INTRA-INDUSTRY EFFECTS OF THE TEN LARGEST UNITED STATES BANK FAILURES: EVIDENCE FROM THE CAPITAL MARKETS

DISSERTATION

Presented to the Graduate Council of the
North Texas State University in Partial
Fulfillment of the Requirements

For the Degree of

DOCTOR OF PHILOSOPHY

By

In Suk Choi, M.B.A.
Denton, Texas

December, 1987

3/M
no. 2917

Choi, In Suk, Intra-Industry Effects of the Ten Largest United States Bank Failures: Evidence from the Capital Markets. Doctor of Philosophy (Finance), December, 1987, 121 pp., 13 tables, bibliography, 53 titles.

This study examines the differential effect of each of the ten largest bank failures on shareholders' wealth of non-failed banks over the period from 1973 through 1984. It examines how contagion and information effects of major bank failures have changed over time.

FDIC policy for settling failures has important implications for system stability, and has changed over time. This study's purpose is to provide empirical evidence on the effects of FDIC policy. The FDIC's handling of the Penn Square failure signaled a policy shift and offers a unique opportunity to examine changes in market reactions to large bank failures.

The literature on the capital market effects of major bank failures provides limited evidence on the impact of bank failures and related FDIC policy. Most fail to discriminate between contagion and information effects, and conduct analysis on one (or a few) bank failure(s) in the mid-1970s using traditional event study methodology.

This study considers multivariate regression (MVRM) an appropriate methodology for bank failures which are likely

to have simultaneous impact on non-failed banks. MVRM, which accounts for contemporaneous cross-sectional dependence of residuals, has three advantages over standard residual analysis: no "event clustering" problem, multiple hypotheses tests, and computational efficiency. This study uses daily stock-return data for fifty-one non-failed commercial banks. For each bank failure, the non-failed banks are grouped into three portfolios: "information-related," "large," and "small." The impact on each portfolio is tested for an average effect and joint hypotheses on excess return.

This study offers evidence on no contagion effects and lack of information effects before Penn Square, strong information effects since Penn Square, contagion effects in post-Penn Square failures, and capital market discipline on large banks since Penn Square. There has been a change in the nature of the impact of bank failures since Penn Square.

TABLE OF CONTENTS

LIST OF TABLES

CHAPTER I

INTRODUCTION

General Statement of the Problem

The FDIC's primary concern in handling major bank failures is potential impact of the failures on the financial system stability. Advocates of strong federal regulation argue that the failure of a major bank, for whatever reason, will cause a loss of confidence in the financial system as a whole. At worst, this loss of confidence may lead to a series of bank runs: this is the "contagion effect" of a bank failure.

The major objective of the FDIC is to prevent bank runs and consequent failures. The FDIC policy in settling bank failures has changed over time. Prior to the Penn Square failure, the FDIC protected all depositors of most bank failures through purchases and assumptions (P & A). With the Penn Square failure on July 5, 1982, FDIC Chairman William Issac threatened to withdraw the agency's de facto 100 percent guarantee of uninsured deposits by selecting deposit payout on the bank. However, after Penn Square, the FDIC appears to have resumed the preferential treatment for major bank failures (e.g., full rescue package for Continental crisis). Since the presumed large bank bias of the FDIC has important policy implications for the banking industry, a study on how the contagion effect of a major bank failure has changed over time is appropriate. The implicit shift in the FDIC policy in handling Penn Square failure offers a unique opportunity to examine possible change in market reactions to a major bank failure over time.

A major bank failure can influence the equity value of non-failed banks through two mechanisms: the contagion effect and the information effect. If there is a contagion effect, then uninsured depositors will require higher yields to offset their perceived increase in risk, causing a decline in the equity value of non-failed banks. Alternatively, if a major bank failure releases adverse information regarding the asset quality of non-failed banks, then the market will re-evaluate risk-return relationships on these banks' equity, bringing down their equity value.

There are a number of articles on the capital market effects of a major bank failure. Pettway (10) implicitly examined the contagion effect of pre-Penn Square failures on the banking industry, and Aharony and Swary (1) explicitly investigated the contagion effects on selected groups of non-failed banks. Lamy and Thompson (7) examined an impact of the Penn Square failure on the industry as a whole, and Peavy and Hempel (9) investigated the information effect of the Penn Square failure on the overall industry and on selected groups of non-failed banks.

In general, evidence for the contagion effect is weak at best, whereas evidence for the information effect is strong. However, the evidence obtained from these studies is weakened by their failure to separate the information and contagion effects of a bank failure. Recently, Swary (11) explicitly examined both the contagion and information effects of the Continental crisis on three selected groups of non-failed groups as well as on the industry as a whole. Karafiath and Glascock (6) also examined both effects of Penn Square failure in light of FDIC policy. All of the previous studies use a single or a few bank failures in their work. This small sample of bank failures in previous studies suggests that a comprehensive analysis, with a larger sample of failed banks, might provide more convincing evidence.

Objective of the Study

The objective of this study is to examine how the economic impact of major bank failures has changed over time. Specifically, this study examines intra-industry effects of each of the ten largest United States bank failures on shareholder wealth of non-failed banks over the period from 1973 through 1984. The study focuses on examining the following: (1) contagion effects of each bank failure on "small" and "large" banks, (2) information effects on "information-related" banks, (3) overall effects on the industry as a whole, (4) overall contagion effects on the industry, (5) relative impact of the contagion and information effect, and (6) relative impact of the contagion effects by size of non-failed banks.

Data and Methodology

This study uses daily return data on a sample of fifty-one non-failed commercial banks over the period from 1973 through 1984. The data are obtained from the Center for Research in Security Prices (CRSP) tapes. A more robust analysis can be performed with daily data because the event can be better specified (5). For each of the ten failures the non-failed bank sample is partitioned into three portfolios. The first portfolio, "information-related" banks, is made up of non-failed banks with characteristics similar to a failed bank. The remaining non-failed banks that are not related to the failed bank are divided into two portfolios: "large" and "small" banks. The "large" portfolio consists of the largest national banks, which have been known, implicitly and explicitly, as "too big to fail" (TBTF). The remaining unrelated non-failed banks comprise the "small" portfolio.

This study measures the impact of major bank failures using the multivariate regression model (MVRM) developed by

Binder (4), Malatesta (8), and Thompson (12). The MVRM is an application of Zellner's (13) "seemingly unrelated regression" (SUR) technique to event studies. Like other event study methodology, the MVRM measures the impact of the failure event by estimating excess returns to shareholders of non-failed banks. However, the MVRM departs from the traditional residual analysis, which examines average residual generated from a "fair-game" model, in the following ways: the MVRM measures excess returns by parameterizing it in the model and provides numerous hypotheses to be tested.

A bank failure announcement is likely to have simultaneous impact on non-failed banks, because it occurs on the identical calendar date for non-failed banks. This feature of the failure event motivates the use of MVRM, which accounts for cross-sectional dependence of residuals at a given time. The MVRM has three advantages over the standard residual analysis: (1) it generates a smaller standard error of test statistics, (2) it permits a variety of hypotheses, and (3) it provides for efficient use of data.

Significance of the Study

In comparison with the previous empirical work, this study provides more convincing evidence on the impact of major bank failures and FDIC policy. This study uses the ten largest United States bank failures over the period of

1973 through 1984, which spans both change in FDIC policy and deregulation. This allows us to examine how market's reactions to bank failures and related FDIC policy have changed over time. In this regard, this paper is the first comprehensive study in this area of research. In addition, this study focuses on intra-industry effects of the failures by discriminating between the contagion and information effects. This allows us to examine relative impact of the failures on the banking industry as a whole. Further, use of multivariate regression model (MVRM) as an event study methodology provides more powerful tests on the impact by solving problems of "event clustering," and conducting a variety of hypotheses. Also, use of daily capital market data reduces "contamination" problems, which might occur when weekly or monthly data are used.

This study finds that there is a change in the nature and scope of the impact of the failures on the banking industry since Penn Square. This finding implies that there has been a change in the stock market's reaction to the bank failures. This may reflect widespread concern over soundness and safety of the banking industry among bankers and investors as well as policymakers. Deregulation and the manner in which the FDIC has handled major bank failures have been suggested as potential sources of the concern.

FDIC's large bank bias policy has two opposite effects on the financial system stability: prevention of a series of bank runs and promotion of bank risk-taking. Before 1981, the FDIC prevented bank runs through full protection of all depositors in event of a bank failure. However, after 1981, the federal agency faced a serious conflict because its traditional policy also reduced constraints against bank risk-taking, which may further destabilize the system.

In this context, the results of this study offer evidence that the change in the stock market reactions to major bank failures may reflect the conflicting effects of the FDIC policy on the system stability. Thus, this change in the market reaction will shed insight on federal regulation, bank risk-taking, and market discipline in maintaining the financial system stability in an era of growing deregulation of the industry.

Organization of the Paper

Chapter II provides an overview of the FDIC's policy in settling bank failures. Chapter III reviews literature on empirical studies using traditional residual analysis and the multivariate regression model approach (MVRM), and explains the general procedure of the MVRM. Chapter IV describes the methodology including the discussion of the sample grouping and empirical testing procedure. Chapter V presents the results of various tests, and analysis of the results is presented in Chapter VI. Summary and implications are given in Chapter VII.

CHAPTER BIBLIOGRAPHY

1. Aharoney, J. and I. Swary, "Contagion Effects of Bank Failures: Evidence from the Capital Markets," Journal of Business, 56 (July, 1983), 305-322.

2. Binder, John, "Measuring the Effects of Regulation with Stock Price Data: A New Methodology," working paper, University of Chicago and Washington University, August, 1983.

3. ____________, "Measuring the Effects of Regulation with Stock Price Data," Rand Journal of Economics, 16 (Summer, 1985), 167-183.

4. ____________, "On the Use of the Multivariate Regression Model in Event Studies," Journal of Accounting Research, 23 (Spring, 1985), 370-383.

5. Brown, S. J. and J. B. Warner, "Using Daily Stock Returns: The Case of Event Studies," Journal of Financial Economics, 14 (March, 1985), 3-31.

6. Karafiath, Imre and J. L. Glascock, "Intra-Industry Effects of a Regulatory Shift: Capital Market Evidence from Penn Square," working paper, North Texas State University, Denton, Texas, 1986.

7. Lamy, Robert E. and G. Rodney Thompson, "Penn Square, Problem Loans, and Insolvency Risk," The Journal of Financial Research, 9 (Summer, 1986), 103-111.

8. Malatesta, Paul, "Measuring Abnormal Performance: The Event Parameter Approach Using Joint Generalized Least Squares," Journal of Financial and Quantitative Analysis, 21 (March, 1986), 27-38.

9. Peavy, J. W. and G. H. Hempel, "The Penn Square Bank Failure: Effect on Commercial Bank Security Returns," working paper, Southern Methodist University, Dallas, 1986.

10. Pettway, R. H., "The Effects of Large Bank Failures upon Investor's Risk Cognizance in the Commercial Banking Industry," Journal of Financial and Quantitative Analysis, 11 (September, 1976), 465-477.

11. Swary, Itzhak, "Stock Market Reaction to Regulatory Action in the Continental Illinois Crisis," Journal of Business, 59 (July, 1986), 451-473.

12. Thompson, Rex, "Conditioning the Return Generating Process on Firm Specific Events: A Discussion of Event Study Methods," Journal of Financial and Quantitative Analysis, 20 (June, 1985), 151-186.

13. Zellner, A., "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias," Journal of the American Statistical Association, 57 (June, 1962), 348-368.

CHAPTER II

FDIC POLICY ON BANK FAILURES AND ITS IMPLICATIONS

Since the main objective of the FDIC is to minimize bank runs and consequent bank failures, the FDIC has played a crucial role in maintaining the public's confidence in the financial system. This chapter briefly explains several alternatives available to the FDIC in handling a bank failure, FDIC practice and the expected impact of FDIC policy on the system stability and the equity market.

Settlement Methods

When a chartering agency, the comptroller of the currency for a national bank or the state banking authority for a state bank, has declared a commercial bank insolvent, the FDIC has three basic methods to handle the failed bank.

Deposit Payoff

The FDIC pays off the insured depositors up to the insurance limit (at present $100,000). The uninsured depositors become general creditors and receive payment on the uninsured deposits as the FDIC liquidates the assets of the failed bank. How much they receive depends on the liquidated value of assets. With deposit payoff, uninsured depositors are not fully protected. They are exposed to some loss on their deposits.

Purchase and Assumption

The FDIC arranges for other banks to assume all of the failed bank's deposits along with the purchase of its sound assets. The FDIC pays cash to an acquiring bank to cover a gap between the value of the purchased assets and the received deposit liabilities. With purchase and assumption (P&A), all depositors--uninsured and insured--are fully protected from the bank failure.

The FDIC considers two criteria in choosing a deposit payoff and a purchase and assumption when a bank fails: first, the FDIC mandate is to preserve the stability of the financial system; second, the FDIC may wish to promote market discipline by placing uninsured depositors at risk. The choice between the two depends on the relative importance of long-run and short-run factors. In December, 1983, the FDIC adopted a new "modified" payment procedure. The new procedure exposes uninsured depositors to some loss from failure, but less than the previous deposit payout procedure.

Direct Assistance

The FDIC provides financial assistance (i.e., a loan) to keep the bank from failing. This procedure is used only when the FDIC deems the continued operation (existence) of the failed bank to be essential to provide adequate banking service in the community. With this reserve package, direct assistance provides 100 percent guarantee of uninsured deposits.

Settlement Practice

Since the creation of the FDIC in 1933, there have been about 750 bank failures over the period 1934 through 1984. Most of these failures were relatively small banks. During the thirty-nine years from 1934 to 1972, which was not a period of high risk-taking by banks, no failed banks had total deposits in excess of $100,000,000 ranging from $300,000 to $93,000,000. But after 1972, the average size of failed banks and the number of failures has increased sharply, reflecting an increase in risk-taking by large banks. In 1973, United States National Bank, San Diego, with $932,000,000 in deposit was closed. In the following year, Franklin National Bank, New York, with $1.4 billion in deposits was also closed. Moreover, in 1984, Continental Illinois National Bank, Chicago, the nation's eighth largest bank, was declared insolvent.

As a result of the drastic change in the nature of bank failures, bank depositors have expressed concern about their exposure to risk and the value of deposit insurance. The level of insurance coverage and the federal actions on failed banks have become important to the general public as well as to depositors and regulators.

During the past thirty years, most bank failures, particularly large bank failures, have been settled through the purchase and assumption transaction. From 1968 through 1981, about three-fourths (76) of failed commercial banks (108) were handled by purchase and assumption. These 76 banks had average total assets of $171,000,000. The other 32, which had average total assets of $10,800,000 were handled through the deposit payout. Until the Penn Square failure, the FDIC never selected a deposit payout on a failed bank larger than $100,000,000 in assets. Until 1982, virtually all large bank failures were settled through purchase and assumption methods, giving all depositors in large banks *de facto* 100 percent protection from bank failures.

The FDIC action on the Penn Square Bank of Oklahoma was unique in that it represented the first deposit payoff of a bank in excess of $100,000,000 in assets. At the time of failure, the bank had $517,000,000 in assets. As a result, uninsured depositors of the bank suffered financial losses. Various factors account for the manner in which the failed bank was handled [for details, see Zweig (8)]. One factor is the FDIC's new policy of promoting market discipline by shifting risk back to uninsured depositors and away from the FDIC.

Since the Penn Square failure, the FDIC's practice in handling bank failures, however, has not been uniformly applied to failed banks. Over the period from 1983 through 1984, the FDIC applied the new "modified" payout procedure to thirteen small banks (two of them had deposits just above $150,000,000), causing uninsured depositors to suffer financial loss while it resumed the purchase and assumption or used a rescue package to large banks (i.e., First National Bank of Midland with deposits of $574,000,000, and Continental Illinois of $30 billion). This provided 100 percent protection to uninsured depositors of large banks. Therefore, the policy of FDIC following the Penn Square failure has produced an impression that it uses a double standard in handling bank failures: market discipline standard for small banks, and banking system stability standard for large banks.

