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Instructor, Texas A&M University

### **Articles Published in Peer-Reviewed Journals**

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## **Definition of Supervision and Regulation**

Since financial institutions are subject to various forms of regulation, it is necessary to define what I mean by supervision and regulation. My definition reflects the practice of supervision in the United States.

## **Financial Regulation in the Information Age**

I investigate these issues by examining banking history. While the technology involved in processing payments has changed over time, issues involving the role of the government in ensuring the safety and soundness of the payment system have remained the same. Lessons drawn from history are still relevant for the entry by nonbank firms into the payments business.

One type of threat to safety and soundness involves the nature of the technology used in these new payment arrangements: reliability of the systems and vulnerability to fraud or attack over computer systems. This article does not deal with these issues raised by new payments technology. Instead, this article deals with the role of the government in limiting the vulnerability of the payment system to shocks resulting from default by providers of payment services on their payment obligations.

Several groups are attempting to develop new arrangements for making payments: stored value cards and payments over the Internet. This article examines the implications of these developments for the safety and soundness of the payment system.

Some of the firms developing new payment arrangements are not banks. This article examines the implications of entry into the payments business by the nonbank firms whose liabilities are used or will be used for making payments, if their plans are successful. The appendix describes the services of two of these nonbank providers of payment services. Entry of these firms into the payment business raises some important issues for public policy. Should the new providers of payment services whose liabilities are being used for making payments be supervised and regulated as banks? Is it important, for preserving stability of the payment system, that they be granted access to the discount window?

## **Lessons from Banking History**

Major institutions in this history are clearinghouses, which functioned somewhat like central banks (, *Timberlake (1984)*). Banks formed clearinghouses for efficient clearing and settlement of payments. Operation of clearinghouses required a great deal of cooperation among their member banks, especially during periods of financial crises. Clearinghouses engaged in activities similar to supervision and regulation of their member banks, to ensure that the financial condition of each member warranted support during a financial crisis (, *Gorton and Mullineux (1987)*).

While a thorough comparison of banking history in the United States and other countries is beyond the scope of this article, the following observations support the relevance of these lessons from United States banking history for current policy analysis. First, while banking panics were less frequent in other countries, they did occur. The last banking panic in England occurred in 1866, but after that episode, the Bank of England accepted its role as the nation's lender of last resort (, *Wood and Gilbert (1986)*). Second, one explanation for the occurrence of banking panics in the United States long after they had ended in other countries is that, because of an unusual ideology involving the government and banking, the United States established the appropriate government policies for dealing with instability in the banking system long after other nations had adopted appropriate monetary arrangements. From this perspective, United States history is especially relevant for studying the ability of private firms to achieve stability in the operation of a nation's payment system through private arrangements. Third, evidence to support the claim that free banking systems (those without central banks or government supervision and regulation) were stable is subject to conflicting interpretations (, *Goodhart (1987)*).

One basis for challenging these conclusions is that banking panics were more frequent and their effects more severe in the United States than in other countries. Bordo (1990) documents this difference in the frequency of panics across countries and attributes the relatively high frequency of panics in United States history at least partially to restrictions on branch banking in the United States. This perspective would tend to undermine the relevance of United States banking history as the basis for determining the validity of assumptions that underlie the market discipline argument. Another challenge involves evidence that free banking systems (those that operated without central banks or government supervision and regulation) were more stable than systems with central banks and government supervision and regulation (, *White (1984)*).

Banking history illustrates the importance of a central authority for preserving stability of a payment system. To be effective, a central authority must be empowered to act quickly in injecting reserves into providers of payment services in an emergency situation. Its actions must not be hindered by conflicts of interest among providers of payment services. In our payment system that central authority is the Federal Reserve System.

