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The Persistence of Bank Profits: What the Stock Market Implies

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This paper examines the speed with which abnormal economic profits vanish in the U.S. banking industry. A model is developed to infer expected speeds of profit adjustment from stock market and financial accounting data, deriving the rate of adjustment that is most consistent with observed cross-sectional relationships between bank stock prices and profitability. The model allows for the possibility that reported accounting income may be a biased and noisy signal of economic profit. Estimation is performed using generalized nonlinear least squares on a pooled series of cross sections. The results indicate that the expected rate of adjustment tends to be significantly greater than zero, although smaller than adjustment speeds found in studies of nonbank firms. The estimated speed of adjustment for negative profits is greater than for positive profits; for banks with high profit rates, the adjustment speed is near zero, implying that supernormal profits are very long-lived.

I. Introduction

This paper examines the expected path of bank profits over time, with an emphasis on the persistence of abnormal profits at the individual bank level. A method is developed to infer the persistence of economic profits from stock market and financial accounting data for a cross section of banking firms. Specifically, a rate of profit adjustment is derived that is most consistent with the observed cross-sectional relationship between stock prices and profitability, with slower implied rates of adjustment indicating that the market believes bank profits are more persistent.

Banking presents an interesting case, since government regulatory policies shelter the industry from outside forces to some extent. These policies are introduced for various reasons related to the stability of the financial system, but as an unintended side effect they may tend to discourage vigorous competition as well. On the other hand, regulators generally recognize that competition yields both static and dynamic efficiency benefits, and therefore attempt to encourage a degree of interbank competition that stops short of causing financial instability.[1] If these opposing strains within bank regulation have the net effect of weakening competitive forces relative to other industries, bank profits should reflect that fact, and abnormal bank profits should be more persistent.

Using a sample of U.S. banks, I find that stock market investors implicitly believe that competitive forces operate in banking, as profits do tend toward zero over time. However, the implied rates of adjustment are slow, suggesting that nonzero economic profits tend to be quite persistent. The results are conditional on the model of stock valuation; if the stock price model is valid and the stock market efficiently reflects information, the implied adjustment speeds can be taken as important and valuable information about industry dynamics. Although I apply these techniques specifically to banking, they should be applicable to other industries as well.

Section II discusses the reasons that profits might not always be zero, and why adjustment toward zero profit equilibrium might take time. Section III describes a few

1. For example, current regulations require the denial of bank applications for mergers, acquisitions, or certain other activities if approval would substantially reduce competition.

previous studies of price and profit persistence. Persistent profits and their effect on market value are modeled in Section IV. Section V resolves some issues related to the use of accounting profit data. Section VI develops the estimation framework, Section VII describes the data set used in the paper, and Section VIII presents the basic estimation results. The possibility of asymmetric profit adjustment is addressed in Section IX. Section X considers questions raised by the existence of imperfectly priced deposit insurance. Section XI summarizes the paper and suggests directions for possible extensions and future research.

II. ABNORMAL PROFITS AND THEIR PERSISTENCE

Basic, textbook microeconomic theory asserts that economic profits are zero in perfectly competitive equilibrium: Profits are just sufficient to provide a normal risk-adjusted return on capital. But the notion of zero profit equilibrium embodies an inherently static view of markets and competition; any realistic depiction of dynamic competition must allow for the possibility that profits in a competitive market might diverge from zero, if only temporarily. A positive difference between the return on equity capital and the opportunity cost of investing that capital can be called a "positive spread."

A firm earns positive spreads through either luck or skill. The firm might benefit from unanticipated exogenous shocks that affect demand or production functions, shocks that collectively constitute "luck." Among these might be poor decisions by competitors that enhance the firm's competitive position (for example, that make the firm's products relatively more attractive) without any action by the firm itself. Beyond these external forces, a likely characteristic of competitive markets is that producers strive to *make* opportunities to earn positive spreads. Positive spreads might be created through cost-reducing process innovations that cannot be copied immediately by other producers, or through product differentiation that confers a degree of market power enabling producers to sell at prices above marginal cost. In either case, the consequent benefits may exceed the costs of innovating or differentiating. Since most firms continuously attempt to create positive spreads, at any point in time it is likely that some firms will have succeeded at least temporarily, creating some degree of dispersion of profit rates within an industry.

Some sources of positive spreads are intrinsically temporary, and decay naturally over time, all else equal. Other spreads are eliminated through competition. Several types of competitive forces might be expected to drive firms' profits back toward zero and eliminate short-run divergences from zero profit equilibrium. One likely mechanism is entry: Positive spreads encourage the introduction of new capacity, either by existing competitors or through actual entry by new competitors. Competitors attempt to duplicate the advantages of successful firms through imitation of product or process innovations. In some cases the threat of entry—or a demonstration that the market is contestable—might be sufficient to eliminate positive spreads with no actual entry occurring. If several firms have nonzero spreads arising from identical or similar sources, interfirm rivalry might provide a second mechanism to dissipate excess profits. Yet another route for adjustment is migration of demand to substitute products (which may themselves migrate in product characteristic space to become closer substitutes to highly profitable products). Finally, if markets for factors of production are not perfectly competitive, factor prices might change to allow suppliers to capture part of the rents inherent in the positive spreads; for example, wages might rise.

Some combination of these adjustment mechanisms is likely, but full adjustment probably takes time. Various factors affect the speed of adjustment. These factors may be classified as either structural characteristics of banking markets, or aspects of the conduct of competitors in those markets. Among the more important structural characteristics is the cost of acquiring and using information: the cost to existing and potential competitors of observing relevant data about products, technology, and prices, and then analyzing or making sense of those data to formulate strategy. Other important structural characteristics relate to the speed with which producers and consumers can respond to new information. The cost of many of these adjustments may be convex as a function of the size of the adjustment per period, and therefore lower if adjustment takes place slowly over time. Examples include the cost of adding appropriate capacity (acquiring technology, building facilities, hiring or training specialized staff), the cost of altering characteristics of products or their pricing, and the cost to customers of switching to a different producer. In addition to structural characteristics, the conduct of various players may also matter a great deal. For example, firms with positive spreads may act to obscure vital information about aspects of the market or may take other steps to raise the cost of entry. Finally, government regulatory or other policies may either inhibit or encourage adjustment in certain industries.

The more significant the impediments to competitive adjustment are in a particular market or industry, the slower the adjustment will be, and the further that market or industry will depart from the perfectly competitive norm. The persistence of positive economic profits, or the extent to which nonzero profits in one period tend to be sustained in future periods, therefore might be considered an indicator of market competitiveness. A "competitive" market is one that rapidly reachieves competitive (zero profit) equilibrium.[2]

Firms also may have negative economic profits, earning less than the normal return to capital. No firm would intentionally create such a "negative spread" for itself; negative spreads arise through unsuccessful product innovation, overestimation of demand, process experimentation gone awry, relative successes of competitors, or simple misfortune. Whatever the source, negative spreads also represent disequilibria. The return to equilibrium occurs through exit, broadly defined: Abandonment of unsuccessful processes or products, reduction of capacity, or perhaps even the disappearance of firms from the market. As with positive-profit disequilibria, adjustment is unlikely to be instantaneous, so negative spreads may persist as well.[3]

III. EMPIRICAL STUDIES OF COMPETITIVE ADJUSTMENT

I am aware of no previous papers that look directly at the persistence of bank profits, although profit persistence has been examined in other industries.[4] For example, Mueller (1977) examines changes in the profitability rankings of firms; Mueller (1986) deals with profit persistence and related issues in more depth. Geroski and Jacquemin (1988) present data on rates of profit change for a sample of industrial firms in three European countries. These studies examine the convergence of profitability to a long-run mean value, either for industries or for the economy as a whole; without exception, they exclude banks. Relevant conclusions from previous studies are discussed in Section VIII.

Several studies in the banking literature examine the loosely related issue of price "stickiness." For example, Neumark and Sharpe (1992) assess the speed with which interest rates on retail bank deposits change when market interest rates change; Hannan and Berger (1991) examine the frequency of deposit rate changes. These price adjustment studies generally focus on the effect of market structure—primarily the number and relative size of competitors—on price adjustment. The idea that firms in concentrated markets might have some degree of market power and use it to manipulate prices in their favor (dynamically as well as statically) is intuitively plausible. Such firms could act to accelerate or retard the rate at which prices adjust to supply and demand shocks, affecting the speed of adjustment when the equilibrium point shifts. However, Worthington (1989) points out that the relationship between market structure and the degree of price stickiness is theoretically ambiguous; markets characterized by fewer firms might have either faster or slower rates of price adjustment.[5]

Despite the theoretical ambiguity, the deposit rate studies generally find that banks in more concentrated markets have been slower to change interest rates on deposits when market rates change. Neumark and Sharpe (1992) find evidence of asymmetry: Banks in concentrated markets are less likely to raise rates when market rates rise, but more likely to reduce them when market rates fall; the asymmetry thus runs in the banks' favor. However, the pricing results must be interpreted with some caution. Bank deposits are multidimensional products; if deposit rate changes are costly for banks, then banks may find it less expensive to adjust other aspects of the deposit product when market conditions change. Prices might appear to be sticky even if full, multidimensional adjustment is rapid and continuous.

