MARK-TO-MARKET ACCOUNTING
FOR U.S. BANKS AND THRIFTS:
LESSONS FROM THE DANISH EXPERIENCE

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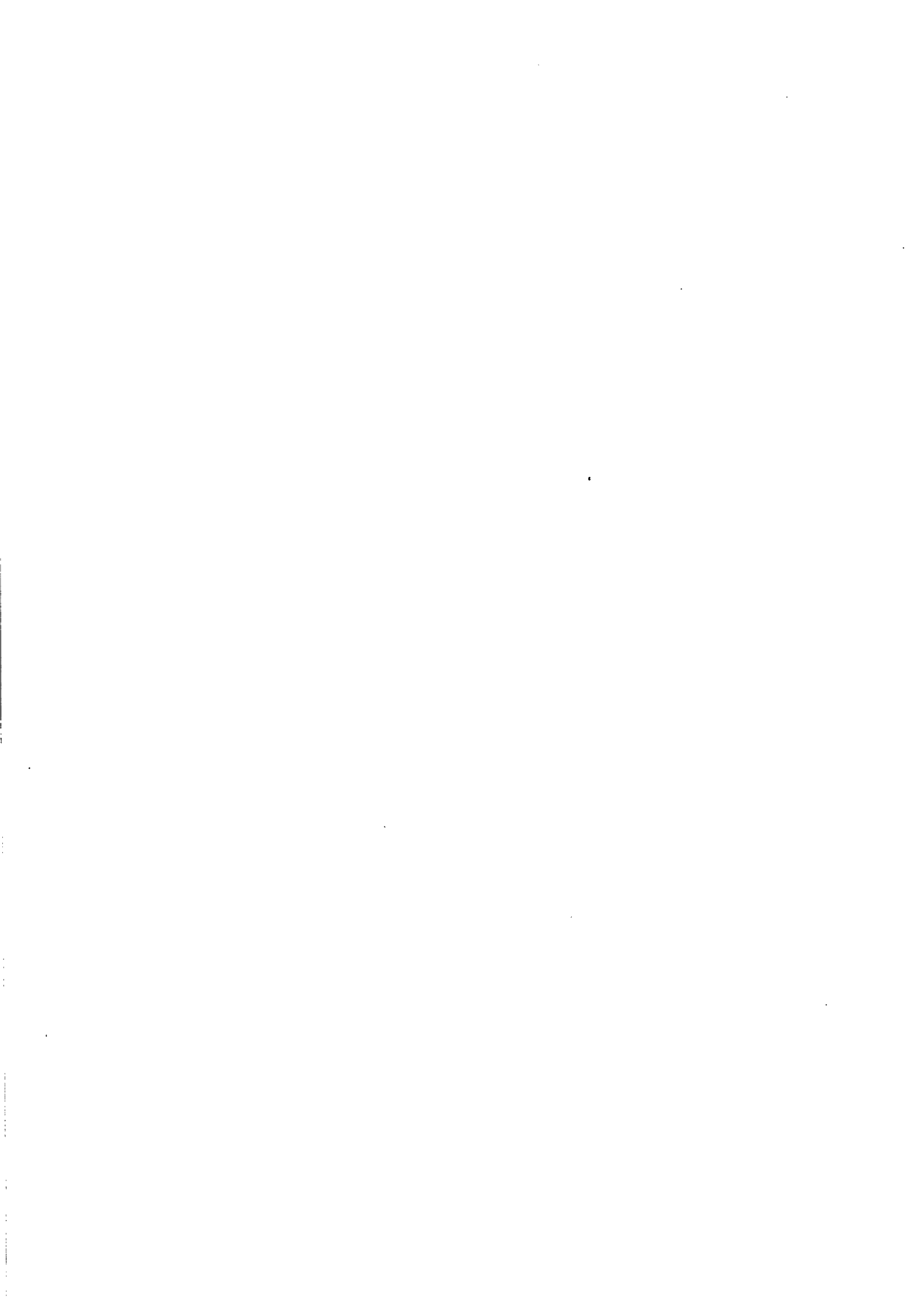**Robert C. Merton and Krishna G. Palepu**
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I. Introduction

One outgrowth of the banking crisis in the United States (U.S.) has been a debate about the wisdom of moving to a mark-to-market accounting system for banks and thrifts. Proponents of such a change argue that the historical-cost-based financial statements now used by banks obscure underlying economic losses, allowing troubled institutions to continue operating without regulatory intervention. Others argue that measurement of market values of financial institutions involve difficult practical problems, rendering a mark-to-market accounting system unreliable. The primary institutional focus of the mark-to-market debate in the U.S. is on banking. However, similar issues arise for other financial institutions, such as insurance companies.

Some monitors of the thrift industry have long called for consideration of mark-to-market accounting in that industry (FHLBB Annual Report to Congress [1983], Benston [1989], White [1988, 1991a]). The Financial Institutions Reform, Recovery, and Enforcement Act of 1989 (FIRREA) requires the Treasury Department to study the wisdom of a movement to mark-to-market accounting. Securities and Exchange Commission (SEC) Chairman Breeden argued strongly in favor of such a move in his Congressional testimony of September 1990, and the issue continues to be considered by the Congress. Financial Accounting Standards Board (FASB) Statement No. 107, which becomes effective in 1992, takes a first step toward a mark-to-market approach, by requiring companies to disclose market values of all financial assets and liabilities in financial statement footnotes. Should another FASB statement proposed in July 1992 become effective, mark-to-market accounting would be required for all investment portfolio securities, except those to be held to maturity.

The movement to mark-to-market accounting surely has its detractors. Federal Reserve Chairman Alan Greenspan and the American Bankers Association are among those arguing against the approach. Beaver, Datar, and Wolfson [1990] caution that market value accounting is not a panacea for the problems of financial institutions. They argue that

before rushing to adopt a market value system, it is important to consider carefully the complex problems involved in measuring market values, as well as the manner in which such numbers would be used by regulators.

The *potential* benefits of a mark-to-market system are likely to be less than fully realized in practice. All the real-world costs of adopting such a system are not easily identified. It is, thus, difficult to determine the cost-benefit tradeoff of the system using theory alone. Therefore, we proceed along an alternative route by examining the evidence from a real-world application of a market-to-market system to banks. The U.S. banking sector has never used mark-to-market accounting for regulatory and external reporting purposes. The banking system in Denmark, however, has used an (incomplete) mark-to-market accounting system for many years (Pozdena [1990, 1991]).[1]

In this paper we report our findings concerning the Danish experience. Section II discusses of the role of mark-to-market accounting in regulating financial institutions. The structure of the Danish financial sector is described in section III, and a summary of the accounting system used by Danish banks appears in section IV. Empirical results reported in section V show that the mark-to-market accounting system induces substantial volatility in reported profitability. Although this may explain why small Danish banks tend to maintain substantial equity "cushions" above minimum capital requirements, it is not clear that this represents an inefficient approach to managing the contract between Danish banks and their guarantor, the government.

Sections VI and VII report tests on the reliability of market value estimates by Danish banks. There is some evidence of earnings management by Danish banks, supporting concerns that mark-to-market accounting systems are potentially vulnerable to manipulation. However, there is no reliable evidence that the mark-to-market numbers are managed so as to avoid regulatory capital constraints. There are, moreover, indications that

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[1]We thank FASB board member Robert Swierenga, who brought the existence of the Danish system to our attention.

the mark-to-market accounting system in Denmark produces more reliable estimates of value (as measured by stock prices) than the historical cost book values produced in the U.S. Evidence discussed in section VIII suggests that a combination of mark-to-market accounting and rigid regulatory intervention policies can lead to low costs of resolving bank failures in Denmark. Even though one in eight Danish banks and savings banks failed during the last five years, all but one of these failures were handled without explicit government assistance.

Some lessons for the U.S. from the Danish experience are summarized in section IX. On balance, our evidence lends support to the proponents of mark-to-market accounting for financial institutions. However, there are three caveats to this conclusion. First, the evidence of certain forms of earnings management in Denmark suggests either limitations inherent in accounting for credit losses, or the desirability of modifications to the Danish version of mark-to-market accounting. Second, Denmark has both a mark-to-market accounting and a rigid regulatory intervention system. Therefore, the implementation of a mark-to-market accounting in the U.S. may not be as effective as in Denmark if the current flexible regulatory intervention procedures remain unchanged. Third, in evaluating the relevance of the Danish evidence for the U.S., one must take account of the differences in size and complexity of the financial sectors in the two countries. For example, the greater complexity of the U.S. banking operations could introduce difficulties in market value estimations that have not been faced in Denmark. Moreover, given the U.S. history of regulatory forbearance for both thrifts and banks, there is cause to question whether a seizure policy as aggressive as the one in Denmark would be tolerated by the political system in the U.S.

II. Mark-to-Market Accounting: A Conceptual Discussion

There have been many prior arguments in the accounting literature for and against market value accounting. It is difficult to evaluate the merits of these arguments without

specifying an objective function for the accounting system. Accounting systems in banks are used for internal management, external reporting to shareholders, tax reporting, and for the administration of deposit insurance system, and no one system is likely to be optimal for all purposes. In this paper, we focus primarily on the use of a mark-to-market accounting system as a key element in the administration of the deposit insurance system.[2] Although much of our analysis is likely to be relevant for shareholder reporting as well, a complete analysis of this application has to consider other factors .

II.A. The Management of Deposit Insurance System

The primary purpose of deposit insurance is to assure that the value of deposits will be preserved irrespective of the financial health of bank or savings institution. Deposi insurance is efficient when it is less costly for a centralized agency than for individual depositors to monitor the financial soundness of banks. However, it has been long recognized that deposit insurance also leads to potential moral hazard costs (see Merton [1977, 1990] and Kormendi, Bernard, Pirrong, and Snyder [1989]). These costs arise because banks' owners are motivated to undertake high-risk investments when they have little economic capital at stake; the owners enjoy the full upside potential associated with risky assets, whereas the downside is borne by the deposit insurance system.

As Merton and Bodie (1992a, 1992b) point out, there are three interrelated methods available to a deposit insurer to minimize the moral hazard costs: (1) restricting the kind of assets that the insured financial institution can hold; (2) setting a risk-based insurance premium schedule; and (3) monitoring the value of the assets and liabilities held by the bank. In general, any one of these three methods alone is unlikely to be adequate; the best combination of the methods to be used depends on several factors, such as the feasibility

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[2]Although the deposit insurance system is currently administered by the US government, the basic principles we discuss in this section apply equally to a private sector insurance system.

of restricting assets, the ability of the insurer to estimate risk-based premiums, and surveillance costs.

