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Free Bank Failures In New York and Wisconsin:
A Portfolio Analysis*

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Free Bank Failures In New York and Wisconsin:

A Portfolio Analysis

Rolnick and Weber found that a sharp decline in asset prices led to bank panics and, ultimately, bank failures during the free banking era. An examination of New York and Wisconsin free bank portfolios prior to a fall in asset prices indicates banks that weathered the turmoil held significantly different portfolios than closed banks. In general, solvent banks held more loans and specie, and issued more deposits and less banknotes than closed banks.

I. Introduction

The impact of deregulation on banking markets is a key concern of policymakers. Many economists assert that increased competition in banking would result in more bank failures, large bank creditor losses, and possibly bank panics. Support for their contention is based, in part, on the experiences of the Free Banking Era (1838-1863). The conventional view depicts the period as having few restrictions, numerous bank failures, large noteholder losses, and unscrupulous bank managers. However, recent studies by Rolnick and Weber (1982, 1983, 1984) and Economopoulos (1988) have found evidence to the contrary and suggest that the primary cause of bank failures was falling asset prices and not fraudulent behavior.

What is key in these studies is the link between falling bond prices and bank failure. It has been suggested by Rolnick and Weber (RW) that one of the portfolio restrictions provided valuable asset information to bank creditors. This restriction required free banks to hold long-term bonds to back a short-term liability (banknotes) where each banknote issued was redeemable into specie on demand. RW theorized that during periods of falling bond prices, noteholders, aware of the depreciated reserves, attempted to redeem their banknotes.¹ If the bond reserve and remaining assets were insufficient to redeem the outstanding banknotes, either the stockholders would have to provide additional capital or the bank would have to default on

the payment. RW suggest that the default option was preferred to the investment of additional capital.

Although the RW falling bond price hypothesis links the bond-secured banknote to bank failures, it does not fully explain which banks failed. Their hypothesis provides some insight into individual bank failures when a single bond or selective group of bonds fall in price. In their study (1985) on interregional contagion, they showed that between 1860 and 1861 bank runs occurred in Wisconsin while none occurred in New York. They contended that a selective run on Wisconsin banks was due to the bond portfolios held by the free banks. Although both Wisconsin and New York banks were required to hold bonds, New York banks were restricted to hold only NY and US bonds, while Wisconsin banks could hold a variety of state bonds, many of which were southern bonds. The events leading up to the Civil War depressed southern bond prices over 50%, thus leading to a run on Wisconsin banks. These events had little effect on NY and US bond prices and thus, little effect on the New York banking market.²

Although their "selective run" hypothesis explains interstate failure rates, it does not explain intrastate failure rates. RW data shows that during the 1860-61 period the 52 banks that exited in Wisconsin held over 70% of their bond portfolio in southern bonds while the 55 banks that stayed open held only 64% in southern bonds. Given the significant southern bond holdings of all Wisconsin banks, it would seem that some other aspects of the free bank's financial position would help explain which banks

failed. In New York, thirteen banks (5% of the market) exited during the same period, even though New York banks held only NY and US bonds. What then may have caused these banks to exit? This study is concerned with determining the financial characteristics that distinguished failed from solvent banks.

The cause of individual bank failures would probably be linked to the liquidity management of the bank. Even though the free banknotes were backed by a bond reserve, the reserve was not accessible to the bank until the bank returned a portion of its circulation. Thus, the value of the non-bond reserve assets would be crucial to understanding individual bank failures. Economopoulos (1986) gives preliminary evidence on the impact of non-bond reserve assets: states requiring high specie reserve were less likely to have bank failures than states allowing low specie reserve. This work supports the contention that the portfolio of banks may have decided the fate of the free bank.

One means of distinguishing ex ante poorly managed free banks from soundly managed banks is to use multivariate discriminant analysis (MDA). Altman (1968), Sinkey (1975) and others have shown with MDA that financial ratios of solvent banks were significantly different from failed banks even though impropriety may have been a factor in bank failures; thus, the application of MDA to free bank financial data could provide insight into the possible causes of bank failures.

Two free banking states examined by RW, New York and Wisconsin, provide an excellent case study of free bank failures

for several reasons. First, neither state imposed a specie reserve requirement, thus yielding a sample of banks which had flexibility in their asset selection. Second, both states experienced numerous bank failures, thus providing a suitable sample to employ MDA. Finally, the study of the New York and Wisconsin free banking experience allows us to examine bank failures in different banking markets. In 1860, the average New York bank held over \$1 million in assets and serviced over 12,000 customers while the average Wisconsin bank held under \$150,000 and serviced less than 7,200 customers.³

II. Assets and Liabilities of Free Banks

The New York free banking law, enacted in 1838, provided the legal framework for many of the free banking states. Unlike previous banking legislation, the free banking laws exposed free banks to public scrutiny (Economopoulos, 1987). In general, free banks were required to publish at least an annual report in the local newspapers detailing the types of assets and liabilities held, and the capital and surplus (retained earnings) account. The typical items required in a published balance sheet are present in Figure 1.

Figure 1.