Overall, the price stickiness literature suggests the presence of factors in the banking industry that could lead to the persistence of disequilibria. Prices that are slow to adjust to exogenous changes might be one manifestation of the types of impediments to competitive adjustment discussed above in Section II. If these factors create a rate of adjustment that is materially slower than in other industries, then bank profits may be measurably more sticky as well.

IV. PROFIT PERSISTENCE AND MARKET VALUE

Let $\tilde{R}_{it}$, represent the rate of economic return for a discrete period (taken to be one year) on beginning-of-period shareholder equity for bank i at time t. I model this return as the sum of a longer-term component, R_{it}, and a transitory component, η_{it}, so that $\tilde{R}_{it} = R_{it} + \eta_{it}$. I assume that η_{it}

2. Conceivably, the frequency with which nonzero profits arise also might be relevant, although frequent deviations from zero profits might simply indicate a high rate of innovation within the industry.

3. The term "equilibrium" as used here refers to long-run steady-state equilibrium. If adjustment to demand and supply shocks occurs over several periods, changes may follow some optimal path, with each period's outcome therefore representing a short-run equilibrium. In the terminology of this paper, the intermediate states all are referred to as points of disequilibrium.

4. Unpublished work by Gup, Lau, Mattheiss, and Walter (1992) sheds indirect light on the persistence of bank profits. The relevant results from their Markov analysis are discussed below.

5. Worthington (1989) demonstrates that price stickiness increases with seller concentration, all else equal, but *falls* with the conjectural variation parameter (a measure of the extent of collusive/cooperative behavior in setting output levels), which probably also rises with concentration; hence, structure and conduct may have offsetting effects on price stickiness.

has a stationary distribution with an expected value of zero for all t, so that the expected rate of return for period t is R_{it}. The normal risk-adjusted return on equity capital (that is, the cost of equity including an appropriate risk premium) is assumed constant ex ante at k_i for any given firm, but varies across firms. Economic profits differ from zero if $\tilde{R}_{it} \neq k_i$, which can occur either because R_{it} differs from k_i, or as a result of transitory shocks ($\eta_{it} \neq 0$). Competition generally pushes R_{it} toward k_i, and in perfectly competitive equilibrium, spreads are zero, with $R_{it} = k_i$.

It is important to understand the distinctions between the different rates of return defined here. The required return k_i is the return an investor can expect to earn on the firm's shares if purchased in the secondary market. It is the opportunity cost of capital. Ex ante, that rate can be estimated from an asset pricing model, such as the single-factor Capital Asset Pricing Model used below. If a firm is earning economic rents, an investor fortunate enough to be able to invest a dollar directly in the firm's assets—through reinvestment of earnings or through the purchase of newly issued shares, as opposed to secondary share purchases—will participate in those rents and receive a return that exceeds the opportunity cost k_i. The expected value of this rate of return on equity is R_{it}. Efficient capital markets adjust the price of shares so that the expected return in the secondary market is always k_i, but adjustments in markets for the goods and services produced by the firm (or for the inputs consumed by the firm) are necessary if R_{it} is to be driven to k_i. A maintained assumption of this paper is that capital markets are efficient, but markets for goods and services may not be, so that market power or the other impediments to complete and instantaneous adjustment discussed above could lead to observed differences between R_{it} and k_i at any point in time. A firm with a positive spread has $R_{it} > k_i$ by definition.[6]

Modeling the path of R_{it} as a partial adjustment process with adjustment speed λ gives:

$$R_{it} = R_{it-1} - \lambda(R_{it-1} - k_i), \tag{1}$$

or

$$(R_{it} - k_i) = (1 - \lambda)(R_{it-1} - k_i). \tag{2}$$

Thus, if λ is equal to one, adjustment is essentially instantaneous, in that nonzero spreads vanish within one period of their appearance. If λ is equal to zero, no adjustment occurs, and spreads are infinitely persistent; in that polar case, once a wedge between R and k develops, it lasts forever. Intermediate values of λ imply that the rate of return on equity gradually moves toward k in the long run. The actual speed of adjustment depends on aspects of structure and conduct within the industry, as discussed above.

Time Series versus Cross Section

Given observations or estimates of R_i and k_i, the adjustment parameter λ in principle could be estimated from time-series data, either for individual firms or for the industry as a whole. However, time-series methods generally require either that λ be constant over time or that it change in some systematic way. The size, speed, and unpredictability of recent changes in the financial sector, and especially in banking, make it unlikely that λ would be sufficiently stable over a period long enough to permit confident statistical estimation. Time-series estimates of the adjustment speed therefore may be untrustworthy.[7]

An alternative approach, taken here, is to infer the speed of adjustment from the market capitalizations of banking firms. If share markets are efficient, share prices incorporate market expectations of the future stream of economic earnings; that is, the path of the expected R_{it} for $t = 1 \ldots \infty$ is embedded in the current market value of equity M_{i0}. Although R_{it} and λ cannot be observed directly, the implicit values used by the market to evaluate bank shares can be calculated. Inferring R_{it} and λ requires an appropriate model of the relationship between M_{i0} and the R_{it} path; the values inferred are then conditional on market beliefs and on the model used to replicate market pricing. I assume that the adjustment speed is the same for all firms, so that cross-sectional estimation is possible.

A Model of Market Value with Persistent Profits

A simple financial model of the value of shares[8] specifies that the current market value of equity at time $t = 0$ is equal

6. I assume throughout that producers are differentiated to some degree, so that R_i and k_i may vary across banks. The differentiation may stem from variations in product characteristics, or from differences in the geographic location of products for which value depends to some degree on proximity to the consumer, as is likely in the case of retail deposits.

7. The likely instability of the competitive adjustment speed might seem to question the assumption that λ is independent of t in equation (1). However, λ can be viewed as an expectation based on current information; I assume that λ is not *expected* to change systematically over time. This assumption about expectations is necessary for cross-sectional estimation. (The assumption may be violated if, for example, changes in regulations lead to anticipation of future changes in the vigor of competition or the difficulty of entry into banking markets.) In contrast, time-series estimation would require that λ *actually be* constant (or its variation captured within the model) during the period from which the sample data are drawn.

8. A similar model is developed by Wilcox (1984), although that model has an arbitrary finite horizon, and implicitly assumes that the rate of

to the discounted value of expected future cash flows CF_{it} for firm i:

$$(3) \qquad M_{i0} = \sum_{t=1}^{\infty} \frac{CF_{it}}{(1+k_i)^t} .$$

Expected cash flow is defined as expected economic earnings flowing to equity, net of any reinvestment or new equity contributions.[9] Letting E_{it} represent total contributed (including previously reinvested) equity at date t (the end of period t), and defining g_{it} as the rate of increase in E_i during period t, expected economic earnings at date t are equal to $R_{it}E_{it-1}$, and new investment is equal to $g_{it}E_{it-1}$. Then expected cash flow for bank i at date t is:

$$(4) \qquad CF_{it} = (R_{it} - g_{it})E_{it-1} .$$

However, only the realizations of variables at $t=0$ or earlier points in time can be observed currently, so (4) must be rewritten to express cash flow at any t in terms of current values. Recursive substitution in (2) yields an expression for the spread $(R_{it} - k_t)$ in terms of the current spread between R_{i0} and k_i:

$$(5) \qquad (R_{it} - k_i) = (1 - \lambda)^t (R_{i0} - k_i) .$$

Rearranging gives an expression for R_{it} in terms of current values:

$$(6) \qquad R_{it} = (1 - \lambda)^t (R_{i0} - k_i) + k_i .$$

Note that at $t=0$ the expected return and its realization are identical and equal to R_{i0}.

I make the simplifying assumption that the rate of equity investment is expected to be constant for each firm, so that $g_{it} = g_i$ for all $t>0$. (This corresponds, for example, to a constant "plowback" rate for earnings.) It directly follows that contributed equity evolves over time according to $E_{it} = (1+g_i)E_{it-1}$. In terms of the current value E_{i0}, contributed equity at future dates can be written as:

$$(7) \qquad E_{it-1} = (1 + g_i)^{t-1} E_{i0} .$$

Substituting (6) and (7) into the cash flow equation (4) yields:

$$(8) \qquad CF_{it} = ((1-\lambda)^t (R_{i0} - k_i) + k_i - g_i)(1+g_i)^{t-1} E_{i0} .$$

Finally, substitution back into the equity market valuation equation (3) gives:

$$(9) \qquad M_{i0} = \sum_{t=1}^{\infty} \frac{((1-\lambda)^t (R_{i0} - k_i) + k_i - g_i)(1+g_i)^{t-1} E_{i0}}{(1+k_i)^t} .$$

competitive adjustment is zero and that accounting returns accurately represent economic returns. The model of P/E ratios in Leibowitz and Kogelman (1990) is in the same spirit.