Asset restrictions allow the guarantor to limit the amount of risk that an insured financial institution can take. However, such restrictions are not always simple to implement or monitor, and may preclude investments that could be efficiently managed within the banking sector. Risk-based premiums allow the insurer to charge a fee that is commensurate with the riskiness of the guarantee. However, risk-based premiums will be ineffective if the asset composition can be unilaterally changed by the insured institution after the premium has been set. Only severe (and probably inefficient) restrictions on investment and financing decisions could eliminate this problem.[3] Therefore, for a proper functioning of the deposit insurance, it is important to have an effective monitoring and seizure system as well. If the insurer has a right to monitor and seize assets, shortfall losses can be minimized either by auditing the value of assets and seizing them before their value drops below the guaranteed deposits, or by making sure that the assets always have a value at least equal to the promised payment.

II.B. Experience with the Current Monitoring and Seizure System

Traditionally, capital adequacy regulations in the US have relied on historical cost accounting measures of capital. US banks and thrifts typically hold short-term and long-term investment securities, loans, and other assets; these are financed with deposits, other liabilities, and equity. The current regulatory capital measures generally do not recognize changes in the values of either assets or liabilities. The exceptions include the recognition of: (1) declines in the market value of short-term investments (i.e., the trading account securities), (2) impairments in the value of long-term investments and loans that are deemed

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[3] See Chan, Greenbaum, and Thakor [1992] and John, John, and Senbet [1991].

permanent by management, and (3) gains and losses on some off-balance sheet items (e.g., interest rate futures) that are not used as hedges against a specific asset or liability.

These adjustments narrow the gap between book values and market values for the majority of assets. They do not, however, eliminate the gap, for four reasons. First, the current system fails to recognize changes in the values of long-term investments and loans resulting from changes in interest rates. Second, given the subjectivity involved in determining whether the impairment of the value of such assets is permanent, declines in value resulting from increased credit risk may not be recognized on a timely basis. For example, significant write downs of LDC loans did not occur until 1987, even though there was widespread discussion of impairments in the value of those loans during the early 1980s. Third, the system completely ignores changes in the values of liabilities. Fourth, the system fails to recognize changes in the value of intangible assets, such as the core deposit premium.

Some have argued that the primary cause of the thrift crisis was a failure of regulators to intervene in the early 1980s, when the economic capital of the thrift industry deteriorated as a result of increased interest rates. Several economists estimated that by 1981, the market value of thrift assets (other than any intangible due to deposit insurance) was exceeded by the market value of liabilities, for the industry as a whole and for perhaps several hundreds of individual thrifts (e.g., Carron [1982], Kane[1983]). However, capital ratios based on generally accepted accounting principles (GAAP) indicated widespread insolvencies only with a lag (during the mid-1980s), and in the vast majority of cases, even the thrifts that were GAAP-insolvent were still deemed solvent on the basis of regulatory accounting principles (RAP). Thus, in those cases, regulators had no obligation to intervene. White [1991b] argues that it was these thrifts with little or no economic capital at stake that were largely responsible for the risky investment strategy and related losses that translated ultimately into hundreds of billions of dollars of government assistance.

II.C. An Example of an Effective Monitoring and Seizure System

Perhaps the best example of an effective monitoring system to protect the provider of a guarantee is that used by stock brokerage houses to handle customers' margin accounts. When an investor opens a margin account with a broker and borrows money to buy stocks or bonds, the broker is effectively is in the position of a loan guarantor. In practice, brokers typically borrow the funds that they lend to investors from a bank and guarantee the bank payment in full even if the investor defaults. The broker's fee for providing the loan guarantee and for servicing the investor's account is embodied in the spread between the interest rate it charges the margin investor and the interest it pays to the bank.

As guarantors, brokers set two types of capital margins: initial margin and maintenance margin. The required maintenance marging is determained by the broker daily, by calculating the market value of the investor's securities and the net worth of the account. In the net worth falls below a prespecified fraction of the value of the collateral, the broker notifies the investor that additional equity capital is required to be added to the account immediately. If the investor does not respond to this margin call, the broker exercises the right to sell the securities serving as collateral and pays off the loan out of the proceeds. The investor receives the remainder, if any.

The brokerage system functions with only a minimal fee for the guarantee provided. Indeed, the interest rates charged on margin accounts are low—typically substantially less than the prime rate. Further, even though margin accounts can be established without extensive credit checks and even though such accounts can include highly risky assets, they expose the brokerage house to very little risk.

II.D. Applying the Broker Loan Example to Deposit Insuranc.   .agement

Two key elements make the above broker loan system work effe. . ely: (1) the market value of the collateral is recomputed frequently at readily ascertainable market prices; and (2) the loan guarantor has a right to seize and liquidate the collateralized assets, and does exercise that right, when the ongoing capital requirement is violated. As discussed below, while both these elements are conceptually simple, applying them to banks and thrifts is significantly more complex.

Designing a Mark-to-Market Accounting System

Effective monitoring requires that the collateral be valued at current market value (marking to market). Although the concept of market-to-market is straight forward, its implementation in banks and thrifts can be complex and costly for several reasons. We discuss below some of these complexities and the conceptually desirable ways of addressing them.

Estimation of Values. While market prices are readily available for some important classes of financial instruments (e.g., marketable securities, standardized loans, interest rate swaps, and certain futures contracts), market prices are nonexistent or difficult to estimate for other bank assets and liabilities. Examples include many "middle-market" commercial loans that are uniquely fashioned for the debtor. Even when market prices exist for some assets, they may not reflect managers' private information. Estimates of the price at which some assets could be sold are subject to significant errors, and reaching agreement on the proper mark-to-market procedures is considerably more difficult.

Estimation errors impose risks on both the guarantor and the insured bank. If the errors overstate values, the insurer will not seize as quickly as it should, and ·? proceeds realized from seizure will be less than expected. If the errors understate the   ·s, the bank will be seized and liquidated when it is actually solvent. Thus, a "const   ve" valuation method from the perspective of one party to the system will be an "aggressive"

valuation method from the perspective of the other party. This suggests that the case for anything other than an unbiased valuation method is unclear. If protection from measurement errors in one direction or the other is desired, that can be accomplished without resorting to biased accounting rules; for example, one could adjust the minimum size of bank's net worth before seizure is permitted.

Because of natural tension between banks and insurers over asset valuation, a key element of an effective mark-to-market system is that it seeks to constrain the opportunities for manipulation. While accuracy of the valuation procedures is important, it is just as important that the procedures be known, agreed upon by both parties in advance, and difficult to manipulate. That is, an efficient mark-to-market system is one that, specified *ex ante*, gives the best estimate of the price at which an asset could be sold, using verifiable information.

Bank managers may have private information about the value of some assets and liabilities which could be used to improve the accuracy of estimated market prices. In principle, such private information could be used in valuation if it could be (confidentially) verified by an independent auditor working in the interest of potential buyers. However, bank managers' incentives typically favor upward-biased estimates of the value of net assets. It is, therefore, sometimes optimal to neglect banks' private information if inclusion of this information creates opportunities for too much manipulation. Estimation errors from neglecting banks' private information is a deadweight loss collectively to the bank and the insurer. At some point, estimation problems become large enough to render it inefficient to allow banks to hold the related assets as collateral to insured deposits.[4]

Illiquidity of assets. Even among those assets for which market prices are available, some have a large bid-ask price spread due to illiquidity. From the perspective

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[4]One could argue that such assets should be retained within the deposit insurance system, despite the inefficiency, on the grounds that doing so represents a vehicle for indirect taxpayer support of certain investment activities. The merit of such an argument depends on what other mechanisms would arise for financing the activity in the private sector, or whether some other form of subsidy would be more efficient.

of deposit insurance management, the relevant market price for valuing the collateral is the price at which it can be sold in an orderly liquidation: the *bid* price. As long as assets are marked to market at the bid price, the illiquidity of an asset serving as collateral is not a problem for the insurer.

However, illiquid assets make a bank vulnerable to having the assets seized and liquidated when the bid price falls, even if the ask price is relatively unchanged. The cost from this "bid-ask bounce" is again a deadweight loss to the collectivity of the bank and the insurer. If it is sufficiently large and the chances of a violation are not negligible, it is inefficient to have banks hold such assets as collateral to insured demand deposits.

Liabilities and Intangible Assets. Just as it is important to mark the assets to market, so guaranteed liabilities must also be marked to market. Otherwise, the value of banks' net worth is the difference between assets and liabilities, will be distorted. Such a "mismatch" between asset and liability evaluation methods can be so dysfunctional that it causes the intermediary to avoid hedging or matching assets with liabilities, whereas such hedging would actually reduce the economic exposure of the bank and hence, of the insurer.

In principle, intangible assets like goodwill and core deposit premia are relevant in calculating banks' net worth if these assets can be preserved in liquidation, and if their value can be estimated using procedures that are verifiable by an independent auditor working in the interest of potential buyers. However, if such estimates are too vulnerable to manipulation and error, it may be more efficient to ignore them; effectively, this would preclude the use of such intangibles as collateral to insured deposits.

Rigid Regulatory Intervention

Monitoring of the market value of bank capital is unlikely to be effective by itself unless regulators use that information to intervene on a timely basis. Beaver, Datar and Wolfson [1990] note that market value accounting alone will not guarantee timely

intervention, since the government can (and did, during the 1980s[5]) act unilaterally to alter the nature of the deposit insurance contract so as to delay action.[6] The broker loan guarantee system works effectively because both the broker and the investor clearly understand that the broker will seize and liquidate the collateral if the investor does not maintain the required capital. In contrast, US bank regulators have considerable flexibility in determining whether or not to seize a financial institution when its capital falls below the required minimum.

The question of how much regulatory flexibility should be permitted involves a tradeoff between two costs. On the one hand is the cost of delaying intervention in ultimately failed institutions with weak management and/or owners that face incentives to expose the institution to risk. On the other hand, especially in light of the measurement error problem described above, there is the possible cost of intervening early at an institution that would have survived if left alone. Premature interventions are costly if they destroy any portion of going concern value.

The US experience of the 1980s indicates that the costs of delayed intervention can be extremely high. On the other hand, while premature intervention can also be costly, there is a counter-argument to the claims that a policy of early intervention is necessarily inefficient. If managers and/or owners believe a mark-to-market system has erroneously indicated deficient capital levels, then they have the option to invest additional capital. Even if the error in the mark-to-market system is also reflected in an undervaluation of the institution's stock, the existing owners are not harmed by the equity issue so long as they

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[5] During the early 1980s, Congress and the Federal Home Loan Bank Board took several steps that relaxed regulatory capital requirements for thrifts, including introduction of accounting methods outside the scope of GAAP.