Typical Free Bank Balance Sheet

Assets:		Liabilities:
Loans and Discounts		Banknotes
Loans to Directors		Deposits on Demand
Bonds		Deposits Due to Banks
Banknotes of Other Banks		Net Worth:
Specie		Capital
		Surplus

The amount of banknotes held by the free banker was linked to the amount of bonds purchased. Free bankers could obtain banknotes by transferring qualified assets to the state banking authority. Wisconsin accepted state and federal bonds as collateral for bank notes as long as they were of good standing in the financial markets. A state was considered in "good standing" as long as the state did not default on an interest payment. New York restricted eligible bonds to their own state and the federal government. In return for the bonds, the banker would receive banknotes equal to the market value of the securities or the par value, whichever was the lowest at the time

of remittance.

New York also allowed mortgages on unincumbered land as legal reserves for banknotes. The amount of notes issued to the bank equaled the mortgage value, but the mortgage could not exceed two-fifths of the land's assessed market value.⁴ This restrictive assessment of mortgages was due, in part, to the unreliable appraisals of the mortgaged property. In the Comptroller's report of 1849, the comptroller shared his concerns about the mortgage-backed banknote:

"All the experience of this department shows that mortgages are not the best security for this purpose... the lands mortgaged may have been appraised too high, or some legal defense to a suit of foreclosure, all conspire to depreciate their value in the estimation of purchasers, when offered for sale at auction on the failure of a bank... Capitalists are cautious about purchasing (mortgages), and the consequence is that they have sometimes sold for less than 20% on the amount secured by them..."

Since the mortgage-back provision was never repealed, it appears that the legislature did not share the comptroller's apprehensions.

Once the free bank was in receipt of the banknotes they could exchange them for loans and discounts, for specie, or additional bonds. The bank was required to redeem each banknote into specie on demand. Refusal of a noteholder's request for specie resulted in forfeiture of banking privileges. Such a harsh penalty provided an incentive for the prudent bankers to maintain "adequate" specie reserves in accord with the liquidity needs of the moment.⁵

Besides banknotes, many banks used deposits as a secondary source of funds to support loan demand. The amount of deposits issued by the bank depended on the economic base of the community. In general, deposits accounted for a small percentage of the liabilities in a country bank while deposits accounted for over half the liabilities in a city bank. Economic historians have suggested two reasons for this.⁶ First, the city banks developed a better network for clearing checks which reduced user cost of checks. Second, city banks recognized the benefits of having country bank deposit accounts. Country bank deposits were a source of funds for earning assets as well as security for the exchange of country banknotes. Some city bankers attracted country bank deposits by paying interest on such bank deposits. Free banks that paid interest on deposits varied the rate according to the short-term commercial paper rate. However, payment of interest on deposits was not the general practice among bankers at that time.

One benefit of having access to deposits was that bankers were not required to back the deposits with bonds or specie, although prudent bankers would no doubt hold sufficient specie to meet daily demands. Thus, a free bank with a deposit base afforded the banker some flexibility of asset selection.

One disadvantage of issuing deposits was the relative riskiness of this kind of bank credit. One of the common provisions of the free banking laws was the first-lien rights of the banknote holder. In the event of a bank failure, all

proceeds from the sale of the bank's assets were first applied to the banknote holder, then the depositor. This first lien provision and the rule that one unredeemed note would close the bank provided an incentive to depositors to monitor the financial position of the bank. Thus, a fiscally irresponsible bank with a large informed deposit base would likely have faced a significant drain of specie prior to or at the onset of a period of falling bond prices.

III. Free Bank Failures, Free Bank Management, and Financial Ratios

Given the bond-secured note restraint and the nature of the type of loans issued by the free bank, it would seem likely that free banks that purchased loans instead of bonds with banknotes were more likely to handle liquidity risk. Although bonds and mortgages were held as reserves for banknotes, they could not be considered as "free" reserves. In a liquidity crisis, the bonds could not be sold for specie until the free bank returned an equal amount of banknotes to the banking authority and banknotes could only be obtained by drawing down specie reserves or from additional capital subscriptions by stockholders. Thus, the creditworthiness and liquidity of the non-reserve asset was crucial to the expected value of a banknote and ultimately, to the success of the free bank.

The liquidity management problem of the free bank that relied on banknotes as a primary source of funds was very similar

to the problem faced by commercial banks today. Like current-
d a y
demand deposits, banknotes had no explicit maturity date or
interest rate expense. However, for a given interest rate, the
implicit average maturity of banknotes depended on the average
circulation period. ⁷ The longer the circulation period of a
banknote the longer the average maturity. In this case, the
liquidity problem facing free bank managers was to match the
average circulation period with the average maturity of the loan
portfolio thereby minimizing specie reserves. Specie reserves
would then support any unanticipated decrease in the average
circulation period or any unexpected credit losses.

The practice of matching the maturity of the loan portfolio
with the anticipated liquidity need was practiced by some free
bankers. Loans during the period were typically short-term - 3
to 12 months; this allowed bankers some measure of flexibility in
asset management.⁸ By reducing the average maturity, the free
bank could anticipate an increase in liquidity within a given
period. Peter Temin (1975) showed that N.Y.C. bankers adjusted
their loan portfolios to meet seasonal liquidity demands.⁹
Margaret Meyer (1931, p. 54) found that lending policies of banks
were also influenced by economic conditions; as trade and
commerce improved, credit terms were relaxed and loans were
extended for as long as 12 months.