Implication for the Financial System

There are a number of justifications for the FDIC's use of purchase and assumption when settling a large bank failure (1; 2, pp. 22-23; 5). One common justification is that the purchase and assumption contributes to the stability of the financial system by preventing the "contagion" effect of a bank failure. The "contagion" effect is a series of bank runs that occurs when a bank failure causes a loss in public confidence in the system. The purchase and assumption's are *de facto* 100 percent protection of uninsured depositors and thus prevents bank runs and consequent failures.

However, extensive use of the purchase and assumption method also has an adverse effect on the financial system stability (3, 4, 6, 7). It has been argued that the FDIC's preferential policy to failing large banks subsidizes large bank risk-taking. The reason is that *de facto* 100 percent guarantee of all deposits would reduce incentives for uninsured depositors to monitor risk exposure of their banking. This, in turn, would reduce restraints against bank risk-taking, providing banks with incentives to take excessive risk. This may lead to destabilization of the financial system. This view is best expressed by the FDIC.

> The problem is that deposit insurance may come to exert a preverse effect--furthering rather than containing financial instability. This may happen if the combination of government underwriting of deposit risk and the natural tendency of institutions to trade on this advantage is not checked by off-setting constraints imposed by government, or by the market, or both (2, p. 25).

Implication for the Capital Market

As implied above, the role of the market is equally important in maintaining the stability of the financial system. The market can penalize large banks by sending adverse signals such as higher costs of funds and thus curtail bank risk-taking. For example, if uninsured depositors or shareholders of non-failed banks will require higher returns to offset their increased perception in financial risk.

However, this potential market discipline depends on how investors react to new information associated with bank failures. If the market is efficient, current stock price will fully and rapidly reflect changes in investors' perceptions of the contagion effect of a bank failure. As shown above, the FDIC has demonstrated no consistency in handling bank failures after Penn square. This inconsistency might have strengthened the perception that uninsured depositors at large banks (i.e., money-center banks) will be fully protected in the same way that they were before Penn Square. Or, the inconsistency might have generated uncertainty that uninsured deposits at a small bank would suffer loss if the bank fails.

Under the assumption of market efficiency, the response of the bank equity market to the FDIC action on handling large bank failure will provide an opportunity to examine the following questions.

1. Does a major bank failure have any negative effect on the banking industry?

2. Does the market "tier" banks by size?

3. Has the market reaction to bank failures changed over time?

One caveat in measuring contagion effects with capital market data is that there is another mechanism through which bank failure can influence equity value of non-failed banks: information effect. If a bank failure reveals new information concerning non-failed banks, equity values of related non-failed banks are likely to be affected. This information effect should be isolated from the contagion effect.

Summary

This chapter has reviewed FDIC policy in handling a major bank failure. Three basic methods of settlement (deposit payoff, purchase and assumption, and direct assistance) are mentioned. Settlement practice before and after Penn Square is reviewed. In addition, two opposite effects of the FDIC large bank bias policy on the system stability are addressed: positive effect of preventing bank runs and negative effect of promoting bank risk-taking.

Finally, the FDIC policy's implications for the capital market are explained: the market plays an important role in maintaining the system stability through "market discipline." This implication justifies an opportunity to examine equity return behavior of the banking industry, around bank failure announcement which is the primary purpose of this study.

CHAPTER BIBLIOGRAPHY

1. Diamond, D. W. and P. H. Dybvig, "Bank Runs, Deposit Insurance, and Liquidity," Journal of Political Economy, 5 (June, 1983), 401-419.

2. Federal Deposit Insurance Corporation, Deposit Insurance in a Changing Environment, Washington, FDIC, August, 1985.

3. Forrestal, Robert P., "Bank Safety: Risks and Responsibility," Economic Review, Federal Reserve Bank of of Dallas, August,1985, pp. 4-12.

4. Gilbert, R. Alton, "Recent Changes in Handling Bank Failures and Their Effects on the Banking Industry," Federal Reserve Bank of St. Louis, St. Louis, June-July, 1985.

5. Horwitz, Paul M., "Failures of Large Banks: Implications for Banking Supervision and Deposit Insurance," Journal of Financial and Quantitative Analysis, 10 (November, 1975), 589-610.

6. Mayer, Thomas, "Should Large Banks be Allowed to Fail?," Journal of Financial and Quantitative Analysis, 10 (November, 1975), 161-173.

7. Short, Eugenie D., "FDIC Settlement Practices and the Size of Failed Banks," Economic Review, Federal Reserve Bank of Dallas, Dallas, March, 1985, pp. 12-20.

8. Zweig, Phillip L., Belly Up: The Collapse of the Penn Square Bank, New York, Crown Publishers, 1983.

CHAPTER III

LITERATURE REVIEW

There are a number of articles in the literature on the capital market effect of a major bank failure. Most of them use standard residual analysis in measuring capital market effect of the bank failure. Recently, the multivariate regression model (MVRM) approach has been suggested as a better methodology. This chapter briefly reviews the literature on (1) empirical studies using traditional residual analysis, (2) theoretical framework of the MVRM, and (3) empirical studies using the MVRM.

Empirical Studies Using Traditional Residual Analysis

There are several articles on the capital market effect of a major bank failure. Earlier studies examined the contagion effects of a bank failure on the banking industry as a whole. Recent studies focused on information effect of the Penn Square failure in 1982 on related bank groups within the industry. Only one study examined both effects separately.

Pettway (19) investigated the contagion effect of a failure of large insured commercial banks on the banking industry and the market as a whole. The study examines shareholder's risk perception in the banking equity market in an attempt to determine the influence of the two large bank failures (the U. S. National Bank of San Diego in 1973, and the Franklin National Bank in 1974) upon non-failed large banks.

Pettway (19) used nineteen large commercial banks for the analysis of industry effect and Standard and Poors composite 500 index for the overall market effect. Using weekly return data, he implements _t_-tests on each of the parameters of the market model to identify the source of structural change in risks, i.e., beta for systematic risk, and variance of error terms for unsystematic risk. He finds the following results: (1) Each failure has no impact on the market as a whole; (2) United States National Bank (USNB) has no impact on the banking industry as well; and (3) Franklin National BAnk (FNB) has a significant adverse effect on the banking group, but its effects are transitory.

Pettway concludes that the effect of large banks' failure is "isolated and noncumulative," implying that large bank failures may not have contagion effect on the banking industry as well as the economy as a whole. One weakness of the study is that he fails to explain what causes each failure to have differential short-run effects on the banking group.

Aharony and Swary (1) examine three aspects of the impact of a large bank failure on the banking industry:

(1) the contagion effect on the banking industry, (2) the possible relation between the specific cause of each failure and any contagion effect, and (3) the differential effect within the industry. For the analysis, they use three large bank failures: the United States National Bank (1973), the Hamilton National Bank (1976), and the Franklin National Bank (1974). They divide a sample of seventy-three solvent banks into three portfolios grouped by size: (1) twelve "money center," (2) thirty-one "medium size," and (3) thirty "smallest."

They employ the standard event study methodology (i.e., residual analysis) to detect the effect of each bank failure. Weekly return data over the period from 1969 through 1977 are used to measure and test the average abnormal return of each portfolio. They implicitly hypothesize negative correlation between bank size and contagion effect; the smallest group would be impacted the greatest. The major findings of this study were as follows:

1. There is no contagion effect on any of the three groups when the cause of a failure is firm-specific (i.e., fraud or internal irregularities, as in USNB and HNB), and

2. There are significant negative returns on each portfolio when the failure is caused by industry-wide problems (i.e., foreign exchange risk as in FNB). They conclude that regardless of the causes of failure, no

contagion effect appears to exist. They interpret the drop in bank stock prices in case of the FNB failure as "investor's reaction to a common type of unfavorable signal."

Fraser and Richards (11) examine the informational efficiency of the equity market of banks by evaluating information effects of the Penn Square failure on upstream banks, which co-loaned with the failed bank. They argue that if the market is efficient, adverse information on the upstream banks already available prior to the bank failure should have been impounded in their stock price, resulting in minimal effect upon the failure announcement. For the analysis, Fraser and Richards calculate average and cumulative residuals using the standard market model. Their general conclusions are as follows: (1) the market did not fully anticipate the failure, and (2) the market was slow in incorporating the closure information. However, this study has two problems. First, it fails to implement significance tests on the abnormal returns, weakening the validity of the results. Second, it uses weekly data, making it difficult to assess the speed of the market reaction to the closure.

Peavy and Hempel (18) examined differential information effects of the Penn Square closing on the following three bank stock groups: (1) directly involved, upstream banks, (2) indirectly related, regional banks, and (3) unrelated, major national banks. They also examined the equity return behavior of these three groups before, on, and after the actual announcement in an attempt to detect exact timing of the impact. Peavy and Hempel used a market-adjusted return model, and tested the daily abnomal returns at various times and intervals over a seventy-five day event period.

Their results can be summarized as follows: (1) the unrelated major banks are not significantly affected throughout the event period except after the event date, (2) the regional banks are continuously impacted but not disruptively, and (3) the upstream banks are continuously and significantly affected throughout the period. Contrary to Frasor and Richards, Peavy and Hempel find that the upstream bank stock prices quickly responded to the new information revealed by the closure. The evidence indicates that equity markets are efficient under incomplete information in that the market response to new information is appropriate for the degree of each bank's involvement to the Penn Square. The authors conclude that "the failure of Penn Square appeared to be viewed as an isolated event with limited effect" (18, p. 16) implying no contagion effect on the banking industry. This conclusion is consistent with the previous studies (1, 19).

Lamy and Thompson (15) also investigated an impact of the Penn Square failure on the banking industry. Like

Pettway (19), they examined structural change in risk in the market before and after the failure. Using daily data on a sample of fifty-four banks, excluding upstream banks, they performed *t*-tests and F-tests to identify sources of shifts in total variance in the market model. The *t*-test is adjusted for cross-sectional dependence in "clustering" of event dates, discussed by Brown and Warner (5, p. 232).

They found that significant structural change in unsystematic risk of the portfolio return occurred after the failure. They argue that their finding is an indication of the investors' perception that the observed change in the riskiness of the industry is structural, not transitory as shown in Pettway's study (19). They provide evidence that the increased interdependence between banks as well as the change in FDIC policy on protecting depositors may have potential negative impact on the banking industry. But they fail to divide the impact into contagion effect and information effect.

Swary (21) investigated economic effects of a bank failure, focusing on causes of the effect. Swary examined the market reaction to the Continental Illinois (one of the money-center banks) crisis in 1984, regarding the bank-run effect and the information effect.

Assuming market efficiency, Swary analyzed shareholders' abnormal returns as a response to unanticipated information on the Continental. The market model was used with weekly return data. To discriminate between a bank-run effect and an information effect, he divided a sample of sixty-seven non-failed banks into two groups: forty-six "solvent" banks and twenty-one banks of "questionable" solvency. The latter group included twelve banks that had similar characteristics in assets and liabilities to the failed bank. He expected the last group to be affected the greatest.

Swary found that all groups were significantly affected by the failure announcement, and in particular, the twelve-bank group was affected most. He attributed the significant negative reaction of the market to an information effect, rather than a bank-run effect. He found additional evidence to support his results by examining the volume of trading and deposit withdrawals during the event period.

All of these studies use the traditional residual analysis. Although standard residual analysis [i.e., Fama and others (10); Dodd and Warner (7)] has been a durable event study methodology, it has been subjected to criticism (4, 16).

The main criticism is that it ignores cross-sectional dependence by assuming independence of error terms. This problem is particularly severe when a common event is likely to influence asset prices simultaneously. Brown and Warner (5, 6) examined the effect of "clustering" of event dates, and report that there is a systematic upward bias in the variance of mean prediction errors in the case of positive cross-sectional dependency, weakening validity of the inference.

Multivariate Regression Model Approach

As a solution to this problem, several methods have been proposed. One of them is the multivariate regression model (MVRM) approach. The MVRM is a special case of Zellner's seemingly unrelated regression model (SUR), in which the equations are related through the nonzero contemporaneous covariances associated with errors. Following Binder (2), Thompson (22), and Malatesta (17), this section briefly outlines the MVRM, focusing on its characteristics and proposed advantages.

Model Formulation

The Multivariate Regression Model approach (MVRM) formulates a model by including effect of an event applicable to a problem in the traditional return-generating model such as market model. Equation 2 explains an individual multivariate regression model using the market model of Equation 1.

$$R_{jt} = \alpha_j + \beta_j R_{mt} + U_{jt} \tag{1}$$

$$R_{jt} = \alpha_j + \beta_j R_{mt} + \gamma_j D_t + U_{jt} \tag{2}$$

where:

R_{jt} = return to security j on time t,

α_j = intercept coefficient,

β_j = beta coefficient or systematic risk of security j,

R_{mt} = return to a market index on time t,

γ_j = event parameter of security j,

D_t = an event dummy variable which is set equal to 1 on time t and o otherwise, and

U_{jt} = disturbance term of security j on time t.

Equation 2 conditions the return-generating process on the existence or absence of an event by adding dummy variables to the right hand side of Equation 1. Equation 2 contains one explanatory variable, R_{mt}, and a single event dummy variable over a given sample period. But the equation can include other explanatory variables and multiple event dummy variables, as in Binder (2), and use other forms of "fair-game" model (i.e., capital asset pricing model) in conditioning the event dummy variable, as in Schipper and Thompson (20).

Since event studies investigate the impact of an economic event on a set of securities, a system of equations for J securities can be written as Zellner's (23) seemingly unrelated regression model (SUR). Equation 3 explains a system of equations in shorthand form:

$$R = X \, \Gamma + U \tag{3}$$

where:

R = JT x 1 vector of security returns with T observations on each of J firms,

X = a [JT x J (2 + K)] matrix of explanatory variables including the event dummies. Again, there are T observations on each of K firms; for each firm, column one is the intercept; column two is T observations on the market; the next K columns are the event dummies,

Γ = a [J (2 + K) x 1] vector of coefficients, and

U = a JT x 1 vector of residuals.

The disturbance matrix of U in Equation 3 plays a critical role in MVRM approach as an alternative to standard residual analysis in event study. The covariance matrix U contains all of the information about error covariances, cross-sectionally and over time. Like Zellner's SUR, the MVRM, represented by Equation 3 has the following three assumptions on U in Equation 3:

Assumption 1: No correlation within equation; errors are independent and identically distributed,

Assumption 2: Non-zero cross-sectional covariance at a given point in time,

Assumption 3: Zero cross-sectional covariance at different points in time.

The structure of the MVRM and the assumptions on the error matrix require that the number of observations and the calendar time periods considered be the same for all securities.

Parameter Estimation

Since the MVRM is a special case of Zellner's SUR, the parameter estimation of Equation 3 follows the procedure of Zellner's SUR estimation, which is simply the application of joint generalized least-squares estimations (JGLS). It provides the estimator identical to the JGLS estimations which are consistent and asymptotically efficient. Accordingly, the MVRM estimators obtain no gain in efficiency, which is generally expected from the JGLS estimators, because the JGLS estimators and OLS estimators are identical in case that all explanatory variables are the same across equations as in Equation 3 [see Judge and others (12)].

However, this special case enables us to simplify estimation of the cross-sectional sum of prediction errors (i.e., gamma in Equation 2). Since the sum is a scalar multiple of the mean of event parameters, testing the null hypothesis of zero sum of event parameters is equivalent to testing the null hypothesis of zero mean of event parameters. Given the common explanatory variable (i.e., R_m in Equation 2), this zero mean hypothesis can be tested by forming an equally weighted portfolio of J securities. The event parameters on the portfolio is the mean of event parameters across securities [for proof, see Thompson (22, pp. 162-166)]. The estimation of the mean is based on Equation 4:

$$R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma_{pn} \sum_{n=T+1}^{T+N} D_{nt} + U_t \qquad (4)$$

$$t = 1,..,T,T+1,..T+N$$

where:

R_{pt} = return to an equally weighted portfolio P of J securities on time t,

γ_{pn} = event parameter of portfolio P on the dummy variable D_n, and

D_{nt} = a dummy variable for portfolio P that is set equal to 1 on time n in the event period and o otherwise.