9. This definition of cash flow roughly corresponds to total dividends paid, although it also accounts for new equity contributed by stockholders.

Since all variables in (9) are as of $t=0$, the time subscripts on M_i, R_i, and E_i can be suppressed to simplify notation; from this point forward, these variables should be understood to have an implicit time subscript of 0.

This expression can be simplified further by splitting the infinite sum into two separate summations and applying the useful fact that $\sum_{t=1}^{\infty} x^t = x/(1-x)$ as follows:[10]

$$(10) \qquad \sum_{t=1}^{\infty} \frac{((1-\lambda)^t (R_i - k_i) + k_i - g_i)(1+g_i)^{t-1}}{(1+k_i)^t}$$

$$= \left(\frac{1}{1+g_i}\right)\left[(R_i - k_i) \sum_{t=1}^{\infty} \left(\frac{(1-\lambda)(1+g_i)}{(1+k_i)}\right)^t + (k_i - g_i) \sum_{t=1}^{\infty} \left(\frac{1+g_i}{1+k_i}\right)^t\right]$$

$$= \frac{(R_i - k_i)(1-\lambda)}{k_i - g_i + \lambda(1+g_i)} + 1 .$$

Thus, the market value of equity can be written as:

$$(11) \qquad M_i = \frac{(R_i - k_i)(1-\lambda)E_i}{k_i - g_i + \lambda(1+g_i)} + E_i .$$

Additional insight into the model is gained by dividing (11) by E_i to create an analog of the commonly constructed market-to-book ratio:

$$(12) \qquad \frac{M_i}{E_i} = (R_i - k_i)\left(\frac{(1-\lambda)}{k_i - g_i + \lambda(1+g_i)}\right) + 1 .$$

Equation (12) shows that the divergence between market value and contributed equity for firm i is positively related to $(R_i - k_i)$, the spread between the actual economic rate of return on equity and the required rate of return. If $R_i = k_i$, then $M_i/E_i = 1$; a company without a positive spread has no surplus value to pass along to shareholders in the form of higher equity value.[11] The effect of any given spread

10. Of course, this relation requires $|x|<1$ for the sum to converge. For (10), the restrictions on the summands require only that λ be nonnegative and that k exceed g. Both conditions should be satisfied in general: $\lambda \geq 0$ is necessary for dynamic stability of the adjustment model, and $k<g$ could occur only if a firm were expected to invest forever at a rate exceeding the market rate of return on equity.

11. The M/E ratio, which is the current market value of equity divided by the value of equity contributions, can be related to Tobin's q (Tobin and Brainard, 1977). If the market value of bank liabilities is assumed to be equal to the book value of those liabilities, then $q>1$ if and only if $M/E>1$, and similarly for $q<1$ and $q=1$. The implications of q equal to or different from 1 would apply to M/E as well, subject to the usual qualifications related to the distinction between average q and marginal q. The relationship between M/E and $R-k$ implies that the cases in which R is not equal to k also correspond conceptually to values of Tobin's q different from one; in competitive equilibrium $R=k$, $M=E$, and $q=1$.

between R_i and k_i on the M_i/E_i ratio depends on λ in an intuitively appealing way: Faster speeds of adjustment to equilibrium—meaning less persistence in profits—imply smaller differences between M_i and E_i. If $\lambda=1$, then $M_i=E_i$. If spreads are more durable (λ is closer to zero) then any difference between R_i and k_i will persist longer, and those abnormal returns raise the market value of equity relative to E_i.

V. ACCOUNTING PROFITS AND ECONOMIC PROFITS

Practical application of equation (11) requires knowledge of the rate of economic return on equity R_i. No established methods exist for computing such economic profit rates. *Accounting* income can be observed and a return on equity computed; however, a variety of well-known peculiarities of accounting practice make it unlikely that accounting returns will be equal to the underlying nontransitory economic rate of return.

Fisher and McGowan (1983; hereafter, F-M) are widely cited as demonstrating that accounting returns cannot proxy for economic returns. F-M present several numerical examples to establish their key propositions. As Mueller (1986) notes, F-M demonstrate that use of accounting data *can* lead to serious errors, but neither their examples nor theory can prove that the problems are material in practice. The many studies that find relationships between accounting returns and other economic variables make it implausible that in practice those returns contain *no* information about economic returns, as F-M appear to argue (see Mueller, 1986, pp. 107-108). However, it would be naive to argue the opposite, that accounting data portray underlying economic flows with perfect accuracy. A prudent interpretation of F-M is that accounting returns are potentially misleading, and may be both biased and noisy as indicators of economic returns; the possible bias and imprecision must be recognized within any model that uses accounting data.

The cash flow definition in equation (4) adjusts for some of the factors most commonly believed to make accounting and economic returns differ. For example, if an arbitrary schedule for the amortization of intangible assets improperly reduces reported income in a period, it also causes the net value of assets to decline by more than is economically appropriate during the period. The relative reduction in assets (and equity) tends to reduce measured growth g, offsetting the inappropriate reduction in the rate of return on equity. In practice, this offset is not complete because g is assumed constant over time for each firm; some allowance for possible errors in reported earnings still must be introduced.

I assume that accounting returns are related to nontransitory economic returns as follows:

$$ROE_i = \alpha + R_i + \epsilon_i, \tag{13}$$

where ROE_i is the accounting return on equity at $t=0$. The parameter α is an unobserved industry-wide bias in reported earnings incorporating two types of effects: (i) distortions due to the failure of accounting practices to reflect economic realities, and (ii) the cross-sectional mean of transitory shocks to rates of return at $t=0$. Profits also are affected by an unobserved firm-specific deviation ϵ_i, which like α subsumes any transitory shocks that cause $\tilde{R}_i$ to differ from R_i, as well as any distortionary accounting conventions peculiar to individual firms. Firm-specific deviations may be the result of events with dissimilar impact on different firms (for example, the effect of a given interest rate shock depends on the structure of a bank's portfolio); alternatively, they may reflect divergent choices in the application of accounting principles if generally accepted accounting permits some degree of latitude. Solving equation (13) for R_i gives:

$$R_i = ROE_i - \alpha - \epsilon_i. \tag{14}$$

This equation can be viewed either as a model of how the market forms beliefs regarding R_i from accounting ROE_i, or simply as a means to deduce a market estimate of R_i using the biased and noisy information in ROE_i.

For estimation, the unobserved firm-specific deviation is treated as a random variable in cross section, with the ϵ_i identically distributed with the same variance for each firm, and zero mean across firms. This formulation addresses the F-M criticisms of accounting returns. It is consistent with the possibility, stressed by F-M, that for any two firms i and j, $ROE_i>ROE_j$ but $R_i<R_j$. Given a statistical distribution of ϵ, such an occurrence in the data has some well-defined likelihood; there is always some probability that a bank with a higher observed ROE does not actually have a higher economic rate of return R. In fact, such an apparent "anomaly" may be very likely if the variance of ϵ_i is large. That the probability is positive, or even large, does not imply that accounting ROE is void of information. For a given distribution of ϵ, the larger the difference in ROE between two firms, the less likely it is that the relationship between economic returns runs in the opposite direction.

VI. ESTIMATION FRAMEWORK

Substituting R_i from (14) into (11) yields:

$$M_i = \frac{(ROE_i - \alpha - \epsilon_i - k_i)(1-\lambda)E_i}{k_i - g_i + \lambda(1+g_i)} + E_i. \tag{15}$$

For statistical estimation of the parameters α and λ, this relationship is assumed to hold in cross section at any point in time. The coefficient α may vary in sign and magnitude across sample dates, since the shocks that cause ROE_i to differ from R_i may vary over time. The adjustment speed λ also may vary, since at any point in time it reflects the market's expectation of the future path of profits conditional on available information. To account for such variation, time subscripts are added to all variables and parameters in (15). With this notational change, solving for the spread between ROE_i and k_i yields a more readily estimable form with an additive firm-specific error term:

$$(16)\quad (ROE_{it}-k_{it}) = \left(\frac{M_{it}}{E_{it}}-1\right)\left(\frac{k_{it}-g_{it}+\lambda_t(1+g_{it})}{1-\lambda_t}\right) + \alpha_t + \epsilon_{it}.$$

(The time subscripts in (16) refer to sample dates, in contrast to the time subscripts used in Section IV above, which referred to future periods viewed from a single point in time.) The coefficients of equation (16) can be estimated using nonlinear least squares from pooled cross sections of N firms at each of T sample dates.

The firm-specific ϵ_{it} are assumed to be independently and identically distributed with zero mean in cross section at each sample date t. However, the variance of the ϵ_{it} need not be the same for all t. In addition, the error terms may not be independent across sample dates; for example, a bank with large ϵ at one date may be likely to have large values at other dates as well. To account for such possibilities, the variance structure of the ϵ_{it} is assumed to be:

$$(17)\quad \mathrm{var}(\epsilon) = \Sigma \otimes I_N,$$

where I_N is the N-dimensional identity matrix, and Σ is a $T \times T$ matrix with error variances for each period on the diagonal and intertemporal covariances off the diagonal.