A simple example can illustrate the liquidity risk
exposure problem. Assume that two free banks bought bonds with

their capital and used them to issue banknotes. Bank A used the banknotes to purchase loans that became due the following day, payable either in the bank's own notes or in specie. Bank B used the banknotes to purchase additional bonds. Let us assume that interest rates increased the next day causing bond prices to decline by 50%. In the absence of credit risk, Bank A would have sufficient funds to redeem the outstanding banknotes while Bank B would be forced to close or would have to secure additional funds from an outside source, most likely the stockholders. Thus, Bank A's purchase of loans and discounts helped reduce liquidity risk.¹⁰

The preceding discussion of the free bank's internal operations suggests that several ratios can be calculated that reflect the risk exposure of the free bank and the portfolio flexibility of free bankers in both New York and Wisconsin.

- (1) Liquidity ratios. A high specie to banknote and deposit ratio would indicate lower liquidity risk exposure than a low specie to banknote and deposit ratio.
- (2) Asset ratios. High specie to total asset, specie to bonds, and loans to bonds ratios would indicate lower liquidity risk exposure than low specie to total assets, specie to bonds, and loans to bonds ratios.
- (3) Flexibility ratios: high deposit to total debt, and high deposit to banknote ratios would indicate greater flexibility for portfolio managers than low deposit to total debt, and low deposit to banknote ratios.

One additional ratio is calculated for the New York free banks: the mortgage to total asset ratio. Based on the conjecture of the New York Comptroller, a high mortgage to total

asset ratio would suggest a higher reserve-portfolio risk than a low mortgage to total asset ratio. The higher the reserve-portfolio risk the higher the likelihood of failure.

IV. EMPIRICAL EVIDENCE

The focus of this study is to assess the financial position of the free banks prior to closing. Financial statements for a sample of banks were compiled from the New York and Wisconsin bank commissioners' annual reports to the state legislatures that was published in the United States Congressional Serial Sets. The banks were divided into two categories: solvent and closed. In New York, 289 banks were listed as solvent banks, banks that remained in operation as of the beginning of the National Banking Act in 1863; 162 banks were listed as closed banks, banks that exited before 1863. In Wisconsin, 61 banks were listed as solvent and 69 were listed as closed. Most of the Wisconsin closing occurred between June of 1860 and June of 1861.

From this population of solvent and closed banks, a sample was compiled according to several criteria. First, only banks that closed within twelve months of their last financial statement were selected; this limitation provides us the most up-to-date information on the banks prior to closing.' In Wisconsin, the reports were published annually. In New York, the publication frequency varied from 21 months to 9 months; thus some closed banks were excluded from the sample.

Second, the closed banks were matched with solvent banks

first according to equity structure, then geographical location (either city or country bank), and lastly, asset size. In the Wisconsin sample the matching process was simple, since most banks in the system were of comparable size and the same equity structure. However, some Wisconsin closed banks were not matched because a suitable solvent bank could not be found. The difference in average asset size between the groups as a percentage of average asset size was approximately 7%.

In New York, the matching process was not as exact. New York allowed two equity structures to exist. If there was only one stockholder, the minimum capital was set at \$50,000, but if there was more than one stockholder, the minimum capital was set at \$100,000.¹² The matching process was also limited by available data; forty-two banks exited prior to 1846 - a period when annual reports were incomplete. The loss of data due to the pre-1846 closings and the one year reporting period limitation lead us to relax the asset size criteria in order to compile an adequate sample; the average difference in asset size as a percentage of total asset size was 37%.

Based on the above criteria fifty-two pairs of free banks were selected from the New York population and 44 pairs of free banks were selected from the Wisconsin population with asset size ranging from \$50,000 to over one million. (See Table 1.)¹³

One caveat concerning the financial analysis is in order. Many of the banks closed during periods of falling asset prices. In the New York sample, 35 of the 52 banks closed during a period

of falling asset prices while in Wisconsin all the banks closed during a period of falling asset prices.¹⁴ If the bank's report date occurred during a period falling assets prices, one may contend that the statements of closed banks (ex post) should reflect significant differences from solvent banks. The differences could reflect asymmetry of information; that is, large depositors, aware of the bank's financial position at the beginning of the decline, bailed out prior to the published report. Thus, the analysis of these banks would not necessarily show how prepared the free banks were prior to a fall in asset prices, but rather how unprepared they were. The statements of 17 of the 52 paired New York banks were issued during a period of falling asset prices while all of the Wisconsin bank statements were issued during a period of falling asset prices.

A total of thirteen ratios were calculated for solvent and closed banks one year prior to exit. A differences in means test was performed on the ratios of the two classes of banks. Since two or more ratios may interact and may better distinguish a solvent bank from a failed bank, stepwise multivariate discriminate analysis was also performed. This procedure compares the dispersion of one or more ratios across the three classes of banks.

A. Mean-Difference Tests on Solvent and Closed Banks One Year Prior To Exiting

The results of the mean-difference test reveal some significant differences between closed and solvent banks. (See

Table 2.) The comparison between solvent and closed banks shows significant differences in most of the asset ratios, except for the mortgage-total asset ratio, for both states. Solvent banks generally had a higher proportion of loans and specie, and less bonds relative to total assets than closed banks. Solvent banks in both states also held three to four percent more specie relative to demand liabilities than did closed banks. Surprisingly, there was no statistical support for closed New York banks having a higher mortgage to total asset ratio than solvent New York banks. These results tend to support the hypothesis that closed banks had higher levels of liquidity risk exposure and that the composition of the reserve portfolio had little influence on bank closings.