The other notations are the same as in Equation 2.

The mean of estimated gamma, $\hat{\gamma}_{pn}$, is a weighted average of each prediction error, $\hat{\gamma}_{jn}$, across J securities, which is equivalent to the sum of prediction errors of the portfolio P of J securities. Instead of running multi-equation (i.e, Equation 3) by either OLS or JGLS, we can run only one multiple regression for the average prediction error. In short, under the special condition such as equal weighting of the portfolio, the MVRM provides a simplified procedure to estimate cross-sectional sum or mean of prediction errors.

Hypotheses Testing

Within the framework above, the MVRM allows us to formulate a variety of null hypotheses across equations as well as within equations, which can be tested by imposing linear restriction on values of coefficient. The hypothesis that the cross-sectional sum of prediction errors is zero, stated in Equation 5, can be tested by imposing one constraint on the sum of gamma coefficients.

$$\text{Hypothesis 1:} \quad \sum_{n=T+1}^{T+N} \gamma_{pn} = 0 \tag{5}$$

Given the common explanatory variable such as R_m, the hypothesis that the mean prediction error is zero, which is equivalent to the hypothesis of zero sum of prediction errors (Equation 5), can be implemented by simple _t_-test in the portfolio regression of Equation 4.

Further, it is possible to test the hypothesis that all prediction errors across event period are jointly zero, stated in Equation 6,

$$\text{Hypothesis 2:} \quad \gamma_{pn} = 0, \; n = T+1,\ldots,T+N \tag{6}$$

by imposing n restrictions on the coefficients across event period.

This joint hypothesis is conducted in order to sharpen the ability of the methodology to detect common effect of an event. The joint hypothesis is particularly important when prediction errors differ in sign as common in regulatory events (3, 20). That is, the joint test may give more information on the event's impact even if a test fails to reject Hypothesis 1 because some of the individual prediction error could be different from zero.

In the event study, the MVRM has an advantage over the traditional residual analysis in that it tests joint hypotheses such as Equation 6, while the latter only tests for the average related-hypothesis such as Equation 5. The hypotheses of Equation 6 as well as Equation 5 enable a more powerful test, because some of the individual parameters could be different from zero.

It is generally expected that test statistics used in the multivariate regression model (MVRM) may increase power of the tests because they account for cross-sectional covariances of disturbance terms. The cross-sectional dependence is ignored in traditional residual methodology. As a matter of econometric and computational efficiency, the null hypothesis on average-related effect such as Equation 5 can be implemented by t-tests in the portfolio regression of Equation 4. The standard error of event parameter, $\hat{\gamma}$, is identical to that of forecast error, $R_{jt}-\hat{R}_{jt}$, developed in standard econometrics textbooks such as Kmenta (14, pp. 240-241). [For a proof, see Defour (8, 9).]

In summary, the Multivariate Regression Model (MVRM) is a new event study methodology which is, in principle, similar to standard residual analysis. The MVRM also uses prediction errors (abnormal returns) in examining impact of an economic event on asset prices. The joint GLS estimation on the MVRM have no gain in efficiency when examining a common event; however, the technique explicitly accounts for cross-sectional dependence of residuals.

The MVRM has a number of advantages over standard residual analysis such as FFJR methodology. The main advantages are (1) avoidance of the statistical problems in hypotheses testing, discussed by Brown and Warner (5, 6); (2) provision of a variety of hypotheses to be tested (i.e., test of joint hypothesis in Equation 6); and (3) efficient use of data (i.e., OLS estimation and standard _t_-tests on the portfolio regression). A summary of comparison of standard residual analysis and the multivariate regression model (MVRM) is shown in Table I.

Empirical Studies Using the MVRM

There are two major studies that use the multivariate regression model in event study of regulation change. Contrary to the theoretical advantage of the methodology, both studies find no support that the MVRM is powerful in detecting significance of excess returns when it is applied to multiple announcement event such as regulatory changes.

Binder (2, 3) examines usefulness of market data and event study methodology in detecting the effects of regulatory

TABLE I

COMPARISON OF RESIDUAL ANALYSIS AND MVRM

Features	Residual Analysis	MVRM
Model	Market Model $R_{jt} = \alpha_j + \beta_j R_{mt} + U_{jt}$	Conditional Market Model $R_{jt} = \alpha_j + \beta_j R_{mt} + \gamma_j D_t + U_{jt}$ $R = X \Gamma + U$
Estimation of Excess Return	Two-Step Procedure $\hat{R}_j, R_j - \hat{R}_j$	One-Step Procedure $\hat{\gamma}_j$
Hypotheses	Average-Related	Average-Related Joint
Significance Tests	t-Test	F-Test t-Test
Power of Test Statistics	"Clustering" Problem: Type II Error	No "Clustering" Problem
Computation	Inefficiency	Efficiency
Nature of Event	Single	Single Multiple
		Advantages 1. No "Clustering" Problem 2. A Wide Range of Hypotheses 3. Computational Efficiency

change. Specifically, he conducts a series of tests based on the multivariate regression model in an attempt to capture abnormal return of the firms affected by the twenty major regulatory changes which occurred since 1887. Two systems of equations are estimated by joint GLS using 60 monthly and 250 daily stock returns.

Following Brown and Warner (5), he suggests that when there is a single unanticipated announcement, the event study methodology, particularly the MVRM, is powerful in detecting nonzero excess returns. However, he finds no significant evidence that the multivariate regression model approach is appropriate to detect abnormal returns expected from announcements of regulatory change. Tests with daily returns provide no better performance than those with monthly data. Tests on the most important announcement provide results similar to results of tests on all announcements. This lack of significance is also shown on both the average effect tests and joint tests. He concludes that the MVRM as well as other event study methodology using equity market data may not be useful for the event such as regulatory changes.

Schipper and Thompson (20) perform a similar analysis using the multivariate regression model (MVRM) approach in examining an impact of four merger-related regulatory changes on equity value of acquiring firms. Unlike Binder

(2, 3), they employ the excess return form of the capital asset pricing model (CAPM) using monthly data on a sample of thirty-nine acquiring firms over the period from 1966 to 1970. They conduct several hypotheses tests on excess returns such as zero average effect and all zero effect. In particular, for comparison purpose, they use three estimation techniques in testing traditional zero cross-sectional average hypothesis; OLS for the residual analysis, OLS for the portfolio regression, and joint GLS for the system of equations.

They find that all regulatory changes except one show different results depending on the test statistics used. For example, in two regulatory changes, they fail to reject the null hypothesis of zero average excess returns, while rejecting the null hypothesis of jointly zero excess returns. They conclude that choice of the methodology is an important factor in an event study dealing with regulatory change.

Karafiath and Glascock (13) investigated intra-industry effects of FDIC's policy shift in handling Penn Square closure using a multivariate regression model (MVRM). They used daily capital market data of fifty-five financial institutions to examine the contagion and information effects. The sample was partitioned into four subgroups: upstream banks, Texas energy lenders, money-center banks, and non-involved industry, which is used as a control group. They conducted *t*-tests on the difference in mean cumulative prediction errors between each of those three subgroups and the non-involved industry group in order to examine any negative effects in addition to pure contagion effect.

Major findings are as follows:

1. Evidence for the contagion effect is weak at best: the impact is small and transitory;

2. Evidence for the information effect is relatively strong: shareholders of related non-failed banks suffered larger loss; and

3. The market reacts quickly to the failure announcement.

They concluded that the primary impact of the Penn Square closure was through the information effect rather than contagion effect associated with the FDIC's implied shift in policy.

Summary

This chapter has reviewed some of the literature on capital market effects of a major bank failure. Theoretical framework of multivariate regression model as an alternative to the traditional residual analysis is provided, and comparison between the two methodologies are summarized.

The emphasis of the literature before Penn Square centered upon contagion effect. In general, the evidence for the contagion effect is weak at best: the impact is small and short-lived. On the other hand, since Penn Square the evidence for the information effect is strong.

This study adds to the literature in several ways. First, previous literature fails to discriminate between the contagion and information effects. Second, previous work is based on a single or a few bank failures in the mid-1970s. Third, no previous study examined how the market's reactions to bank failure have changed over time. Finally, extant literature used traditional event methodology (i.e., residual analysis), which does not take into account cross-sectional dependence of residuals. These limitations point out the need to conduct a comprehensive analysis with a larger sample of failed banks using appropriate research methodology.

CHAPTER BIBLIOGRAPHY

1. Aharoney, J. and I. Swary, "Contagion Effects of Bank Failures: Evidence from the Capital Markets," Journal of Business, 56 (July, 1983), 305-322.

2. Binder, John, "Measuring the Effects of Regulation with Stock Price Data: A New Methodology," working paper, University of Chicago and Washington University, August, 1983.

3. Binder, John, "Measuring the Effects of Regulation with Stock Price Data," Rand Journal of Economics, 16 (Summer, 1985), 167-183.

4. Brenner, M. and S. Smidt, "A Simple Model of Non-Stationarity of Systematic Risk," Journal of Finance, 32 (September, 1977), 1081-1092.

5. Brown, S. and J. Warner, "Measuring Security Price Performance," Journal of Financial Economics, 8 (September, 1980), 205-258.

6. Brown, S. J. and J. B. Warner, "Using Daily Stock Returns: The Case of Event Studies," Journal of Financial Economics, 14 (March, 1985), 3-31.

7. Dodd, P. and J. Warner, "On Corporate Governance: A Study of Proxy Contests," Journal of Financial Economics, 12 (April, 1983), 401-438.

8. Defour, J., "Dummy Variables and Predictive Tests for Structural Change," Economics Letters, 6 (1980), 241-247.

9. Defour, J., "Generalized Chow Tests for Structural Change: A Coordinate Free Approach," International Economic Review, 23 (October, 1982), 565-575.

10. Fama, E. and others, "The Adjustment of Stock Prices to New Information," International Economic Review, 10 (February, 1969), 1-21.

11. Fraser, D. and R. Richard, "The Penn Square Bank Failure and the Inefficient Market," The Journal of Portfolio Management, (Spring, 1985), 34-36.

12. Judge, G. and others, The Theory and Practice of Economics, New York, John Wiley, 1980.

13. Karafiath, Imre and J. L. Glascock, "Intra-Industry Effects of a Regulatory Shift: Capital Market Evidence from Penn Square," working paper, North Texas State University, Denton, Texas, 1986.

14. Kmenta, J., Elements of Econometrics, New York, Macmillan Publishing Company, 1971.

15. Lamy, Robert E. and G. Rodney Thompson, "Penn Square, Problem Loans, and Insolvency Risk," The Journal of Financial Research, 9 (Summer, 1986), 103-111.

16. Larcker, D. F., L. A. Gordon, and G. E. Pinches, "Testing for Market Efficiency: A Comparison of the Cumulative Average Residual Methodology and Intervention Analysis," Journal of Financial and Quantitative Analysis, 15 (June, 1980), 267-287.

17. Malatesta, Paul, "Measuring Abnormal Performance: The Event Parameter Approach Using Joint Generalized Least Squares," Journal of Financial and Quantitative Analysis, 21 (March, 1986), 27-38.

18. Peavy, J. W. and G. H. Hempel, "The Penn Square Bank Failure: Effect on Commercial Bank Security Returns," working paper, Southern Methodist University, Dallas, 1986.

19. Pettway, R. H., "The Effects of Large Bank Failures upon Investor's Risk Cognizance in the Commercial Banking Industry," Journal of Financial and Quantitative Analysis, 11 (September, 1976), 465-477.

20. Schipper, K. and Rex Thompson, "The Impact of Merger-Related Regulations: Finite Sample Distributions and a Reinterpretation of Significance," Journal of Accounting Research, 23 (Spring, 1985), 184-220.

21. Swary, Itzhak, "Stock Market Reaction to Regulatory Action in the Continental Illinois Crisis," Journal of Business, 59 (July, 1986), 451-473.

22. Thompson, Rex, "Conditioning the Return Generating on Firm Specific Events: A Discussion of Event Study Methods," Journal of Financial and Quantitative Analysis, 20 (June, 1985), 151-186.

23. Zellner, A., "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias," *Journal of the American Statistical Association*, 57 (June, 1962), 348-368.

CHAPTER IV

METHODOLOGY

This study employs a multivariate regression model (MVRM) to examine economic impact of a major bank failure on the banking industry. This chapter begins by stating the hypotheses to be tested. Subsequent discussion focuses on the data and procedures of the empirical testing. This chapter ends with a brief summary.

Hypotheses

There are two mechanisms by which a major bank failure can influence equity value of non-failed banks: the information effect and the contagion effect. The information effect states that information revealed by a bank failure announcement may have an adverse impact on asset quality and earnings of non-failed banks to the extent that the information is related to their activities. That is, if a major bank failure releases adverse information regarding asset quality of non-failed banks, then the market will reassess the risk-return relationship on these banks' equity, bringing down their equity value. The hypothesis that non-failed banks related to a bank failure can be negatively affected by failure announcement is called "information effect" hypothesis.

Alternatively, the hypothesis that a bank failure has a negative impact on non-failed banks unrelated to the failure is called "contagion effect" hypothesis. The contagion effect is defined as a series of deposit runs at non-failed banks that occurs when a bank failure causes a loss in public confidence in the banking system. If there is a contagion effect, then uninsured depositors will require higher yields to offset their perceived increase in risk, leading to lower equity values of non-failed banks.

In this context, statistical tests of expected impact of each of the ten failed banks are organized around four null hypotheses about event parameters.

Hypothesis 1: The average (or sum) of event parameters across a sample of J securities is equal to zero.

Hypothesis 2: The cumulative average (or sum) of event parameters across event periods is zero.

Hypothesis 4: The difference in event parameters between two groups is equal to zero.

Hypotheses 1, 2 and 3 are tested for the contagion and information effects of each bank failure. Hypothesis 4 is tested to examine relative impact of the information and contagion effects of the failure, and differential contagion effects within the industry.

Data and Sample Grouping

The ten largest United States commercial failures in FDIC history are used to examine the impact of large bank failure. Table II shows the names of the ten largest failed banks and general information on each failed bank such as the actual date the failure was declared by a chartering agency, FDIC actions on settling the failed banks, and accounting data at the time of failure. Primary sources of information on the failed banks were the Wall Street Journal and the New York Times.

Daily return data for a sample of fifty-one banks, representing large commercial banks and bank holding companies, were obtained from the period from January, 1973, through December, 1984. The data were obtained from the Center for Research in Security Prices (CRSP) tapes. A list of the sample banks is shown in Appendix A.

Three groups are constructed for each bank failure: (1) "information-related" banks group, (2) "large" banks group (i.e., money-center banks), (3) "small" bank s group (i.e., non-money-center banks). The first group makes up non-failed banks, which are related, directly or indirectly, to the failed bank. This group includes those banks with characteristics similar to those of the failed bank or regional banks subject to economic conditions similar to the failed bank. The remaining non-failed banks, which are not

TABLE II

TEN LARGEST UNITED STATES BANK FAILURES

Failed Bank	Failed Date	Assets at Failed Date (million)	Deposit at Failed Date (million)	FDIC Action
Continental Illinois	1984 5.18	$41,000	$30,000	Rescue
Franklin National Bank	1974 10.8	3,656	1,445	Purchase and Assumption
United States National Bank	1973 10.18	1,265	932	Purchase and Assumption
Banco Credit y Ahorro	1978 3.31	712	608	Purchase and Assumption
United American Bank	1983 2.14	778	585	Purchase and Assumption
First National Bank of Midland	1983 10.14	1,404	574	Purchase and Assumption
Penn Square Bank	1982 7.5	517	470	Deposit Payoff
Hamilton National Bank	1976 2.16	412	336	Purchase and Assumption

TABLE II--*Continued*

Failed Bank	Failed Date	Assets at Failed Date (million)	Deposit at Failed Date (million)	FDIC Action
Abilene National Bank	1982 8.6	446	310	Purchase and Assumption
American City Bank	1983 2.25	272	255	Purchase and Assumption

Source: Edward Kane, *The Gathering Crisis in Federal Deposit Insurance*, Cambridge, Massachusetts, MIT Press, 1985 and Various Issues of the *Wall Street Journal* and *New York Times*.

related to the failed bank comprise the second and third group. The second group includes the largest money-center banks (i.e., "too big to fail"), which are likely to be immune from bank failure for the reasons explained in Chapter II. The third group contains the remaining unrelated non-failed banks, which are smaller than those banks in the second group.