[6] Of course, such acts are possible in conjunction with *any* accounting system, and may be more politically feasible within a historical cost system.The enhanced political feasibility of postponing regulatory action derives from the tendency for the historical cost system to delay loss recognition. Even after a period of severe economic deterioration, the accounting numbers produced by the historical cost financial reporting system may still indicate solvency, providing regulators with an "excuse" for inaction.

participate and hold until the valuation error is corrected.[7] In this case, the ri~ ~ ~timate failure is borne by those who also reap the rewards of ultimate success, rather ~nan passing that risk to those who finance the deposit insurance system. Although a credible threat of government intervention is necessary to make such a system function, a costly intervention should not actually occur so long as the accounting system triggers the threat of intervention on a timely basis, while the owners perceive the net assets to be positive; at that point, they should prefer an equity infusion (or a sale to an acquirer) to a costly government intervention.

In conclusion, the experience with the present regulatory intervention system suggests that it is desirable to adopt a system which assures a more timely intervention when a financial institution violates the regulatory capital requirements.

II.E. Critics' Concerns

Reliability of Market Value Numbers. Critics of mark-to-market accounting ~ that the measurement problems inherent in such a system have several serious implications. Since market values may be difficult to audit and movement to a market value system does nothing in and of itself to alter the incentives of managers to disclose their private information to regulators, it is not obvious that a market value system would produce more information than the current US system that combines historical costs with a variety of footnote disclosures about interest rate and credit risk (Beaver, Datar, and Wolfson [1990]). That is, managers may be able to manipulate reported market values to such an extent that they are no more, or even *less* informative than a combination of other more

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[7]The equity holders do bear transactions costs and the cost of any deviation from an otherwise optimal capital structure that is caused by the equity issue. Also, those with wealth constraints may not be able to invest additional capital. (Wealth constraints could be particularly important if only managers recognize that government intervention is premature.) However, these costs arise not just in depository institutions, but in all organizations where there are conflicts of interest between debtholders and equity holders.

readily auditable disclosures. Another criticism is that efforts to limit the amount of error in market value estimates might substantially increase the costs of producing and auditing financial statements (American Bankers' Association [1990]).

Volatility. Yet another complaint is that mark-to-market accounting produce earnings and capital values that are volatile (e.g., American Bankers' Association [1990]). Although proponents of mark-to-market accounting would counter that real economic volatility *should* be recognized, *excessive* volatility could reduce the usefulness of a mark-to-market system. Excess volatility could arise from measurement error in market value estimates, thus leading to more frequent violations of capital requirements.[9]

Costs of Early Intervention. Beaver, Datar and Wolfson [1990] note that eliminating regulators' flexibility concerning the timing of intervention is not necessarily good, since regulators may possess information about the least-cost approach to dealing with a weakened institution that cannot be captured in a simple rule-based capital requirement. A system of rigid regulatory intervention might also be inefficient if there is a large probability of capital ratio violations due to volatility induced by measurement errors

Seidman [1991] also argues that the costs early intervention are high; he indicates that the mere act of intervention destroys significant value, on the order of 10 to 15 percent of assets. Seidman argues that the loss arises from an erosion of the bank's intangible franchise value, and because (given their information disadvantage) purchasers require a discount on even good loans.[10]

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[8]Of course, mark-to-market accounting could be required while preserving the existing set of readily auditable disclosures (such as data on nonperforming loans) that would permit outsiders to assess the reasonableness of the market value estimates. Such a system would at least weakly dominate the current one in terms of the amount of information disclosed.

[9]As indicated earlier, the more frequent violations need not be economically inefficient. Furthermore, while measurement error *could* induce excess volatility, the portion of the error derived from exercise of management discretion could also *dampen* volatility.

[10]An alternative possibility is that at least to some extent, the loss referred to by Seidman is not a real destruction of value due to intervention, but simply a recognition of economic losses not yet recorded within the historical-cost-based accounting system used in the US.

II.F. Experience in Denmark

The conceptual discussion presented above shows the *potential* benefits of a mark-to-market accounting system for deposit insurance administration. However, critics arguments suggest that there are also *potential* costs of implementing such a system. The debate about the *actual* costs and benefits of implementing a mark to market accounting for regulatory purposes is difficult to settle in the absence of empirical evidence. The issue of measurement error raises open empirical questions about the extent to which a mark-to-market system is subject to the discretion c   l manipulation by management. The issue of regulatory intervention raises open empir   l questions about the costs of reducing or eliminating regulatory flexibility, and tying capital requirements directly to market-value-based equity ratios. The issue of volatility in mark-to-market numbers raises open questions about, among other things, how mark-to-market accounting would affect the frequency of regulatory capital violations.

Given the current absence of any experience in the US with a direct reliance on market-value-based capital requirements, the open empirical questions cannot be settled in this country. Thus, we turn to the experience of Denmark, which has long tied regulatory capital requirements for banks and savings banks to an accounting system that is based largely on current market values. Although the Danes do not employ a comprehensive mark-to-market accounting system, it is more complete than any other operating accounting system for banks of which we are aware. Another advantage of studying the Danish approach is that it offers experience with a system that affords essentially no regulatory flexibility, so far as capital requirements are concerned.

The same accounting system is used in Denmark for regulatory reporting and financial reporting to shareholders. Because market-value financial statements are widely available in Danish banks' financial statements, it is possible for outsiders to monitor both bank managers and regulators. Whether or not the same accounting system is best suited

for regulatory and financial reporting, however, is a complex question.[11] In the empirical study discussed next, we will analyze the Danish system from the bank regulators' point of view.

III. The Structure of the Banking Sector in Denmark

At the end of 1989, there were 71 banks and 131 savings banks in Denmark, with DKr 780 billion and DKr 280 billion in total assets (approximately $115 billion and $41 billion), respectively. Banks and savings banks offer a full range of banking services and are similar in terms of their activities; the primary difference between the two is that banks are stock companies whereas savings banks are mutuals.

Asset structure. Table 1 describes the balance sheet structure for the Danish banks and savings banks in the aggregate in 1975, 1980, 1985, 1989. Table 2 compares these structures to those of U.S. banks and thrifts as of 1989. At least at the crude level of detail displayed in the tables, the Danish banks and savings banks have a structure not unlike that of U.S. banks and thrifts. The one readily apparent difference is that Danish banks are permitted to hold equity securities; those holdings amount to 1 to 4 percent of total assets, or 10 to 70 percent of owners' equity.

The balance sheets in Table 2 indicate that about 14 percent of Danish bank assets are placed in cash and deposits and other banks; Danish banks are required to hold such liquid reserves in an amount not less than 15 percent of short-term deposits (those due within 30 days). Cash assets held by U.S. banks and thrifts represent a smaller fraction of total assets.

The bond investment portfolios of Danish banks and savings banks are of approximately the same magnitude as those of U.S. banks (slightly less than 20 percent of

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[11] While bank regulators are primarily interested in measuring market values in liquidation, shareholders are interested a bank's upside potential also. Therefore, for financial reporting, market values based on both bid and ask prices are potentially relevant.

total assets), and include a combination of domestic and foreign government bonds and mortgage-backed securities.

The magnitude of loan portfolios (relative to total assets) is slightly smaller in the Denmark than in the U.S. (53 and 57 percent for Danish banks and savings banks, versus 62 and 61 percent for U.S. banks and thrifts, respectively). The contents of the portfolios are difficult to compare across the two nations, since disclosures about their components are not uniform. However, as will be discussed, there are few long-term mortgages within the loan portfolios of either banks or savings banks in Denmark. Hence, the Danish loan portfolios appear more like those of U.S. banks than U.S. thrifts. The Danish loan portfolios differ from those of U.S. banks in that they consist almost entirely of variable interest rate loans, rather than the mixture of fixed and variable rates found in the U.S. Given the reliance on primarily variable rate loans, the major source of interest rate risk associated with the assets of Danish banks and savings banks lies in their bond portfolio.

In addition to banks and savings banks, the Danish banking sector includes a small number (4 as of 1989) of mortgage credit associations, which are the only originators or first mortgages in Denmark. These credit associations issue primarily long-term, fixed rate mortgages. Within days of issuance of mortgage loans, the associations are required to sell mortgage-backed bonds that offset the loans in terms of magnitude and duration, passing through the interest rate risk associated with the mortgages to the bond buyer. In addition to pension funds, insurance companies, and other investors, the bond buyers include banks and savings banks. Thus, whereas U.S. thrifts originate mortgages in the U.S. and often retain the associated interest rate risk, that risk is borne in Denmark by banks, savings banks, and other sectors of the economy that do not issue mortgages. An implication is that the problems of how to account changes in the value of mortgages—a key issue for U.S. thrifts—is confronted in Denmark by banks and savings banks, but never by the thrifts that originate the mortgages.

Supervision and capital requirements. Danish banks and savings banks are regulated and monitored by the Danish Financial Supervisory Authority (Supervisory Authority), an agency within the Ministry of Industry. Through 1990, the Supervisory Authority required that capital (including stock, retained earnings, and subordinated debt) be at least 8 percent of total liabilities. Beginning in 1991, Danish banks were required to comply with the risk-based capital requirements to be adopted by the nations of the European Economic Community under the auspices of the Bank for International Settlements (BIS). For most banks, the BIS standards allow lower levels of capital than previously required in Denmark.

When a bank or savings bank falls below the required capital level at the end of any quarter, the Supervisory Authority allows six months for the institution to raise new equity or otherwise satisfy the capital requirement. New equity in Denmark is raised through a rights offering to current shareholders, typically at a discount. If at the end of the six months, the bank is still not in compliance, the Supervisory Authority immediately places the bank under new control, generally by arranging an acquisition by a healthy bank. In this process, the Supervisory Authority serves as a merger broker, identifying a willing acquirer in advance, so that the change of control can occur quickly and with little publicity. In two cases during 1987 (6. juli Banken and C & G Banken), a willing acquirer could not be found and the banks were closed.

Deposit Insurance. Prior to 1987, Denmark maintained no deposit insurance system, although it might have been assumed that the government would somehow protect depositors from losses associated with any bank failures. Since that time, in compliance with European Community Directives, a deposit insurance fund has been established, and banks contribute an annual insurance premium of 2/10 of one percent of their deposits. The insurance guarantee applies to deposits up to DKr 250,000 (currently about $37,000). Indeed, when the C&G Banken failed soon after deposit insurance was established and was found to have negative net worth, the Danish government covered the resulting

deficiency to small depositors. However, although the Supervisory Authority h intervened in 23 institutions since the C&G case due to capital deficiencies, there has yet to be a case where government assistance was necessary to cover obligations to depositors.

IV. The Danish Accounting System for Banks and Savings Banks

Summary of accounting rules.

Accounting principles for banks, savings banks, and mortgage credit associations are established by the Danish Supervisory Authority. Generally, accounting is based on a mark-to-market approach not only for financial reporting and regulatory purposes, but also for tax purposes. There are important exceptions to the use of mark-to-market accounting, however, as explained below.

Investment securities. Investment securities, including stocks and bonds, are accounted for at market value so long as a market value is publicly quoted. Gains and losses are recorded as a component of earnings and immediately affect owners' equity. For unquoted securities, which typically represent less than 10 percent of the investment portfolio, a lower of cost or market approach is used.