Solvent banks also had higher loans and discounts to bonds ratios than did their counterparts. However, the total loan to bond ratio is insignificant. (The difference between the two ratios is the addition of loans to directors and other non-traditional loans to loans and discounts.) One possible explanation for the disparity between the loan and discount to bond and the total loan to bond ratios is that closed banks had a significant amount of loans to directors. In a period of stress, these loans would be highly illiquid and thus contribute to the demise of the bank.

The evidence provided by the equity and liability ratios is not as conclusive as that provided by the asset ratios. While most of Wisconsin's ratios are significant, only the deposit-

total debt ratio is statistically significant for New York. In Wisconsin, solvent banks generally issued a lower proportion of their debt in banknotes, held a higher proportion of their debt in deposits, and were more leveraged than failed banks. The statistical support for solvent banks having more deposits relative to banknotes indicates that solvent banks were in a better position to reduce liquidity risk by purchasing loans. The significant loan to bond ratio suggests that free banks did indeed purchase loans with their deposits.

In summary, there were significant differences between solvent banks and closed banks one year prior to failure. The evidence lends support to the contention that closed banks assumed higher liquidity risk exposure than solvent banks.

B. Stepwise Multivariate Discriminant Analysis of Solvent and Closed Free Banks

One drawback of the univariate test is that it does not capture the interaction among the variables. For example, low specie reserves combined with a large bond portfolio may be a better basis for distinguishing between closed banks and solvent banks. MDA captures this interaction among the variables. In this study the variables are represented by the financial ratios and the groups compared are the solvent and closed banks. The stepwise procedure employed in this study examines the relative dispersion of each variable and selects those variables that maximize the separation between the groups. One advantage of

stepwise MDA is that the relative contribution of each variable is measured against the other variables and the variables added into the model are those that "best" discriminate between solvent and closed banks.¹⁵

The first variable that is selected provides the greatest univariate discrimination between the groups. This variable is then paired with each of the remaining variables, one at a time, to find the combination of variables which produces a linear relationship that best discriminates between the two groups. The procedure continues to select variables, one at a time, and includes each one in the linear model until all the variables are selected or the remaining variables do not significantly contribute to the discriminatory power of the model.

From the selected variables, a linear discriminate function is derived:

$$Z_1 = W_0 + W_1 X_{11} + W_2 X_{21} + \dots + W_n X_{n1}$$

where weights (W_j) are assigned to each predictor variable (X_i) so that a discriminate score (Z_1) for each bank is estimated. (In this case the predictor variables are the selected ratios.) The estimated discriminate scores are used to classify the banks into the two classes of banks. The accuracy of classifying the banks by the discriminate function provides one indication of the discriminating power of the selected variables.

The results of the analysis are presented in Table 3. Included in Table 3 is the Wilk's lambda, an indicator of the overall discriminating power of the functions; the canonical and

standardized coefficients, indicators of the absolute and relative contribution of each variable; and the classification matrices using a holdout group. For both states, two variables were selected as discriminator: deposits-total debt and deposit-banknote ratios. The loans and discounts-total assets ratio was selected in the New York sample while total loans-total assets ratio was selected in the Wisconsin sample. It is interesting to note that for each state the variables entered in the same order, suggesting consistency of the discriminating variables between the two classes of banks. A fourth variable entered each function; in New York the total loans-bond ratio entered and in Wisconsin the bonds-total assets entered.

The selection of the deposit-debt ratio suggests that deposits provided a stable source of funds and allowed free bank managers flexibility in asset selection. In both states, the relative contribution of deposits as a discriminator is at least twice that of the next most important variable. The selection of the loan-total asset ratio is consistent with the liquidity exposure hypothesis. However, the evidence also indicates that a balanced asset portfolio, as noted by the negative loan-bond ratio in New York and by the positive bond-asset ratio in Wisconsin, was important in distinguishing between solvent and closed banks. (A positive sign indicates a high predictor variable is associated with a high discriminant score; the higher the discriminant score the higher the likelihood of that score being associated with a solvent bank.) This implies that bond

holdings, and the corresponding note issue, did not necessarily increase the likelihood of failure as long as they were supported by other earning assets.

The predictive power of the discriminate function is also presented in Table 3. Since there is an upward bias in classifying banks that were used to develop the discriminant function, the Lachenbruch technique was used to classify the banks. Lachenbruch (1967) devised a discriminate classification technique for small samples which classifies each observation based on the remaining observations. This procedure reduces the biasedness of the classification. In New York, seventy-four percent of the solvent banks and fifty-seven percent of the closed banks were classified correctly, while in Wisconsin seventy-one percent of the solvent banks and seventy-five percent of the closed banks were correctly classified. These results are better than the sample proportions which would be the best estimate of population priors; thus validating the variables as a reliable discriminator of solvent and closed banks.¹⁶

To illustrate the results of MDA process, four Wisconsin banks were classified as having varying degrees of financial strength. (The balance sheets of these banks are given in Table 4.) Given the discriminant function and the financial data of each bank, discriminant scores were calculated. The scores were evaluated at the group's mean and then classified. City Bank of Kenosa was listed as having the "best" financial position. The probability of misclassifying City Bank as a closed bank was

2.4% At the other end of the financial strength spectrum was Mechanics' Bank. The probability of misclassifying Mechanics' as a solvent bank was 8.5%. Oshkosh Commercial and Iowa County represented the typical solvent and failed banks, respectively. It appears that banks most likely to succeed were banks that were doing "legitimate" business in loans and discounts while banks least likely to succeed were issuing an abnormally high amount of promissory notes (typically, uncollateralized loans) and few deposits.¹⁷ Although the evidence supports the proposed hypotheses, it also raises questions about bank's portfolio choice.