The coefficient estimates minimize a generalized sum of squared errors:

$$(18)\quad GSSE = \hat{\epsilon}'(S^{-1} \otimes I_N)\hat{\epsilon},$$

where S is the estimate of Σ and $\hat{\epsilon}$ is the residual vector. In essence, this is a nonlinear version of seemingly unrelated regressions. Approximate standard errors for each coefficient are computed as the square root of the corresponding diagonal element of the matrix $(G'(S^{-1} \otimes I_N)G)^{-1}$, where G is the NT-by-$2T$ Jacobian matrix of first partial derivatives. To measure the fit of the model, the $GSSE$ for the model is compared to the $GSSE$ from a null model specified as $\alpha_t = \lambda_t = 0$ for all sample dates t; this null model corresponds to the textbook constant growth accounting cash flow model with no dynamic adjustment (see Wilcox 1984 as an example).[12] Denoting the $GSSE$ from the null model as $GSSE_0$, a generalized goodness-of-fit statistic is computed as:

$$(19)\quad F = \frac{(GSSE_0 - GSSE)}{GSSE} \times DFR,$$

where DFR is the ratio of the denominator's degrees of freedom to the numerator's degrees of freedom for the first term in (19). This is analogous to the familiar regression F statistic that is isomorphic to the R^2 statistic in linear estimation.

VII. DATA

A sample of U.S. banks and bank holding companies with exchange-traded shares was drawn from Standard and Poors' Compustat database.[13] Since banking assets dominate most of the holding companies, all of the institutions in the sample are simply called "banks" throughout the paper. Cross-sectional data sets were constructed for the ends of the second and fourth quarters (June and December) for each of the six years from 1986 through 1991; these dates are denoted as 86:II through 91:IV. Banks were included in the sample if (i) the necessary market and financial data existed for each sample date; (ii) no more than two monthly stock price observations were missing over the period 81:II through 91:IV (the sample period plus the 60 months preceding the first sample date); and (iii) the stock price did not fall below one dollar at the close of any of those months. Of the roughly 150 banks in the Compustat database, 83 survived this screening.

Market capitalization M_i for each firm was calculated as price per share multiplied by the number of outstanding shares, both as of the quarterly financial reporting date; contributed equity E_i was approximated by the book value of equity at that same date.[14] By definition, g_i should equal the annual growth rate of E_i; g_i was estimated as the average growth in book equity over the previous five years. The return on equity ROE_i was computed as the sum of the four

12. Another interesting null model might be the case of $\lambda = 1$, which corresponds conceptually to unitary Tobin's q at all times. A model with $\lambda = 1$ also has constantly growing cash flows, but those cash flows provide only a normal return on equity. However, such a model fits the data so poorly that it seems an unlikely alternate hypothesis, and thus does not present a useful standard for goodness-of-fit.

13. Foreign banking organizations issuing American Depository Receipts are included in Compustat; they were excluded from this analysis. Subsidiaries of foreign banks were left in the sample.

14. This approximation is common in banking research; see for example Keeley (1990). Book value may be a reasonable proxy for the replacement value of bank equity, since bank assets and liabilities are short term, and therefore turn over relatively frequently.

preceding quarters' net income divided by book equity as of the beginning of the first of those four quarters. (For example, *ROE* for 86:II is the sum of quarterly earnings for 85:III, 85:IV, 86:I, and 86:II, divided by book equity as of 85:II.) Fifteen banks reporting a rate of return on equity of less than –50 percent were dropped from the sample.[15]

Drawing the sample from Compustat introduces the possibility that the results may not typify all firms within the banking industry, since Compustat includes only banks with publicly traded equity and such institutions tend to be larger than the average firm. For example, as of 91:IV the banks in the sample ranged from $355 million to $217 billion in assets, with a mean of $20 billion and a median of $7 billion; in contrast, the mean for the entire U.S. banking industry at that date was $257 million in assets. On the other hand, precisely because they are large, these firms account for nearly two-thirds of the assets of the U.S. banking sector, and therefore may provide a useful picture of the industry.

The Equilibrium Return on Equity

The firm-specific cost of equity k_i was calculated using the Sharpe-Lintner Capital Asset Pricing Model, using methods recommended by Ibbotson Associates (1991) for computing discount rates for long-term investments. Beta coefficients were estimated for each bank using monthly stock returns for the preceding 60 months.[16] Annualized required rates of return on equity were constructed from the betas by adding a base Treasury bond rate to the product of the estimated beta and a market risk premium of stocks over Treasury securities. Ibbotson Associates report an average equity premium of about seven percentage points, with only minor differences depending on the bond maturity used; accordingly, 0.07 is taken as the market risk premium.

Most references on practical calculation of risk-adjusted rates of return (for example, Copeland, Koller, and Murrin 1990, and Ibbotson Associates 1991) recommend using a rate on medium or long-term Treasury bonds as the risk-free rate to construct discount rates for equity cash flows. This leaves open a fairly wide range of possible maturities. A rough estimate of the "modified duration" of the bank stocks in the sample was constructed by computing the theoretical partial derivative of market value with respect to k. On average for this sample, a 100 basis point increase in k reduced market value by approximately 23 percent, suggesting a duration of about 23 years. However, it is unlikely that changes in k would occur without some change in other variables, most notably R, the rate of return on equity; this is especially true for banks. If R changes in the same direction as k, then the partial derivative with respect to k overstates the duration of equity. Under the alternative assumption that changes in R and k are equal (parallel shifts in all rates of return), the average duration falls to approximately 10 years. The true duration of these stocks is probably somewhere between the extremes of 10 and 23 years.[17] A rate on 20-year Treasury bonds might be ideal, as the duration typically would fall in the desired range, but consistent data are not available for that maturity. However, since there is generally a difference of only a few basis points between any of the maturities from 10 years on out, the rate on 10-year Treasuries is used as the risk-free rate for the CAPM calculations. Sensitivity analysis (discussed below) shows that the main results of the paper are robust to changes in assumptions regarding k.

VIII. Estimation Results

The model was estimated from the pooled cross sections using equation (16). Figure 1 presents the resulting adjustment coefficients (the λ_{it}) graphically. The shaded band reflects a 95 percent confidence interval based on the standard errors of the estimates, with the point estimates given by the solid line in the middle of the band. The estimated adjustment speeds are not significantly different from zero during the period 88:II–90:II, but otherwise significantly exceed zero, reaching a high of 0.082 in 87:IV. A conservative conclusion is that the market believes competitive forces operate in the banking industry to push economic profits toward zero, although the forces are not strong and at times may be nonexistent. Moreover, in all periods λ clearly is significantly less than the value of 1.0 that would characterize an ideal world of frictionless instantaneous adjustment to zero profit equilibrium.

To put the adjustment speeds in perspective, λ can be reinterpreted in terms of the time required for nonzero spreads to decay. Corresponding to each λ is an implicit

15. Within the simple partial adjustment model of profit persistence, sufficiently negative rates of return on equity can imply negative market values, which are impossible under limited liability. The elimination of banks with large negative profits is a stopgap solution; more elegant approaches might allow for the rate of profit adjustment to be faster for these very unprofitable firms.

16. Returns were computed as the change in the log of the monthly closing stock price. One firm, Landmark Bancshares, had negative betas for some dates; it was dropped from the sample.

17. Such a range also is consistent with the likely range of asset and liability durations for banks. For example, with 8 percent capital, asset duration of 1.5 years, and liability duration of 0.5 years, the balance sheet identity implies an equity duration of 13 years.

FIGURE 1

ADJUSTMENT SPEED COEFFICIENT

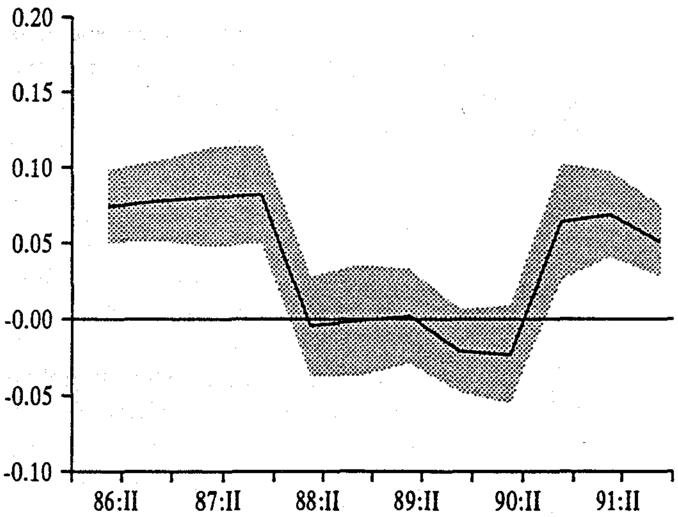
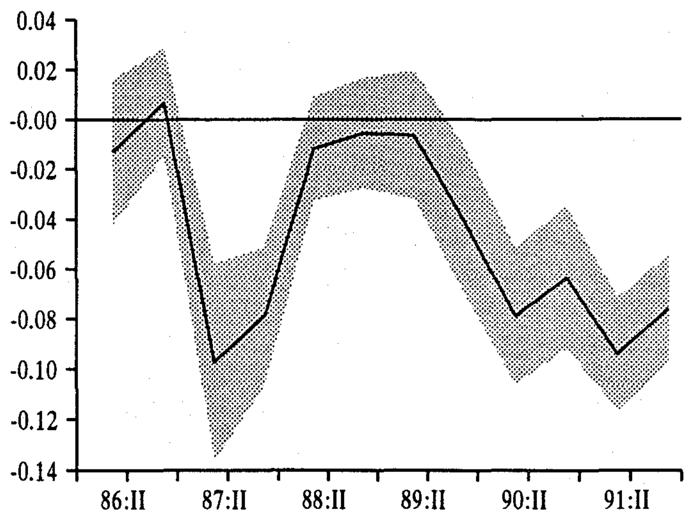