Loan portfolio. Since the vast majority of loans carry variable rates, the primary deviation between the nominal loan portfolio balance and current market value arises from changes in credit risk. The Danish system accounts for such loans by recording a provision for loan losses that is sufficient to cover "both known and foreseeable losses." Those we spoke with—including representatives from auditing, banking, and the Supervisory Authority—interpreted the rules to indicate that the loan balance, net of provisions, should approximate current market value. The approach differs from that of the U.S. in two important respects. First, under U.S. GAAP (Financial Accounting Standard No. 5), loan losses need not be recognized until they are "probable." Second, depending on how extensively banks apply the spirit of Financial Accounting Standard No.

15, U.S. GAAP does not necessarily require any loss recognition so long as expected future cash flows exceed the loan principle (thus ignoring that a portion of loan value is attributable to interest).

Although there is a well developed secondary market for mortgage loans in Denmark, there is essentially none for the types of loans carried by banks and savings banks. Thus, approximating the market value of such loans based on dealer quotes for similar loans is not possible. Furthermore, although some "rules of thumb," much like those used by asset-based lenders in evaluating collateral, are sometimes used in practice to estimate the provision for loan losses, there is no required set of systematic procedures for this process. Those with whom we spoke uniformly labeled the process of estimating the provision for loan losses as subjective. Thus, the system of accounting for loans is potentially much more vulnerable to manipulation than objective approaches like that proposed by Berger, Kuester, and O'Brien [1990].

For the small number of loans that carry fixed interest rates, a comprehensive mark-to-market accounting system would record not only gains and losses due to changes in credit risk, but also those due to changes in the general level of interest rates. The Danish rules require the recording of losses in value due to interest rate swings, but permit the recording of gains only to the extent that previous unrealized losses are offset.

Fixed assets typically represent a small fraction (1 to 2 percent) of the total assets of a Danish bank. Land and buildings can be written up or down, based on government assessments, so long as the appreciation or depreciation is deemed to be of a permanent nature. Machinery and equipment is carried at depreciated cost.

Off-balance sheet assets and liabilities (interest rate swaps, currency swaps, futures and forward contracts, etc.) are also marked to market, and gains and losses are recorded as a component of earnings. Some of these off-balance sheet items are traded in active markets, and others (e.g., forward contracts) can be priced by reference to the values of a combination of traded securities. In other cases, market values are based on dealers'

quotes, or must be estimated using discounted cash flow techniques, option pricing models, or other approaches.

Liability accounts are not subject to mark-to-market accounting. However, two factors serve to minimize the importance of this deviation from a comprehensive mark-to-market system. First, the vast majority of liabilities (other than subordinated debt, which is considered a part of capital) are short-term in nature, and thus have values that are relatively unaffected by interest rate swings. Second, to the extent that swaps are entered into for purposes of hedging fixed-rate liabilities, any unrealized gain or loss on the swap need not be recognized in earnings. Thus, for properly hedged positions, the accounting yields the same impact on earnings and owners' equity (no net gain or loss) as mark-to-market accounting for both assets and liabilities.

There is no attempt in the Danish system to account for *intangible assets*, such as a core deposit premium, unless such intangibles are recorded as goodwill upon the acquisition of another institution.

To summarize, the accounting system used for Danish banks and savings banks differs from a comprehensive mark-to-market system in several ways. The most important is that there is no attempt to record the value of internally-developed intangible assets. Other deviations, including the failure to mark liabilities to market and the failure to record appreciation on fixed-rate loans due to interest rate declines, turn out to be unimportant given the structure of Danish banks, even though such deviations could be quite important in other contexts.

Auditing of Danish banks and savings banks.

The above-described subjectivity in accounting for loan loss provisions suggests that there is potential for the exercise of a large degree of management discretion. One factor that could constrain the exercise of discretion is auditing. Danish banks and savings banks must be audited by at least *two* independent firms (although the two audit firms are

permitted to share the scope of the audit). In addition, since the internal audit staffs of banks and savings banks report directly to the board of directors, internal auditing could potentially offer another assessment of the accounts that is independent of management. Finally, the Supervisory Authority periodically conducts its own examinations. Thus, in principle, the financial statements are subject to audit by four independent parties. Another factor that may enhance the effectiveness of auditing is that audit firms can be dismissed and replaced by the Supervisory Authority, and that auditors are held directly responsible, along with management and the board of directors, to report difficulties (such as capital deficiencies) to the Authority.

V. Capital ratios, and volatility due to mark-to-market adjustments.

Especially in light of the strict enforcement of capital regulations in Denmark, the impact of mark-to-market accounting on capital ratios is important. If mark-to-market accounting increases volatility in income, and that volatility can be offset only by costly changes in asset bases or trips to the capital market, then banks may choose target capital levels well in excess of the required minimum. In this section, we examine the level of capital ratios in the Danish banking industry, and the degree of volatility in those ratios due to mark-to-market adjustments.

In these and subsequent empirical analyses, we use financial statement data obtained from annual publications of the Danish Financial Supervisory Authority. The tests are performed on two samples, one of which is a subset of the first. The first sample includes data for all Danish banks for the years 1976-89; the number of banks in these years varies from 69 to 78. The second sample includes data for the six largest banks in Denmark for the same period. Analysis of the full sample provides information about the average behavior across all banks. However, because the six largest banks dominate the industry, analysis of that subsample may provide a clearer view of "value-weighted" industry behavior.

Table 3 Panel A describes the distribution of capital ratios (equity :·. subordinated debt, scaled by total liabilities excluding subordinated debt) for the full sample and the large bank subsample for 1976-89. Within the full sample, banks frequently maintain a sizable "cushion" above the required minimum 8 percent ratio. Nearly half of the observations fall above 11 percent, and more than a third fall above 12 percent. The six large banks maintain capital ratios closer to the minimum requirement; for these banks, the median ratio is 8.9 percent and nearly all observations fall below 11 percent.

Table 3 Panel B presents some evidence on the impact of the two key mark-to-market accounting adjustments on reported bank profitability. The first is the loan loss provision, which at least in principle represents a market-based adjustment for credit risk. The second is the so-called "price adjustment," which reflects realized and unrealized gains and losses on investments (stocks and bonds), interest rate and currency swaps, and fixed-rate loans and mortgage deeds. (Gains and losses on some financial instruments, including forward rate agreements and interest rate and currency options, are treated as adjustments to interest income/expense or currency gains/losses, and thus we have no detailed data on these items.)

Table 3 Panel B indicates that before considering the impact of the two primary mark-to-market adjustments and some other minor items, annual pretax earnings increases the capital ratio for the full sample by an average of 2 percentage points—that is, 2 percent of total unsubordinated liabilities, the denominator of the capital ratio. This amount can be judged relative to the minimum requirement of 8 percent or the median actual level of 10.8 percent. To help assess the amount of volatility this pretax earnings number contributes to the capital ratio, Table 3 reports that the time-series standard deviation in the earnings increase is 0.5 percentage points for the average bank.

The volatility in capital ratios induced by earnings is much larger when one considers the impact of the primary mark-to-market adjustments. Price adjustments, with a mean effect of 0.8 percentage points, have an average standard deviation of 2.2 percentage

points —more than four times the standard deviation of the pretax earnings *before* mark-to-market adjustments. Loan loss provisions contribute less volatility; they have a mean effect of -0.8 percentage points and an average standard deviation of 0.7 percentage points. As will be discussed later, there tends to be some offsetting of the effects of the three major components of pretax earnings, so that the standard deviations do not aggregate as if the components were independent. Total pretax earnings, with a mean impact on the capital ratio of 1.8 percentage points, has an average standard deviation of 2.0 percentage points. Note that *all* of this "volatility" can be accounted for by the price adjustments, and that if other components of earnings did not offset the variability in price adjustments, then the standard deviation of pretax earnings would be even larger.

On an after-tax basis, earnings increases the capital ratio by 1.1 percentage points on the average, with an average standard deviation of 1.3 percentage points. To appreciate the significance of this degree of volatility in earnings, assume that the impact of earnings on a given bank's capital ratio has a distribution that is typical for the full sample. Then the probability of a loss large enough to reduce the capital ratio by 1 percentage point is approximately 20 percent, and a bank with a ratio close to the median—nearly 3 percentage points above 8 percent—faces approximately a 2 percent probability of violating the 8 percent threshold, before considering the effects of any offsetting stock issues or shrinkage in the asset base.

Table 3 Panel B also shows that the volatility in capital ratios induced by earnings is only about half as large for the six large banks as for the full sample. Again, much of the existing volatility can be attributed to the impact of the price adjustments. The lower degree of earnings volatility for the large banks may be among the factors that explain why the large banks maintain a smaller "cushion" above the minimum capital requirements.

Overall, Table 3 indicates that mark-to-market adjustments—particularly the price adjustments—contribute significantly to the volatility of earnings. However, so long as that volatility accurately reflects the changes in the values of the banks' net assets (that is,

the volatility is not "excessive"), recognition of the volatility should enhar. .e efficiency of the deposit guarantee contract. Note also that, given the cushion maintained by the average Danish bank, the probability of a loss large enough to cause violation of capital requirements in any given year is less than 2 percent. There is, of course, a cost associated with maintaining this cushion. However, such costs arise generally from mechanisms for dealing with conflicts of interest between guarantors and the guaranteed; it is not clear that such costs represent an inefficiency, relative to other feasible approaches to managing a banking system.

VI. Evidence of Manipulation of Market Value Numbers by Danish Banks

As argued earlier, when the goal of a mark-to-market accounting system is to enhance the efficiency of a deposit guarantee system, the accounting would ideally permit only market value estimates subject to verification by independent parties (such as external auditors). Within the domain of estimating market values for loan portfolios, Berger, Kuester, and O'Brien [1990] describe a rather mechanical matrix pricing approach that is systematic and could be agreed upon *ex ante*, thus constraining the influence of management discretion.[12] In contrast to this approach, at least with respect to loan losses, the Danes permit wide management discretion in producing mark-to-market estimates. Given that the reported numbers are used by bank regulators, tax authorities and investors, managers are likely to have strong incentives for distorting earnings. Although the several layers of auditing should mitigate the influence of management discretion on the Danish mark-to-market numbers, the success of this process is an open empirical question.

The more vulnerable is a mark-to-market accounting system to management manipulation, the less valuable it is as part of a deposit guarantee system. In this section,

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[12] Matrix pricing systems employ a formula based on loan-specif. .ata to place the loan in a risk category; the future cash flows from the loan are then discounted at a rate app.opriate for the risk category to arrive at an estimated market value.

we examine the extent to which mark-to-market accounting adjustments appear to have been "managed" in Denmark. We focus on the two primary mark-to-market adjustments described above: loan loss provisions and price adjustments. Our priors are that the loan loss provisions are more vulnerable to manipulation, due to the subjectivity of the process used to estimate them. Much of the gain or loss reflected in the price adjustment is based directly on publicly observable market prices, and thus we expect it to be less vulnerable to manipulation.

