schwartz (1963) point out, the period from 1873 to 1879 has an unusual number of years in which declines in the money supply occur. These declines were probably an important factor in the decrease in aggregate demand in this period. The resulting extraordinary and prolonged deflation was then likely to have been an important factor in the rise of asymmetric information problems because of the resulting deterioration in firms' balance sheet positions, which further encouraged a contraction in aggregate economic activity.

3.2.3   The Panic of 1884

We will devote somewhat less discussion to the panic of May 1884 because it was not a particularly severe crisis. However, in figure 3.4 the patterns in the data around the panic date are very similar to the patterns we see in other financial crises. A recession had begun in April 1882, well before the panic, and the interest-rate-spread variable had been declining, with the exception of one large upward blip toward the beginning of 1884. With the decline of stock prices after February 1884, the spread variable again begins to rise. Then, as Sprague (1910, 110) puts it, "within little more than a week an astonishing series of instances of fraud and defalcation, unexplained in our history, were brought to light."[12] On May 8 the firm of Grant & Ward, in which the son of Ulysses S. Grant was a major partner, failed. When audited the firm was found to have assets of only $67,174 and liabilities of $16,792,640. The Marine National Bank, whose president, James D. Fish, was a partner in Grant & Ward, failed immediately when it came to light that the bank had illegally certified one of Grant & Ward's checks for $750,000. On May 13, it became known that John C. Eno, the president of the Second National Bank, has absconded with over $3 million of the bank's securities. The next day, the Metropolitan National Bank closed its doors when it was learned that its president, George Seney, had used bank funds to speculate in railroad stocks which had declined precipitously in value. On the morning of May 16, A. W. Dimock & Co. failed, while in the afternoon, Fisk & Hatch (which had been able to reopen after the panic of 1873) followed suit, taking down with it several banks connected with the firm.

The conditions seemed ripe for a full-scale panic, and we see in panel A of figure 3.4 the typical pattern associated with a panic of a sharp increase in interest rates, especially for call loans, a sharp decline in stock prices (over 8% in May), and a sharp rise in the interest rate spread. However, a panic of the 1873 magnitude was avoided by the timely action of the New York Clearing House Association. On the afternoon of May 14, the New York Clearing House met and approved the issue of clearing-house certificates to the Metropolitan National Bank. The bank was thereby enabled to resume operations the next day and was reorganized with a new president. In addition, the Second National Bank was able to meet all payments because the father of the bank's president repaid the funds stolen by his son. The net result was that the
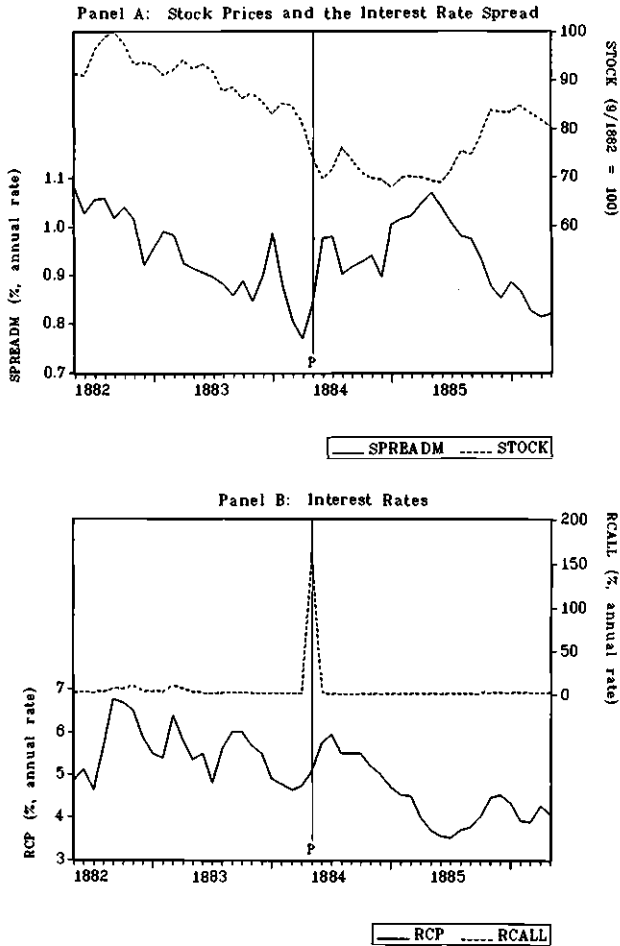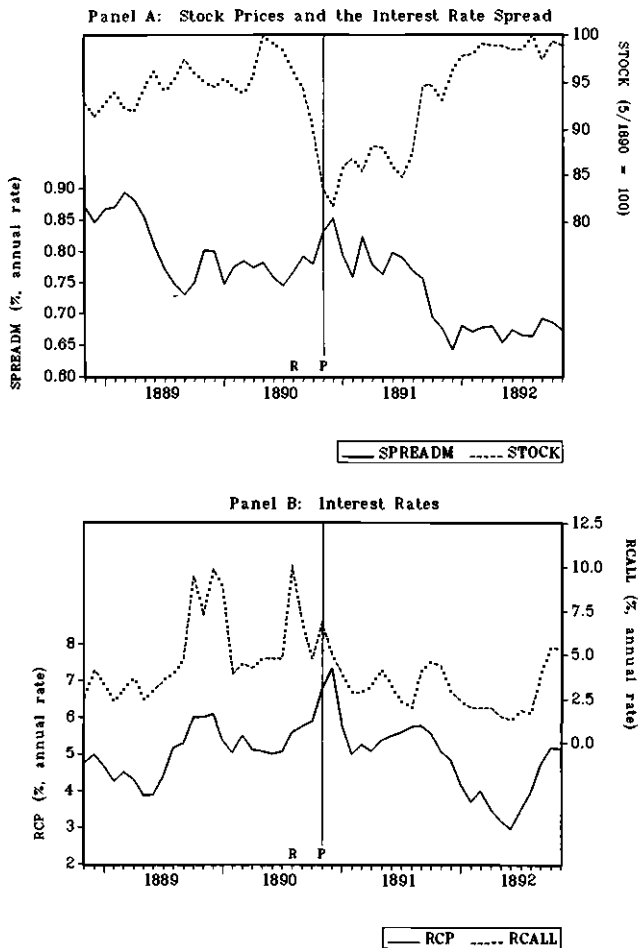
Fig. 3.4 The panic of 1884

bank panic subsided and there was no general suspension of specie payments in the banking system. In the aftermath of the financial crisis, we see the usual pattern that interest rates decline along with the interest rate spread. We also see a pattern that was found after the 1873 panic: the interest rate spread rose again after the decline immediately following the panic. The continuing deflation, which caused a deterioration of firms' balance sheet positions, and continuation of the recession, which increased uncertainty, help explain this rise in the interest rate spread.