FIGURE 2

ACCOUNTING RETURNS MINUS ECONOMIC RETURNS



half-life of positive or negative spreads. From (5), the number of years h required for any initial spread between R_{i0} and k_i to fall by half can be calculated by setting $(1-\lambda)^h$ equal to ½, or:

$$h = \frac{-\log(2)}{\log(1-\lambda)} . \tag{20}$$

Excluding the five consecutive periods for which the estimated λ is not significantly different from zero, h ranges from 8.1 years in 87:IV to 13.2 years in 91:IV.

Figure 2 presents the results for the *ROE* bias coefficient α, again with a 95 percent confidence interval shaded around the central line of point estimates. As the figure shows, almost all of the estimates of α are negative, implying that the stock market prices bank shares as if accounting *ROE* understates expected economic returns. In seven of the twelve sample periods, the estimates of α are significantly negative at the 5 percent level.

For the set of estimates illustrated in Figures 1 and 2, the goodness-of-fit measure defined in equation (19) was 9.93. This statistic is roughly comparable to the conventional F statistic testing the restrictions of a null model with $\alpha = \lambda = 0$ for all periods, for which the 5 percent critical value is 1.53 in this case. The difference suggests that allowing for persistent profits and biased accounting may add significantly to the fit of the cash flow valuation model.

Sensitivity to the Asset Pricing Model

The constructed equilibrium rates of return on stockholder equity k reflect many relatively arbitrary assumptions. The beta coefficients used to calculate the individual k_i are themselves subject to estimation error, and the simple CAPM may not even be an appropriate model of returns, particularly for banks (for example, see Flannery and James 1984). Thus, the robustness of the results to errors in k must be examined.

As one test of the sensitivity of the results to potential errors, the individual k_i were replaced at each date by the average k for all of the sample banks in that period. This substitution eliminates all interfirm differences in the assumed equilibrium return. The model was then reestimated; the resulting adjustment coefficients were little different from the results reported in Figure 1. The model also was reestimated under several alternative assumptions about the CAPM parameters: The assumed risk-free rate was raised and lowered by 1 percentage point, and the market risk premium was raised and lowered by 1 percentage point. In all cases, the resulting estimates of the adjustment speed were well within one standard error of the original estimates for each period.

As one final sensitivity test, required returns were set uniformly equal to the average *ROE* for the sample at each date. This case is of more than passing interest, since previous studies of profit persistence (Mueller 1986, and Geroski and Jacquemin 1988) use the average accounting return for the industry as the estimate of the normal or equilibrium rate of return. Figure 3 shows the estimated adjustment speed coefficients in the same format as the earlier charts. The estimates of λ generally are higher than in Figure 1, although the basic pattern and overall conclusions are unchanged. Figure 4 gives the corresponding estimates of α, the *ROE* bias coefficient. Not surprisingly, the estimates are insignificantly different from zero for most periods; if average *ROE* is the expected long-run economic rate of return, then observed *ROE* for each bank is much more likely to be an accurate reflection of "true" economic returns. Despite these differences, the key substantive conclusions regarding bank profit persistence are unchanged.

Since in all cases the essential qualitative conclusions are the same, it seems safe to infer that the results are relatively insensitive to the required rates of return and that any errors introduced by the assumptions are likely to be inconsequential. Moreover, the fundamental conclusions probably would be robust under alternative models of bank stock returns. One notable exception might be a return model of the type suggested by Fama and French (1993), in which required stock returns depend on variables such as the size of the firm and the price-to-book ratio. Since the price-to-book ratio appears in the estimation above, and since bank size may be related to variables such as profitability or the growth rate, the results of the model might be substantially affected if the Fama-French approach were used to construct estimates of k_i.

Test of Coefficient Restrictions

Tests of the stability of the accounting bias parameter α and the adjustment speed λ can be constructed from the pooled cross-sectional model by restricting the coefficient estimates across sample dates. Besides indicating whether the estimates differ significantly over time, the restricted estimates are useful as rough indicators of the typical values of the parameters across the 1986–1991 period.

The restricted estimate of the adjustment speed (with α permitted to vary over time) is 0.048, with a standard error of 0.006. The restricted estimate of α with λ unrestricted is -0.044, also with a standard error of 0.006. When both coefficients are restricted, the resulting estimates are $\lambda = 0.056$ and $\alpha = -0.042$, both with standard errors of 0.005. However, in all cases likelihood ratio tests reject the restrictions (at the 5 percent level) in favor of the unrestricted model.

Comparison with Other Studies

The speeds of profit adjustment in Figure 1 are much slower than the speeds of price adjustment found in studies of bank deposit interest rate stickiness. For example, Neumark and Sharpe (1992) find rates of adjustment of 0.25 to 0.35 *per month* for money market deposit accounts and six-month certificates of deposit (see their Table III and related discussion). This difference suggests that profit persistence is not simply an extension of deposit rate persistence.

FIGURE 3

ADJUSTMENT SPEED, WITH K = AVERAGE *ROE*

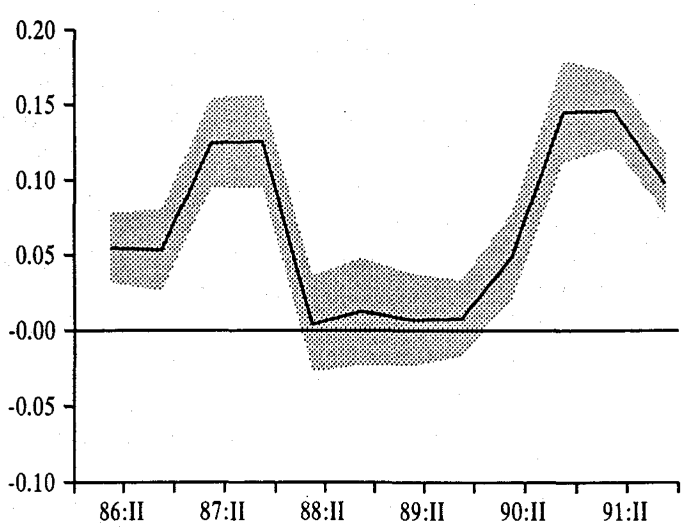
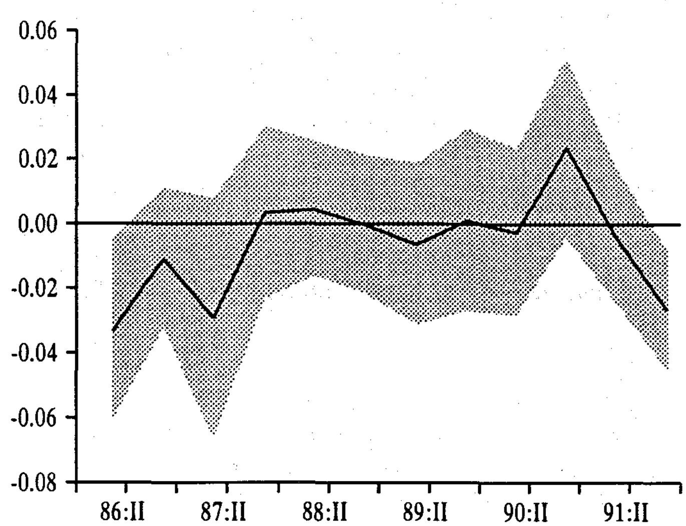


FIGURE 4

ACCOUNTING BIAS, WITH K = AVERAGE *ROE*



The degree of profit persistence also can be compared to figures for nonbank firms. Results in Geroski and Jacquemin (1988, their Tables 1 and 2) for European firms imply annual adjustment speeds for profits averaging 0.48 to 0.55. Individual industries range from 0.35 for metal processing to 0.75 for metal manufacturing and 0.68 for chemicals and automobiles.