In our tests of manipulation, we would prefer to use measures of the mark-to-market adjustments that reflect only the application of management discretion, and exclude any nondiscretionary component (see Healy [1985], Kaplan [1985], and McNichols and Wilson [1988] for a discussion). Unfortunately, there is little publicly available supplementary information that would facilitate such a segregation, and thus our tests rely on purely statistical procedures to make this distinction. The implication is a loss of power to identify manipulation, the magnitude of which is difficult to assess.

A general test for "smoothing" of mark-to-market adjustments.

Our first analysis tests for the existence of a general influence of management discretion on mark-to-market accounting numbers. The tests examine the extent to which price adjustments and loan loss provisions are recognized only gradually over time. If asset prices follow a random walk, then price adjustments are expected to be uncorrelated over time. On the other hand, if managers smooth these price adjustments, the reported adjustments will be related over time. A similar logic applies for provisions. If provisions are sufficient for all known and foreseeable loan losses, as required by Danish law, then there should be no correlation over time in the provisions. However, if managers adjust provisions only gradually when credit risks change, then provisions will be serially correlated. Wahlen [1991] shows that a significant portion of loan loss provisions for U.S. banks are predictable, confirming that the U.S. accounting system permits at least *de*

facto gradual recognition of changes in credit risks (as would be expected, given the wording of Financial Accounting Standard No. 5).

We also test whether loan loss provisions and/or price adjustments are managed so as to offset each other and thus smooth reported income. There are several reasons why managers of Danish banks may use the discretion afforded by mark-to-market accounting to smooth income. For tax purposes, managers have an incentive to minimize current earnings, subject to the constraints of the regulatory requirements. Assuming a smooth pattern of dividend payments, that objective can be met by smoothing income. Managers may also be concerned about adverse investor reaction to earnings volatility. For evidence of income smoothing and earnings management by U.S. banks, see Scholes, Wilson, and Wolfson [1990].

The tests are conducted two ways. In one set of tests, we collapse the banks into a single group, and examine the resulting time series of 14 observations (1976-1989). Thus, these tests are sensitive only to *industry-wide* manipulation of mark-to-market adjustments. The other set of tests is based on pooled regressions and focuses on *firm-specific* manipulation. In the pooled regressions, a fixed effect error term formulation is adopted, which is equivalent to expressing all observations as deviations about a sample-wide, time-varying effect and a firm-specific, time-invariant effect. As a result, these tests can detect whether banks are managing "abnormal" provisions or price adjustments—those that deviate from current industry experience and the long-run average experience for the given bank. If one believes that industry-wide impacts and the long-run average experience of each bank are largely beyond the control of managers, then the pooled regressions should isolate the discretionary component of the mark-to-market adjustments within the "abnormal" deviations.

The pooled regressions based on firm-specific data take on the following forms:

$$LLP_{it}/Adv_{it} = \alpha_0 LLP_{it-1}/Adv_{it-1} + \sum_{i=1}^{N-1} \alpha_i + \sum_{t=1}^{T-1} \alpha_t + \varepsilon_{it} \qquad (1)$$

$$PAdj_{it}/Assets_{it} = \beta_0 PAdj_{it-1}/Assets_{it-1} + \sum_{i=1}^{N-1} \beta_i + \sum_{t=1}^{T-1} \beta_t + \omega_{it} \qquad (2)$$

$$LLP_{it}/Adv_{it} = \gamma_0 PAdj_{it}/Assets_{it} + \sum_{i=1}^{N-1} \gamma_i + \sum_{t=1}^{T-1} \gamma_t + \upsilon_{it} \qquad (3)$$

where

LLP_{it}/Adv_{it} = loan loss provisions for firm i in year t, scaled by total advances; and

$PAdj_{it}/Assets_{it}$ = price adjustments for firm i in year t, scaled by total assets.

The time-series regressions based on industry data contain the same variables as the pooled regressions, but (of course) contain no firm or year dummies in the error structure.

When equations (1) through (3) are estimated with pooled time-series cross-sectional data, there is a potential for bias in standard error estimates resulting from cross-sectional heteroscedasticity, as well as any cross-sectional dependence that remains after controlling for industry-wide shifts in the data (see Bernard [1987]). For that reason, we report an alternative set of estimates for the pooled regressions. Under the alternative, we allow the slope coefficients to vary by year, and then report the mean of the series of annual coefficients. The standard deviation of that time series provides the basis for the associated t-test. This alternative test is free from bias in standard errors due to cross-sectional heteroscedasticity or dependence. The disadvantage is that this approach forfeits statistical efficiency, by placing equal weight on each year of the sample period. Because the size of the cross-section is so small when we deal with the subsample of six banks, we do not attempt the alternative test for that subsample.

Table 4 reports the results of the tests.[13] In the time series regressions based on industry data, there are few observations and thus limited power to detect serial correlation

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[13] Throughout this and the subsequent regression analyses, we exclude the effects of "influential observations," defined as those with a Cooke's D-statistic of greater than 1 (see Weisberg [1985]). However, it turns out that this is an issue only in estimating equation (1) with the full sample, and even there the sign and significance of the primary coefficient are unaffected (see footnote to table for details).

in the data. Nevertheless, so far as loan loss provisions are concerned, we still find some evidence of the positive serial correlation that would suggest gradual recognition of loan losses. (The t-statistics indicate a significant degree of serial correlation in the data at the .05 level, based on a one-tailed test.) For price adjustments, we find no significant serial correlation, and thus no indication of manipulation.

The time series estimates on the right-hand-side of Table 4 indicate that, consistent with income-smoothing, approximately one-third of the variation in price adjustments is offset by variation in loan loss provisions. Although we can imagine economic conditions that would induce such an effect, we would not necessarily expect such a result in the absence of manipulation. That is, we would not necessarily expect positive price adjustments (which are largely driven by falling interest rates and gains in the bond market) to occur simultaneously with higher loan losses (which are largely driven by rising credit risks).

To a large extent, the results of the pooled regressions corroborate those from the time-series regressions. Again we find no significant serial correlation in price adjustments. In contrast, we do find such correlation for the loan loss provisions—not for the six large banks, but when the full sample is used. The latter result suggests that when a bank's expected loan losses deviate from their average level relative to the current industry-wide experience and the banks' long-run average experience, the bank recognizes such losses only gradually. The regression estimate of .30 suggests that when such a loss is recorded in the amount of DKr 1, it tends to be followed by another recorded loss of DKr .30 in the subsequent year, of DKr .09 two years hence, and so on. The implication is that only about 70 percent of the expected loss is recognized immediately.

For comparison purposes, Table 4 also includes pooled regression results for the loan loss provisions for U.S. banks, based on the sample of 106 banks from 1977-1988 examined in Wahlen [1991]. The degree of serial correlation in U.S. banks' loan loss provisions, after controlling for year- and firm-effects, is .32, about the same as that

documented for the full sample of Danish banks. Thus, although there are indications of a gradual recognition of loan losses in Denmark, they are no stronger than those in the U.S.

The final result in Table 4 is the pooled regression that examines the contemporaneous relation between loan loss provisions and price adjustments. The pooled regressions demonstrate that, consistent with the findings in industry-wide data, there is a significant degree of offsetting of the two mark-to-market adjustments in the firm-specific data. For the sample of large banks, the magnitude of the offsetting is very high; the estimates suggest that 86 percent of the variation in price adjustments is offset by variation in loan loss provisions. For the full sample, the magnitude is much smaller—either 5 percent or 11 percent, depending on the estimation approach—and is not statistically significant when we use the t-test free from bias due to cross-sectional heteroscedasticity and dependence.

The contemporary relation between loan loss provisions and price adjustments found for the large banks could reflect manipulation of either or both numbers. However, given the subjective nature of the loan loss estimates and the fact that much of the price adjustment is driven by gains and losses on publicly traded bonds, a likely explanation is that loan loss estimates are managed by the large banks so as to "smooth" the impact on income of the price adjustments.

The most direct approach to testing for smoothing of earnings would be to examine whether loan loss provisions and/or price adjustments offset the variation in earnings before these adjustments. While such tests are feasible, they are difficult to interpret, because there are sound economic reasons to expect some offsetting even in the absence of earnings management (or that the offsetting effects due to earnings management could be masked). For example, since (during our test period) earnings *before* price adjustments includes some gains/losses on positions used to hedge against the gains/losses reflected in the price adjustments themselves, one would expect a negative relation between those components of earnings—consistent with smoothing—even if earnings were not

manipulated. (Indeed, such a negative relation does exist.) Given that interest income is reduced as loans become nonperforming and loan losses are recognized, there are also reasons to expect a negative relation between pre-loan-loss, pre-price-adjustment earnings and loan loss provisions—which could mask the effects of smoothing. (Indeed, there is some mixed evidence of such a relation.)

In summary, we find no compelling evidence that price adjustments are managed, but some mixed evidence suggesting that loan loss provisions are managed. Specifically, as in the U.S., there are indications of gradual recognition of industry-wide and "abnormal" (bank- and year-specific) losses; this gradual recognition of "abnormal" losses is driven by the smaller banks in the sample. We also find evidence that loan loss provisions may be managed to offset the impact of price adjustments; this result is a large-bank phenomenon.

Manipulation of mark-to-market adjustments to meet capital requirements.

From the perspective of the regulator, the key question about manipulation of market-to-market adjustments is whether it is used by the banks to avo   ns of capital requirements. In this section we report evidence on whether loan lo.
and price adjustments are manipulated in this way. The tests are intended to isc *discretionary* components of provisions and price adjustments, and then compare them across three groups with low, medium, and high capital ratios *prior to* estimated discretionary accruals (calculated as explained below). The low category includes those banks with ratios less than 9 percent, which are therefore the ones closest to the 8 percent minimum capital requirement. Under the hypothesis of manipulation, we expect to see a lower provision and/or higher price adjustment for banks in the low category, relative to banks in the higher categories.

The tests are conducted within the framework of the following dummy-variable regression models:

$$LLP_{it}/Adv_{it} = \delta_1 D_L^{low}{}_{it} + \delta_2 D_L^{med}{}_{it} + \delta_3 D_L^{high}{}_{it} + \sum_{i=1}^{N-1} \eta_i + \sum_{t=1}^{T-1} \eta_t + \xi_{it} \qquad (4)$$

$$PAdj_{it}/Assets_{it} = \phi_1 D_P^{low}{}_{it} + \phi_2 D_P^{med}{}_{it} + \phi_3 D_P^{high}{}_{it} + \sum_{i=1}^{N-1} \mu_i + \sum_{t=1}^{T-1} \mu_t + v_{it} \qquad (5)$$

where

LLP_{it}/Adv_{it} = loan loss provisions for firm i in year t, scaled by total advances;

$PAdj_{it}/Assets_{it}$ = price adjustments for firm i in year t, scaled by total assets;

$D_L^{low}{}_{it}$, $D_L^{med}{}_{it}$, and $D_L^{high}{}_{it}$ = dummy variables indicating that, prior to estimated

discretionary loan loss provisions, the capital ratio for firm i in year t is low

(<9 percent), medium (9 to 11 percent), or high (>11 percent), respectively;

$D_P^{low}{}_{it}$, $D_P^{med}{}_{it}$, and $D_P^{high}{}_{it}$ = dummy variables indicating that, prior to estimated

discretionary price adjustments, the capital ratio for firm i in year t is low

(<9 percent), medium (9 to 11 percent), or high (>11 percent), respectively.