During occasional financial crises, bank customers attempted to withdraw their deposits in the form of currency. Banks attempted to cope with these large cash withdrawals through mutual support coordinated through their clearinghouses. Banks loaned their cash reserves to the clearinghouse member banks experiencing the greatest difficulty coping with depositor withdrawals. Clearinghouses created special certificates during crisis periods (called loan certificates) that the members agreed to accept in settlement through their clearinghouses. This arrangement freed banks to use their cash reserves to meet the demands of depositors, rather than holding inventories of reserves for settlement at the clearinghouse. The discount window of the Federal Reserve was modeled after these actions of clearinghouses during banking panics. Clearinghouses were effective in limiting the effects of bank runs during some banking panics. On other occasions, actions of the

clearinghouses were not adequate to deal with panics, and banks resorted to suspension of cash payments to their depositors, which were major disruptions in the operation of the payment system.

I don't think that it is necessary to apply this prescription at this time to all such firms. Currently, there is a lot of research and development in the payment system, and the dollar amounts of payments settled through the new arrangements are small. The government should limit its actions that would discourage this research and development. Stored value cards and electronic payments for households may become important elements of our payment system, or they might fail to attract the interest of substantial numbers of consumers.

I draw the following conclusions from this period of United States banking history.

#### Implications for the Future

Now to apply these lessons from history to current issues. Banking history does not support the assumptions that underlie the market discipline argument. Experience indicates that providers of payment services are vulnerable to runs by their depositors. While market discipline of banks is important for enhancing the effectiveness of supervision, there are limits to what can be accomplished through market discipline alone. Market discipline and market mechanisms for allocating reserves, are not effective in preventing crises in the operation of the payment system, or in dealing with crises when they occur. In addition, private associations of nonbank providers of payment services would not be effective in ensuring the stability of their operations.

On the basis of U.S. banking history, I conclude that all firms which offer liabilities used by the public for making payments should be required to obtain bank charters. They would be supervised and regulated as banks, and have access to the discount window to help them deal with occasional liquidity problems.

To understand why banks attempted to deal with panics through cooperative actions, it is necessary to understand the conflict between the interest of banks as individual organizations and banks as a group during a crisis. The best actions for an individual bank would be to meet the liquidity needs of its customers while keeping its cash reserves as high as possible, and refuse to lend to other banks. Loss of public confidence in a competing bank might drive the bank out of business. Actions by individual banks to guard their own cash reserves, however, would make the crisis worse. It is in the interest of banks as a group that each use its cash reserves to meet the demands of its depositors and lend to the banks having the greatest difficulty meeting the demands of their customers. Through such actions banks might be able to restore confidence of the depositors at all banks in the community.

While I don't know the outcome of these experiments, I can predict the nature of the relationship between the government and providers of payment services in the future. The firms whose liabilities are used for making payments will have bank charters, will be supervised and regulated as banks by government agencies, and have access to the discount window. This is my prescription for what this future relationship should be, and my prediction of what it will be. We may get to this future through deliberate planning, or through some future crises in the operation of new entrants to the payments business. History includes many examples of crises in the operations of firms that provide payment services leading to changes in their relationship to the government. The challenge for government policy involves choosing a path to this future that facilitates innovation while limiting the potential trauma for those who begin using the new arrangements for making payments.

### **Nonbank Providers of Payment Services**

A rival system for payments over the Internet, Digicash, involves different relationships among this service provider, customers and banks. Digicash licenses its Internet payment system to banks. The monetary value in computers available for purchases over the Internet is the monetary liability of the banks that license the system from Digicash. Integrity of this part of the payment system does not depend on the cash management practices of Digicash.

A service planned by CyberCash called "Electronic Coin" involves payments transmitted over the Internet. To receive electronic coins, customers send money to CyberCash and receive coins transmitted over the Internet that are stored in their computer, in the form of digits recognized in the Cybercash system as monetary value. According to the plans of CyberCash, customers of its Electronic Coin service will be able to make purchases over the Internet. A customer who sees a product on the Internet he wishes to buy will transmit the coins to the merchant over the Internet. The merchant, in turn, will transmit the coins to CyberCash.