VI. CONCLUSION

The evidence from New York and Wisconsin free banks indicates that liquidity risk one year prior to exit may have been a contributing factor to free bank failures. The Wisconsin and New York data show strong support for the hypothesis. The comparison of financial ratios one year prior to failure, which occurred during a drop in asset prices, indicates significant differences between solvent and failed banks. Solvent banks were able to mitigate liquidity risk by issuing more loans and by holding a higher proportion of assets in specie than failed banks. Deposits held by the free bank also distinguished solvent from failed banks; solvent banks held more deposits than failed banks.

Several issues are raised from these results which would new avenues for research. Does the evidence tend to support the

conventional notion of inherent instability of private note production?'⁹ The inherent instability hypothesis is based, in part, on two interrelated aspects of the free banking experiences: (1) the fraudulent behavior of bankers (commonly known as wildcat bankers), and (2) the overissue of banknotes. The overissue of banknotes traditionally linked to wildcat banks. This tradition appears to have result from observations made by some of the contemporaries of the period. The 1853 Annual Report of the New York Banking Superintendent, states

"the only failures of banks that have taken place in the state for the last eight years by which billholders have obliged to suffer loss have been banks of circulation, generally located in remote parts of the state, and owned by brokers and speculators... not a failure has occurred in any legitimate bank..."⁹

Although the evidence in this study suggests that "banks of circulation" were most likely to fail, it can not be construed that such banks were also wildcat banks. Rolnick and Weber (1982) and Economopoulos (1988) found that fraudulent behavior was generally the exception, not the rule. However, their studies do not address individual banks of circulation.

If the intention of bankers was not to defraud the public what basis did they have for their operations? Is it possible for legitimate banks to be "banks of circulation"? White (1984) and Selgin (1988) have set up theoretical models on free banking and provide insight to these questions. From the supply side, bankers would maximize profits and by issuing banknotes and deposits until the marginal cost of the issues were equal. One

of the major costs of issue would be liquidity cost (that is, the maintenance of specie reserves for redemption); another cost was that of attracting deposits. Under such an optimization problem, "banks of circulation" could legitimately arise in the market where the cost of attracting and maintaining deposits was prohibitive; these banks would most likely be located in "remote" areas.

What is crucial to their legitimacy is that noteholders (demanders) are monitors of the issuing bank.²⁰ If noteholders do not discriminate between issuers, then it is possible for selective banks to overissue or possibly be an illegitimate wildcat bank. Although far from conclusive, some evidence indicates that note discrimination was practiced in New York and Wisconsin. In New York, note discrimination was institutionalized by requiring all "country" banks to have redemption agents in either Albany or New York. As long as the agent bank was not conspiring with the bank of issue, it would seem likely that the agent bank would monitor the note issuer. No such law was enacted in Wisconsin, but there is evidence of note discrimination of Wisconsin banks by Chicago Banks.²¹

If these banks were organized to meet market needs, then what would explain their higher likelihood of failure? One possible explanation is that banks were closely monitored by the market; both competing banks and depositors had an incentive to monitor. In a downturn, competing banks aware of the market value of the banks' assets would increase liquidity demands of the

note issuing bank.²² Depositors, likewise, would increase liquidity demands. Unlike previous banking regulations, the free banking law gave first lien rights to all of the assets to the noteholder. Thus, the subordinate nature of deposits required either financial compensation for the risk taken by the depositor or required greater assurance of fiscal responsibility of bank managers. Since most banks did not pay interest on deposits, it seems likely that depositors were monitors of free bank operations. Some of these banks, especially banks of circulation, did not have the assets to support an increase in liquidity demand. Consequently, many of these banks probably closed. The evidence in this study, however, only provides preliminary support for monitoring; further study of free bank monitoring would be necessary before any definitive conclusions could be made.

Endnotes

1. Rolnick and Weber actually stated that the cause was due to a fall in asset prices, and used bond prices as a proxy for asset prices. This study refers to these periods as periods of falling bond prices.

2. See Rolnick and Weber (1985) for the bank and bond price data. It should be noted that RW separated exiting banks into those that redeemed notes below par and those that redeemed notes at par. This study makes no distinction.

3. The source of the estimates came from the U.S. Bureau of the Census, and the New York and Wisconsin bank commissioners' reports of 1861.

4. The original law specified that the mortgage could not exceed half of the land's market value. For a complete listing of New York banking laws from the beginning to the National Banking Act, see Cleavland and Hutchinson (1864).

5. In general, bankers were not prosecuted during general liquidity crises, such as the one that occurred in 1857 when all banks suspended bank note redemption.