3.2.4   The Panic of 1890

The panic of 1890, like that of 1884, was only a minor crisis, in large part because of the swift action by the Clearing House Association. In figure 3.5,

Panel A: Stock Prices and the Interest Rate Spread

Panel B: Interest Rates

Fig. 3.5   The panic of 1890

we see the usual pattern of stock prices, interest rate spread, and interest rates before the panic in November 1890. Interest rates begin to rise and the stock market begins to fall several months before the panic, and at the same time the interest rate spread begins to widen. On November 7, the Bank of England raised its discount rate from 5% to 6%, which created concern in the New York money market. Heavy selling in the London stock market on November 10 was followed by substantial declines in stock prices in New York, and at 2 P.M. (EST) the failure of Decker, Howell & Co. was announced, which also involved the Bank of North America. The Clearing House Association then immediately decided to issue clearing-house certificates, although this action did not become known until after the close of business on the eleventh. Although the next day the brokerage firm of J. C. Walcott & Co. suspended and

the North River Bank closed, confidence was restored with the knowledge that clearing-house certificates were being issued. When news of Baring Brothers & Co.'s failure in London reached New York early on November 15, stocks fell sharply. However, despite almost thirty failures of brokerage houses, a major panic was avoided. The rise in the interest rate spread was quite small, and by the end of November when Wall Street recognized that the Bank of England and a syndicate of bankers were providing support to the London money market, stock prices were recovering. The banking system weathered the panic nicely and was able to continue full payments of specie to their depositors. After December the commercial paper rate declined along with the interest-rate spread. The recession, which lasted until May 1891, remained a mild one.

3.2.5   The Panic of 1893

The panic of 1893, in contrast to the two previous panics of 1884 and 1890, was a severe one. As we can see in figure 3.6, after the onset of the recession in February 1893, interest rates rose and the stock market began to decline. Business conditions were very unsettled, and nonfinancial business failures were substantial. Sprague (1910) reports that the number and amount of liabilities of mercantile failures from January to July 1893 were unprecedented. In addition, the deflation that had set in at the beginning of the year was producing a deterioration in business firms' net worth. Given the climb in interest rates and fall in stock prices, along with uncertainty about the health of business firms and the deterioration in firms' balance sheets, the adverse selection and agency problems began to increase and the spread between interest rates on high- versus low-quality borrowers began to rise, as is indicated by the increase in the interest-rate-spread variable.

On February 26, the Philadelphia & Reading Railroad went into receivership, but more importantly, on May 4 word was received in New York of the failure of the National Cordage Co., a stock market favorite, and a stock market crash ensued. At this stage, the New York banks appeared to be weathering the crisis. However, banks in the West and the South, which were burdened with many problem loans, began to face bank runs, and in June this led to substantial withdrawal of funds by these banks from the banks in New York. Although the wave of bank failures was subsiding by the beginning of July, a second wave of panic hit the western and southern banks in the third week of July. On July 25, the New York, Lake Erie & Western Railroad and the Wisconsin Marine & Fire Insurance Company suspended and there was another sharp drop in the stock market. The bank panics in the South and West, the resulting withdrawals by these banks from the New York banks, and the loss of confidence in the New York banks meant that they too would succumb to the crisis, despite provisions early on by the Clearing House Association to issue loan certificates. Finally, by the beginning of August there was a general suspension of specie payments to bank depositors.
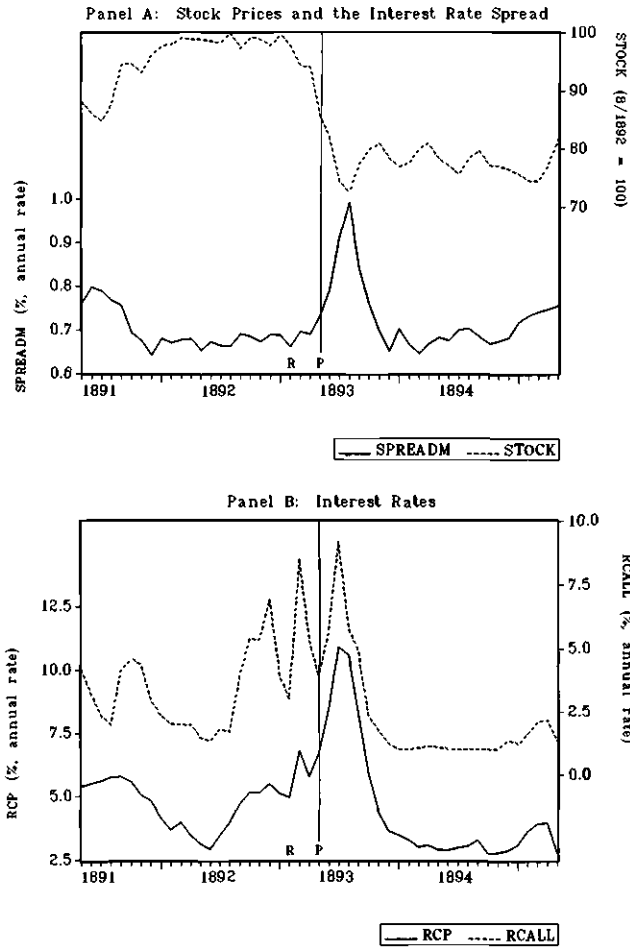
Panel A: Stock Prices and the Interest Rate Spread

Panel B: Interest Rates

Fig. 3.6   The panic of 1893

The contraction of lending by the banking system as a result of its troubles reduced its role in solving adverse selection and agency problems and clearly made these problems worse in the financial markets. The seriousness of the asymmetric information problems is reflected in the high values of the interest-rate-spread variable in panel A of figure 3.6, which peaked in August 1893. Our asymmetric information analysis indicates that the events of the 1893 panic were then a major factor in the very severe economic contraction that occurred from February 1893 to June 1894. Sobel (1963) reports that besides the more than 600 bank failures as a result of the panic (5% of all American banks), there were over 15,000 commercial bankruptcies, which included such prominent railroads as the Northern Pacific, the Atchison, To-peka & Santa Fe, and the New York & New England.

Panel A: Stock Prices and the Interest Rate Spread

Panel B: Interest Rates
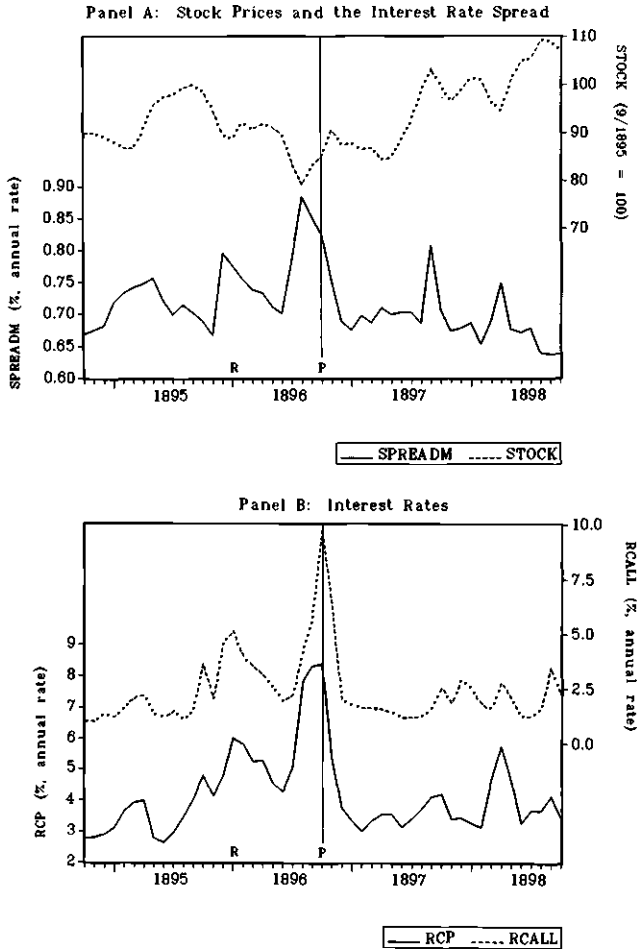
**Fig. 3.7   The panic of 1896**

3.2.6   The Panic of 1896

Little seems to be written about the panic of 1896, but since Gorton (1988) includes it in his listing of bank panics, the data surrounding his date for the panic in October 1896 is reported in figure 3.7. The data show the typical patterns found in the other panics. Interest rates rise and stock market prices fall several months prior to the panic date and, as our asymmetric information story indicates, there is also a rise in the interest-rate-spread variable. After the panic subsides, interest rates and the interest rate spread fall, while stock prices recover. Another typical pattern is that the panic occurs after the onset of the recession in January 1896, which ends in June 1897. Both the panic and the recession are mild ones, and there is no suspension of specie payments, as in the panic of 1893.