There are two special cases in this grouping. One case is that all of the banks in the first group contain all money-center banks. This special case allows the formation of only two groups ("information-related" and "small") for two of the ten failures (Franklin National Bank and Continental Illinois Bank). The other case is that if the failed bank is judged to reveal no relevant information, then only two groups are formed: "large" and "small" banks group (i.e., Banco Credit, United American Bank and Hamilton National Bank).

To examine an overall contagion effect of bank failures, an "industry" group of thirty-one non-failed banks was selected separately out of the sample of fifty-one non-failed banks. This group consists of a "large" banks group of eleven non-failed banks and a "small" banks group of the twenty remaining non-failed banks, which are not related to any of the ten failed banks. Table III shows summary information about grouping for each of the ten failed banks.

TABLE III

SUMMARY INFORMATION OF THE SAMPLE GROUPING

Failed Bank	Location	Cause of Failure	Asset Features	Number of Groups
Continental Illinois	Chicago	Common	Foreign Loan Energy	2
Franklin National Bank	New York	Common	Foreign	2
United States National Bank	San Diego	Firm Specific	. . .	3
Banco Credit y Ahorro	Puerto Rico	Common	Real Estate	2
United American Bank	Tennessee	Firm Specific	. . .	2
First National Bank of Midland	Texas	Common	Energy	3
Penn Square Bank	Oklahoma	Common	Energy Co-Loan	3
Hamilton National Bank	Tennessee	Firm Specific	. . .	2

TABLE III--Continued

Failed Bank	Location	Cause of Failure	Asset Features	Number of Groups
Abilene National Bank	Texas	Common	Energy	3
American City Bank	Los Angeles	Firm Specific	. . .	3

Source: Edward Kane, *The Gathering Crisis in Federal Deposit Insurance*, Cambridge, Massachusetts, MIT Press, 1985 and Various Issues of the *Wall Street Journal* and the *New York Times*.

Empirical Testing

A bank failure announcement is likely to have a simultaneous impact on non-failed banks both because the announcement time is identical for all non-failed banks and because they are in the same industry. Thus, security return residuals of the non-failed banks are likely to have high cross-sectional correlations. The multivariate regression model (MVRM) approach is employed as an appropriate technique in measuring and testing event parameters associated with the bank failure. The MVRM technique, which is a special case of Zellner's (5) "seemingly unrelated regression" (SUR), takes into account the cross-sectional contemporaneous covariances in an event study. This section explains model specification, parameter estimation and hypotheses testing within the MVRM framework.

Model Specification

This study uses the portfolio regression model, stated in Equation 4, which uses an equally weighted portfolio P of J securities as a dependent variable. Because the MVRM employs the traditional market model of Equation 1 in formulating the model, all explanatory variables (R) in a system of Equation 3 are the same across securities. This special case of the common explanatory variable provides a simplified procedure to estimate and test cross-sectional mean of prediction errors, as explained in Chapter III.

$$R_{pt} = \alpha_p + \beta_p R_{mt} + \gamma_{pn} \sum_{n=T+1}^{T+21} D_{nt} + U_t \qquad (4)$$

$$t = 1,..,T,T+1,..T+21$$

where:

R_{pt} = daily return to portfolio P on day t

$= \frac{1}{J} \sum_{j=1}^{J} R_{jt}$

α_p = coefficient of intercept,

β_p = beta coefficient or systematic risk of portfolio P,

R_{mt} = daily return to the value-weighted market index,

γ_{pn} = event parameter or prediction error of portfolio P

$= \frac{1}{J} \sum_{j=1}^{J} \gamma_{jn}$

D_{nt} = a dummy variable which is set equal to 1 on day n o otherwise, and

U_{pt} = disturbance term of portfolio P on day t.

The portfolio regression model in Equation 4 is used to estimate relevant prediction errors for the tests of Hypotheses 1, 2 and 3, and a modified version of Equation 4, which is developed in the next section, is used to test Hypothesis 4. Each equation is used separately for each bank failure.

Equation 4 specifies a return-generating process conditional on bank failure announcement by adding a dummy variable vector to a single factor market model. Prediction errors are parameterized by the coefficients on the dummy variables. Equation 4 contains only one event announcement. In case of multi-announcement on a bank failure, only the first announcement is considered. For example, the FDIC made two announcements on the rescue plan in handling the Continental Illinois case, on May 17, 1984, and July 26, 1984, respectively. The second announcement is excluded from this study.

Estimation of Prediction Errors

Equation 4 is estimated over a 131-day interval including the test period of 10 days on each side of event day ($t = 0$). The event day ($t = 0$) is defined as the day a regulatory agency officially declared a bank insolvent. The estimation period used is uniform for each bank failure. The uniform use of the 131 observations, which represents the maximum nonoverlapping period between bank failures, is required to meet the assumed structure of the MVRM as mentioned in Chapter III. Daily return data are used to avoid possible noise during event periods, which may occur when weekly or monthly return data are used.

There are three things to mention about the MVRM estimators in comparison with those obtained from the traditional residual analysis. First, the unconditional estimators of OLS, $\hat{\alpha}$ and $\hat{\beta}$, are identical to those conditional estimators obtained over a period of 110 day interval (-130 to -11). Second, estimated event parameter (γ_{pn}) on each dummy D_{nt} is equal to the average of estimated prediction errors, $R_{jt} - \hat{R}_{jt}$ which is the difference between the actual and forecast values of security j on day n. Third, prediction errors over a subperiod of the event window may be estimated without affecting any of the included estimates. Thus, the mean daily and cumulative prediction errors obtained from the MVRM approach are the same as would be calculated from two-step procedures of the traditional residual analysis.

As a straightforward application of the "portfolio" regression approach, differences in mean cumulative (or daily) prediction errors between two portfolios can be estimated in a similar way. First, form a "difference portfolio," which is the difference between two equally weighted portfolios. Second, use the difference as a dependent variable in Equation 7. Third, estimate Equation 7 by OLS.

$$R_{dt} = \alpha_d + \beta_d R_{mt} + \sum_{n=T+1}^{T+21} \gamma_d D_{nt} + U_{dt} \qquad (7)$$

$$t = 1,..T,T+1,..T+21$$

where:

R_{dt} = daily return to difference in average return between two portfolios (J and V),

$$+ \frac{1}{J} \sum_{j=1}^{J} R_{jt} - \frac{1}{V} \sum_{v=1}^{V} R_{vt},$$

α_d = coefficient of intercept,

β_d = beta coefficient of the difference,

γ_{dn} = event parameter of the difference,

$= \frac{1}{J} \sum_{j=1}^{J} \gamma_{pn} = 1/V \sum_{v=1}^{V} \gamma_{vn}$, and

U_{dt} = disturbance terms of the difference.

Hypotheses Testing

Within this framework, the four hypotheses concerning the prediction errors, mentioned previously, can be expressed as follows.

Ho 1: $\gamma_{pn} = 0$, at various n n = T+1...T+21 (8)

Ho 2: $\sum_{n=T+1}^{T+21} \gamma_{pn} = 0$, for N days (9)

Ho 3: $\gamma_{pn} = 0$, for all n n = T+1...T+21 (10)

Ho 4: $\sum_{n=T+1}^{T+21} \gamma_{dn} = 0$, for N days (11)

where:

γ_{pn} = mean daily prediction errors across J securities, on day n.

$\sum_{n=T+1}^{T+N} \gamma_{pn}$ = mean cumulative prediction error of portfolio P on day n.

$\sum_{n=T+1}^{T+N} \gamma_{dn}$ = difference in mean cumulative prediction errors between two portfolios.

The first hypothesis, $\gamma_{pn} = 0$, is that the mean of prediction error of portfolio P across j securities is equal to zero. This hypothesis is the traditional hypothesis of zero average abnormal returns or the hypothesis of zero cross-sectional sum in the SUR. The _t_-test is conducted on the OLS estimation of prediction errors in Equation 4. This simple _t_-test is equal to an F-test across γ_{pn} for JGLS on EQuation 3. For proof, see Dufour (2) and Thompson (4).

The second hypothesis, $\sum_{n=T+1}^{T+N} \gamma_{pn} = 0$, is that mean cumulative prediction error for N days is zero. This hypothesis is another commonly used hypothesis to detect prediction errors for a certain subperiod of event period. The F-test on the OLS estimators is done to examine market reactions over a five or ten day interval before and after the failure announcements.

The third hypothesis, $\gamma_{pn} = 0$ for all n, is that all mean prediction errors across event period are jointly zero. This joint hypothesis is tested in order to detect a more convincing effect of a failure event. This study excludes the cross-sectional joint hypothesis, which is particularly important when prediction errors differ in sign as is common in regulatory events. In a bank failure event, a sign of the prediction errors is likely similar by the nature of the event for reasons already given. The joint hypothesis across event period may give more convincing information on the event's impact, particularly when the test fails to reject the hypothesis (Ho 2). Tests of Hypotheses 1 and 2 are necessary to better investigate the event's impact with prediction errors. In this sense, this study departs from standard residual analysis (1, 3).

The fourth hypothesis, $\sum_{n=T+1}^{T+N} \gamma_{dn} = 0$, is that the difference in mean cumulative prediction errors between two portfolios for N days is zero. This hypothesis is tested to examine relative importance of bank failure's effect between two groups. Although a joint t-test may be implemented by joint GLS on two systems of equations or on the two equally weighted portfolios, an F-test on the OLS difference in mean cumulative prediction errors in Equation 7 is used, because the "difference portfolio" in Equation 7 is a straightforward application of the "portfolio regression" in Equation 4. This hypothesis is used to examine relative impact of the contagion and information effects of a bank failure, and the contagion effects by size of non-failed banks.

Summary

This chapter explained procedures for empirical testing of the hypothesized impact of a major bank failure within the framework of multivariate regression model (MVRM). They are:

1. Defining two economic hypotheses to be tested: contagion and information effect;

2. Stating four statistical hypotheses in terms of event parameters (i.e., prediction errors);

3. Selecting the ten largest United States bank failures over the period from 1973 through 1984;

4. Selecting a sample of fifty-one non-failed commercial banks, whose daily return data are available from the Center for Research in Security Prices (CRSP) tapes;

5. Disaggregating the sample into three groups for relevant hypothesis testing: "information-related," "large" and "small" banks groups;

6. Using the "portfolio regression" model of the MVRM to estimate mean prediction errors;

7. Estimating mean daily and cumulative prediction errors by ordinary least square (OLS) technique;

8. Conducting t-test (or F-test) on the hypotheses of zero mean daily and cumulative prediction errors;

9. Conducting joint F-test on the joint hypothesis over several intervals; and

10. Testing differential CPE behavior of each of the information related and large banks groups relative to small banks group.

If the contagion and information effects hypotheses, and the implications of the FDIC large bank bias policy in handling bank failures (see Chapter II) hold, then expected impact of major bank failures is as follows:

1. No negative impact is expected on large banks (i.e., "too large to fail") both before and after Penn Square;

2. Negative impact is expected on small banks before Penn Square and stronger after Penn Square; and

3. Negative impact is expected on non-failed banks related to failed banks.

CHAPTER BIBLIOGRAPHY

1. Dodd, P. and J. Warner, "On Corporate Governance: A Study of Proxy Contests," Journal of Financial Economics, 12 (April, 1983), 401-438.

2. Defour, J., "Generalized Chow Tests for Structural Change: A Coordinate Free Approach," International Economic Review, 23 (October, 1982), 565-575.

3. Fama, E. and others, "The Adjustment of Stock Prices to New Information," International Economic Review, 10 (February, 1969), 1-21.

4. Thompson, Rex, "Conditioning the Return Generating Process on Firm Specific Events: A Discussion of Event Study Methods," Journal of Financial and Quantitative Analysis, 20 (June, 1985), 151-186.

5. Zellner, A., "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias," Journal of the American Statistical Association, 57 (June, 1962), 348-368.

CHAPTER V

RESULTS

This chapter presents the results of various tests of intra-industry effects of the ten largest United States bank failures. First, it presents the results of tests on two sets of average-related hypotheses: the hypothesis of zero mean daily prediction error (Ho 1), and the hypothesis of zero mean cumulative prediction error (Ho 2). The two hypotheses, stated in Equations 7 and 8 are designed to test for contagion, information, and overall industry effects of each bank failure. This chapter also contains the test results on a set of joint hypothesis (Ho 3): mean prediction errors across event period are jointly equal to zero. The joint test on the hypothesis, stated in Equation 9, is performed on the portfolio designed to reflect contagion, information, and overall industry effects. Further, this chapter includes the results of tests of difference in mean cumulative prediction errors between two portfolios. This difference test (Ho 4), stated in Equation 10, is implemented to examine the contagion effects by size of non-failed banks, and relative impact of the contagion and information effects of a bank failure.

These results are organized by the possible effects of bank failures. First, a major bank failure's contagion effect within the banking industry is examined. Next, existence of information effects and changes in the information effect over time are investigated. Finally, the overall impact of major bank failures on the banking industry is examined. The chapter ends with a short summary of major findings.

Contagion Effects

This section examines the contagion effects on non-failed banks by size of the non-failed banks. For each failure, two subgroups of non-failed banks, which are not related to a failed bank, have been defined to test the contagion effect: a group of large banks, which consists of the largest money-center banks (i.e., "too big to fail"), and a group of small banks, which includes the remaining non-related banks, smaller than those contained in the former group. Each group is examined in two different time periods--before and after Penn Square. The "small" group results are presented first. After that, the "large" group results are presented. The contagion effect by non-failed bank size and the contagion effect on the industry as a whole are investigated separately.

Effects on Small Non-Failed Banks

The results of tests of Equations 7 and 8 on a "small" bank group are presented in Table IV. Equation 7 formulates

TABLE IV

PREDICTION ERRORS (PE) AND CUMULATIVE PREDICTION ERRORS (CPE) FOR SMALL BANKS

	Pre-Penn Failures							
	USNB		FNB		HNB		Banco	
Interval	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F
-10 to -1	1.32	1.07	5.37	4.07**	-0.67	0.11	2.47	7.09*
0	0.02	0.04	2.15	2.67*	-0.53	-0.85	0.24	0.87
1	0.06	0.15	0.13	0.15	-0.45	-0.73	-0.04	-0.13
2	-0.25	-0.64	1.35	1.64	0.38	0.61	0.35	1.27
3	-0.29	-0.75	1.73	2.12	0.09	0.16	0.31	1.08
4	-0.13	-0.33	0.26	0.32	-0.49	-0.79	0.22	0.78
5	0.33	0.84	0.27	0.34	0.04	0.07	-0.21	-0.71
6 to 10	-0.06	0.00	2.55	1.90	1.03	0.52	2.32	12.57*
1 to 10	-0.34	0.07	6.31	5.10**	0.61	0.09	2.97	9.85*
-10 to 10	0.99	0.27	13.83	11.52*	-0.60	0.04	5.68	15.99*

TABLE IV--Continued

Interval	Post-Penn Failures											
	Penn		ANB		UAB		ACB		FNB (Midland)		Continental	
	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F
-10 to -1	1.62	1.60	1.48	1.31	-0.55	0.07	-2.20	0.04	-0.47	0.12	-0.28	0.06
0	-0.38	-0.09	0.28	0.73	0.01	0.01	-0.56	-0.87	-0.24	-0.57	-0.51	-1.45
1	-0.55	-1.43	-1.03	-2.67*	1.24	1.92**	-0.23	-0.35	0.41	0.96	-0.44	-1.26
2	-0.94	-2.44*	0.23	0.59	-0.76	-1.17	-0.76	-1.16	0.02	0.04	-0.58	-1.63
3	0.36	0.92	-0.34	0.88	-0.36	-0.56	-0.27	-0.41	-0.25	-0.61	1.05	0.15
4	0.54	1.38	-0.11	-0.29	0.09	0.15	1.42	2.19**	-0.08	-0.19	-1.71	-4.77*
5	0.39	1.01	-0.52	-1.32	-0.72	-1.11	0.96	1.48	-0.56	-1.34	-0.15	-0.44
6 to 10	-0.23	0.07	3.42	12.58*	-2.79	3.57	1.00	0.46	-2.60	7.37*	-0.27	0.11
1 to 10	-0.44	0.12	1.64	1.51	-3.30	2.40	2.12	0.99	-3.09	4.85**	-3.21	7.65*
-10 to 10	0.79	0.17	3.41	3.01	-3.84	1.42	-0.06	0.04	-3.79	3.26	-4.01	5.15**

*Significant at the 1 percent level.