6. Miller (1920, p.109) presents a discussion on the use of checks in cities and Meyers (1931, pp.120-125) states that the practice of paying interest on country bank deposits occurred primarily in New York City banks.

7. If Rolnick and Weber's falling asset price hypothesis is correct, then it is expected that the average circulation period of a banknote would decline as interest rates increased.

8. Several studies have estimated loan maturities prior to 1913. Gibbons (1858, p.200) estimated the average discount period for New York Banks prior to the Civil War was 40 days. In Dailey's (1934, p.499) examination of Chicago banks before 1890, banks limited loan maturities to 60 days in peak periods. However, Moulton (1918) pointed out that bankers renewed at least 40% to 50% of their unsecured loans, implying that the effective maturity could be longer than the estimates by Gibbons and Dailey.

9. Don Daily (1934) found that when credit demands were at their peak, bankers were reluctant to loan as long as 60 days. Although the Daily study focused on the post-free banking period, it lends support to the Temin findings.

10. The assumption concerning no credit risk is restrictive. One would expect that a portion of the loan portfolio would default and consequently, noteholders would sustain losses. Noteholders of Bank A would sustain losses equal to noteholders of Bank B if the default rate of Bank A's loan portfolio was 50%.

11. The primary source of bank closings came from the Bank Commissioner's Reports of the states. All of the Wisconsin banks were identified through these reports. In New York, two secondary sources were needed to identify bank closings: Rolnick and Weber (1982) and Dillistin (1946).

12. Due to the limited population size, some individual banks were matched with banking associations; there were twenty-six closed individual banks in the sample, ten of these were matched with banking associations.

13. The consistency in results between Wisconsin and New York indicate that asset size did not influence the distinguishing characteristics of failed banks. See the Appendix I for the list of banks in the samples.

14. For the sample period, bond prices decline significantly in 1854, 1857, and 1860. This study defines the periods of falling asset prices according to those used by Rolnick and Weber (1984). They found that Indiana bond prices decline by 33% between June, 1854 and December, 1854, by 26% between March, 1857 and October, 1857, and Missouri bond prices fell by 57% between June, 1860 and June, 1861.

15. The selection criteria corresponds to a one-way analysis of variance. After the first variable is selected, the one-way analysis of covariance is performed on the remaining variables. In other words, the remaining variables are conditional to the selected variables. The selection process continues until the remaining variables do not significantly discriminate between the groups.

16. The prior probabilities are determined by the relative proportion of the subgroup to the sample population; in this study, 50 percent of the solvent and failed banks.

17. Promissory notes was included in New York banks' balance sheet under bonds, but was a separate account on Wisconsin balance sheets. In order to make a valid comparison between the states, promissory notes was not included in the "loan and discount" account in the analysis.

18. See King (1983) for a detail review of the issues regarding private note issue.

19. From the context of the superintendent's statement, the superintendent used the term "bank of circulation" as a polite synonym for "wildcat bank". Wildcat banks were noted for their inaccessible locations.

20. See Selgin (1988, pp.42-47) and White (1984, p.7-9) on a detailed discussion on monitoring and note issue.

21. Bankers' Magazine (September, 1858, p.235) published a statement from the Bankers of Chicago showing their dissatisfaction with selective Wisconsin Banks.

22. It is reasonable to assume that a monitoring bank could assess the loan default risk of a competing bank from its own default risk.

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Table 1.
New York and Wisconsin Free Bank Sample
Asset Size and Location

Asset Size (In Thousands)	Wisconsin	New York City*	Country
50 to 100	32	0	16
101 to 150	40	0	15
151 to 200	10	0	8
201 to 300	2	1	18
301 to 400	2	1	11
401 to 500	0	2	4
501 to 1000	2	10	8
over 1000	0	10	0
Total	88	22	82

* Includes Buffalo, Albany, and New York City.

Table 2
Differences in Ratio Means of Solvent and Closed Free Banks
in New York and Wisconsin

Ratios	New York	Wisconsin	Hypothesized Relationship
<hr/>			
Asset Ratios:			
Ln & Dis/Total Assets(LDTA)	.1056*	.1633*	LDTAs > LDTAc
Total Loans/Total Assets(LNTA)	.1046*	.1310*	LNTAs > LNTAc
Specie/Total Assets(SPTA)	.0099**	.0149*	SPTAs > SPTAc
Mortgages/Total Assets(MTA)	-.0013	b	MTAs < MTAc
Bonds/Total Assets(BDTA)	-.1154*	-.1045*	BDTAs < BDTAc
Total Loans/Bonds(LNBD)	.5868	-.2150	LNBDs > LNBDc
Ln & Dis/Bonds(LDBD)	.5950	-.4486	LDBDs > LDBDc
Liquidity Ratios:			
Specie/Banknotes+Dep(SPBD)	.0174***	.0265*	SPBDs > SPBDc
Specie/Total Debt(SPTD)	.0157***	.0199*	SPTDs > SPTDc
Debt & Equity Ratios:			
Banknote/Total Debt(BNTD)	.0429	-.2588*	BNTDs < BNTDc
Deposits/Total Debt(DPTD)	.1024**	.2240*	DPTDs > DPTDc
Deposits/Banknotes(DPBN)	.4472	-1.753	DPBNs > DPBNc
Debt/Equity(TDEQ)	.2614	.5114*	

*, **, *** Significant at the one, five, and ten percent levels.

aThe null hypothesis states that for any measure the difference in means of the underlying populations of solvent and closed free banks is equal to zero: $XXXX_j - XXXX_i = 0$, where $XXXX_j$ denotes the mean of the j th measure of the i th class of bank.

b Wisconsin did not allow free banks to purchase mortgages.