CyberCash will deposit the money received from purchasers of Electronic Coins in transactions accounts at federally insured depository institutions, and make payments to merchants out of these accounts. Thus, CyberCash, which is not a bank, plans to offer payment services to its customers through use of deposit accounts at banks. The electronic coins, which will be assets of CyberCash customers, will be liabilities of CyberCash.

Firms that issue stored value cards encode the cards with monetary value which customers use for making purchases at vending machines and retail outlets equipped with card readers. Use of such cards for vending machines is common on university campuses. One of the nonbank providers of payment services is National CasheCard, of St. Louis, Missouri. This firm provides identification cards for students at Washington University, located in St. Louis. Students who wish to use the cards for purchases at vending, copying and washing machines first load value on the cards at terminals on campus. Value recorded on the cards

is reduced each time a student uses a card in a machine.

When a student loads value on a card, by injecting currency into a terminal or debiting a transactions account at a depository institution, the transactions account of National CasheCard at a federally insured depository institution is credited. National CasheCard pays vendors and provides any student refunds out of that transactions account. Students and vendors rely on National CasheCard to honor its payment obligations out of that transactions account. Thus, National CasheCard offers payment services through a deposit account at a bank. The bank that offers the transactions account does not accept responsibility for honoring those payment obligations. National CasheCard offers to license its system to banks or their payment associations.

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The Federal Reserve uses two econometric models for bank surveillance, which is the process of monitoring the condition of banks between on-site examinations. The SEER (System for Estimating Examination Ratings), *risk rank* model was estimated to predict bank failures. The coefficients of this model were estimated with observations on bank failures for the years 1985 through 1991. The model has not been re-estimated since 1991 because of the small number of bank failures in the United States since 1991. Federal Reserve staff rank banks by their probability of failure each quarter by plugging current accounting data into this model. The SEER, *rating* model predicts the supervisory rating of each bank on its next examination. The following article provides information about these models.

At the Federal Reserve Bank of St. Louis, we have been working on models to predict which banks will have their supervisory ratings downgraded to problem status in future periods. After the early 1990s the number of bank failures fell below a level appropriate for re-estimating the coefficients of a bank failure model each year. It is possible to estimate a model for predicting downgrades of supervisory ratings each year, however, because the number of banks downgraded to problem status each year has been much larger than the number of failures. The following article presents a model for predicting downgrades of supervisory ratings to problem status.

The causes for distress among banks in the future must be similar to the causes of distress in the past. Predictions of early warning models will have large errors if the influences that cause banks to experience financial distress in the future are different from the influences that caused financial distress in the past. The problems of agricultural banks in the United States in the 1980s illustrate a change in the causes of bank failures. Banks that specialized in lending to farmers had relatively low failure rates for several decades prior to the mid-1980s. The outlook for agricultural banks changed substantially in the early 1980s, however, as land prices and farm income began falling. Predictions of the financial



problems of agricultural banks derived from an early warning model would have come too late to have helped supervisors identify the banks most vulnerable to failure. Failure rates of agricultural banks began to rise in the second half of 1984. Out-of-sample simulations of an early warning model would not have predicted the distress of agricultural banks until 1986 or 1987. Our paper cited above provides more information about the implications of this experience for the use of models and screens in bank surveillance.

Supervision and regulation of savings and loan associations (S&Ls) in the United States during the 1980s illustrates a change in the regulatory regime. Increases in interest rates in the United States that began in the late 1970s reduced the market value of the assets of many S&Ls below the value of their liabilities. The supervisory agency for S&Ls permitted many bankrupt S&Ls to remain in operation. In addition, the supervisory agency changed the accounting rules to help the S&Ls avoid reporting negative net worth on their balance sheets. After this change of regime, an early warning model for savings and loan associations would have been useless as a means of predicting the problems of savings and loan associations during future periods.