3.2.7   The Panic of 1907

The panic of October 1907 is one of the more severe panics to be discussed in this paper. The traditional story about the beginning of the panic (see, e.g., Sprague 1910, Collman 1931, Friedman and Schwartz 1963, and Sobel 1968) emphasizes the difficulties of a group of banks associated with businessmen F. A. Heinze, C. F. Morse, E. R. Thomas, and O. F. Thomas, who used them to finance their speculative activities. Their grand scheme was to establish a corner in the United Copper Company, which they owned, and to make a killing by squeezing the short sellers. When they suffered large losses with the collapse of the corner on Monday, October 14, the eight banks associated with their activities came under suspicion and were forced to seek assistance from the New York Clearing House Association during that week. By Monday, October 21, the Clearing House Association appeared to have put the affairs of these banks in order, when it was then learned that the president of the Knickerbocker Trust Company, the third largest trust company in New York, was involved with Morse's investment activities. The loss of confidence in Knickerbocker Trust resulted in unfavorable clearing balances, and on the following day, October 22, the National Bank of Commerce announced that it would no longer continue to clear for Knickerbocker Trust. The Clearing House Association did not extend assistance to Knickerbocker Trust, and this is generally viewed as having been a serious mistake. The ensuing run on Knickerbocker Trust forced the bank to close its doors on October 22. The following day, a run began on the second largest trust company, the Trust Company of America, and on October 24, the Lincoln Trust Company was also subjected to a run. Although these trust companies were provided with assistance, the steps taken were too slow and not sufficiently dramatic to restore confidence, as Sprague (1910) and Friedman and Schwartz (1963) have noted. The stock market crashed on October 24, and the monthly return for October 1907 was -10.9%, the thirty-first largest negative return for the 1834–1988 period documented by Wilson, Sylla, and Jones (1990). With the assistance of J. P. Morgan, $35 million was raised by the end of the week to assist the Trust Company of America, and the bank panic in New York seemed to be under control. By then, however, fear had spread throughout the United States, and country banks withdrew large amounts of funds from their New York correspondent banks. Only when the situation was grave for the New York banks did the Clearing House Association finally issue clearing-house loan certificates on October 26. This action was too late because the New York banks still suspended payments of specie to depositors, and the suspension of specie payments then spread nationwide. Payments of specie to depositors was not resumed until the beginning of January 1908.

The traditional story about the 1907 panic places much of the responsibility on securities manipulation and inadequate action by the Clearing House Association to prevent a major disruption of the banking system. Friedman and Schwartz (1963) view the substantial decline in the money supply that fol-
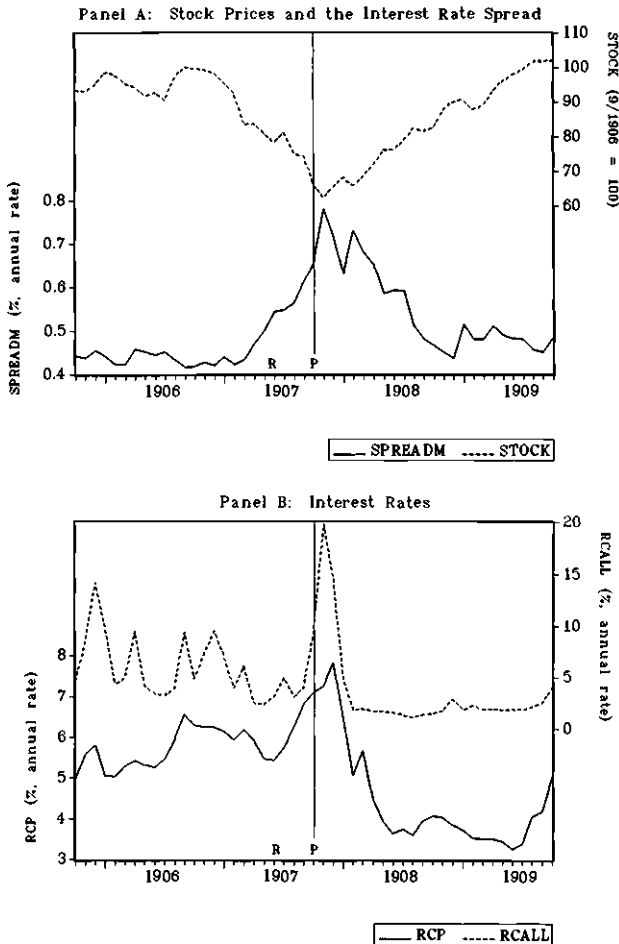
Fig. 3.8   The panic of 1907

lowed the panic to have turned a mild recession into the severe recession that
extended from June 1907 to June 1908. The data in figure 3.8 suggest that
there may be more to the story. The most striking feature of the data, as can
be seen in panel A, is the substantial increase in the interest-rate-spread vari-
able that begins in early 1907, six months before the panic. Indeed, most of
the rise in the spread variable has already occurred by the time of the October
banking panic. As shown in panel A, the banking panic apparently raised the
interest-rate-spread higher and helped prolong its high values in the first half
of 1908, but most of the rise cannot be attributed to the bank panic itself.

The rise in the spread variable before the bank panic is easily explained by
our asymmetric information story. The stock market begins to decline at the
end of 1906, and the negative return in March of -9.8% is the fortieth largest

negative return in the 1834–1988 period. Before the panic begins in October, the stock market has declined even further, by 25% from its peak in late 1906. As I have discussed previously, the decline in the valuation of firms by this substantial amount raises adverse selection and agency problems for borrowing firms because it has, in effect, lowered their net worth.

The onset of the recession in June 1907 before the panic, which raised uncertainty about the quality of firms' investment projects, also increased the adverse selection problem. In addition, the rise in the commercial paper rate starting in June 1907, from 5.4% to 6.8% by September, further worsened the potential for adverse selection. The resulting increases in the degree of asymmetric information problems even before the October banking panic, should raise the spread between interest rates for high- and low-quality borrowers, and hence the SPREADM variable. Indeed, since most of the rise in the commercial paper rate and decline in the stock market has already occurred before the onset of the panic, not surprisingly most of the rise in the SPREADM variable has already occurred. The presence of severe asymmetric information problems, even before the banking panic, suggests that they were potentially important factors in creating a severe business-cycle contraction. The decline in the money supply resulting from the bank panics is almost surely another important factor in the severity of the contraction, but the evidence here suggests that it is far from being the whole story.