TABLE 3
 Stepwise Discriminate Analysis
 of Wisconsin and New York Solvent and Closed Free Banks

Ratios Selected	Wisconsin		New York	
	Absolute Coefficients	Standardized Coefficients	Absolute Coefficients	Standardized Coefficients
Deposits/Total Liabilities	6.023	1.160	5.458	1.056
Deposits/Banknotes	-0.033	-0.006	-0.414	-0.080
Loans and Discounts/Total Assets			2.427	0.470
Total Loans/Total Assets	2.255	0.434		
Total Loans/Bonds			-0.101	-0.020
Bonds/Total Assets	2.927	0.564		
Wilk's Lambda		.812		.686
F Statistic (Degrees of Freedom)		9.50(4, 83)		7.27(4, 99)
Canonical Correlation		.560		.434
Classification: (Lachenbruch Technique)		Percent Correct		Percent Correct
Closed		75.0%		56.9%
Solvent		70.5%		73.6%

Table 4
Balance Sheets of Wisconsin Banks
January, 1861
Classified by the Discriminant Function

	Classified			
	Solvent		Closed	
	<u>High Prob</u> City Bank, Kenosh	<u>Mean Prob</u> Oshkosh Commerial	<u>Mean Prob</u> Iowa Cnty Bank	<u>High Prob</u> Mechanics' Bank
<u>Assets</u>				
Loans and Discounts	\$ 136,895	\$ 31,386	\$ 6,992	\$ 0
Loans to Directors	0	2,788	4,000	0
Bonds	34,146	34,000	26,500	30,000
Promissory Notes (Other than L&D)	0	2,000	42,874	25,000
Specie	1,693	5,711	3,523	0
Cash Items	12,505	358	845	0
Due from Banks	7,607	3,500	11,120	0
Notes of Other Banks	15,624	14,662	4,176	0
Other	<u>14,891</u>	<u>1,773</u>	<u>3,524</u>	\$ <u>0</u>
Total Assets	\$ 223,361	\$ 96,178	\$103,552	55,000
<u>Claims</u>				
Capital	\$ 100,000	\$ 30,000	\$ 50,000	\$ 25,000
Banknotes	24,264	29,135	24,843	23,700
Deposits	90,883	25,536	14,696	0
Due Other	<u>8,214</u>	<u>11,507</u>	<u>14,013</u>	<u>6,300</u>
Total Claims	\$ 223,361	\$ 96,178	\$103,552	\$ 55,000

NEW YORK FREE BANK SAMPLE

NAME OF CLOSED BANK	Type*	ASSET SIZE LAST REPORT	LAST REPORT	MATCHING SOLVENT BANK	ASSET SIZE LAST REPORT
Agriculture Bk	A	\$311,000	1856	BALLSTON SPA	\$284,000
Artisans Bk NYC	A	929,000	1860	Citizens Bk, NYC	1,222,000
Bank o/t Union	I	68,000	1854	Wyoming Cty Bk	222,000
Bk o/t Interior	A	1,137,000	1860	Bk of Rondout	490,000
Bk o/t Union, NYC	A	601,000	1853	Oriental Bk	581,000
Bk of Albany	A	1,134,000	1860	Commercial Bk Alb	2,316,000
Bk of Central NY	A	238,000	1859	BK ATTICA	557,000
Bk of Corning	A	122,000	1859	Bk of Kinderhook	434,000
Bk of Hornelvle	I	337,000	1856	Bk of Bath	351,000
Bk of New Rochell	I	90,000	1850	Exchange BK, Buff	96,000
Bowery Bank, NYC	A	1,487,000	1856	Broadway Bank	2,232,000
Brockpart Exc	I	234,000	1860	Commercial Bk, Clyde	214,000
Camden Bank	A	134,000	1855	Commerical Bk, Whtl	351,000
Catarack Bk	A	139,000	1860	Bk of Chemung	197,000
Central Bk, NYC	A	667,000	1854	East River Bank	881,000
Chemung Cty	I	145,000	1856	Geo Was Bk	199,000
Comercl bk, Alg	I	58,000	1853	Watertown B&L	490,000
Dairymen's B	I	237,000	1856	Burnett Bk	209,000
Drovers Bk	I	80,000	1854	Exchanke Bk, Lockpt	510,000
Dunkirk Bank	I	101,000	1854	Merchant's Bk, Wfld	148,000
Eighth Ave, NYC	A	285,000	1854	Bull's Head	305,000
Empire City, NYC	A	698,000	1854	N.Y. Exchange Bk	448,000
Farmers B. S Cty	A	232,000	1859	Mohawk Valley	349,000
H White	I	70,000	1860	Lake Shore Bk	240,000
Hamilton Ex	I	91,000	1856	Citizen Bk. F-O	325,000
Hollister Bk	A	806,000	1856	Marine Bk, Buff	772,000
Island Cty Bk, NYC	A	624,000	1856	Atlantic Bk	1,000,000
J. Rumsey & Co.	I	86,000	1860	P.R. Westfall	84,000
James Bk	A	156,000	1850	Mech & F, Ithaca	213,000
Kirkland Bk	I	84,000	1853	Cuyler's Bk	309,000
Knickerback, NYC	A	806,000	1854	Chatham BK	1,026,000
Lockport B&T	A	254,000	1854	BK of Danville	358,000
Manufact Bk, Roch	A	397,000	1858	Genessee Cty Bk	141,000
Mechanics Bk, WTN	I	84,000	1853	Oneida Valley	236,000
Medina Bk	I	288,000	1860	Bk of Canandaigua	164,000
Mer & F, Carmel	I	124,000	1853	Middletown Bk	228,000
Merchts ,Cand	I	170,000	1850	W. Shermans Bk	151,000
Monroe Bk	I	59,000	1856	Bank of Newmark	258,000
NY Stock Bk	I	123,000	1850	Suffolk Cnty	114,000
National Bank	A	908,000	1860	Union Bk, Alb	1,008,000
O. Lee & Co	A	997,000	1856	BK of Syracuse	701,000
Onandaga Bk	A	54,000	1859	Bk of Fayetteville	277,000
Ontario Cty Bk	I	149,000	1856	Smith's Bank	133,000
Oswego Cty	I	104,000	1850	Farmers & M, Rock	313,000
Pine Plains	A	190,000	1856	Delaware Bk	274,000
Powell Bk	A	726,000	1856	Farmer's Bk, Hudson	649,000
Prattsville BK	I	239,000	1850	Black River	408,000
Putnam Valley	I	123,000	1853	Bk of Pawling	320,000
Queen City	I	122,000	1853	Merchant Bk, EC	105,000
State, Sang	I	75,000	1853	Bk of Cayuga Lake	59,000
Suffolk B, NYC	A	430,000	1853	Grocers' Bk	1,062,000
White Plains Bk	I	58,000	1853	Lyons Bk	195,000
AVERAGE		342,431			471,922