The most extensive previous study of profit persistence is the book by Mueller (1986). Several significant differences between Mueller's study and the more limited present paper should be noted. Mueller samples 600 U.S. firms (none of them banks), and constructs a time series of abnormal profits for each firm covering the period 1950 through 1972.[18] Mueller estimates two models: one in which the economic profit rate converges hyperbolically to a rate that may differ from the competitive equilibrium level, and a partial adjustment model that is more nearly analogous to the model of returns in equation (5) above. In the partial adjustment model, Mueller's results imply profit adjustment speeds ranging from 0.434 for the 100 highest profit firms to 0.546 for the 100 lowest profit firms.[19] Comparing these results to Figure 1, Mueller's adjustment speeds are well above any reasonable confidence interval for the estimated values of λ in the banking industry, implying that bank profits are significantly slower to adjust than are profits in other industries. A degree of caution is appropriate, since the estimation methods differ considerably between Mueller (1986) and the present paper. Figure 3 may provide a better comparison, since those estimates incorporate an assumption parallel to Mueller's, namely that returns tend toward their average. Even the higher adjustment speeds in Figure 3 are well below Mueller's estimates.

Mueller also finds that the firms with the highest profitability have significantly more persistent profits. Some related evidence for the banking industry emerges from Gup, Lau, Mattheiss, and Walter (1992). Gup, et al., compute Markov transition probabilities for banks in various states of asset size and profitability, as measured by return on assets (*ROA*). Each *ROA* state is defined to be 5 percentage points wide, with the median state at $-.03$ to $+.02$. Gup, et al., find that banks in the *ROA* state just above the median have a lower probability of moving to the median state each period than do banks in the *ROA* state just below the median, .39 versus .58.[20] These results suggest the need to allow for possible asymmetries in adjustment; this idea is developed further in the next section.[21]

IX. Asymmetry in Profit Adjustment

There are good theoretical reasons to suspect that symmetric treatment of positive and negative spreads is inappropriate. For example, firms with positive spreads may take steps to extend, protect, and prolong those spreads if the marginal benefit of such actions outweighs their marginal cost. Firms with negative spreads, on the other hand, probably attempt to eliminate or reverse the situation as rapidly as possible. Moreover, if information is imperfect, a determinant of the rate of adjustment may be the speed with which any situation of nonzero economic profits is recognized, its sources understood, and appropriate actions taken in response. For a firm with a positive spread, it is outsiders who must notice the advantage, decide what has created that nonzero spread, and figure out how to replicate what the successful firm is doing. Outside observers face a filtering problem, since positive profits for one firm may be the result of transitory shocks to rates of return. A firm with a competitive edge might even act to obscure relevant information from competitors. In contrast, negative spreads often may result from a firm's own miscues, so that much of the information necessary to make the adjustment is internal and therefore much more readily available at lower cost. A pronounced information asymmetry for above-normal profits compared to below-normal profits would make positive spreads more persistent than negative spreads.

One test for such differences would divide the sample into two groups according to profitability, firms with $R_i \geqslant k_i$ in one group and firms with $R_i < k_i$ in the other. But as noted above, nontransitory economic rates of return on equity R_i are unobservable. A sample division based on the spread between accounting ROE_i and k_i would result in some firms with particularly large positive or negative ϵ_i (transitory return shocks or accounting distortions) being misclassified. However, note from equation (12) that $R_i < k_i$ if and only if $M_i < E_i$; thus, an appropriate division of the sample results from grouping firms according to whether the observable M_i is greater than or less than the observable E_i.

18. Unlike the present study, Mueller takes average pre-interest return on assets as the estimate of the normal profit rate; the constructed economic returns therefore do not allow for differences in risk across firms.

19. Note that Mueller structures his model to estimate a *persistence* parameter rather than an *adjustment* parameter; thus the "λ" he estimates is equal to $1-\lambda$ as defined in this paper.

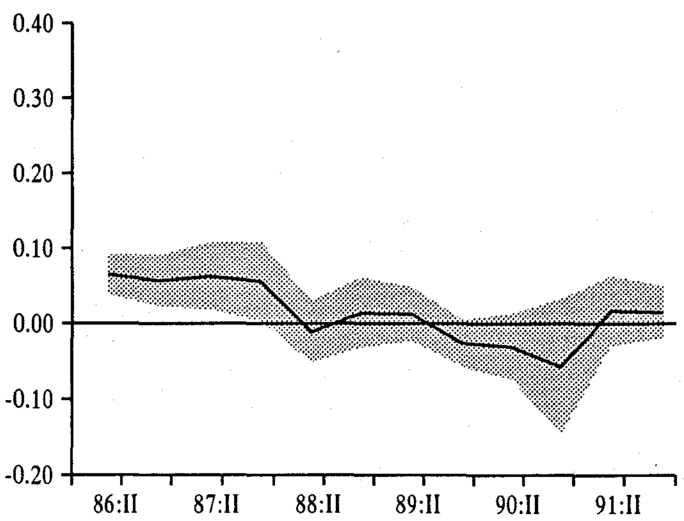
20. The results cited here are for banks in the \$500 million to \$33 billion range, the only group in Gup, et al., for which any banks diverge from the median *ROA* state.

21. However, Gup, et al., also find that the few banks in *ROA* states substantially below the median tend to remain there, which suggests a more complicated asymmetry than is investigated here.

The sample was separated accordingly into two groups for each date around an M_i/E_i ratio of 1.0, and the model was reestimated allowing λ to differ between the groups. Figure 5 presents the adjustment speed results for the profitable firms—that is, those with $M_i \geqslant E_i$ and $R_i \geqslant k_i$—with unprofitable firms in Figure 6.

FIGURE 5

ADJUSTMENT SPEED, HIGH-PROFIT BANKS



The results show that restricting λ to be the same across the entire sample at a given date masks substantial differences between profitable and unprofitable firms. Comparing the results to Figure 1, profitable firms tend to have slower adjustment speeds, unprofitable firms faster. The estimated adjustment speed for profitable firms is significantly different from zero for only the first 4 of the 12 dates. Adjustment speeds for the unprofitable group tend to be higher, but vary considerably over the 1986–1991 period, and tend to have larger standard errors. The lowest values in 88:II–89:II are insignificantly different from zero. The high in 86:II is 0.25, and the adjustment speed for unprofitable banks rises to 0.21 at 91:IV from its trough in 88:IV. Figure 7 displays the difference between the adjustment speed coefficients for unprofitable and profitable firms, with a 95 percent confidence interval for the difference. The difference is generally positive, significantly so at 8 of the 12 sample dates, consistent with the hypothesis that negative spreads disappear more quickly than positive spreads. As in the symmetric case, a likelihood ratio test solidly rejects restricting the coefficients to be equal across time periods.

The results imply that positive spreads in banking are more persistent than negative spreads. The difference in the speeds with which R approaches k from above and below implies a prediction for studies of intraindustry mobility. Banks that achieve superior performance should maintain that position for a relatively long time; hence the same names should appear consistently among the top

FIGURE 6

ADJUSTMENT SPEED, LOW-PROFIT BANKS

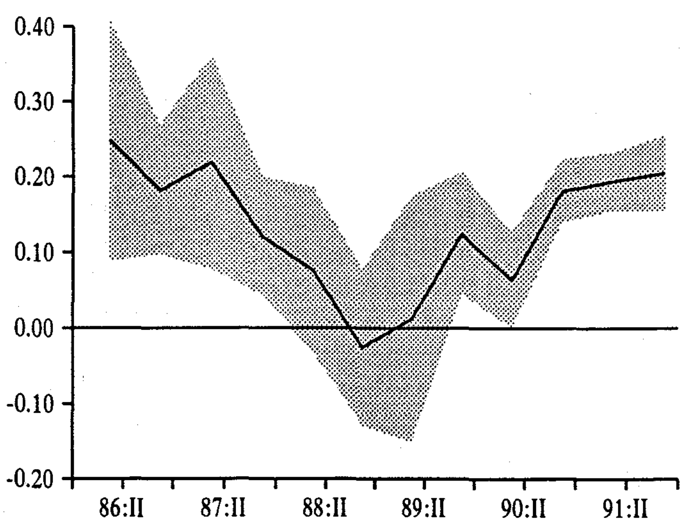
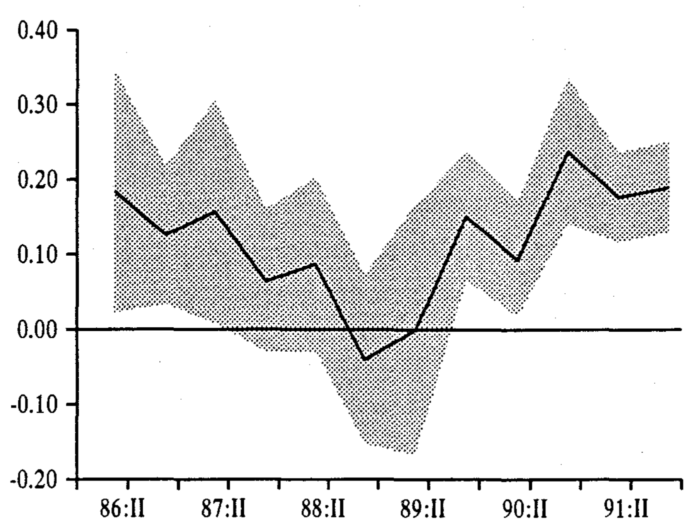


FIGURE 7

DIFFERENCE IN ADJUSTMENT SPEED



group of banks for several periods. The quicker reversal of situations of low profitability means that firms falling toward the bottom ranks should tend to climb up fairly rapidly, to be replaced by other firms suffering setbacks that push returns below the cost of capital. A rough but simple test of this empirical prediction might use any of the many sets of published rankings of banks to look at relative turnover in upper and lower quantiles. Mueller (1977) finds evidence of such an effect in his study of profit rates using a broad sample of industrial firms.