F = Interval, t = Individual Day.

**Significant at the 5 percent level.

the hypothesis (Ho 1) that mean daily prediction error (PE) is zero, and Equation 8 the hypothesis (Ho 2) that the mean cumulative prediction errors (CPE) is zero.

The results presented in Table IV provide no evidence that pre-Penn Square bank failures had an adverse impact on a group of "small" non-failed banks. None of the PEs or CPEs for any of the four pre-Penn Square failures is significantly negative. Of the pre-Penn Square failures, the United States National Bank (USNB) and Hamilton National Bank (HNB) failures were caused by internal irregularities associated with asset management. The lack of an impact for these failures suggests that bank failures caused by firm-specific events have no spillover effect on non-failed banks. Similarly, insignificant PEs and CPEs were observed for two post-Penn Square failures--the United American Bank (UAB) and the American City Bank (ACB) (see Table IV). The major cause of these failures is also internal irregularities. This provides additional evidence that a firm-specific event has no contagion effect on non-failed banks, even after Penn Square.

The Table IV results also indicate that the Penn Square failure had a small and transitory impact on small non-failed banks. The only significant reaction to the failure occurred on the third trading day after the closure. The prediction error on day two is -.94 percent, which is significant at the 1 percent level. The CPEs over the 6,10 and 1,10 intervals after the closure, and the CPE over the -10,10 interval are not statistically significant. These results suggest that impact of the Penn Square failure on a group of "small" banks is limited--its impact was relatively minor and transitory.

Table IV also shows that impact of the Abilene National Bank (ANB) failure, which occurred one month after the Penn Square failure, is small and short-lived. A significant negative prediction error (-1.03 percent) occurred on day one only. There was a reversal over 6,10 interval, in which the CPE is significantly positive (3.42 percent). Further, CPEs over the 1,10 interval and the -10,10 interval are not significant.

For the remaining two failures [First National Bank (FNB) of Midland and the Continental Illinois of Chicago), there is some evidence of adverse impact on the small bank portfolio. The PEs in each case display a negative trend. For FNB (Midland) the CPEs over the 6,10 and 1,10 intervals are significant and negative (-2.60 and -3.09 percent, respectively). The CPEs over the 1,10 and -10,10 intervals for Continental Illinois are also significant and negative (-3.21 and -4.01 percent, respectively). However, the CPEs over the -10,-1 interval for both failures are not significant, indicating that the adverse reactions came after failure announcement. Unlike the ANB failure, the last two major post-Penn Square failures had a substantial impact on non-failed banks in spite of the 100 percent federal protection of uninsured depositors. This latter finding weakens the traditional argument that the FDIC's implicit full guarantee of all deposits prevents a contagion effect.

The major findings for the "small" banks are as follows.

1. Pre-Penn Square failures offer no efidence of a contagion effect.

2. Post-Penn Square failures, in general, offer some evidence of contagion effects.

3. Bank failures caused by firm-specific events have no contagion effect. This result has not changed over time.

4. There is weak evidence of a discernible difference in contagion effect between before and after the Penn Square failure.

Effects on Large Non-Failed Banks

Table V presents the test results of EQuations 7 and 8 on a group of "large" banks. Table V does not include the corresponding "large" bank group for the Franklin National Bank (FNB) and Continental Illinois failures because for each failure all of the "too big to fail" banks have been included in "information-related" bank group, which is discussed later, as a separate test.

TABLE V

PREDICTION ERRORS (PE) AND CUMULATIVE PREDICTION ERRORS (CPE) FOR LARGE BANKS

	Pre-Penn Failures							
	USNB		FNB***		HNB		Banco	
Interval	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F
-10 to -1	-0.29	0.02	. . .	. . .	-0.21	0.00	2.75	3.57
0	-0.24	-0.36	. . .	. . .	0.19	0.18	-0.45	-1.02
1	-0.51	-0.79	. . .	. . .	-1.64	-1.51	0.05	0.11
2	-0.21	-0.32	. . .	. . .	0.43	0.39	-0.04	-0.09
3	-0.85	-1.31	. . .	. . .	0.43	0.39	0.19	-0.43
4	-0.01	-0.01	. . .	. . .	1.29	1.18	0.27	0.63
5	0.55	-0.85	. . .	. . .	0.83	0.76	-0.51	-1.13
6 to 10	0.32	0.05	. . .	. . .	0.58	0.05	4.11	16.00*
1 to 10	-1.80	0.71	. . .	. . .	1.92	0.29	3.70	6.22*
-10 to 10	-2.32	0.52	. . .	. . .	1.91	0.12	5.99	7.24*

TABLE V--Continued

Interval	Post-Penn Failures											
	Penn		ANB		UAB		ACB		FNB (Midland)		Continental***	
	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F
-10 to-1	0.21	0.01	4.57	3.69**	-0.07	0.15	0.21	0.00	0.59	0.07	. . .	. . .
0	-1.34	-1.75	-1.09	-1.51	1.18	1.19	-0.06	-0.05	-0.05	-0.07	. . .	. . .
1	-2.42	-3.16*	0.76	1.06	2.14	2.16**	-0.19	-0.17	-0.77	-1.12	. . .	. . .
2	-0.27	-0.35	0.16	0.22	-0.31	-0.31	-0.85	-0.77	0.18	0.26	. . .	. . .
3	-0.19	-0.25	0.72	1.02	-0.82	-0.84	1.08	0.97	-0.39	-0.57	. . .	. . .
4	1.11	1.43	-1.81	-2.54*	0.33	0.33	2.77	2.48	-1.07	-1.55	. . .	. . .
5	-1.29	-1.69	0.91	1.25	-2.22	-3.34**	5.01	4.48*	-2.86	4.14*	. . .	. . .
6 to 10	-0.79	0.20	-1.09	0.38	-1.07	0.22	-2.81	1.22	-0.72	0.21	. . .	. . .
1 to 10	-3.88	2.32	-0.35	0.02	-1.96	0.36	5.01	1.86	-5.64	6.04*	. . .	. . .
-10 to10	-5.02	1.70	3.13	0.77	-0.84	0.17	5.16	0.86	-5.10	2.20	. . .	. . .

*Significant at the 1 percent level. F = Interval, t = Individual Day.

**Significant at the 5 percent level.

***Failed banks for which no large banks group is formed.

The PEs and CPEs for the USNB and the HNB failures are not negatively significant for any event day or interval. The same is true for one of the post-Penn Square failures (ACB). Another post-Penn Square failure (UAB) presents conflicting results: Although the PE on day five is significant and negative (-2.22 percent), the PE on day one is significant and positive; none of the remaining PEs or any of the CPEs are significantly negative. These findings are additional evidence that a major bank failure caused by a firm-specific event has no contagion effect. The Banco Credit failure shows a positive reaction--the same as was observed in the small bank portfolio. These results suggest that the pre-Penn Square failures had no contagion effect on non-failed banks.

The Table V PE and CPE patterns for the Penn Square failure are similar to those for the corresponding "small" bank group--the impact was small and transitory. Table V also shows that the CPEs for the FNB (Midland) failure for the ten-day interval after the failure announcement is -5.64 percent (significantly different from zero at 1 percent level). This indicates a substantial post-announcement impact. In terms of size and significance of the PEs and CPEs over the 1,10 and -10,10 intervals, the FNB (Midland) failure's impact was stronger on the "large" bank group than on the "small" bank group.

The findings for the "large" bank group are the following.

1. Pre-Penn Square failures had no contagion effect.

2. For bank failures caused by firm-specific problems, there was no contagion effect.

3. In post-Penn Square failures there was evidence of a contagion effect.

4. There was some evidence that after Penn Square impact of failures was greater on "large" banks than it was on "small" banks.

To provide more convincing evidence on contagion effects, joint effects across event period are tested. Table VI presents the results of tests on the "small" and "large" bank group of Equation 9, which states the hypothesis (Ho 3) that mean daily PEs are jointly equal to zero across event period. The results, in general, support previous findings of Tables IV and V.

None of F-values over any interval is significant for any of the four pre-Penn Square failures, regardless of non-failed bank size. The significant F-values for Banco Credit of Puerto Rico reflects the corresponding positive CPEs of Tables IV and V.

F-values of both "small" and "large" bank groups for the USNB and the HNB failures are not significant. A similar observation can be made for two of the post-Penn Square

TABLE VI

JOINT TESTS ON LARGE AND SMALL BANKS

Banks	Interval		
	-10 to -1 F-Value	1 to 10 F-Value	-10 to 10 F-Value
USNB			
Large	0.78	0.55	0.65
Small	1.26	0.32	0.78
FNB			
Large***	. . .	. . .	. . .
Small	1.45	1.66	1.51
HNB			
Large	0.29	0.53	0.41
Small	0.4	0.46	0.43
Banc			
Large	0.8	2.98*	1.92*
Small	3.34*	1.76	2.48*
Penn			
Large	0.96	3.07*	2.07*
Small	1.26	2.03**	1.68**
ANB			
Large	1.59	3.59*	2.65*
Small	1.86	4.90*	3.45*

TABLE VI--Continued

Banks	Interval		
	-10 to -1 F-Value	1 to 10 F-Value	-10 to 10 F-Value
UAB			
Large	1.01	1.4	1.22
Small	0.46	0.97	0.73
ACB			
Large	1.64	2.79*	2.23*
Small	1.19	1.14	1.17
FNB (Midland)			
Large	1.32	2.20*	1.80**
Small	0.7	1.4	1.07
Continental			
Large***	. . .	. . .	. . .
Small	1.97**	2.77*	2.38*

*Significant at the 1 percent level.

**Significant at the 5 percent level.

***No large banks group for the FNB and Continental.

failures (UAB and ACB), indicating no contagion effect. The significant F-values over 1,10 and -10,10 intervals of "large" bank group for the ACB appear to reflect significant positive PE on day five (4.48 percent). The significance of F-values of the Penn Square and the FNB (Midland) provides additional evidence that since Penn Square, failures had greater impact on "large" banks than on "small" banks.

Size Effect

Table VII presents interval statistics of the tests of Equation 10, which states the hypothesis (Ho 4) that differences in CPEs between the "small" and the "large" bank group are zero. The purpose of this test is to examine any difference in cumulative prediction errors (CPD) between two portfolios by subtracting CPEs of "large" banks from those of "small" banks. A significant positive CPD indicates stronger impact on "large" banks. Table VII does not include the FNB and the Continental failures because for each of the failures all of the large non-failed banks (i.e., "too big to fail") have been included in "information-related" banks group, which is discussed later, as a separate test.

The Table VII results do not support an inference that the impact of a major bank failure will depend upon the size of non-failed banks. It has been argued that such an effect might be expected due to FDIC's preferential policy in favor of large banks (1, pp. 22-23; 2). None of the differences in

TABLE VII

DIFFERENCE IN CUMULATIVE PREDICTION ERRORS (CPD) BETWEEN SMALL AND LARGE BANKS

	Pre-Penn Failures							
	USNB		FNB***		HNB		Banco	
Interval	CPD (Percent)	F	CPD (Percent)	F	CPD (Percent)	F	CPD (Percent)	F
-10 to -6	0.05	0.00	. . .	. . .	0.43	0.03	1.55	2.27
- 5 to -1	1.61	0.97	. . .	. . .	-0.89	0.15	-1.82	3.16
-10 to -1	1.66	0.50	. . .	. . .	-0.47	0.02	-0.28	0.04
1 to 5	1.83	1.34	. . .	. . .	-1.76	0.56	1.05	1.04
6 to 10	1.45	0.06	. . .	. . .	0.45	0.04	-1.79	2.89
1 to 10	3.28	0.40	. . .	. . .	-1.31	0.02	-0.73	0.23
-10 to 10	3.53	0.91	. . .	. . .	-2.51	0.24	-0.31	0.02

TABLE VII--Continued

Interval	Post-Penn Failures											
	Penn		ANB		UAB		ACB		FNB (Midland)		Continental***	
	CPD %	F	CPD %	F	CPD %	F	CPD %	F	CPD %	F	CPD %	F
-10 to -6	2.56	2.10	-0.87	0.27	0.53	0.07	-2.69	1.26	-0.12	0.01	. . .	. . .
- 5 to -1	-1.16	0.43	-2.22	1.82	0.18	0.01	0.28	0.01	-0.94	0.33	. . .	. . .
-10 to -1	1.40	0.30	-3.09	1.65	0.71	0.06	-2.41	0.48	-1.06	0.20	. . .	. . .
1 to 5	2.88	2.63	-2.53	2.35	0.39	0.03	-6.69	7.47*	4.44	7.15*	. . .	. . .
6 to 10	0.56	0.10	4.52	6.29*	-1.73	0.70	3.81	2.51	-1.88	1.30	. . .	. . .
1 to 10	3.44	1.79	1.99	0.64	-1.34	0.20	-2.89	0.69	2.56	1.13	. . .	. . .
-10 to 10	5.81	2.24	0.28	0.01	-1.81	0.16	-5.81	1.22	1.31	0.13	. . .	. . .

*Significant at the 1 percent level.

**Significant at the 5 percent level.

***Failed banks for which no information-related banks group is formed.

cumulative prediction errors (CPD) for pre-Penn Square failures is statistically significant. The CPDs of the USNB, the HNB, and the Banco Credit failures are not statistically different from zero. These findings are consistent with previous results, which showed no evidence of a contagion effect in either "small" or "large" bank group for the three pre-Penn Square failures (see Tables IV and V).

The Penn Square failure shows insignificant CPDs over each of the intervals after the closure and the -10,10 interval. The same is true of one of the post-Penn Square failures (UAB). There are only three failures after Penn Square which show significant CPDs (ANB, ACB and FNB). The CPDs over the 6,10 interval for the ANB failure and the 1,5 interval for the FNB (Midland) are significant and positive (4.52 and 4.44 percent, respectively). However, the CPD for the ACB failure is significant and negative over the 1,5 interval (-6.69 percent). These results suggest no evidence of systematic large bank bias after Penn Square.

In summary, this study provides no evidence of a differential effect for major bank failures by bank size before Penn Square, and shows weak evidence after Penn Square. Further, it provides no support for an argument that impact of a bank failure is negatively related to size of a nonfailed bank. Instead, two of the post-Penn square failures (ANB and FNB of Mindland) showed potential positive relationship, indicating stronger impact on large banks.

Overall Contagion Effect

To better evaluate the potential contagion effect of a major bank failure on the banking industry, Table VIII presents the results of a separate test of Equation 8 on an "industry" group of thirty-one non-failed banks, which are not related to any of the ten bank failures. For further analysis, the "industry" group of thirty-one non-failed banks has been divided into two subgroups by asset size: "large" bank group of eleven largest non-failed banks and "small" bank group of twenty remaining banks. The "large" bank group excludes the Chase Manhattan Bank, which co-loaned with the failed Penn Square, and the failed Continental of Illinois (see Appendix B for a list of the sample banks).