* An "A" signifies association; an "I" signifies individual bank.

WISCONSIN FREE BANK SAMPLE

REPORT DATE: 1/7/1861

NAME OF CLOSED BANK*	ASSET SIZE LAST REPORT	MATCHING SOLVENT BANK	ASSET SIZE LAST REPORT
ARTIC BK	\$392,000	RACINE CTY	\$322,000
BK OF ALBANY	150,000	CORN EXCHANGE	152,000
BK OF APPLETON	100,000	BK OF INTERIOR	103,000
BK OF B DAM	56,000	SUMMIT	63,000
BK OF COLUMBUS	176,000	EXCHANGE BK	178,000
BK OF FODULAC	93,000	OSHKOSH COMM	96,000
BK OF HORICON	110,000	BK OF PARIRIE	105,000
BK OF OCONTO	115,000	BK OF JEFFERSON	118,000
IOWA COUNTY	123,000	SHAWANAW	125,000
BK OF PORTAGE	131,000	BK OF WISCONSIN	135,000
BELIOT SAVINGS	42,000	ELKHORN	66,000
CHIPPEWA BK	99,000	WALWORTH CTY	100,000
CITY BK, B. DAM	128,000	BK OF BELIOT	128,000
CLARK CTY	132,000	ROCK CTY	130,000
COMMERIAL BK	105,000	BK OF RACINE	107,000
DODGE CTY BK	91,000	GREEN BAY	96,000
FARMERS BK	99,000	CITY BK, PRESCOTT	119,000
HALL BROS	106,000	BK OF OSHKOSH	123,000
HUDSON CITY	70,000	BK OF RIPON	76,000
KATANYAN	100,000	CORN PLANTERS	87,000
KOSHKONONG	102,000	BK OF MANITOWOC	108,000
LABORERS	113,000	SAUK CTY	114,000
LA CROSSE	61,000	BK OF SPARTA	68,000
LAKESHORE	72,000	BK OF MONROE	81,000
MANITOWOC	85,000	BK OF SHEBUYGAN	89,000
MECHANICS	55,000	BK OF WHITEWATER	70,000
MERCHANTILE	110,000	SCROIX VALLEY	136,000
NORTHERN	66,000	WIS BK, MAD	80,000
NORTHWESTERN	147,000	COLUMBIA CTY	143,000
OAKWOOD	101,000	MONROE COUNTY	105,000
OCONTO	193,000	DANE	208,000
OSBORN	177,000	BK OF WATERTOWN	174,000
PORTAGE	107,000	FMRS & MERCH	121,000
REEDBURG	108,000	ROCKVILLE	105,000
SEC WARD	60,000	FRONTIER	64,000
STATE STOCK	529,000	FARM & MILLERS	677,000
SCROIX RIVER	126,000	BK OF FOX LK	138,000
TRADESMAN	157,000	BK OF GRANT CTY	169,000
WAUPACCA	110,000	BK OF WEGAWEGA	115,000
WAUPAN	62,000	FOREST CITY	82,000
WINNEBAGO	134,000	GERMAN	131,000
WIS PINERY	175,000	JEFFERSON CTY	189,000
WIS VALLEY	208,000	CITY BK, KENOSA	233,000
WOOD CTY	109,000	BK OF GREEN BAY	131,000
AVERAGE	126,932		135,455