3.2.8   The Great Depression

The Great Depression differs significantly from other periods of financial panic analyzed above owing to the presence of the Federal Reserve System, which began its operations in 1914. Although the Great Depression is dated by the NBER as beginning in September 1929, the public always associates the onset of the Depression with the stock market crash of October 1929. The outcome of the panic period starting October 23 and culminating in the crash on October 29 was a negative return for the month of October of close to 20%. This was the largest monthly negative return in the stock market up to that time. The data in figure 3.9, however, indicate that this financial panic differed substantially from those in previous periods.

Because of the large swing in the interest-rate-spread variable in 1929–35, it is hard to discern its movements in the early phase of the Great Depression shown in panel A of figure 3.9. Thus, an extra panel, panel C, has been added to the figure to show the stock price and interest-rate-spread data for 1929–31. In figure 3.9, *C* marks the October 1929 stock market crash, *P1* the first banking panic of November 1930, *P2* the second banking panic of March 1931, *P3* Britain's departure from gold in September 1931, and *PH* the bank holiday of March 1933.

As we have seen in the analysis of previous panics, the usual pattern is for a stock market crash to be accompanied by a sharp rise in both the level of interest rates and the interest rate spread. Although in panel C of figure 3.9
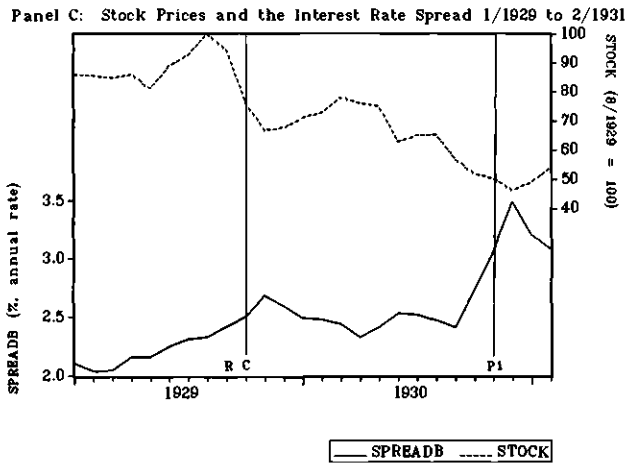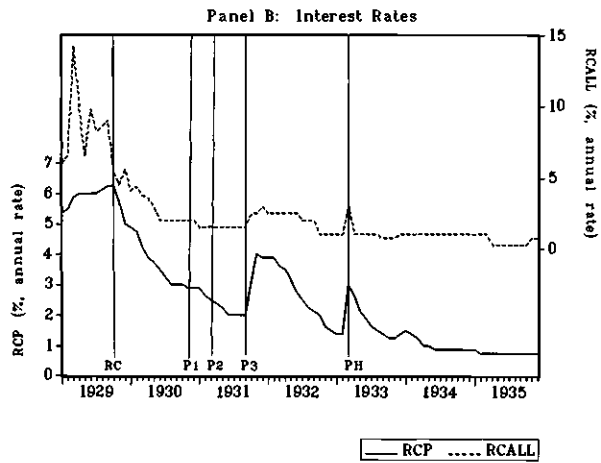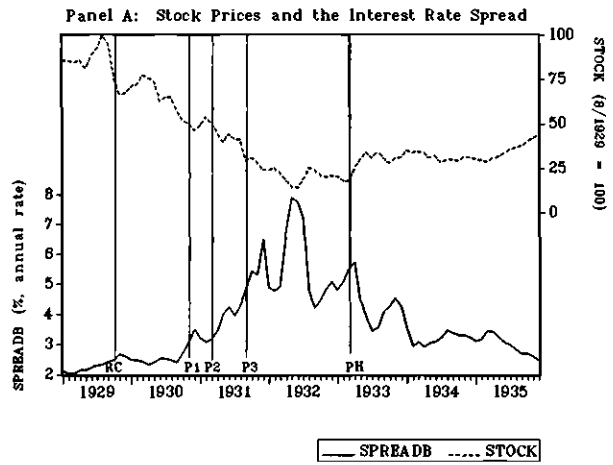
Panel A: Stock Prices and the Interest Rate Spread

Panel B: Interest Rates

Panel C: Stock Prices and the Interest Rate Spread 1/1929 to 2/1931

Fig. 3.9 The Great Depression

there is some rise in the interest rate spread when the crash occurs, the increase is fairly small. In addition, panel B indicates that interest rates did not rise, the commercial paper rate held steady, while call loan rates actually fell. Although the stock market crash had such a great impact on a whole generation, it does not appear to have developed into a full-fledged financial crisis, as in the other episodes I have examined. The credit for this goes to the prompt action by the Federal Reserve Bank of New York to provide reserves to the New York banks. During the panic period, banks and lenders outside of New York rushed to liquidate their call loans to brokers. In order to keep market conditions from getting more unsettled, the Federal Reserve Bank of New York, as described by its president, George L. Harrison, kept its "discount window wide open and let it be known that member banks might borrow freely to establish the reserve required against the large increase in deposits resulting from the taking over of loans called by others" (Friedman and Schwartz 1963, 339). In addition, the New York Fed made open market purchases of $160 million during this period, even though this amount was far in excess of what was authorized by the Federal Reserve System's Open Market Investment Committee.

The aftermath of the New York Fed's action to provide sufficient liquidity for the economy was a decline of the interest rate spread to levels below those before the stock market crash and a continuing low level up until October 1930. What is quite remarkable about the level of the interest rate spread before October 1930 is that it remained so low despite the sharp economic contraction up to that point and the more than 40% decline in the value of common stocks. Friedman and Schwartz (1963, 306) state that, from the peak in August 1929 through October 1930, industrial production fell 26%, wholesale prices by 14%, and personal income by 16%. The failure of the interest rate spread to rise seems to indicate that asymmetric information problems had not yet become severe in financial markets.[13]

Just prior to the first banking panic in November–December 1930, the interest rate spread began to increase and reached a temporary peak at the height of the bank panic in December 1930. The first banking panic is described by Friedman and Schwartz (1963, 308) as starting in agricultural regions, where a "contagion of fear spread among depositors," leading to the failure of 256 banks with $180 million of deposits in November and the failure of 352 banks with over $372 million of deposits in December, including the failure on December 11 of the Bank of United States with over $200 million in deposits. Friedman and Schwartz viewed the nature of the economic contraction as changing at this stage. The continuing bank panics, which by the time of the Banking Holiday in March 1933 had reduced the number of banks by over a third, was the unique feature of the Great Depression that Friedman and Schwartz saw as the force behind a steep but normal recession turning into the largest economic contraction ever experienced in U.S. history.

An asymmetric information analysis of the Great Depression, first outlined

in Bernanke (1983), agrees with this view, but it does not see the decline in the money supply resulting from the banking panics as being the sole cause of the prolonged depression.[14] Instead the collapse of the banking system is seen as preventing banks from engaging in financial intermediation activities that would reduce asymmetric information problems. The resulting increase in asymmetric information problems in credit markets led to a decline in investment by those with otherwise profitable investment opportunities. Further, the debt deflation, in which the decline in prices transfers resources from debtors to creditors, and the continuing decline in the stock market until the middle of 1932 led to a deterioration in firms' balance sheets. This increased adverse selection and agency problems, so that lending decreased and investment then fell. In addition, as pointed out by Mishkin (1978), a similar deterioration in the balance sheets of consumers led them to reduce their spending. A further effect could have come from the behavior of real interest rates in this period. As shown in Mishkin (1981), although nominal interest rates on high-quality bonds fell during this period, real interest rates climbed to exceedingly high levels during 1931–33.[15] The high level of real interest rates increased the adverse selection problem in credit markets and is one more reason for a decline in investment spending.