X. A Comment on Capital Ratios and Deposit Insurance

Federal insurance of bank deposits is a prominent feature of the U.S. banking system. This section considers the implications of deposit insurance for the adjustment speed results. The insurance pricing schedule in effect at the sample dates probably led to imperfect pricing of the federal guarantee.[22] Premiums paid by each bank depended only on the size of the bank as measured by deposits, and did not reflect other factors that affect the economic value of the insurance, most notably risk. It is likely that banks with a higher probability of failure underpaid for their insurance; for these banks, the net value would represent an off-balance-sheet asset. Other banks that overpaid for insurance bore a net off-balance-sheet liability. (See Marcus and Shaked 1984, or Ronn and Verma 1986, for estimates of the fair market value of deposit insurance.)

It is easy to find evidence that the net value of deposit insurance might be correlated with the profitability of a bank. Chi-square tests using the data set from this paper confirm that banks with $M/E<1$ tend to have lower equity capital ratios than banks with $M/E\geqslant 1$. Conventional theory says that a bank's market capital ratio affects the probability of failure, and therefore the value of deposit insurance: Lower ratios raise the value of the guarantee, all else equal. As a result, the value of deposit insurance probably is related to capital ratios to some extent, and thus to market-to-book ratios, although the latter correlation may be spurious.

The impact of any such relationship on the model may be minor. One implication is that use of the simple CAPM is not strictly appropriate, since bank stocks have significant aspects of contingent claims under these conditions. However, as discussed above, the estimation results are not very sensitive to the choice of required rates of return. A second implication is that market-to-book ratios will tend to be higher for low capital banks than they would have been absent imperfectly priced deposit insurance. But measured rates of return on equity also will be higher, as the benefits of the deposit insurance subsidy flow through to the banks' income. The relationship between returns and the M/E ratio, which is the foundation of the model, may be little affected. Put differently, the model specifies a relationship between expected future cash flows and the market value of equity. If deposit insurance affects expected cash flows, it affects market value, and that effect is captured within the model; if deposit insurance does not affect expected cash flows, then it cannot affect market value.[23]

XI. Conclusions, Implications, and Possible Extensions

This paper presents a model of the market value of firms in which profits are persistent. Zero profit equilibrium is reestablished gradually when positive or negative spreads generate a return on equity different from the required return. The resulting nonlinear model can be estimated using stock market data, in which case the parameter estimates reflect market beliefs about the degree of profit persistence. The model is applied to the banking industry, with a sample of large U.S. banks. Results generally indicate that the market views the rate of competitive adjustment as positive. Despite the protection extended to the banking industry by government regulatory policies, there appear to be forces operating to eliminate nonzero profits, and any nonzero spreads can be expected to be temporary rather than permanent; however, the pace of adjustment is slow. When the sample is split into two groups—banks with economic returns below the cost of equity and banks earning at least their cost of equity—the estimated speed of adjustment for negative spreads generally exceeds that for positive spreads, although not always significantly so.

The model used is a relatively simple discounted cash flow model of the value of shares. The features that

22. This comment refers to the explicit pricing structure. It is possible that other elements of the regulatory process associated with deposit insurance brought the true cost of the insurance more closely in line with its value.

23. The correlation between capital ratios and market-to-book ratios creates a degree of ambiguity, in that the data cannot be used reliably to test the hypothesis that *profitable* banks have slower adjustment speeds than unprofitable banks against an alternative hypothesis that *high-capital* banks have slower adjustment speeds than low-capital banks. However, it is not clear why adjustment speeds should depend on capital. It is occasionally claimed that regulators pressure low-capital banks to increase profits to rebuild capital; this story rests on questionable assumptions about bank behavior, since it is in banks' interest to raise profits as rapidly as possible, regardless of any pressure from regulators.

distinguish it from other such models are (i) that accounting ROE reflects, albeit imperfectly, the economic rate of return R (and therefore the rate of economic profits for any given required return k), and (ii) that competitive forces tend to push economic profits toward zero over time.

No effort is made to identify the sources of the profit persistence evident in the banking data. A high degree of profit persistence might simply follow from the nature of the banking business; perhaps information costs are exceptionally high, or innovations are difficult to imitate successfully. On the other hand, persistence could result from impediments to competition created intentionally by the banks or unintentionally by government policies. In principle, one could identify the markets in which sample banks operate, and test whether profit persistence is systematically related to market structure. However, a valid test would be difficult or impossible with available data. Banks that are large enough to have publicly traded equity generally operate in many different banking markets, each with different structural and behavioral features. Profit persistence almost certainly varies across geographically separate markets, but there is no realistic way to attribute total bank profitability to specific local markets.

Nevertheless, the results may have implications for the way competitive performance is evaluated. In a world of uncertainty, imperfect information, and adjustment costs, profits may turn positive temporarily and then adjust back to zero over time; the existence of nonzero profits at a single point in time, or even over several periods, is not a practical signal of lack of competition. Ultimately, dynamic competitive performance may be more important than static performance. Thus it may be more useful to gauge the degree to which a market is competitive by how rapidly any excess profits disappear. Adjustment speeds could be calculated using the method described in this paper, especially when the results of time-series estimation may be untrustworthy. The method used here distinguishes between economic returns and accounting returns, and filters out transitory elements of the economic returns.

Several possible enhancements to the model seem desirable. One modification would allow for the possibility that profit rates might converge to some nonzero long-run value, that is, that R might converge to some value $R^* \neq k$. Mueller (1986) finds substantial differences across industries in the long-run profit rate to which individual firms converge (although he also reports evidence that in the *very* long run these differences tend to disappear). Lambson (1992) provides theoretical justification for Mueller's empirical observation, arguing that long-run economic profits can be nonzero. Another potential modification would allow the adjustment speed to be a function of the absolute spread between R and k. Larger positive spreads may be more likely to stimulate a response for two reasons: (i) large excess profits are more obvious, and (ii) greater potential rewards might compensate would-be entrants for the uncertainty they face, or for any fixed costs of entry. Similar comments apply to negative spreads, with the affected firm facing a large potential payoff from rapid adjustment. Finally, it may be useful to investigate whether other obvious groupings—related to firm size or other characteristics—affect the degree of profit persistence.

The model presented above permits the growth rate to vary across banks, but assumes that the market expects growth to be constant for any individual bank; this assumption is made for the sake of tractability, not realism. An enrichment of the model would allow g to depend on the size of any positive spread. In the model, the value of equity increases with g, provided $R>k$. It is possible that firms with a spread-creating competitive advantage face a strategic choice: Raise profit margins to increase the spread between R and k, or hold prices down to grab market share from competitors and raise g. Competitive adjustment then might occur in both the profit dimension and the growth dimension.

The adjustment speeds estimated here are lower than those found in studies of nonbank firms. However, the methods used in previous studies are different, making direct comparisons difficult. Application of the model developed in this paper to other industries is an obvious avenue for future research. The degree of asymmetry in bank profit persistence could be compared with similar estimates for other industries; for example, do bank profits adjust more slowly in both directions?

As a final note, this model specifies a theoretically defensible relationship between market data and the accounting data used to construct ROE, g, and E. The relationship seems to fit reasonably well, and may provide a framework for using accounting figures to generate pseudo-market-value numbers. Such an imputation of market value would be helpful in analyzing the condition of banking firms more generally, particularly those without publicly traded equity.

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Financial Regulation and Banking Sector Performance: A Comparison of Bad Loan Problems in Japan and Korea

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We estimate the bad loan rate in Japan and Korea for 1973–1992 using data on defaults on notes issued by the corporate sector. This method exploits institutional features common in both countries which suggest a close linkage between default on notes and default on bank borrowing. Our main findings are as follows. First, the pattern of the estimated bad loan rate series generally conforms to past business cycle patterns in both countries. Second, the bad loan rate is substantially higher in Korea than Japan. Lastly, a much tighter linkage is observed for Japan between the bad loan rate and a set of plausible economic explanatory variables. We offer some interpretation for these findings.

I. Introduction

Exploring the links between a country's financial system and its real economic performance has been an increasingly active research area in recent years. One strand of the literature has focused particularly on Japan's bank-centered financial system and within it, the role of the so-called main banks in attenuating capital market imperfections and hence supporting rapid growth (e.g., Hoshi, et al., 1990, 1991). More recently, interest has extended to include other rapidly growing economies in the region, such as Korea and Taiwan (e.g., World Bank 1993).