The CPEs for the "industry" group at the USNB and HNB failures are insignificant over the post-announcement 1,10 interval and the -10,10 interval. The CPEs for the FNB and the Banco Credit failures are positive and significant. Like the USNB and HNB failures, two post-Penn Square failures (UAB and ACB) show no significant CPEs. This is further evidence that failures caused by firm-specific events have no widespread impact. The Penn Square failure had no impact on these thirty-one non-failed banks: the CPEs over the 1,10 interval and the -10,10 interval were not statistically different from zero. The ANB failure's impact also was not significant over these intervals.

TABLE VIII

CUMULATIVE PREDICTION ERRORS (CPE) FOR BANKS OF COMMON GROUP

Bank	Interval					
	-10 to -1		1 to 10		-10 to 10	
	CPE %	F	CPE %	F	CPE %	F
USNB						
Industry	0.97	0.54	-1.3	0.76	-0.37	0.03
Large	1.72	0.58	-1.47	0.07	-0.04	0.05
Small	0.71	0.15	-1.58	0.89	-0.78	0.11
FNB						
Industry	4.29	1.67	6.25	4.84**	12.91	9.69*
Large	1.29	0.11	5.82	2.06	8.52	2.07
Small	5.94	3.87**	6.49	4.20**	15.33	11.00*
HNB						
Industry	-1.21	0.25	0.39	0.03	-0.98	0.09
Large	-0.68	0.05	1.14	0.14	0.29	0.00
Small	-1.51	0.32	-0.02	0.00	-0.18	0.17
Banc						
Industry	3.16	8.30*	3.65	11.58*	6.71	17.36*
Large	2.37	2.89	3.52	6.11*	5.81	7.39*
Small	3.59	7.50*	3.72	7.73*	7.2	12.83
Penn						
Industry	2.00	1.46	-1.34	1.09	0.11	0.00
Large	0.4	0.03	-4.4	4.01**	-5.08	2.35
Small	2.88	3.89**	0.34	0.05	2.97	1.78

TABLE VIII--Continued

Bank	Interval					
	-10 to -1		1 to 10		-10 to 10	
	CPE %	F	CPE %	F	CPE %	F
ANB						
Industry	2.2	2.98	1.10	0.7	3.3	2.96
Large	5.22	5.65*	0.16	0.01	4.81	2.13
Small	0.54	0.13	1.63	1.13	2.47	1.24
UAB						
Industry	0.33	0.01	-1.8	0.72	-1.34	0.18
Large	-0.03	0.00	-2.08	0.46	-1.22	0.07
Small	0.54	0.06	-1.64	0.51	-1.41	0.17
ACB						
Industry	-0.49	0.05	3.11	2.15	1.88	0.35
Large	1.1	0.13	4.48	2.13	5.45	1.37
Small	-1.36	0.36	2.35	1.05	-0.08	0.00
FNB (Midl)						
Industry	-1.09	0.29	-2.9	3.74**	-4.3	3.64**
Large	0.22	0.01	-5.26	6.28	-5.15	2.67
Small	-1.82	1.05	-0.92	0.8	-3.15	2.02
Continnental						
Industry	-1.36	1.63	-4.63	14.46*	-6.53	12.42*
Large	-3.01	1.95	-7.05	10.80*	-9.94	9.28*
Small	-0.46	0.13	-3.3	7.11*	-4.65	6.11*

*Significant at the 1 percent level

**Significant at the 5 percent level.

The CPEs of the FNB (Midland) and Continental failures are negative and significant over the 1,10 intervals (-2.90 and -4.63 percent), and the -10,10 interval CPEs are also significantly negative (-4.30 and -6.53 percent), indicating substantial adverse market reaction following the closure. The CPEs over the -10,-1 interval for the FNB and Continental is not significant.

The results of the test on "small" and "large" bank groups contained in Table VIII, in general, reinforce the corresponding findings observed in Tables IV and V by displaying consistency in sign and significance of interval statistics. None of the CPEs over any interval is significant for two of the pre-Penn Square failures (USNB and HNB), regardless of non-failed bank size. The same is true of two of the post-Penn Square failures (UAB and ACB). The FNB and Banco Credit failures show significantly positive CPEs over the 1,10 and -10,10 intervals, as were observed in Tables IV and V.

Several inferences concerning contagion effects of a major bank failure can be drawn. They are the following.

1. There were no negative non-failed bank stock price reactions before Penn Square failure, regardless of non-failed bank size or cause of bank failure.

2. Failures caused by events specific to individual banks have no adverse impact on the industry, regardless of

non-failed bank size: they are "isolated" events. This is true for before and after the Penn Square failure.

3. There have been substantial negative stock price reactions in non-failed banks after Penn Square. The evidence is stronger for large banks.

4. Evidence on size effect does not support the argument that a major bank failure has a similar impact on large banks due to preferential treatment by the FDIC. Two of the post-Penn Square failures had greater impact on "large" banks than on "small" banks.

5. This evidence, in total, suggests that there has been a change in the contagion effect since the Penn Square failure.

Information Effect

This section examines information effects on non-failed banks, which are related to a failed bank. For each failure, an information-related group has been formed to include non-failed banks whose asset structure or regional location is similar to that of the failed bank. The group is examined in two different time periods: before and after Penn Square. Average-related effects and joint effects across event periods are examined.

Table IX reports the results of average effect tests of Equations 7 and 8 on the information-related groups for seven bank failures. The HNB, the Banco Credit, and the UAB

TABLE IX

PREDICTION ERRORS (PE) AND CUMULATIVE PREDICTION ERRORS (CPE) FOR INFORMATION-RELATED BANKS

	Pre-Penn Failures							
	USNB		FNB		HNB***		Banco***	
Interval	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F
-10 to -1	-1.37	0.09	-0.48	0.03	. . .	. . .	. . .	. . .
0	-2.54	-1.82	1.14	1.29	. . .	. . .	. . .	. . .
1	1.17	0.84	-0.57	-0.63	. . .	. . .	. . .	. . .
2	-2.32	-1.65	1.69	1.88	. . .	. . .	. . .	. . .
3	-0.66	-0.47	0.84	0.95	. . .	. . .	. . .	. . .
4	-0.57	-0.47	-0.24	-0.27	. . .	. . .	. . .	. . .
5	-0.07	-0.05	-0.69	-0.79	. . .	. . .	. . .	. . .
6 to 10	-1.06	0.11	3.18	2.52	. . .	. . .	. . .	. . .
1 to 10	-3.50	0.58	4.20	1.92	. . .	. . .	. . .	. . .
-10 to 10	-7.42	1.14	4.85	1.20	. . .	. . .	. . .	. . .

TABLE IX--Continued

Interval	Post-Penn Failures											
	Penn		ANB		UAB***		ACB		FNB (Midland)		Continental	
	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F
-10 to -1	-3.52	1.62	-4.04	0.64	. . .	. . .	2.47	0.45	-7.78	8.23	-3.85	6.25*
0	-4.37	-4.21*	-1.75	-1.56	. . .	. . .	-0.01	-0.01	-0.13	-0.15	-0.16	-0.36
1	-3.99	-4.75*	-0.29	-0.26	. . .	. . .	-0.59	-0.53	0.75	0.91	-0.85	-1.82
2	-1.43	-1.71	0.52	0.46	. . .	. . .	-0.14	-0.13	0.55	0.66	-1.81	-3.86*
3	0.03	0.03	-0.29	-0.26	. . .	. . .	1.43	1.28	0.04	0.05	-0.45	-0.96
4	2.04	2.42*	0.72	0.65	. . .	. . .	4.14	3.71*	0.03	0.04	-2.83	-6.01*
5	0.61	0.72	-0.85	-0.75	. . .	. . .	3.13	2.81*	-2.65	-3.21*	0.71	1.53
6 to 10	-1.95	1.03	-4.06	2.15	. . .	. . .	4.34	2.89	-0.70	0.14	-2.54	5.62*
1 to 10	-4.70	2.83	-4.26	1.24	. . .	. . .	3.64	0.98	-1.96	0.51	-7.77	25.76**
-10 to 10	-12.60	8.94*	-6.02	2.61	. . .	. . .	6.09	1.20	-9.87	4.72*	-11.78	25.61

F = Interval, t = Individual Day.

*Significant at the 1 percent level.

**Significant at the 5 percent level.

***Failed banks for which no information-related banks group is formed.

failures have no corresponding information groups (see Table III).

Table IX indicates that pre-Penn Square failures had no information effect. The FNB failure, caused by heavy foreign exchange loss, shows insignificant PEs and CPEs following the failure announcement. The PEs and CPEs of banks geographically related to the USNB are not significant on either day zero or over -10,10 period. The insignificant reactions at the FNB failure and the USNB failure suggest that before the Penn Square failure there was no information effect on related non-failed banks.

The information effects after Penn Square are mixed, depending upon the nature of information and information dissemination process for each failure. Like the USNB failure, the ACB failure has no negative impact on geographically related non-failed banks; none of the CPEs is negatively significant and the PEs on days four and five are positively significant. On the other hand, all of the energy-related (also regionally-related) groups of the Penn Square, the ANB, and the FNB (Midland) failures show different degrees of information effect. The Penn Square and the FNB (Midland) failures had a substantial impact in the -10,10 interval, while the ANB failure had no impact.

The PEs for the Penn Square information-related portfolio on days zero and one (collectively -8.36 percent) are significant at the 1 percent level. The CPE over the -10,10 period is -12.60 percent (significant at the 1 percent level), although a significant positive reversal occurs on day four. For the FNB (Midland) failure, the information-related group shows a significant negative CPE over the -10,10 interval (-9.87 percent). The CPE over the ten-day interval following the closure is not significant, implying that the stock prices impounded all relevant information before closure. The CPE over the -10,-1 interval is -7.78 percent and significant at the 1 percent level. The ANB failure shows no impact. Judging from size and significance of PE and CPE, the Penn Square failure shows stronger impact than the other two energy-lender failures.

The CPEs of the Continental failure group, which include all of the "too big to fail" (TBTF) banks and regional energy-related banks, are negative and significant over all five- and ten-day intervals, indicating an informational content in failure announcement. The significant impact of the Continental failure may reflect the combined contagion and information effects because the "information-related" banks group for the Continental failure includes all of the largest money-center banks, whose asset quality and liability management are similar to those of the Continental.

The F-values of joint tests of Equation 9 on "information-related" group are reported in Table X.

TABLE X

JOINT TEST ON INFORMATION RELATED BANK

Bank	Interval		
	-10 to -1 F-Value	1 to 10 F-Value	-10 to 10 F-Value
USNB Information	1.08	0.75	0.90
FNB Information	0.59	1.23	0.93
HNB Information	. . .***	. . .	. . .
Banco Information	. . .	. . .	. . .
Penn Information	1.14	5.66*	3.48*
ANB Information	0.23	1.51	0.88
UAB Information	. . .	. . .	. . .
ACB Information	0.82	2.60*	1.74**
FNB (Midland) Information	2.40*	1.56	1.95*
Continental Information	1.89**	8.68*	5.37*

*Significant at the 1 percent level.

**Significant at the 5 percent level.

***Failed banks for which no information-related banks group is formed.

Pre-Penn Square failures had no information effect. None of the intervals for the USNB and FNB failures show significant F-values. On the other hand, post-Penn Square failures show, in general, significant F-values, which are consistent with the corresponding results of Table IX. The significant F-values of the ACB failure seem to reflect positive reactions on days four and five.

The major findings on information effects can be summarized in the following statements.

1. Pre-Penn Square failures had no information effect.

2. Bank failures caused by firm-specific events have no regional effect.

3. After Penn Square, failures have, in general, had a substantial information effect.

4. Together, these findings suggest a discernible change in information effects since Penn Square.

Overall Industry Effect

This section examines the overall impact of a major bank failure on the banking industry. Existence of overall industry effects are examined first. After that, relative importance of causes of the industry effect is examined.

Overall Industry Effects

Table XI presents the results of tests of Equations 7 and 8 on an "industry" group of fifty-one non-failed banks,

TABLE XI

PREDICTION ERRORS (PE) AND CUMULATIVE PREDICTION ERRORS (CPE) FOR INDUSTRY

	Pre-Penn Failures							
	USNB		FNB		HNB		Banco	
Interval	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F	PE or CPE (Percent)	t or F
-10 to -1	0.81	0.46	2.10	0.71	-0.55	0.07	2.54	8.46*
0	-0.21	0.54	1.74	2.31**	-0.34	-0.53	0.07	0.27
1	-0.01	-0.02	-0.14	0.18	-0.77	-1.22	-0.01	-0.05
2	-0.37	-1.01	1.78	2.31**	0.39	0.62	0.26	0.97
3	-0.44	-1.21	1.51	1.98**	0.18	0.29	0.18	0.67
4	-0.12	-0.32	0.22	0.29	-0.02	-0.03	0.23	0.88
5	0.09	0.27	-0.16	-0.22	0.25	0.39	-0.28	-1.04
6 to 10	-0.02	0.00	2.90	2.80	0.91	0.40	2.76	20.05*
1 to 10	-0.86	0.51	6.11	5.50**	0.95	0.21	3.14	12.44*
-10 to 10	-0.24	0.02	9.95	6.83*	0.07	0.00	5.75	18.49*

TABLE XI--Continued

Interval	Post-Penn Failures											
	Penn		ANB		UAB		ACB		FNB (Midland)		Continental	
	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F	PE or CPE %	t or F
-10 to -1	0.64	0.29	1.71	1.89	-0.70	-0.11	-1.46	0.49	-0.96	0.60	-1.85	3.04
0	-1.11	2.94*	-0.21	-0.56	0.26	0.41	-0.44	-0.69	-0.18	-0.49	-0.36	-1.13
1	-1.34	-3.68*	-0.57	-1.54	1.43	2.26**	-0.25	-0.39	0.18	0.47	-0.63	-1.94**
2	-0.89	-2.89*	0.24	0.65	-0.66	-1.04	-0.72	-1.14	0.11	0.28	-1.11	-3.47*
3	0.21	0.57	-0.11	-0.28	-0.46	-0.73	0.07	0.12	-0.25	-0.67	-0.22	-0.71
4	0.84	2.25**	-0.39	-1.06	0.15	0.23	1.85	2.93*	-0.28	-0.75	-2.21	-6.77*
5	0.12	0.33	-0.24	-0.65	-1.05	-1.64	1.78	2.81*	-1.28	-3.37*	0.22	0.71
6 to 10	-0.57	0.44	1.71	3.40	-2.42	2.80	-0.01	0.00	-2.00	5.35**	-1.24	2.85**
1 to 10	-1.64	1.73	0.63	0.24	-3.01	2.09	2.72	1.70	-3.54	7.85*	-5.20	24.28*
-10 to 10	-2.09	1.22	0.42	1.30	-3.45	1.20	0.82	0.07	-4.69	6.13*	-7.41	21.34*

*Significant at the 1 percent level.

**Significant at the 5 percent level.

F = Interval, t = Individual Day.

which include all three groups of information-related, small and large banks. The findings are generally consistent with previous results. All four pre-Penn Square failures show no adverse impact on the industry. Bank failures caused by firm-specific events (USNB, HNB, UAB and ACB) show no industry-wide effect, regardless of whether it was before or after Penn Square.

The Penn Square failure appears to have had limited impact on the industry. On days zero, one, and two, the PEs are negative and significant at the 1 percent level (-1.11, -1.34 and -0.89 percent, respectively). However, the CPEs over the 6,10 and 1,10 intervals following the closure and the -10,10 interval are not significant. On the other hand, the FNB (Midland) and the Continental failures had a substantial impact on the industry: the CPEs over the 1,10 interval (-3.54 and -5.20 percent, respectively), and the -10,10 interval (-4.69 and -7.41 percent, respectively) are significant at the 1 percent level.