All of these effects helped make the Great Depression the most severe in U.S. history. Consistent with this story is the increase in the spread variable to unprecedented levels. By the middle of 1932, the spread between interest rates on corporate Baa and Treasury bonds had risen to above 7.5%, over 5 percentage points higher than the level before October 1930. Indeed, it was not until the end of 1936 that the spread variable fell to levels below those found before October 1930. The fact that the spread between interest rates for low- versus high-quality borrowers remained so high for so long indicates that asymmetric information problems were severe in this period. The continuing severity of asymmetric information problems provides an explanation for why the Great Depression was so prolonged.

The fact that aggregate output remained so far below its potential for such a long period of time has always been a puzzle for neoclassical analysis. Bernanke's (1983) documentation of the disruption of the credit markets during 1931–35 and the attendant asymmetric information problems provides one explanation. An overlooked fact, however, is that another financial crisis appears to have occurred in 1937–38. From its peak in February 1937 until its trough in March 1938, the stock market declined by over 50%. Indeed, four of the fifty largest negative monthly returns from 1834 to 1988, as tabulated by Wilson, Sylla, and Jones (1990), are found in this one-year period. And the stock market return of −23.9% in March 1938 is the second largest negative return (September 1931 is the largest, with a return of −29.3%). As we can see in figure 3.10, which plots the data for 1936–41, there is another rapid run up of the interest rate spread, which peaks in April 1938, one month after the stock market trough. Indeed, in the first half of 1938 the interest rate spread is back at the levels found in 1934. The large spread between interest

Panel A: Stock Prices and the Interest Rate Spread

SPREADB ······ STOCK

Panel B: Interest Rates

RCP ····· RCALL
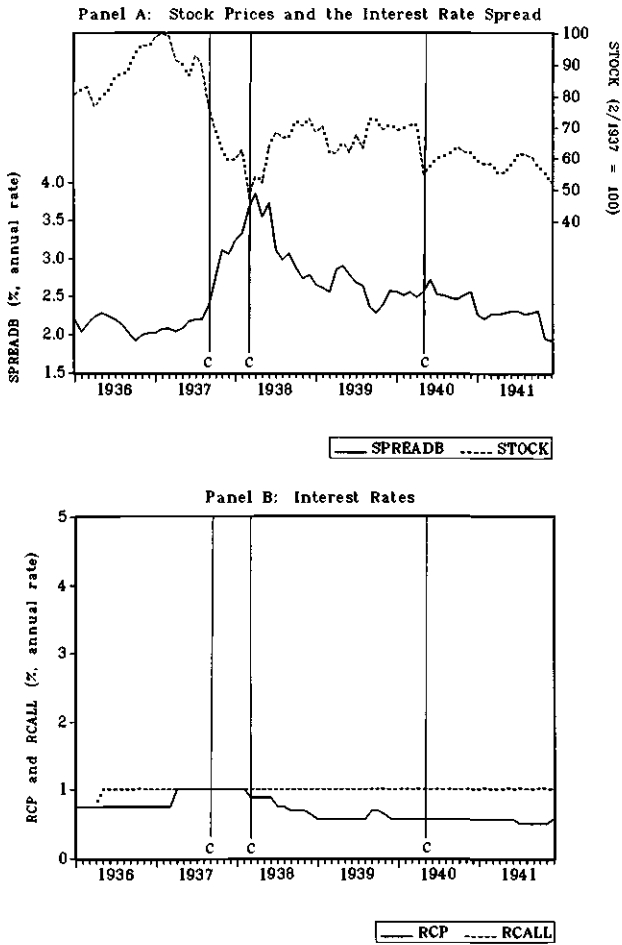
Fig. 3.10   The 1936–41 period

rates on low- and high-quality borrowers suggests that asymmetric information problems were again becoming serious in 1937–38, and this helps explain why the economic contraction during this recession was so severe.

The source of the difficulties in financial markets at this time is not absolutely clear. The increase in reserve requirements in August 1936, March 1937, and May 1937 is one possibility, either through its effects on the money supply, which declined from March 1937 until May 1938, or by decreasing the ability of banks to extend loans because of their need to increase the ratio of their reserves to deposits. Regardless of the cause, the financial disruption in 1937–38 may help to explain why the U.S. economy did not really come out of the shadow of the Depression until World War II.

There is one last episode in the 1936–41 period depicted in figure 3.10 that deserves some comment. May 1940 had a larger decline in stock market prices

than did October 1929. Indeed, the negative return of -22.6% in May 1940 is the third largest negative monthly return in the 1834–1988 period. Although the interest rate spread rose in May and June 1940, the increase was very temporary and its magnitude was very slight. The downward trend in the spread variable which started after April 1938 continued after this episode, leading to a spread below 1% by the end of World War II. This illustrates the following important point: *a stock market crash by itself does not necessarily imply that a financial crisis has occurred.* There is no evidence that there was a serious disruption in financial markets after the May 1940 crash which could have created difficulties for the economy.

3.2.9   An Overview of the Financial Crisis Episodes

Now that we have analyzed a whole series of financial crises, it is worth asking what they have in common and what this tells us about the nature of financial crises. The following facts emerge from the study of episodes in the last half of the nineteenth century and the first half of the twentieth:

1. with one exception in 1873, financial panics always occurred after the onset of a 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 rate spread associated with a panic was 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 increased again when there was deflation and a severe recession;

6. the most severe financial crises were associated with severe economic contractions. The most severe panic episodes were in 1857, 1873, 1893, 1907, and 1930–33, while 1857–58, 1873–79, 1893–94, 1907–8, 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 was not always the case. The crash of the stock market 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 began with a rise in interest rates, a stock market decline, and the widening of the interest rate spread. Furthermore, a financial panic was frequently immediately preceded by a major failure of a financial firm, which increased uncertainty in the marketplace. The increase in uncertainty and the rise in interest rates would magnify the adverse selection–lemons problem in the credit markets, while the decline in the stock market increased agency and adverse selection 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 agency problems would lead to a decline in investment activity and aggregate economic activity.

Depositors would then want to withdraw their funds from the banking system because the poor business conditions would lead them to expect losses on deposits left in the banks. The resulting bank panic would raise interest rates further, cause the stock market to decline even more, and worsen agency and adverse selection problems in the credit markets. This would further encourage a severe economic contraction.

Finally, there would be a sorting of solvent from insolvent firms by bankruptcy proceedings and a sorting of solvent from insolvent banks, often with the help of public authorities and clearing-house associations. The panic would then subside, the stock market might undergo 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 variable and setting the stage for an eventual recovery of the economy. This process might get short circuited if a substantial deflation sets in, leading to a debt-deflation process which transfers resources from debtors to creditors, thereby leading to a deterioration in business firms' net worth. The deterioration of firms' balance sheet positions would lead to increased asymmetric information problems, reflected by a continuation of a large spread between interest rates for low- and high-quality borrowers. Investment spending and aggregate economic activity would then remain depressed for a prolonged period of time.