Regression models (4) and (5) each include a fixed effect error term ($\eta_i + \eta_t + \xi_{it}$ and $\mu_i + \mu_t + v_{it}$, respectively) that controls for a sample-wide, year-specific component and a firm-specific component of the dependent variable. Under the assumption that the non-discretionary portions of loan loss provisions and price adjustments include only a year-specific effect and a firm-specific effect, the remaining variation in the provisions and price adjustments captures discretionary accruals. Thus, any differences among the coefficients for the low, medium, and high capital ratio categories is intended to reflect only accruals caused by the exercise of manager discretion. To the extent that nondiscretionary accruals are not fully captured by our fixed effect formulation, our tests are less likely to capture the effects of any manipulation. However, as indicated earlier, the absence of

detailed data in Danish annual reports that could improve our measures precludes a more powerful approach.

The segregation of discretionary from nondiscretionary accruals is also an issue for the key right-hand-side variables in the model: those that assign banks to low, medium, or high categories of capital ratios. Ideally, we would classify firms on the basis of their capital ratios just *before* the effect of the discretionary accrual being considered. Towards that end, we adjust the reported capital ratios by adding back the total loan loss provisions (or price adjustments, in the case of regression (5)) on a net-of-tax basis, and then deducting an estimated net-of-tax non-discretionary provision (price adjustment). For both provisions and price adjustments, the nondiscretionary portion is estimated by assuming that its scaled value is equal to the scaled sample mean for the year, plus a mean firm effect equal to the amount by which a bank's scaled mean over all years differs from the grand scaled mean. The marginal tax rate is estimated at .50, which is the statutory tax rate in Denmark throughout our test period.[14] This process of adjusting the right-hand-side variables is consistent with the above-described approach to controlling for the nondiscretionary component of the dependent variables, but differs in that it must be done on a tax-effected basis.

Since cross-sectional dependence is a potential concern in the pooled regressions, we again supply (as we did in Table 4) alternative estimates—and t-statistics based on time-series standard errors—for the full sample.

Tests for manipulation of loan loss provisions. Panel A of Table 5 reports the results of tests for manipulation of loan loss provisions to avoid regulatory capital constraints. For the sample of six large banks, we test for a difference between only the

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[14] The desirability of modeling discretionary accruals as a function of right-hand-side variables *before* the influence of the discretion has long been recognized (see Healy [1985]), but some prior studies have relied on alternative procedures. Stinson [1991] models discretionary accruals for U.S. thrifts as a function of reported capital ratios, by assuming that those most likely to have manipulated earnings are the ones whose reported ratios barely achieve the required minimum. Moyer [1990] models discretionary accruals for U.S. banks as a function of reported capital ratios, relative to the required minimum.

low and medium capital ratio categories, since there was but one observation in the high category. The mean ratio of loan loss provisions to advances is 1.01 percent for the low category, which is not significantly lower than the 1.03 percent mean for the medium category. Thus, there is no reliable indication of manipulation for this group of large banks.

For the full sample of banks, the provisions/advances ratio increases across the low, medium, and high capital ratio categories, from 1.36 percent, to 1.52 percent, to 1.59 percent based on the first estimation approach, and from 1.24 percent, to 1.47 percent, to 1.60 percent based on the alternative estimation approach. This pattern is consistent with downward manipulation of loan loss provisions for banks closest to the regulatory capital constraint. However, the differences between the low category and the other categories are not statistically significant. In fact, when the t-tests are conducted under the alternative estimation approach, which avoids overstatement of t-statistics due to cross-sectional dependence in the data, the t-statistics are only .36 and .48, well below the critical value of 1.65 needed for rejection of the null at the .05 level.

Although the regulatory capital requirement for our sample was 8 percent, we included banks with ratios up to 9 percent in the low category, thereby increasing the number of observations in that cell from 77 to 219 in an effort to increase statistical power. However, one concern about the tests is that they could also forfeit some power, since it may be only the banks below the 8 percent regulatory requirement that have strong incentives to manipulate mark-to-market adjustments. To assess the sensitivity of the results to the cutoff, we repeated the analysis with an 8 percent cutoff. (Only the first estimation approach is feasible in this case, since there are some years with no observations in the low category and hence year-specific differences in categories cannot be estimated.) Using this cutoff, we found no reliable indications of manipulation. In fact, for the full sample of banks, the low category banks actually recorded *larger* loan loss provisions (1.96 percent) than the medium category (1.40 percent) or the high category (1.56 percent),

which is the opposite of what would be expected under manipulation. For the subsample of six large banks, the loan loss provisions were smaller for the low category, but the difference was not statistically significant (t=.61).

These results based on Danish data can be compared to others for U.S. banks and thrifts. Moyer's [1990] evidence on U.S. banks and Stinson's [1991] evidence on U.S. thrifts indicates that, in both industries, loan loss provisions are manipulated by institutions close to the regulatory capital requirement, in a direction consistent with increasing reported capital.[15] While precise comparisons are not justifiable, in part because of possible differences between the power of the tests in this study and the others, the evidence is consistent with the hypothesis that manipulation of loan losses for purposes of avoiding regulatory capital constraints is more prevalent in the U.S. than in Denmark.

Tests for manipulation of price adjustments. The relation between capital ratios and price adjustments is examined in Panel B of Table 5. The Panel offers no evidence that price adjustments vary significantly as a function of current or lagged capital ratios. In fact, gains from price adjustments are larger for the firms with higher capital ratios (though not reliably so, except in the case of one of the several tests), which is the opposite of what one would expect under the manipulation hypothesis. Results based on an 8 percent cutoff for low-category banks are similar to those already reported. Thus, we conclude that there is no reliable evidence of price adjustments being manipulated in a way that would allow the Danish banks to avoid regulatory intervention.

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[15] Stinson [1991] estimates a statistically significant degree of downward manipulation of loan loss provisions, as well as other provisions, for thrifts that barely satisfied regulatory requirements. Moyer [1990] estimates a statistically significant degree of *upward* manipulation of loan loss provisions for U.S. banks closest to violating regulatory capital requirements. For U.S. banks, unlike U.S. thrifts during Stinson's test period and unlike Danish banks, loan loss allowances are included as a part of regulatory capital. Thus, since loan loss provisions reduce retained earnings on a after-tax basis and increase loan loss allowances on a pretax basis, such provisions *increase* regulatory capital, and there is an incentive for weak banks to record *higher* loan loss provisions.

Summary of tests for manipulation of mark-to-market adjustments

Throughout our tests, we find no compelling evidence that price adjustments are manipulated. This is consistent with our priors, which recognized that price adjustments are largely determined by publicly observable market prices. For the other major mark-to-market adjustment—loan loss provisions—we find some mixed evidence of manipulation. Specifically, as in the U.S. system, discretionary loan loss provisions of Danish banks are correlated over time, suggesting a gradual recognition of the effects of changes in market values. For the subsample of six large banks, there is also evidence suggesting that loan loss provisions are managed to offset the impact of price adjustments and thus dampen the volatility of earnings. However, the key concern from the perspective of bank regulation is that managers might manipulate mark-to-market accounting numbers so as to avoid capital deficiencies and the associated government intervention. On this score, our tests produce no reliable evidence of manipulation.

VI.   Evidence on "Noise" in Mark-to-Market Numbers, based on Comparisons with Stock Prices

We argued earlier that when the objective is an efficient deposit guarantee system, an ideal accounting system produces an independently verifiable net asset balance representing the "bid" that could be attained from external parties in an orderly liquidation. In such a system, the book value of net assets would differ from the institution's stock price for only two reasons. First, the stock price would include some value associated with the option to "put" the deposits to the guarantee system (Merton [1977]), whereas the recorded net assets of the institution would exclude this amount. (Note that since the value of this put option increases with the riskiness of the institution, including it in regulatory capital would have the perverse effect of encouraging the institution to increase exposure to risk; this is one of the reasons why stock prices would serve as poor measures of capital in a deposit insurance system.) Second, an ideal accounting system would reflect values

based on information that could be revealed to and verified by an auditor, even though the stock market, operating with less information, might not yet recognize such values.

In practice, even if a mark-to-market system were used, large deviations could arise between net asset values and stock prices for reasons beyond the above. One set of potentially large deviations could arise as the result of perceived manager manipulation of the accounting system. A second set of potentially large deviations could arise as the result of incompleteness in the mark-to-market system. In the Danish system, for example, there is no attempt to measure the current market value of intangible assets, such as monopoly rents achievable on future loans, due perhaps to private information about a particular lending market.

Here, we assess the importance of "noise" in mark-to-market accounting numbers—that due to management manipulation or incompleteness in the system—by comparing mark-to-market net asset values with stock prices. The approach relies on the assumption that the deviation of net asset values from stock prices that would exist even in the "ideal" mark-to-market system defined above (those due to the put option and information asymmetry between managers/auditors and investors) are relatively small. Under that assumption, the ratio of stock prices to book values from the ideal mark-to-market accounting system would be close to one. Deviations of these market-to-book ratios about one indicate noise caused by manipulation of and/or incompleteness in the mark-to-market system, which would reduce its effectiveness for managing the deposit guarantee system.

We include in our examination not only an analysis of market-to-book ratios for Danish banks, but also market-to-book ratios for U.S. banks and thrifts. Given that U.S. banks and thrifts do not attempt to reflect current market values in their accounting systems, one would *expect* large deviations of their market-to-book ratios about one. An interesting question, though, is the extent to which the deviations are reduced (if at all) in the Danish system. Given that both the U.S. and Danish systems ignore the values of important

intangible assets, and that both systems are subject to manipulation, it is not immediately obvious that market-to-book ratios would be more tightly distributed about one in Denmark.

Table 6 presents the distribution of market-to-book ratios for all Danish banks at the end of each year from 1983 through 1990. (All Danish banks have publicly traded stock; none of the savings banks do.) This distribution is compared to those for U.S. banks (from the sample studied by Barth [1991]) and for all U.S. thrifts listed on Compustat for the same period.