The findings in Table XI are supported by the results in Table XII, which report interval statistics of joint tests on the "industry" group of fifty-one non-failed banks. The F-values over 1,10 and -10,10 intervals for the FNB (Midland) and the Continental failures are statistically significant, supporting the results of Table X. The significant F-values over 1,10 and -10,10 intervals for the Penn Square (4.21 and 2.72) reflect negative excess returns of -1.11, -1.34 and

TABLE XII

JOINT TESTS ON THE BANKING INDUSTRY

Industry	Interval		
	-10 to -1 F-Value	1 to 10 F-Value	-10 to 10 F-Value
USNB Industry	1.02	0.48	0.75
FNB Industry	0.75	1.85	1.28
HNB Industry	0.32	0.44	0.38
Banco Industry	2.61*	2.36*	2.44*
Penn Industry	1.05	4.21*	2.72
ANB Industry	1.51	4.30*	2.98*
UAB Industry	0.62	1.18	0.91
ACB Industry	1.42	1.90**	1.68*
FNB (Midland) Industry	1.25	1.99**	1.63**
Continental Industry	1.62	7.05*	4.41*

*Significant at the 1 percent level.

**Significant at the 5 percent level.

-0.89 percent, respectively, on days zero, one, and two. The significant F-value for the ANB and ACB reflects the positive reaction after the closure.

The findings in Tables XI and XII reinforce previous results on intra-industry effects by showing that since Penn Square there has been a noticeable difference in the impact of bank failures on the banking industry. Possible causes of the industry impact is discussed in the next section.

Causes of Industry Effect

To investigate relative impact of the information and contagion effects of a major bank failure, the small banks group and the information-related group are selected. The small banks serve as a proxy group for the "pure" contagion effect in that they may have not enjoyed *de facto* 100 percent FDIC protection. Table XIII reports interval statistics of tests of Equation 10, which state the hypothesis (Ho 4) that cumulative predictive difference between two portfolios is zero. This test examines the difference in CPEs between the two groups by subtracting CPEs of "information-related" banks group from those of "small" banks group. Positive significant CPD reveals the impact of information effect, whereas, negative CPD reveals the impact of contagion effect on small banks.

Differences in CPEs between the two groups for the seven post-Penn Square failures are reported in Table XIII.

TABLE XIII

DIFFERENCE IN CUMULATIVE PREDICTION ERRORS (CPD) BETWEEN SMALL AND INFORMATION-RELATED BANKS

	Pre-Penn Failures							
	USNB		FNB		HNB***		Banco***	
Interval	CPD (Percent)	F	CPD (Percent)	F	CPD (Percent)	F	CPD (Percent)	F
-10 to -6	4.84	2.59	0.48	0.06	. . .	. . .	. . .	. . .
- 5 to -1	-2.14	0.51	5.38	7.87*	. . .	. . .	. . .	. . .
-10 to -1	2.17	0.39	5.86	4.50**	. . .	. . .	. . .	. . .
1 to 5	2.16	0.52	2.74	1.83	. . .	. . .	. . .	. . .
6 to 10	1.00	0.11	-0.63	0.11	. . .	. . .	. . .	. . .
1 to 10	3.16	0.53	2.11	0.52	. . .	. . .	. . .	. . .
-10 to 10	8.51	1.64	8.98	4.52**	. . .	. . .	. . .	. . .

TABLE XIII--Continued

	Post-Penn Failures											
Interval	Penn		ANB		UAB***		ACB		FNB (Midland)		Continental	
	CPD %	F	CPD %	F	CPD %	F	CPD %	F	CPD %	F	CPD %	F
-10 to -6	3.40	3.33	1.48	0.36	. . .	. . .	-4.15	3.20	1.52	0.61	1.76	2.44
- 5 to -1	1.73	0.87	4.44	1.43	. . .	. . .	-5.19	0.05	5.78	8.86*	1.80	2.46
-10 to -1	5.13	3.66	5.92	1.52	. . .	. . .	-9.34	1.94	7.30	6.79*	3.56	4.64**
1 to 5	2.53	1.84	-1.58	0.41	. . .	. . .	-6.85	8.71*	0.79	0.16	2.29	3.94**
6 to 10	1.72	0.86	7.81	7.74*	. . .	. . .	5.34	5.28**	-1.91	0.96	2.27	3.90**
1 to 10	4.25	2.47	6.23	2.51	. . .	. . .	-1.50	0.20	-1.12	0.16	4.55	7.68*
-10 to 10	13.38	10.75*	14.20	5.26**	. . .	. . .	-11.40	1.76	6.08	2.02	7.77	9.66*

*Significant at the 1 percent level.

**Significant at the 5 percent level.

***Failed banks for which no information-related banks group is formed.

The HNB, Banco Credit and UAB failures have no "information-related" group, for reasons already given. The USNB, ANB and ACB failures provide no evidence of contagion or information effects, as shown in Tables IV, V and IX. Thus, three post-Penn Square failures (Penn Square, the FNB (Midland), and Continental Illinois) are examined here.

For the FNB (Midland) failure, the differential cumulative prediction errors (CPD) over the -5,-1 and -10,-1 intervals are positive (5.78 and 7.30 percent) and significant at the 1 percent level, while the CPDs over all of three post-announcement intervals are not significant. This result implies that the information effect was not added to the contagion effect after the closure.

On the other hand, the Penn Square and the Continental failures display significant positive CPDs over the -10,10 interval, indicating that there was a strong market reaction to adverse information regarding asset quality of related banks at the time of failure announcements. In the Penn Square failure, the CPDs over the ten-day interval after the closure (1,10) and the -10,10 interval is 4.25 percent and 13.38 percent (significant at the 1 percent level). Considering the lack of a contagion effect (see Table IV), this result suggests that the observed adverse impact on the industry (Table IX) is primarily due to an information effect.

Further, Table XIII shows that CPDs for the Continental failure are positive and significant over most of the intervals. The CPDs over the 1,10 interval and the -10,10 interval are 4.55 percent and 7.77 percent (both significant at the 1 percent level), respectively. This may suggest that the significant adverse impact of the failure on the industry (Table XI) was due to information rather than contagion effects.

Summary

The results indicate that there is a change in the nature and scope of the impact of bank failures on the banking industry since the Penn Square failure. Some of the major findings are as follows: (1) before Penn Square, there was no evidence of contagion or information effects; (2) since Penn square, there is evidence of contagion effect, and the evidence is stronger for large banks; (3) since Penn Square, there is strong evidence of information effects; and (4) failures due to firm-specific causes have no contagion or information effects. This is true for small banks, large banks, and the industry, before and after Penn Square.

These findings imply that there has been a significant change in the stock market reaction to bank failures since Penn Square. Interpretations on each of the major findings are presented in the next chapter.

CHAPTER BIBLIOGRAPHY

1. _FDIC Annual Report_, Washington, FDIC, 1983.

2. Horwitz, Paul M., "Failures of Large Banks: Implications for Banking Supervision and Deposit Insurance," _Journal of Financial and Quantitative Analysis_, 10 (November, 1975), 589-610.

CHAPTER VI

ANALYSIS OF THE RESULTS

This chapter analyzes the results of the statistical tests examined in the previous chapter. Major findings on contagion and information effects of a bank failure on the industry are interpreted. The chapter ends with a brief summary.

Interpretations

Finding 1. Before Penn square there was no evidence of contagion or information effects. This finding is consistent with results of previous studies, which showed no significant negative reactions of stock prices of non-failed banks to pre-Penn Square failures (1, 11). There are several possible explanations for the absence of adverse impact on the industry.

One explanation of no contagion effect is the manner in which the FDIC handles bank failures. The FDIC's extensive use of the purchase and assumption method for settling failed banks might lead uninsured depositors to perceive little risk of loss from the failures. The purchase and assumption approach provides depositors little incentive to discipline bank risk-taking. There is evidence to support this explanation (4, 6).

Another possible explanation is the investor's perception of risk in banking. Before Penn Square, most bank failures resulted from causes specific to individual banks. Thus, a bank failure appeared to be less risky to the banking industry. The banking environment has changed before Penn Square (i.e., bank deregulation and international debt crisis). The new environment encourages banks to take excessive risks.

The efficient market hypothesis provides an argument against information effects (12, 13). That is, the bank equity market has already absorbed unfavorable information prior to an actual failure announcement because some or all of the information revealed (i.e., asset quality of non-failed banks facing common economic pressures) is already publicly known. Therefore, the impact of disclosure of adverse information on stock prices of non-failed banks is not significant. Pettway (12) showed evidence that regulatory information could not be unique. In a related study, Murphy (9) found no evidence of a "spillover" effect of problem bank list disclosure.

Finding 2. Failures due to firm-specific cause have no contagion or information effects. This finding is intuitively reasonable. When a bank fails due to firm-specific causes, depositors in non-failed banks can reasonably interpret this failure as being due to a condition peculiar to that individual bank and as not relevant to the safety of their banks. Accordingly, they have little incentive to start deposit runs on their banks. Also, this type of bank failure would release no information relevant to stock prices of non-failed banks.

This evidence is consistent with the results of Aharony and Swary's study (1), which examined contagion effects of the three pre-Penn Square failures. Unlike the previous study, however, this study provides evidence on the absence of such effects after Penn Square, and for banks of all sizes and the industry.

Finding 3. Since Penn Square there is evidence of contagion in general and the evidence is stronger for large banks in particular. This evidence indicates that since Penn Square there has been a change in market reactions to a bank failure. It also indicates that uncertainty about safety of uninsured deposits, particularly for large banks, has increased since Penn Square. This, in turn, implies a potential of market discipline on bank risk-taking, due to increased risk in banking. There are several ways in which uninsured depositors are exposed to increased risk from bank failures.

First, the FDIC's emphasis on greater market discipline (i.e., use of deposit payoff on Penn Square failure and introduction of "modified" payoff) might place uninsured depositors at higher risk. Second, inconsistency in the FDIC policy (i.e., deposit payoff on Penn Square, purchase and assumption on First National Bank of Midland, and bail-out on Continental Illinois) might generate increased uncertainty about the FDIC policy, causing uninsured depositors to perceive more risk in their funds. Third, the current status of the FDIC's insurance funds may be another depositor's concern. According to the FDIC annual report (5), the ratio of the insurance fund to insured deposits is declining from 1981, while losses and expenses to the fund are rapidly increasing since 1981. Uninsured depositors may be concerned about ability of the FDIC to protect them. If the FDIC fund is insufficient, the probability that they will not be paid increases.

Uninsured depositors should demand higher yields to offset perceived increases in risk exposure. This increase in the costs of uninsured funds, in turn, will be reflected in lower equity returns. Because they use more uninsured funds, large banks would be more likely to suffer a contagion effect since Penn Square. That is, the observed stronger impact on large banks may indicate that the market perceived more risk in large banks, which rely heavily upon uninsured funds.

As explained in Chapter II, the FDIC's preferential policy to failing large banks subsidizes large bank risk taking. Uninsured depositors of large banks receive greater protection than their counterparts in small banks. As a result, large banks have greater incentive to take riskier projects by capitalizing on the FDIC subsidy. Thus, it is more likely that the market would impose discipline on excessive risk-taking of large banks. Before Penn square, the market had less incentives to exert the discipline.

The evidence in this study indicates that since Penn Square there has been market discipline on large banks that are most dependent on uninsured funds. While this interpretation is plausible and supported by recent studies (2, 3), it contradicts the argument that the FDIC's preferential policy for large bank failures will create a market advantage for large banks.

Finding 4. Since Penn Square there is evidence of information effects. There are two possible ways to explain this evidence. One way is to interpret it through information dissemination process. There are several ways that a bank failure may reveal new information sufficient to affect related non-failed banks. The simplest possibility is that regulatory agents provide new additional information to the public. Another possibility is that they provide complete information about potential risks of related banks (i.e., severity of loan loss of co-loaned banks in case of Penn Square failure). The third possibility is that a failure announcement may cause investors to revise assessment of related banks' exposure to common economic crises (i.e., energy loan problems or foreign debt). Recent studies of Penn Square failure (7, 10) provide evidence to support this interpretation. Both studies showed that related banks were significantly impacted, and the impact was much stronger for directly involved non-failed banks.

Another possible interpretation is that the information effect may reflect investors' increased perception of the industry's risk. There is widespread belief that bank deregulation, coupled with the FDIC's full protection of all depositors, has encouraged banks to participate in risky higher-yielding loans to cover their rising costs of funds. This creates a closer interrelationship among banks. This interdependence has a potentially adverse impact on the banking industry. "One bank's bad loan decision can become the industry's bad loan decision" (8, p. 103). This interpretation is supported by Lamy and Thompson's study (8), which examined impact of the Penn Square failure on the stability of the banking industry.

The results of this study indicate that there has been a change in information effect for bank failures since Penn Square. Before Penn Square, most bank failures resulted from causes specific to individual banks. Thus, information effect of a bank failure appears to be less important to the industry. After Penn Square the information effect appears to be more important to the industry, because it reflects, at least partly, the industry's increased risk.

Summary

This chapter presents the analysis of major findings of the study. The analysis indicates that since the Penn Square failure there has been a change in market reaction to major bank failures. This, in part, reflects market perceptions of change in FDIC policy. The FDIC's conventional policy of protecting uninsured depositors may further, rather than contain, banking system instability. Such changes in perceptions would also imply increased risk in banking. The findings of this study provide evidence of capital market discipline in which investors charge riskier banks (i.e., large banks) higher returns. Implications for regulatory policy and further research are presented in the following chapter.

CHAPTER BIBLIOGRAPHY

1. Aharoney, J. and I. Swary, "Contagion Effects of Bank Failures: Evidence from the Capital Markets," Journal of Business, 56 (July, 1983), 305-322.

2. Baer, Herbert and Elijah Brewer, "Uninsured Deposits as Source Market Discipline: Some New Evidence," Economic Perspectives, 10 (September-October, 1986), 23-31.

3. Cramer, Robert H. and Robert J. Rogowski, "Risk Premia on Negotiable Certificates of Deposit and the Continental Illinois Bank Crisis," paper presented to the Financial Management Association, October, 1985.

4. Eisenbeis, Robert A. and Gary Gibert, "Market Discipline and the Prevention of Bank Problems and Failures," Issues in Bank Regulation, 8 (Winter, 1985), 16-23.

5. FDIC Annual Report, Washington, FDIC, 1983.

6. Federal Deposit Insurance Corporation, "The Classified Commercial Loan Survey: A Study of the Performance and Disposition of Adversely Classified Loans," an unpublished paper prepared by the Division of Bank Supervisor, 1977.

7. Karafiath, Imre and J. L. Glascock, "Intra-Industry Effects of a Regulatory Shift: Capital Market Evidence from Penn Square," working paper, North Texas State University, Denton, Texas, 1986.

8. Lamy, Robert E. and G. Rodney Thompson, "Penn Square, Problem Loans, and Insolvency Risk," The Journal of Financial Research, 9 (Summer, 1986), 103-111.

9. Murphy, Neil B., "Disclosure of the Problem Bank Lists: A Test of the Impact," Journal of Bank Research, 10 (Summer, 1979), 88-96.

10. Peavy, J. W. and G. H. Hempel, "The Penn Square Bank Failure: Effect on Commercial Bank Security Returns," working paper, Southern Methodist University, Dallas, 1986.

11. Pettway, R. H., "The Effects of Large Bank Failures upon Investor's Risk Cognizance in the Commercial Banking Industry," Journal of Financial and Quantitative Analysis, 11 (September, 1976), 465-477.

12. Pettway, R. H., "Potential Insolvency, Market Efficiency, and Bank Regulation of Large Commercial Banks," Journal of Financial and Quantitative Analysis, 15 (March, 1980), 219-236.

13. Shick, Richard A. and Lawrence F. Sherman, "Bank Stock Prices as an Early Warning System for Changes in Condition," Journal of Bank Research, 11 (Autumn, 1980), 136-146.