A monetarist interpretation of financial panics cannot explain the events and their timing as effectively as the asymmetric information approach because the monetarist view does not explain why the spread between interest rates for high- and low-quality borrowers rises dramatically before the panic and then declines after the panic subsides. However, the asymmetric information story does not rule out important effects 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 effects on the money supply.

A monetarist explanation of financial panics is also not able to explain why the banking panics occurred when they did. The facts about the panic episodes discussed in this paper are entirely consistent with Gorton's (1988) view that

bank panics are predictable. His analysis depends on asymmetric information because he sees a bank panic as occurring as a result of the inability of depositors to evaluate the risk in individual bank liabilities, so they cannot easily screen out good from bad banks. Hence, when information such as high interest rates, a major failure of a corporation, or weak business conditions stemming from a recession occurs, depositors worry about potential losses on their deposits and withdraw funds from the banking system, precipitating a panic. Gorton finds that unanticipated changes in the liabilities of failed businesses in the best predictive variable for the occurrence of a bank panic. The analysis in this paper suggests that since stock market declines and widening of the interest rate spread often precede bank panics, stock price and interest-rate-spread variables, which were not used in Gorton's analysis, might also appreciably help in the prediction of bank panics.

The successful intervention of the New York Clearing House Association in the 1884 and 1890 episodes and of the New York Federal Reserve Bank during the October 1929 stock market crash illustrates how an effective lender-of-last-resort role can minimize the impact of a financial crisis on the economy. We now turn to two postwar episodes of financial disturbances in which the Federal Reserve actively performed this role, even though the banking system was not directly threatened.

3.3   Two Postwar Episodes of Financial Disturbances

The postwar period differs from the pre–World War II period in one important respect. Since 1945, the banking system has not been subjected to a banking panic and in no instance has there been a financial crisis that has had serious adverse consequences for the aggregate economy. Examining episodes of financial disturbances in the postwar period in which banking panics were not an issue should be particularly instructive because the monetarist interpretation does not view them as real financial crises. However, if we do find that these financial disturbances have many of the same patterns in the data as prewar financial crises, and thus appear to exhibit the potential for serious asymmetric information problems in credit markets, this would lend additional support to the asymmetric information approach to financial crises. Two episodes, the Penn Central bankruptcy of June 1970 and the stock market crash of 19 October 1987, are postwar examples of financial disturbances in which banking panics were not an issue. In both episodes the Federal Reserve actively provided liquidity to a specific financial sector outside of the banking system and thus engaged in a broader lender-of-last-resort role.

3.3.1   The Penn Central Bankruptcy

Prior to 1970, commercial paper was considered one of the safest money market instruments because only corporations with very high credit ratings issued it. It was common practice for corporations to continually roll over

their commercial paper, that is, issue new commercial paper to pay off the old. Penn Central Railroad was a major issuer of commercial paper, with more than $200 million outstanding, but by May 1970 it was on the verge of bankruptcy and it requested federal government assistance from the Nixon administration.[16] Despite administration support for a bailout of Penn Central, after six weeks of debate Congress decided not to pass bailout legislation. Meanwhile, the Nixon administration asked the Board of Governors of the Federal Reserve System to authorize a direct loan from the Federal Reserve Bank of New York to Penn Central. On Thursday, June 18, the New York Fed informed the Board of Governors that its staff studies indicated that Penn Central would not be able to repay the loan and, as a result, the Board decided not to authorize the loan. Without this loan, Penn Central was forced to declare bankruptcy on Sunday, 21 June 1970.

Once the Federal Reserve made the decision to let Penn Central go into bankruptcy, it was concerned that Penn Central's default on its commercial paper would, as Brimmer (1989, 6) puts it, have a "chilling effect on the commercial paper market", making it impossible for other corporations to roll over their commercial paper. The Penn Central bankruptcy, then, had the potential for sending other companies into bankruptcy which, in turn, might have triggered further bankruptcies, leading to a full-scale financial panic. To avoid this scenario, the New York Fed got in touch with a number of large money-center banks on Saturday and Sunday, June 20 and 21, alerted them to the impending Penn Central bankruptcy, encouraged them to lend to their customers who were unable to roll over their commercial paper, and indicated that the discount window would be made available to the banks so that they could make these loans.[17] Indeed, the banks did as they were told and made these loans, receiving as much as $575 million through the discount window for this purpose. In addition, on June 22 the Fed decided to suspend Regulation Q ceilings on deposits of $100,000 and over, in order to keep short-term interest rates from rising, and the formal vote was taken the next day to allow the Federal Deposit Insurance Corporation and the Federal Home Loan Bank Board to take parallel action. The net result was that the Federal Reserve provided liquidity so that the commercial paper market would keep functioning.

The rationale for the Fed's action was that lenders would not be able to screen out good borrowers in this market from bad borrowers. Was this rationale plausible? The data in figure 3.11 are suggestive that it was. Panel A has the same format as previous figures, with the onset of the recession in January 1970 marked with an R, the Penn Central bankruptcy date marked by a P, and data on the stock market and the SPREADB interest-rate-spread variable. Panel B contains data on the commercial paper rate and on the interest rate spread between commercial paper (4–6 month) and the 6-month Treasury bill, denoted by SPREADC (replacing the rate on call loans, which were no longer a major element in money markets).

The data in panel A display the typical pattern that we saw for prewar finan-

Panel A: Stock Prices and the Baa–TBond Spread

Panel B: Interest Rates and the RCP–Tbill Spread
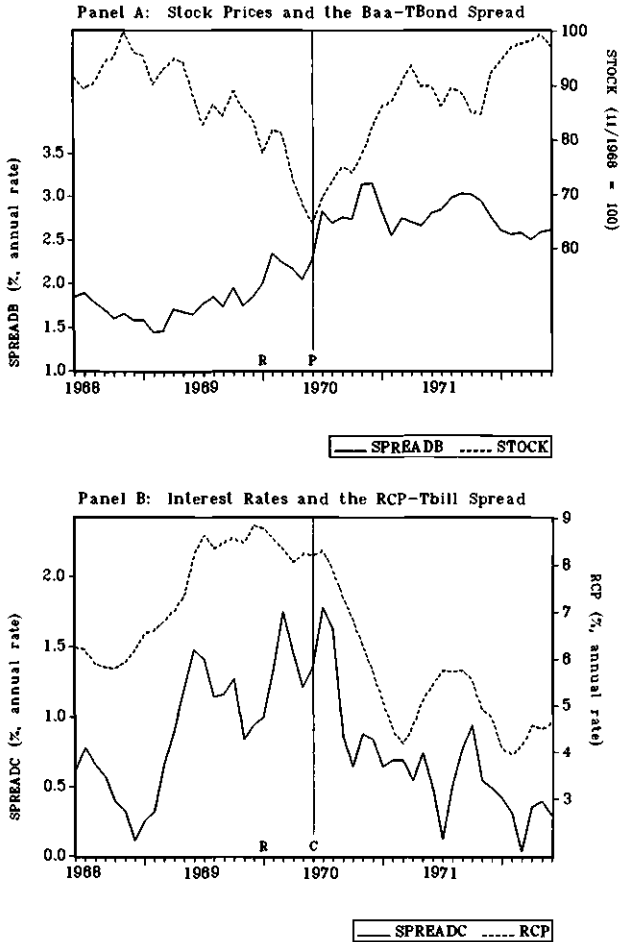
Fig. 3.11   The Penn Central bankruptcy

cial crises. The high level of interest rates reached in late 1969–early 1970, and the increase in uncertainty with the onset of the recession in January 1970 are likely to have increased the adverse selection problem in the credit markets. Furthermore, by May 1970 the stock market had declined over 35% from its peak value in November 1969. This decline in the valuation of firms resulted in a decrease in net worth and increased agency and adverse selection problems in the credit markets. Consistent with the rise in asymmetric information difficulties for the credit markets, there is a rise in both of the interest-rate-spread variables, SPREADB (for long-term bonds) and SPREADC (for commercial paper). Furthermore, despite the Fed's actions, there is also a jump in the interest-rate-spread variables at the time of the Penn Central bankruptcy in