Table 6 documents that the mean market-to-book ratios for Danish banks have varied over the years from .85 to 1.20, with a grand mean of 1.05. There is more variability over time in the means for U.S. banks and thrifts. For the U.S. banks, the annual means range from .98 to 1.60, with a grand mean of 1.28; annual means for the U.S. thrifts range from .40 to 1.34, with a grand mean of .85. The means are significantly different from one in most years for each sample. These differences probably reflect, at least to some extent, the failure of accounting systems for each of these groups to reflect the value of intangibles—that is, the current value of abnormally high (or low) expected profits on future projects. However, the differences in the U.S. could also reflect a failure to record existing assets and liabilities at market values. This is also a possibility in the Danish data, to the extent the mark-to-market numbers are manipulated.

The most interesting finding in Table 6 pertains to the dispersion of market-to-book ratios. For each sample, Table 6 presents the standard deviation of market values around the annual mean, as well as the standard deviation about one. In every year but one, regardless of which standard deviation is examined, the amounts for the U.S. banks and U.S. thrifts are greater than those for the Danish banks. For the Danish banks, the average annual standard deviation is .34 and the average annual standard deviation about one is .36; the comparable amounts for U.S. banks are .50 and .59, and for U.S. thrifts

are .73 and .81. The differences in the annual standard deviations are statistically significant in most years.

Under our assumptions, the higher dispersion in market-to-book ratios in the U.S. can arise for only two reasons: (1) the current value of unrecorded intangibles is more variable in the U.S. than in Denmark, and/or (2) recorded asset balances deviate from externally-perceived market values more in the U.S. than in Denmark.[16] The first source of dispersion may be difficult to eliminate in *any* accounting system, but the second represents dispersion that the Danish system is intended to mitigate, if not eliminate. Given the absence of data on unrecorded intangibles, it is impossible to separate th possibilities. However, to the extent that the second reason plays any role, the findings suggest that the mark-to-market accounting numbers in Denmark contain less noise as indicators of the value of recorded assets than the historical accounting numbers in the U.S. This conclusion stands in contrast to any concern that the subjectivity involved in mark-to-market accounting could produce even more noisy measures of the value than a historical cost system.

Even if the smaller dispersion of market-to-book ratios in Denmark is not surprising, the magnitude of the differences th the U.S. is interesting. The standard deviations about one are 1.6 and 2.3 times larger for U.S. banks and thrifts, respectively, than for Danish banks—suggesting much more noise in the U.S. system. Although cross-country comparisons must be made with caution, the data are at least consistent with the proposition that mark-to-market accounting numbers (at least when viewed in isolation) are significantly more efficient as indicators of the collateral value supporting the deposit insurance system.

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[16] Another distinct possibility, which we ruled out by assumption, is that the value of the option to put the deposits to the guarantee system is more important and more variable in the U.S. system. If the put option value accounts for a large portion of the higher variance in market-to-book ratios in the U.S., it represents an indictment of the U.S.'s ineffectiveness in controlling moral hazard in the banking sector, as opposed to a comment on noise in the accounting system.

VII. The Danish experience with regulatory intervention

Several of the key questions about mark-to-market accounting concern what impact it might have on the cost of resolving capital deficiencies. Since 1985, nine banks and 16 mutual savings banks have experienced capital deficiencies that were not eliminated within six months, and that therefore gave rise to government intervention. Table 7 lists the nine banks subject to intervention. Since those banks were publicly traded, it is possible for us to determine the proceeds (if any) received by owners at the time of intervention, and compare that amount to the final reported book value of each failed institution. Table 7 also indicates that the acquirers of 16 failed mutual savings banks paid for such acquisitions (in the form of cash infusions to trusts), but the amounts of the infusions are not available.

There are several lessons that can be drawn from Table 7. The first concerns the costs of early regulatory intervention. Recall that Seidman [1991] estimates that the mere act of government intervention in the U.S. may destroy as much as a 15 percent of the value of financial institutions' assets. An alternative possibility is that there is no significant destruction of value, but rather a mere recognition, at the time of intervention, of market value losses not yet apparent in the U.S. historical cost accounting system. The experience with the Danish system provides an opportunity to discriminate between these two possibilities.

Danish bankers and regulators with whom we spoke indicated that not only were 23 of 25 failed banks and savings banks sold at a positive price, but in most cases they were sold at a premium over book value. For the failed banks, we have data to verify this indication. For the seven banks sold, data are available in five cases, and as indicated in Table 7, each was indeed sold at a premium to book value. Unless the pre-intervention values of these failed banks were even higher, the data suggest that regulatory intervention can occur without destruction of significant value, and that Seidman's [1991] estimated

cost of intervention in the U.S. may merely a reflect the accounting system's lag in recognizing value changes.[17]

Table 7 also provides evidence corroborating the previous finding that mark-to-market accounting numbers are not manipulated to avoid regulatory intervention. The fact that acquisition prices are positive, and even contain a premium over book value, suggests that the book values are not significantly overstated at the time of the intervention.

Given that only 1 of the 25 cases of regulatory intervention (C & G Banken) involved government assistance, the cos⸱⸱ ⸱f dealing with capital deficiencies in Denmark appear low, especially relative to the U.S. ⸱rience. One might argue that Denmark has avoided such costs by acting too quickly, requiring takeovers of banks that could have survived without intervention. However, given that the owners of the failed banks chose to forego the option to remedy the capital deficiency through cash infusions, and instead sold their shares to acquiring firms, the evidence does not suggest that the interventions were costly and premature.

VIII. Summary and lessons for the U.S.

This paper examines the Danish experience with mark-to-market accounting for banks to help resolve some of the questions raised as the U.S. considers the merits of such a system for financial institutions.

The first lesson concerns the reliability of mark-to-market accounting systems. One potentially serious concern about mark-to-market accounting is that it is subject to management manipulation. We find no evidence in the Danish system that "price adjustments," which include the major realized and unrealized gains and losses on investments and some off-balance sheet positions, are manipulated. We d⸱ ⸱idence

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[17] The acquisition premium paid in Denmark could be viewed at least in part as a payment for ⸱. intangible assets not recorded on the books. An alternative possibility is that the acquisition pric⸱. some implicit pressure from regulators on healthy banks to maintain public confidence in the bankin⸱ system.

of a gradual recognition of loan losses, similar to what occurs in the U.S. banking sector. This provides justification for the concern that mark-to-market accounting for loans (at least as practiced in Denmark) does not overcome managers' tendency to delay reporting of credit risks. However, on the key question of whether the mark-to-market accounting system is managed to avoid regulatory intervention, our tests produce no reliable evidence of manipulation. The evidence suggests that this form of manipulation can be effectively constrained.

There are other indicators that the mark-to-market accounting system in Denmark produces numbers that are more reliable indicators of value than the historical cost numbers reported in the U.S. First, stock prices track book values more closely for Danish banks than for either U.S. banks or U.S thrifts. Second, in contrast to the U.S. experience, the prices of banks sold as a result of regulatory intervention have typically been close to or even higher than final reported book value. Thus, even institutions vulnerable to intervention, which presumably have strong incentives to overstate net assets, report book values that are, if anything, conservative estimates of the selling price of the bank.

A second lesson concerns the importance of regulatory intervention policy. The Danish experience is that a combination of a mark-to-market system and rigid regulatory intervention policies can lead to relatively low costs of resolving bank failures. Consistent with the arguments of Beaver, Datar and Wolfson (1990), simultaneous existence of both the accounting system and the regulatory policy appear to be important in bringing about this outcome.

A third lesson pertains the degree of volatility in mark-to-market accounting numbers. Our research confirms that the mark-to-market accounting system induces substantial volatility in reported profitability and capital ratios, a finding that supports the concerns of the American Bankers Association and others. The greater volatility may explain the maintenance of substantial equity "cushions" by small Danish banks. However, although that practice that is certainly costly, it may represent a relatively

efficient solution for dealing with the conflicts of interest that inevitably arise between guarantors and the guaranteed.

On balance, our evidence lends support to the proponents of mark-to-market accounting for financial institutions. However, in evaluating the relevance of the Danish evidence for the U.S., one must be aware of the differences in size and complexity of financial sectors in the two countries. The sheer size of the U.S. banking sector makes it difficult to rely on reputation in monitoring bank management, increasing both the costs and the benefits of an accurate information system. The greater complexity of the U.S. banking operations could also introduce difficulties in market value estimations that have not been faced in Denmark.

Table 1

Financial Structure of Danish Banks and Savings Banks

	Banks				Savings Banks			
Balance sheet:	**1975**	**1980**	**1985**	**1989**	**1975**	**1980**	**1985**	**1989**
Cash and bank deposits	.15	.19	.25	.15	.07	.08	.11	.20
Investment in debt securities	.22	.15	.24	.17	.19	.22	.29	.19
Investment in stock	.02	.02	.03	.04	.01	.01	.02	.03
Loans	.54	.56	.43	.53	.65	.63	.52	.57
Premises	.02	.03	.01	.01	.05	.03	.02	.02
Other assets	.04	.04	.04	.05	.03	.03	.05	.05
Total assets	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Deposits	.62	.53	.45	.45	.81	.63	.57	.51
Debt to banks	.10	.18	.31	.29	.02	.07	.13	.24
Guarantees issued	.14	.16	.10	.12	.01	.13	.10	.08
Other liabilities	.06	.05	.06	.05	.06	.06	.09	.06
Total liabilities	.91	.91	.92	.92	.90	.89	.89	.90
Subordinated debt	.00	.01	.02	.02	.00	.02	.02	.03
Owners' equity	.08	.07	.06	.06	.10	.08	.08	.07
Total liab &eq	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00

Income Stmt:	**1975**	**1980**	**1985**	**1989**	**1975**	**1980**	**1985**	**1989**
Interest income	.082	.107	.072	.081	.075	.121	.087	.086
Interest expense	-.044	-.074	-.050	-.058	-.042	-.083	-.055	-.057
Spread	.038	.033	.022	.023	.033	.038	.033	.029
Other income	.008	.009	.006	.007	.003	.006	.007	.007
Other expense	-.034	-.038	-.025	-.027	-.027	-.043	-.035	-.034
Extraordinary gains/losses	-.000	.000	-.002	.001	.002	.000	-.005	.000
	.012	.005	.001	.004	.011	.001	.000	.002
Price adjustment	.017	.008	.027	-.000	.002	.008	.036	-.002
Pretax ROA	.029	.013	.028	.004	.013	.009	.036	-.001
Tax expense	-.012	-.003	-.013	-.001	-.000	-.002	-.017	.000
ROA	.017	.009	.015	.003	.013	.007	.019	-.000

Source: Danish Financial Supervisory Authority yearbooks.