CHAPTER VII

SUMMARY AND IMPLICATIONS

Summary and Conclusions

A number of studies have been undertaken to examine the impact of major bank failures on the banking industry through the use of stock market data. Chapter III provides a review of the related literature. In general, most of the previous studies do not support the "contagion effect" hypothesis. This lack of evidence points out the need to evaluate the "contagion effect" in light of FDIC policy. Chapter II reviews the FDIC policy in handling major bank failures. Most of the previous research used a traditional event methodology (i.e., residual analysis) with weekly data. The multivariate regression model (MVRM) is explained as a better event methodology in Chapter III. An empirical testing procedure of the MVRM is shown in Chapter IV.

This paper presents a study of the stock market reactions to a major bank failure. Specifically, this study examines the intra-industry effects of the ten largest United States bank failures over the period from 1973 through 1984. Daily equity return data of a sample of fifty-one non-failed banks are used to investigate the information and contagion effects of each bank failure on the industry.

This study partitions a sample of fifty-one non-failed banks into three portfolios for each of the ten failed banks: (1) "large" banks (i.e., "too big to fail"), (2) "small" banks, and (3) "information-related" banks. The first two groups are designed to test differential contagion effects by size of non-failed banks. The third group is designed for the information effect.

This study, using daily data and the multivariate regression model (MVRM), provides several findings on contagion effects of major bank failures. First, there were no negative non-failed bank stock price reactions to pre-Penn Square failures, regardless of non-failed bank size. This finding supports previous evidence that major bank failures had no contagion effect on the industry (1, 3). Second, in post-Penn Square failure, however, there was evidence of contagion effects. Third, there was no evidence of differential effects for major bank failures by non-failed bank size. Instead, two of the post-Penn Square failures (ANB and FNB of Midland) showed a potential positive relationship, indicating stronger impact on large banks.

This study also shows that pre-Penn Square failures had no information effect. However, the information effect after Penn Square is mixed: the ACB and ANB failure had no impact; the remaining three failures (Penn Square, FNB of Midland, and Continental) had substantial impacts on related non-failed banks. This study further finds that significant adverse impact of two of the post-Penn Square failures (Penn Square and Continental) on the industry might be attributable to information rather than contagion effect, indicating substantial information effect since Penn Square. This evidence is consistent with that of two recent studies, which examined relative impact of the information and contagion effects of the Penn Square and Continental failures, respectively (2, 4).

Another finding of this study is that failures caused by events specific to individual banks (i.e., fraud) have no information or contagion effects, regardless of non-failed bank size. This is true for before and after the Penn Square failure.

This study concludes that there is a change in the nature and scope of the impact of bank failures on the banking industry since the Penn Square failure; before Penn Square there was no contagion or information effects, and since Penn Square there has been contagion and information effects. This study further concludes that since Penn Square the evidence of the contagion effect is stronger for large banks, and the evidence of the information effect is strong.

Implications for Regulatory Policy

There has been growing concern over bank safety since the mid-1970s, when the banking industry was deregulated.

In particular, a recent increase in the number and size of bank failures has created widespread concern over soundness of the industry among bankers and investors as well as policymakers. A number of reasons (i.e., deregulation or cyclical factors) have been suggested as potential explanations for the current concern.

The manner in which the FDIC has settled bank failures is widely recognized as a potential source of concern. The FDIC has provided banks with a subsidy for risk taking. *De facto* 100 percent guarantee of all deposits reduces incentives for uninsured depositors to monitor their banks' risk exposure. Further, this subsidy to risk-taking would provide banks, particularly large banks, incentives to make more risks, which may further destabilize the financial system.

The stock market evidence examined in this study indicates that since Penn Square market reactions to bank failures and investor perception of the FDIC policy have changed. This evidence may reflect the current concerns over bank safety. That is, the observed change in the perception may reflect FDIC policy's conflicting effects on the system stability. The results of this study indicate that before Penn Square, FDIC policy contributed to system stability by preserving the public's confidence. After Penn Square, FDIC policy failed by providing a subsidy to bank risk-taking.

The FDIC's primary concern in settling bank failures is potential impact of the failure on banking system stability. This concern has led policymakers to weigh relative effectiveness of federal regulation and market discipline in constraining banks' risk-taking. This study suggests a reexamination of FDIC policy, placing more weight on size of non-failed banks in handling bank failures in an era of growing deregulation of the banking industry as is the case today.

Implications for Further Research

The policy implications of this study suggest research in several related areas. Changes in the risk structure of the banking industry over time should be examined. Such research should investigate the following issues: (1) Is the banking industry more risky since Penn Square?, (2) Was there structural shift in risk perceptions by the stock market?, (3) Did the market perceive more risk in large banks?, and (4) Can we differentiate between potential sources (i.e., FDIC's subsidy to risk-taking and other sources such as deregulation) of perceived increase in bank risk?

There needs to be further research on the relationship between market discipline and bank behavior. Since Penn Square, bank regulators have stressed potential effectiveness of market discipline as a substitute for regulatory discipline on bank risk-taking. The underlying assumption is that bank behavior is sensitive to market discipline. However, the effectiveness of market discipline ultimately depends upon response of banks to negative signals (i.e., lower stock price) in the markets. Testing how sensitive bank risk-taking decisions are to market discipline would provide additional insights on formulation of policy. One possible approach to testing the relationship is examining changes in balance-sheet decision variables (i.e., portfolio changes) in response to changes in stock returns.

CHAPTER BIBLIOGRAPHY

1. Aharoney, J. and I. Swary, "Contagion Effects of Bank Failures: Evidence from the Capital Markets," *Journal of Business*, 56 (July, 1983), 305-322.

2. Karafiath, Imre and J. L. Glascock, "Intra-Industry Effects of a Regulatory Shift: Capital Market Evidence from Penn Square," working paper, North Texas State University, Denton, Texas, 1986.

3. Pettway, R. H., "The Effects of Large Bank Failures upon Investor's Risk Cognizance in the Commercial Banking Industry," *Journal of Financial and Quantitative Analysis*, 11 (September, 1976), 465-477.

4. Swary, Itzhak, "Stock Market Reaction to Regulatory Action in the Continental Illinois Crisis," *Journal of Business*, 59 (July, 1986), 451-473.

APPENDICES

Appendix A

A Sample of Fifty-One Non-Failed Banks

Amsouth	First Wyoming
Bancal TriState	Fleet Financial
Bank of Boston	General Bankshares
Bank of New York	Guarantee Bancorp
Bank of Virginia	Horizon Bancorp
BankAmerica	Interfirst
Banker's Trust NY	Irving Bancorp
Barnett Banks Florida	Mcorp
Chase Manhattan	Manufacturers Hanover
Chemical	Marine Midland
Citicorp	Mellon Bank
Citizens First	J P Morgan
Continental Illinois	N C N B
Crocker National	NBD Bancorp
Equimark	Norwest
Fidelity Union	Northwest Banking
First Atlanta	Republicbank
First Bankers Fla	Security Pacific
First Chicago	Southeast Banking
First City Texas	Southwest Bankshares
First Fidelity	Southwest Florida
First Interstate	Sterling Bancorp
First Pa Corp	Texas Commerce Bank
First Virginia	United Jersey
First Wisconsin	Wachovia
	Wells Fargo

Appendix B

A List of Thirty-One Non-Failed Banks

"Large" Group (11)

BankAmerica

Banker's Trust NY

Chemical

Citicorp

Crocker National

First Chicago

Manufacturers Hanover

J P Morgan

Norwest

Security Pacific

Wells Fargo

"Small" Group (20)

Amsouth

Bancal TriState

Bank of Virginia

Barnett Banks Florida

Fidelity Union

First Atlanta

First Bankers Florida

First Fidility

First Virginia

First Wyoming

Fleet Financial

General Bankshares

Guarantee Bancorp

N C N B

NBD Bancorp

Northwest Banking

Southeast Banking

Southwest Bankshares

Southwest Florida

Wachovia

BIBLIOGRAPHY

Books

Fama, Eugene, Foundations of Finance, New York, Basic Books, 1976.

Judge, G. and others, The Theory and Practice of Economics, New York, John Wiley, 1980.

Kane, Edward J., The Gathering Crisis in Federal Deposit Insurance, Cambridge, Massachusetts, MIT Press, 1985.

Kmenta, J., Elements of Econometrics, New York, Macmillan Publishing Company, 1971.

Zweig, Phillip L., Belly Up: The Collapse of the Penn Square Bank, New York, 1983.

Articles

Aharoney, J. and I. Swary, "Contagion Effects of Bank Failures: Evidence from the Capital Markets," Journal of Business, 56 (July, 1983), 305-322.

Baer, Herbert and Elijah Brewer, "Uninsured Deposits as Source Market Discipline: Some New Evidence," Economic Perspectives, 10 (September-October, 1986), 23-31.

Benston, George J., "Federal Regulation of Banking: Analysis and Policy Recommendations," Financial Institutions and Markets in a Changing World, Plano, Texas, Business Publications Inc., 1987, pp. 216-244.

Binder, John, "Measuring the Effects of Regulation with Stock Price Data," Rand Journal of Economics, 16 (Summer, 1985), 167-183.

Binder, John, "On the Use of the Multivariate Regression Model in Event Studies," Journal of Accounting Research, 23 (Spring, 1985), 370-383.

Beedles, W. and N. Buschman, "Describing Bank Equity Returns," Journal of Money, Credit, and Banking, 13 (May, 1981), 241-247.

Brewer, M. and S. Smidt, "A Simple Model of Non-Stationarity of Systematic Risk," Journal of Finance, 32 (September, 1977), 1801-1092.

Brown, S. and J. Warner, "Measuring Security Price Performance," Journal of Financial Economics, 8 (September, 1980), 205-258.

Brown, S. J. and J. B. Warner, "Using Daily Stock Returns: The Case of Event Studies," Journal of Financial Economics, 14 (March, 1985), 3-31.

Diamond, D. W. and P. H. Dybvig, "Bank Runs, Deposit Insurance, and Liquidity," Journal of Political Economy, 5 (June, 1983), 401-419.

Dodd, P. and J. Warner, "On Corporate Governance: A Study of Proxy Contests," Journal of Financial Economics, 12 (April, 1983), 401-438.

Defour, J., "Dummy Variables and Predictive Tests for Structural Change," Economics Letters, 6 (1980), 241-247.

Defour, J., "Generalized Chow Tests for Structural Change: A Coordinate Free Approach," International Economic Review, 23 (October, 1982), 565-575.

Eisenbeis, Robert A. and Gary Gibert, "Market Discipline and the Prevention of Bank Problems and Failures," Issues in Bank Regulation, 8 (Winter, 1985), 16-23.

Fama, E. and others, "The Adjustment of Stock Prices to New Information," International Economic Review, 10 (February, 1969), 1-21.

Forrestal, Robert P., "Bank Safety: Risks and Responsibility," Economic Review, Federal Reserve Bank of of Dallas, August,1985, pp. 4-12.

Fraser, D. and R. Richard, "The Penn Square Bank Failure and the Inefficient Market," The Journal of Portfolio Management, 10 (Spring, 1985), 34-36.

Gilbert, Gary G., "Disclosure and Market Discipline: Issues and Evidence," Economic Review, Federal Reserve Bank of Dallas, November, 1983, pp. 70-76.

Gries, T. G., "Discussion: Banking Structure, Failures and Financial Stability," Journal of Financial and Quantitative Analysis, 10 (November, 1975), 615-616.

Hayes, David G., "Discussion: Should Large Banks be Allowed to Fail?," Journal of Financial and Quantitative Analysis, 10 (November, 1975), 617-618.

Horwitz, Paul M., "Failures of Large Banks: Implications for Banking Supervision and Deposit Insurance," Journal of Financial and Quantitative Analysis, 10 (November, 1975), 589-610.

Lamy, Robert E. and G. Rodney Thompson, "Penn Square, Problem Loans, and Insolvency Risk," The Journal of Financial Research, 9 (Summer, 1986), 103-111.

Larcker, D. F., L. A. Gordon, and G. E. Pinches, "Testing for Market Efficiency: A Comparison of the Cumulative Average Residual Methodology and Intervention Analysis," Journal of Financial and Quantitative Analysis, 15 (June, 1980), 267-287.

Malatesta, Paul, "Measuring Abnormal Performance: The Event Parameter Approach Using Joint Generalized Least Squares," Journal of Financial and Quantitative Analysis, 21 (March, 1986), 27-38.

Mayer, Thomas, "Should Large Banks be Allowed to Fail?," Journal of Financial and Quantitative Analysis, 10 (November, 1975), 161-173.

Pettway, R. H., "The Effects of Large Bank Failures upon Investor's Risk Cognizance in the Commercial Banking Industry," Journal of Financial and Quantitative Analysis, 11 (September, 1976), 465-477.

Pettway, R. H., "Potential Insolvency, Market Efficiency, and Bank Regulation of Large Commercial Banks," Journal of Financial and Quantitative Analysis, 15 (March, 1980), 219-236.

Schipper, K. and Rex Thompson, "The Impact of Merger-Related Regulations: Finite Sample Distributions and a Reinterpretation of Significance," Journal of Accounting Research, 23 (Spring, 1985), 184-220.

Shick, Richard A. and Lawrence F. Sherman, "Bank Stock Prices as an Early Warning System for Changes in Condition," Journal of Bank Research, 11 (Autumn, 1980), 136-146.

Short, Eugenie D. and Gerald P. O'Driscoll, Jr., "Deregulation and Deposit Insurance," Economic Review, Federal Reserve Bank of Dallas, September, 1983, pp. 11-22.

Short, Eugenie D., "FDIC Settlement Practices and the Size of Failed Banks," Economic Review, Federal Reserve Bank of Dallas, March, 1985, pp. 12-20.

Swary, Itzhak, "Stock Market Reaction to Regulatory Action in the Continental Illinois Crisis," Journal of Business, 59 (July, 1986), 451-473.

Thompson, Rex, "Conditioning the Return Generating Process on Firm Specific Events: A Discussion of Event Study Methods," Journal of Financial and Quantitative Analysis, 20 (June, 1985), 151-186.

Zellner, A., "An Efficient Method of Estimating Seemingly Unrelated Regressions and Tests for Aggregation Bias," Journal of the American Statistical Association, 57 (June, 1962), 348-368.

Reports

FDIC Annual Report, Washington, FDIC, 1983.

FDIC Annual Report, Washington, FDIC, 1984.

FDIC Annual Report, Washington, FDIC, 1985.

Federal Deposit Insurance Corporation, Deposit Insurance in a Changing Environment, Washington, FDIC, August, 1985.

Unpublished Materials

Binder, John, "Measuring the Effects of Regulation with Stock Price Data: A New Methodology," working paper, University of Chicago and Washington University, August, 1983.

Cramer, Robert H. and Robert J. Rogowski, "Risk Premia on Negotiable Certificates of Deposit and the Continental Illinois Bank Crisis," paper presented to the Financial Management Association, October, 1985.

Federal Deposit Insurance Corporation, "The Classified Commercial Loan Survey: A Study of the Performance and Disposition of Adversely Classified Loans," an unpublished paper prepared by the Division of Bank Supervisor, 1977.

Karafiath, Imre and J. L. Glascock, "Intra-Industry Effects of a Regulatory Shift: Capital Market Evidence from Penn Square," working paper, North Texas State University, Denton, Texas, 1986.

Peavy, J. W. and G. H. Hempel, "The Penn Square Bank Failure: Effect on Commercial Bank Security Returns," working paper, Southern Methodist University, Dallas, 1986.

Newspapers

Carrington, Tim, "U.S. Won't Let 11 Biggest Banks in Nation Fail," *Wall Street Journal*, September, 1984, p. 20.

The New York Times, 1973-1984.

The New York Times Index, 1973-1984.

The Wall Street Journal, New York Dow Jones and Co., 1973-1984.

The Wall Street Journal Index, New York, Dow Jones and Co., 1973-1984.