June 1970. The fact that the spread between interest rates on corporate Baa and Treasury bonds rises along with the commercial paper–Treasury spread variable indicates that the problems in the commercial paper market had a potential for spreading to other sectors of the capital market. As we saw after other financial disturbances, the interest-rate spread declines after the crisis, and this pattern is especially pronounced for the commercial paper–Treasury spread variable in panel B, which returns to 1968 levels by the end of 1970. The SPREADB variable, on the other hand, continues to remain high for over two years after the Penn Central bankruptcy. However, the increase in the SPREADB variable resulting from the Penn Central bankruptcy was not large by the standards of earlier financial crises. A major disturbance to the credit markets as a result of increased asymmetric information problems seems to have been avoided by the Fed's willingness to perform its lender-of-last-resort function.

3.3.2   The Stock Market Crash of 19 October 1987

The causes of the stock market crash are still being hotly debated, but the biggest danger to the economy appears not to have come from the decline in wealth resulting from the crash itself, but rather from the threat to the clearing and settlement system in the stock and futures markets.[18] From the peak on 25 August 1987 until October 16, just prior to the crash, the Dow Jones Industrial Average (DJIA) had declined 17.5%. On Monday, October 19, the market fell by 22.6% (as measured by the DJIA) on record volume of 604 million shares. Although 19 October 1987, dubbed "Black Monday," will go down in history as the largest one-day decline in stock prices to date, it was on Tuesday, October 20, that financial markets received their worst threat. In order to keep the stock market and the related index futures market functioning in an orderly fashion, brokers needed to extend massive amounts of credit on behalf of their customers for their margin calls. The magnitude of the problem is illustrated by the fact that two brokerage firms, Kidder, Peabody and Goldman, Sachs, alone had advanced $1.5 billion in response to margin calls on their customers by noon of October 20. Clearly, brokerage firms as well as specialists were severely in need of additional funds to finance their activities. However, understandably enough, banks were growing very nervous about the financial health of securities firms and so were reluctant to lend to the securities industry at a time when it was most needed.

Upon learning of the plight of the securities industry, Alan Greenspan, chairman of the Board of Governors, and E. Gerald Corrigan, president of the New York Federal Reserve Bank and the Fed official most closely in touch with Wall Street, began to fear a breakdown in the clearing and settlement systems and the collapse of securities firms. To prevent this from occurring, Alan Greenspan announced before the market opened on Tuesday, October 20, the Federal Reserve System's "readiness to serve as a source of liquidity

to support the economic and financial system." In addition to this extraordinary announcement, the Fed encouraged key money-center banks to lend freely to their brokerage firm customers and, as in the Penn Central bankruptcy episode, made it clear that it would provide discount loans to banks so that they could make these loans. Again, the banks did as they were told, and by October 21 had increased by $7.7 billion their loans to brokers and to individuals to purchase or hold securities. As a result, the markets kept functioning on Tuesday, October 20, and a market rally ensued that day, raising the DJIA by over 100 points (over 5%). This action by the Fed is reminiscent of the actions it took in the October 1929 panic period, during which it provided liquidity to enable money-center banks to take over call loans which had been called by others.

The data for the period surrounding the October stock market crash are found in figure 3.12. Panels A and B have the same format as those in figure 3.11, while an additional panel, panel C, is shown which contains weekly data on interest spread variables for the six months surrounding the crash. Panel C also plots a series obtained from weekly issues of *Barrons,* the spread between interest rates on junk bonds (those with ratings below Baa) and Treasury bonds, denoted by SPREADJ.

The data in figure 3.12 again display patterns seen in other financial crises. The commercial paper rate had been rising for a year before the stock market crash because of the tight money policy followed by the Fed, while stock prices began a decline over a month earlier. The evidence for increased asymmetric information problems in credit markets before the crash, however, is not particularly strong. The commercial paper–Treasury bill interest-rate-spread variable, SPREADC, also had been rising for a year before the crash, and yet the junk bond–Treasury and Baa-Treasury spread variables, SPREADJ and SPREADB, did not rise until the stock market crash, when they immediately jumped. Not surprisingly, given that asymmetric information effects should have more effect on low-quality borrowers than on high-quality borrowers, the junk bond–Treasury spread shows the largest jump. In the week of the stock market crash, it jumped by 130 basis points (1.3 percentage points) and rose another 60 basis points over the next two weeks. However, as usually occurs after a panic, the junk bond–Treasury spread fell quickly thereafter, and within two months of the crash was back to pre-crash levels. The commercial paper–Treasury spread, SPREADC, followed a similar pattern by returning quickly to its pre-cash levels, but the Baa–Treasury spread, SPREADB, declined more slowly and only reached its pre-crash level six months after the crash.

The fact that the spread variables seem to fit a classic pattern for financial crises suggests that the October 1987 stock market crash had the potential to create major asymmetric information problems in the credit markets. However, the prompt action by the Fed to perform its lender-of-last-resort role kept the asymmetric information problem from getting out of hand, as is indicated