Table 2

**Comparison of Financial Structure of
Danish and U.S. Financial Institutions**

	Danish Banks[a] 1989	Danish Svgs bnks[a] 1989	U.S. Banks[b] 1989	U.S. Thrifts[c] 1988
Balance sheet:				
Cash and bank deposits	.15	.20	.08	.04
Investment in debt securities	.17	.19	.17	.26[d]
Investment in stock	.04	.03	.00	.00
Loans	.53	.57	.62	.61
Premises	.01	.02	.01	.01
Other assets	.05	.5	.13	.08
Total assets	1.00	.0	1.00	1.00
Deposits	.45	.51	.70	.72
Debt to banks and other liabilities	.34	.30	.24	.24
Guarantees issued	.12	.08	—	—
Total liabilities	.92	.90	.94	.96
Subordinated debt	.02	.03	.00	e
Owners' equity	.06	.07	.06	.04
Total liab &eq	1.00	1.00	1.00	1.00
Income Stmt:				
Interest income	.081	.086	.094	.088
Interest expense	-.058	-.057	-.061	-.068
Spread	.023	.029	.033	.020
Other income	.007	.007	.016	
Other expense	-.027	-.034	-.041	-.027[f]
Extraordinary gains/losses	.001	.000	.000	.000
	.004	.002	.007	-.008
Price adjustment	-.000	-.002		
Pretax ROA	.004	-.001	.007	-.008
Tax expense	-.001	.000	-.003	-.002
ROA	.003	-.000	.004	-.009

[a]Source: Danish Financial Supervisory Authority yearbooks.

[b]Data for commercial banks, as reported in Ritter and Silber [1990] based on FDIC and Federal Reserve data.

[c]Data for FLSIC-insured savings institutions, as reported in the Savings Institution Sourcebook (U.S. League of Savings Institutions [1989]).

[d]Includes mortgage-backed securities and other debt securities, and insured mortgages.

[e]Subordinated debt included in liabilities.

[f]Other income and other expense are netted together here.

Table 3

Capital Ratios for Danish Banks:
Level, Volatility, and Impact of Mark-to-market Adjustments

Panel A: Level of capital ratios, 1976-1989[a]

Capital ratio	Percentage of observations	
	Six large banks:	Full sample:
greater than 15 percent	0.0	14.9
12 to 15 percent	0.0	20.6
11 to 12 percent	1.2	12.3
10 to 11 percent	21.4	14.0
9 to 10 percent	25.0	17.5
8 to 9 percent	44.0	14.0
less than 8 percent	<u>8.3</u>	<u>6.8</u>
	100.0	100.0
Median capital ratio	8.9	10.8

[a]Capital ratio is defined by the Danish Financial Supervisory Authority as shareholders' equity plus subordinated debt, scaled by total unsubordinated liabilities.

Panel B: Impact of mark-to-market adjustments on volatility of capital ratio
(amounts expressed as percentages of liabilities, the denominator of the capital ratio)

	Six large banks (means across banks):		Sample of 57 banks with full time series (means across banks):	
	Mean over time	Standard deviation over time	Mean over time	Standard deviation over time
Required capital ratio:	8.0%		8.0%	
Impact on capital ratio of:				
Earnings before loan loss provisions, price adjustments, depreciation, extraordinary items, and taxes:	1.2%	0.4%	2.0%	0.5%
Price adjustments:	0.8	1.6	0.8	2.2
Loan loss provisions:	-0.5	0.4	-0.8	0.7
Earnings before taxes	1.2	1.2	1.8	2.0
Earnings after taxes	0.8	0.7	1.1	1.3
Incremental effect of capital transactions (dividends, stock issues, etc.) and growth/shrinkage in asset base:	-0.8	0.5	-1.0%	0.3
Annual change in capital ratio:	-0.0%	1.2%	0.1%	1.6%

Table 4

Tests for Earnings Management:
Gradual Recognition and Smoothing of Changes in Value

	Tests of gradual recognition of changes in value (coefficient from regression of current component of earnings against lagged amount)[a]				Tests of smoothing (coefficient from regression of loan losses on price adjustments)[a]	
	Serial relation in loan loss provisions		Serial relation in price adjustments		Contemporary relation between loan losses and price adjustments	
	Coefficient	t-statistic	Coefficient	t-statistic	Coefficient	t-statistic
Time-series regressions for banks as a group:						
Six large banks:	.45	1.75	-.12	-.41	.34	4.34*
Full sample:	.48	1.91*	-.21	-.73	.29	2.91*
Pooled times-series cross-sectional regressions (results driven by firm-specific deviations about mean for firm and year)[b]:						
Six large banks:	-.06	-.47	-.02	-.17	.86	8.40*
Full sample: Estimates from pooled regression:	.30[c]	5.88*	-.05	-1.60	.11	2.21*
Mean of coefficients allowed to vary by year:	.35	3.91*	.26	1.58	.05	.41
U.S. Banks (from pooled regression):	.32	10.20*	NA	NA	NA	NA

[a]Loan loss provisions are scaled by total advances (i.e., total loans); positive provisions are expenses. Price adjustments are scaled by total assets; positive adjustments are gains.

[b]To control for industry-wide movements and variation across firms in the mean levels of the variables, the pooled regressions are estimated with a fixed effect error formulation. Specifically, the error term is assumed to consist of one component that varies across time, a second component that varies across firms, and a random disturbance term.

[c]This result is based on sample after deletion of the only "influential observation" (that with a Cook's D statistic in excess of one). When all observations are used, the coefficient is .12, with a t-statistic of 2.95. No other tests involved observations with a Cook's D in excess of one.

*Statistically significant (based on one-tailed test) at .05 level.

Table 5

Tests of Earnings Management to Avoid Regulatory Intervention

Panel A: Variation in Mean Level of Provisions/Advances Ratio,
   Across Levels of Capital Ratio *before* estimated Discretionary Provision[a]

Sample and year covered:	Capital ratio less than 9%	Capital ratio 9 to 11 percent		Capital ratio above 11 percent	
	Mean provisions/ advances ratio	Mean provisions/ advances ratio	t-stat for difference from low cap group	Mean provisions/ advances ratio	t-stat for difference from low cap group
Six large banks: Estimate from pooled regression:	1.01	1.03	.11	NA[b]	NA[b]
Full sample: Estimate from pooled regression:	1.36	1.52	.99	1.59	1.27
Mean of coefficients allowed to vary by year:	1.24	1.47	.36	1.60	.48

Panel B: Variation in Mean Level of Price Adjustments/Assets Ratio,
   Across Levels of Capital Ratio *before* estimated Discretionary Adjustment[a]

Sample and year covered:	Capital ratio less than 9%	Capital ratio 9 to 11 percent		Capital ratio above 11 percent	
	Mean price adjustmts/ assets ratio	Mean price adj./ assets ratio	t-stat for difference from low cap group	Mean price adj./ assets ratio	t-stat for difference from low cap group
Six large banks: Estimate from pooled regression:	.73	.79	.34	NA[b]	NA[b]
Full sample: Estimate from pooled regression:	.60	.71	1.08	1.12	4.51
Mean of coefficients allowed to vary by year:	.53	.72	.40	1.13	1.05

[a]Means for each group are estimated within a regression with a fixed ef·   or formulation. The error term is assumed to consist of a component that v..·. across time, a second component that varies across firms, and a random disturbance term. Amounts reported above represent the mean of the sample-wide fixed effects, adjusted for the deviation about that mean for the given capital ratio category.

[b]Not applicable. The sole observation in this cell was included within the category labeled as 9 to 11 percent.

Table 6

Level of and Dispersion in Market-to-Book Ratios for Banks and Thrifts: A Comparison of Denmark and U.S

	1983	1984	1985	1986	1987	1988	1989	1990	Average
Market/book ratios for Danish banks:									
Sample size	49	49	51	51	51	52	55	51	51
Median	.93	.79	1.08	1.08	1.13	1.04	.95	.88	.99
Mean	.95	.85	1.16	1.19	1.20	1.09	1.02	.97	1.05
t-test: mean vs. one	-1.59	-4.38*	3.46*	2.56*	3.40*	2.40*	.49	-.54	
Standard deviation	.22	.24	.33	.53	.42	.27	.30	.40	.34
Standard deviation about one	.23	.28	.37	.56	.47	.28	.30	.40	.36
Market/book ratios for U.S. banks:									
Sample size	150	150	150	150	150	150	150	150	150
Median	.93	1.09	1.58	1.50	1.25	1.22	1.11	1.03	1.21
Mean	.98	1.21	1.63	1.60	1.27	1.30	1.18	1.04	1.28
t-test: mean vs. one	-.84	5.14*	12.86*	10.97*	6.48*	7.82*	4.50*	1.06	
Standard deviation	.29	.50	.60	.67	.51	.47	.49	.46	.50
Standard deviation about one	.29	.54	.87	.90	.58	.56	.52	.46	.59
F-test: variance vs. variance for Dmk	1.71#	4.28#	3.26#	1.58#	1.46	2.99#	2.64#	1.31	
Market/book ratios for U.S. thrifts									
Sample size	31	38	43	48	55	52	48	39	44
Median	1.02	.80	.99	.87	.57	.55	.59	.30	.71
Mean	1.18	1.01	1.34	.93	.62	.58	.76	.40	.85
t-test: mean vs. one	1.35	.07	1.92	-1.13	-6.71*	-5.82*	-1.30	-8.92*	
Standard deviation	.74	.84	1.16	.43	.42	.52	1.28	.42	.73
Standard deviation about one	.76	.84	1.21	.44	.57	.67	1.30	.73	.81
F-test: variance vs. variance for Dmk	11.45#	12.32#	12.40#	.66	1.00	3.71#	18.25#	1.11	

*Statistically significant at .05 level (two-tailed test). T-test for average level of mean not calculated, due to lack of independence in data across years.

#Statistically significant at .05 level. F-test for overall test period not calculated, due to lack of independence in data across years.

Table 7

**Resolution of Failed Danish Banks and Savings Banks:
Final Book Value and Price/Cost of Disposition**

Institution	Year of capital deficiency	(1) Last Reported Book Value/ Total Assets	(2) Value at Disposition/ Total Assets	(3) Ratio of (1) to (2)
Banks closed (2):				
6. juli Banken	1987	5.6%	0.0	0.0
C&G Banken	1987	-8.8	0.0	N M
Banks merged (7):				
Kronebanken	1986	-4.3	8.8	NM
Hellerup Bank	1987	3.7	13.2	3.6
Faellesbanken	1987	5.9	NA	NA
Arhus Discontobank	1987	4.8	15.8	3.3
Bendix Bank	1987	NA	NA	NA
H&L Banken	1988	7.4	20.7	2.8
Holstebro Bank	1988	<u>7.4</u>	<u>13.8</u>	<u>1.9</u>
Median:		5.6%	13.5%	2.4

Mutual savings banks merged (16):

The sixteen mutual savings banks that failed during this period were all placed under the control of other institutions which, in turn, agreed to infuse undisclosed amounts of cash into trusts.

Source: Personnel and Yearbooks at Danish Financial Supervisory Authority.

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