## Conclusions

### Conditions that are Necessary for the Use of Econometric Models in Supervision

Consistent Regulatory Regime over Time. Estimation of early warning models involves predicting certain events, which may be bank failures, downgrades of supervisory ratings, or reductions of capital ratios to relatively low levels. The conditions for these events happening must remain essentially the same over the period when a model is estimated and simulated. If the supervisors change the rules for closing banks, change the conditions for downgrading supervisory ratings, or change the accounting rules that affect capital ratios, early warning models will not be useful for predicting which banks will have problems.

Frequent on-site examinations by competent examiners who are free of the political influence of bankers. Our experience in the United States indicates that on-site examinations are essential for validating the accuracy of the accounting data that bankers provide to their supervisors. The authors of the following working paper found that revisions to bank accounting data tended to be relatively large just after banks had been examined and their supervisory ratings downgraded.

### Use of Econometric Models for Bank Surveillance in the United States

Well-defined accounting principles and rigorous enforcement of penalties for violating the principles. Use of econometric models rests on the assumption that the data are accurate.

I assume that the use of econometric models for surveillance is also rare in other nations.

In addition, a working paper of the Office of the Comptroller of the Currency (the agency that supervises banks with national charters) has investigated the use of trait recognition for bank surveillance.

My knowledge of bank supervision is limited primarily to the United States. The following BIS working paper indicates that among the G-10 countries only France and the United States use econometric models for bank surveillance.

My topic is the use of models for measuring the risk assumed by individual banks. I describe econometric models that have been developed by bank supervisors in the United States. The purpose of these models is to use bank accounting data to predict which banks will experience financial distress. This paper refers to several papers on early warning models and Internet links to recent papers. In addition, I discuss the conditions that are necessary for the use of econometric models to measure the risk assumed by individual banks, and possible approaches to bank surveillance if some of the conditions are not met.

Our article also demonstrates that predictions of the banks that will be downgraded to problem status each year derived from econometric models are more accurate than predictions based on individual financial ratios, which supervisors commonly call "screens."

Supervisors in our Bank use our model of downgrades in supervisory ratings to "scope" examinations, which is the process of identifying the major issues to address in an on-site examination before sending examiners to a bank. We use the coefficients of the model to predict the probability that a bank will be downgraded to problem status. In addition, we use the coefficients on the individual independent variables to determine the aspects of a bank's operation that contribute most to its probability of being downgraded.

Suppose the conditions in your national system are not consistent with one or more of these assumptions. How can you do bank surveillance? Your best option is to rely on a few screens that you think are the most reliable. Choice of screens requires your judgement, and you will not be able to validate your judgement with evidence from econometric models. Our research cited above indicates, however, that reliance on screens comes with a price. An econometric model would outperform screens if the assumptions I have listed are valid for your national system.

The Office of the Comptroller of the Currency recently released the following document which includes a discussion of the use of early warning models by the staff of the Comptroller's office.

The Supervision and Regulation Department of the Federal Reserve Bank of Chicago has recently conducted research on use of a technique called "trait recognition" for bank surveillance. Trait recognition is a technique for examining the predictive power of combinations of financial ratios. This technique could be especially useful for surveillance in banking systems with small numbers of banks.

While the experience in the United States indicates that econometric models can be useful tools for bank surveillance, this result rests on some important features of our financial system. Unless your national system has these features, reliance on econometric models for surveillance could be useless or dangerous. The following is my list of conditions that are necessary for the use of econometric models for bank surveillance.

### **The Market Discipline Argument for Exemption from Supervision and Regulation**

Are these assumptions valid? Is there evidence to support them? Such evidence must be derived from periods with a variety of experience with payment system stability, and a variety of relationships among providers of payment services. In the history of banking in the United States, the relevant period is that prior to formation of the Federal Reserve System in 1914.

One argument for exempting nonbank providers of payment services from supervision and regulation rests on the assumption that market discipline will ensure the safety and soundness of the payment system. This market discipline argument rests on the following assumptions.