Panel A: Stock Prices and the Baa-Tbond Spread

Panel B: Interest Rates and the RCP-Tbill Spread

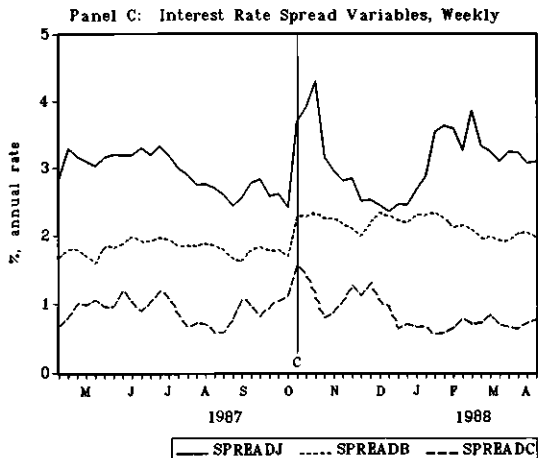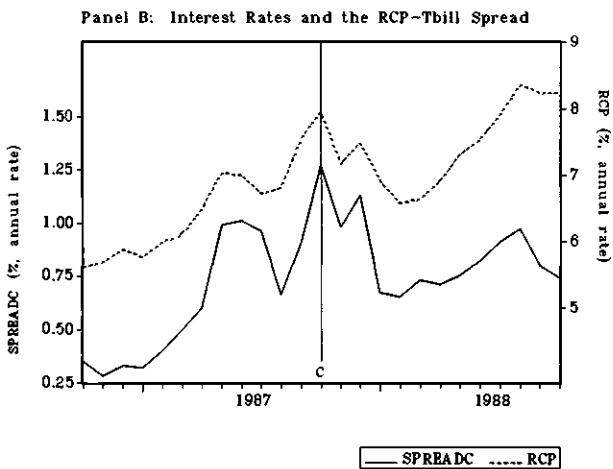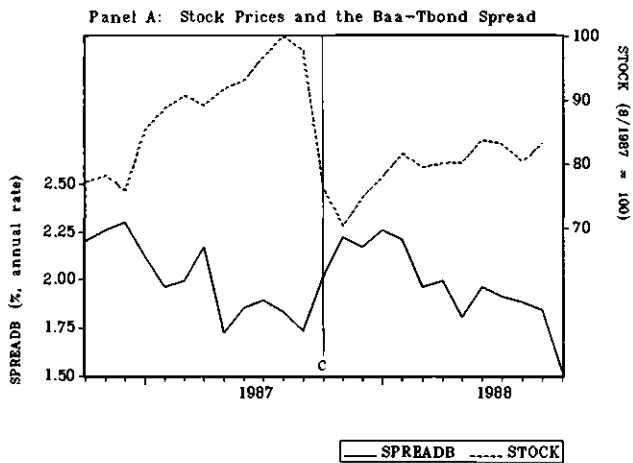**Panel C: Interest Rate Spread Variables, Weekly**

Fig. 3.12   The stock market crash of October 1987

by the moderate increase in the Baa-Treasury spread relative to earlier financial panics. The failure to enter a recession after the stock market crash, despite many forecasters' predictions along these lines, is consistent with the view that the Fed's actions prevented the development of serious asymmetric information problems in the credit markets.

3.3.3   An Overview of the Postwar Episodes

The key fact that emerges from the postwar episodes analyzed here is that they display the typical timing patterns visible in the data for the prewar financial crises, although with a much-muted amplitude. This fact suggests that these episodes had the potential to create a major disturbance to the credit markets by substantially increasing asymmetric information problems. Furthermore, the small magnitude of the effects on the interest-rate-spread variables suggests that the quick and decisive action by the Federal Reserve to perform as lender-of-last resort prevented more serious asymmetric information disturbances to the credit markets which could have had significant adverse consequences for the aggregate economy.

3.4   Conclusions

The asymmetric information approach to financial crises explains the timing patterns in the data and many features of these crises which are otherwise hard to explain. It also suggests why financial crises have had such important consequences for the aggregate economy over the past one hundred and fifty years. The evidence thus seems to favor as asymmetric information view of financial crises over a monetarist view.

However, the asymmetric information approach can be viewed as complementary to the monetarist view of financial crises since it provides an important transmission mechanism for how banking panics and monetary disturbances affect aggregate economic activity. Yet, the asymmetric information approach does not view banking panics and money supply declines 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 1937–38 suggests that a financial crisis which has serious adverse consequences for the economy can develop, even if there is no threat to the banking system. The asymmetric information approach also 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.

The analysis in this paper suggests that there could be benefits to a lender-of-last-resort role for the central bank to provide liquidity to nonbanking sectors of the financial system in which asymmetric information problems have developed. However, there are also potential costs to such an expanded lender-of-last-resort role since it might encourage too much risk-taking on the

part of nonfinancial corporations. There are thus complex issues involved in deciding whether an expanded lender-of-last-resort role will, on the whole, be beneficial and how it should be executed. This is a topic that I plan to pursue in further research.

Notes

1. The lemons problem also can be important in equity markets. Myers and Majluf (1984) and Greenwald, Stiglitz, and Weiss (1984) describe how the inability of investors to distinguish between good and bad issuers of equity means that the price they will pay for shares will reflect the average quality of the issuers. The result is that high-quality firms receive a lower price for their shares than the fair market value, while low-quality firms receive a price above the fair market value. As a result, some high-quality firms will not issue shares, and thus investment projects with a positive net present value will not be undertaken.

2. Asymmetric information can also explain credit rationing in which there are restrictions on the size of loans, as in Jaffee and Russell (1976).

3. F. Ross Johnson, the former CEO of RJR-Nabisco, is reputed to have had RJR-Nabisco pay for two personal maids, two dozen country club memberships, and a fleet of ten corporate planes nicknamed the "RJR Airforce."

4. Calomiris and Hubbard (1989) emphasize this mechanism in their econometric analysis of the 1894–1909 period.

5. In addition, as pointed out by Stiglitz and Weiss (1983), banks have an advantage in minimizing moral hazard on the part of borrowers because banks can use the threat of cutting off lending in the future to improve borrowers' behavior.

6. Credit controls, such as those imposed in 1980, or disintermediation arising out of deposit rate ceilings are another possible way in which banks may find themselves unable to fully perform their intermediation role.

7. Note that the dates at which the number of bonds in each category changes do not fall within any of the subsamples analyzed in the paper. This avoids the potential for discontinuities in the interest-rate-spread series during the episodes studied.

8. The stock price series developed by Schwert (1989b) is very close to that of Wilson, Sylla, and Jones (1990), and its use would not change any conclusions in the analysis here.

9. The financial crisis associated with the beginning of World War I in August 1914 is not examined in this paper because data are not available from August to November 1914, when the New York Stock Exchange was closed.

10. Another important role of the clearing-house associations mentioned by Gorton (1985) is that they would provide liquidity to the banking system by issuing clearing-house certificates during a panic. The clearing-house associations had not yet taken on this role in 1857, but did so in later banking panics.

11. A similar phenomenon can also affect consumer spending, as discussed in Mishkin (1978).

12. For those who, like myself, do not know the meaning of the word "defalcation," it is a misappropriation of funds held by a trustee or other fiduciary.

13. The failure of the interest rate spread to rise also casts some doubt on the story put forward by Romer (1988) that the initial severity of the Great Depression may have resulted from increased uncertainty. Since such uncertainty should increase adverse selection and thereby increase the interest rate spread, and yet this does not seem to

happen before October 1930, it is not at all clear that uncertainty rose appreciably in this period.

14. See also Hamilton (1987).

15. Hamilton (1987) disputes the view that real interest rates were high during this period because he finds that futures prices in commodity markets were not indicating an expected deflation in this period. Mishkin (1990), however, demonstrates that futures prices in commodity markets are not capable of informing us about expected inflation for aggregate price indices. Cecchetti (1989), using additional evidence, also criticizes Hamilton's position that the deflation in this period was not anticipated. More recent work by Hamilton (1990) is more favorable to the view that real interest rates rose during the 1931–33 period. Indeed, an interesting finding in the Hamilton paper is that substantial anticipated deflation, and hence high real rates, did not occur until late 1930, and this is exactly when we start to see evidence that serious asymmetric information problems are beginning to appear in the U.S. economy.

16. See Maisel (1973) and Brimmer (1989) for further discussion of the Penn Central bankruptcy episode.

17. It is noteworthy that when the Fed advanced discount loans to banks lending to customers who needed to roll over their commercial paper, the banks were told that they would be responsible for the credit risk involved in this lending; see Brimmer (1989, 6).

18. See the *Wall Street Journal* (1987) and Brimmer (1989) for a description of the events surrounding the stock market crash.

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