One puzzle that emerges from this literature is that, for a subset of East Asian countries at least, which includes Japan, rapid growth occurred alongside a financial system that many would describe as "repressed;" that is, interest rates were strictly controlled and capital markets were segmented both domestically and vis-à-vis international transactions. In other words, these countries' experience seems to contradict the received wisdom that financial repression impairs efficient accumulation and allocation of financial resources and hence retards economic growth.

Was financial repression indeed costless? This paper tackles this question by indirectly assessing the cost of financial repression by comparing Japan and Korea. Although Korea clearly has followed Japan in terms of economic development, both countries experienced rapid investment-led growth spearheaded by heavy and chemical industries—Japan in the early 1960s and Korea in the 1970s—and growth was financed by a bank-centered financial system within an environment of segmented capital markets and regulated interest rates. The notable difference, however, is that Korea's banks, as government-owned institutions, were much more stringently regulated than Japanese banks, which have been privately owned. This affords an opportunity to assess whether this greater degree of regulation of banks in Korea has engendered greater costs or inefficiencies.

To the extent that industrial financing has been virtually the exclusive preserve of banks in both countries until recently, we propose to assess the relative efficiency of the two systems by focusing on the bad loan rate. The rationale is, other things equal, a more efficiently run banking industry will engender a lower bad loan rate. A major contribution of the paper is to derive an estimate of the bad loan rate which is unavailable from published sources. To anticipate a key result of this paper, we find that the bad loan problem has been unambiguously more severe in Korea than in Japan. We attribute this difference to the lack of discretion Korean banks have had in allocating funds and their lower incentive to control bankruptcy risk through screening and monitoring corporate borrowers.

II. Estimating the Bad Loan Rate

Measuring the bad loan rate directly is difficult for at least two reasons. First, continuous data are not available because neither Japanese nor Korean banks are required by law to report nonperforming loans. Second, for Korea, even in instances where patchy data exist, banks are bound to understate severely the true amount, since banks frequently have been required to retain nonperforming loans on their books instead of writing them off by drawing on loan loss provisions.[1]

We propose to circumvent data problems on banks' (i.e., the lenders') balance sheets by turning to the (aggregate) balance sheet of the corporate sector (i.e., the borrowers). This indirect method of estimating the extent of bad loans exploits a salient feature of corporate finance common to both economies: the extensive use of notes and accounts payable (henceforth, notes), which are essentially very liquid short-term financing instruments. Why these data are useful for the stated purpose requires some elaboration.[2]

Table 1 shows that notes constitute a significant share of the liabilities of both Korean and Japanese firms. For the Korean manufacturing sector as a whole, notes accounted for about 27 percent of current liabilities and 17 percent of total liabilities in 1990, while the share of short-term bank borrowing was 33.5 percent and 20.6 percent, respectively. The reliance on notes is even higher in Japan, at 30 percent of total liabilities, compared to 16.7 percent for short-term bank borrowing. The share of notes in Japanese corporate liabilities is more than double the level observed in the U.S.

One important reason for the relatively heavy use of notes, especially in Korea, has been the chronic excess demand for funds in the corporate sector. Firms unable to meet their external financing requirements through bank borrowing have resorted to the issue of short-term notes to raise additional liquidity. In Japan, notes have been used relatively more intensively by the small and medium-sized firms, while in Korea, perhaps reflecting more widespread and severe credit rationing, use of notes payable appears ubiquitous across the corporate sector. Within Japanese corporate groupings (keiretsu), major firms have been providing *de facto* financing to smaller firms (typically subcontractors) by selling longer-term notes, while paying their own bills on a short-term basis (Aoki 1984). Another common reason for the intensive use of notes in Japan and Korea is the lack of a developed corporate bond or commercial paper market until recently.

Although time series data are not available for nonperforming bank loans, they are available (at a monthly frequency) for the amount of notes defaulted for both Japan and Korea. We propose that these note default data may be an unbiased indicator of the financial health of the corporate sector and, by implication, the extent of the bad loan problem in the banking sector. The reasoning becomes evident as we examine how the notes are issued, discounted, and cleared in both countries.

In Korea, firms typically issue notes on a standardized check drawn on an account at a bank with which it has

TABLE 1

LIABILITY STRUCTURE OF CONSOLIDATED BALANCE SHEET 1990

ITEMS	JAPAN (%)	KOREA (%)
Current liabilities	45.1	45.7
Notes payable	20.5	12.5
Short-term foreign borrowing		0.2
Short-term bank borrowing	11.5	15.3
Current maturities of long-term debt		2.8
Other short-term borrowing	1.5	2.3
Other current liabilities	10.5	12.6
Long-term liabilities	23.4	28.2
Bonds payable	7.1	7.7
Foreign debt		1.5
Long-term debt to banks	11.1	12.2
Other long-term debt	5.2	6.8
Capital	31.5	25.9
Liabilities plus Capital	100.0	99.8

NOTE: Data for Japan are from the 1990 year-end consolidated balance sheets of 96,758 firms in all industries, with aggregate assets of ¥337 trillion. Korea's data come from the 1990 year-end consolidated balance sheets of 2081 manufacturing firms, with aggregate assets of 163 trillion won.

1. The Bank of Korea compensated the commercial banks by extending various forms of concessions. One common method was payment of interest to commercial banks for reserve deposits they held at the central bank, although the law did not require such payment. See Kwack and Chung (1986).

2. Descriptions of data and their sources are provided in the Appendix.

established creditworthiness through its business relationship. The maturity ranges from three to six months and, as a transferable security, the notes can be endorsed successively by several firms and are widely used as a means of payment in business transactions. Firms often sell the notes directly to banks prior to maturity at a discount, with the amount of discount equivalent to the interest charge that would accrue from the date of discount to the maturity date. Essentially similar practices apply to Japan, where it is estimated that about 25 percent of bank loan transactions in Japan take the form of discounts of notes (Ballon and Tomita 1988).[3] The bulk of the notes are cleared through clearinghouses which are managed as associate institutions of the Bankers' Association.

Banks promptly report notes in default when funds in the firm's account are insufficient to cover the amount submitted for clearance. In Japan, firms that default twice within six months are subject to two years' prohibition from transactions with member financial institutions of the clearinghouse (Suzuki 1980: p.301). In Korea, although a firm with "insufficient funds" is not legally bankrupt, for practical purposes such a default almost always leads the bank to suspend business and in severe cases puts the firm into receivership for liquidation.

Given that corporate banking in Japan and Korea combines traditional lending activities with discounting and clearing of notes, a suspension of bank transactions triggered by a note default would imply that, from the bank's point of view, the overall creditworthiness of the firm in question has significantly deteriorated. In other words, movements in aggregate suspension of bank transactions due to notes defaults should be closely tied to the business sector's general financial conditions and hence the extent of the bad loan problem. It is also important to note that since no government intervention constrains this reporting procedure, note default data would not be fraught with the underreporting bias of bad loans.[4]

Bad Loan Estimate: Japan

To ascertain more formally the link between defaults on notes and the severity of problem loans in the corporate sector, we first estimated a simple regression; the dependent variable is (changes in) the aggregate liability of bankrupt enterprises (*BANKLIAB*) and the explanatory variable is (changes in) the aggregate liability of firms whose business transactions with banks were suspended due to note default (*SUSPLIAB*).[5] The results are reported in Table 2. A high correlation is observed between these two variables, with *SUSPLIAB* statistically significant at the 1 percent level and explaining almost 90 percent of the year-over-year changes in the aggregate liability of bankrupt firms.

We also regressed *BANKLIAB* on GNP growth instead of *SUSPLIAB* to see the extent to which fluctuations in aggregate growth explain changes in corporate bankruptcy. The coefficient on GNP is negative and statistically significant; that is, higher output growth is associated with lower corporate bankruptcy. However, GNP growth explains only 38 percent of the changes in corporate bankruptcy. Moreover, its explanatory power does not appear robust. When GNP and *SUSPLIAB* are both included as explanatory variables, the former loses statistical significance while the latter retains it.

Having established that *SUSPLIAB* provides a good gauge of the corporate sector's overall financial health, we now turn to the task of actually measuring the extent of the bad loan problem in Japan. For any given quarter, t, we estimated the bad loan rate (*BLR*) by applying the following formula:

$$(1) \qquad BLR_t^J = \left(\frac{BL_t}{BB_t}\right) = \left(\frac{SUSPLIAB_t}{TOTLIAB_t}\right)$$

where *BL* is the level of bad loans, which is unobserved, *BB* is the aggregate outstanding balance of short-term plus long-term bank borrowing, *TOTLIAB* is the aggregate liability of the corporate sector and, as before, *SUSPLIAB* is the combined liability of firms with suspended business transactions with banks due to defaulting on notes. The intuition underlying this equation is straightforward: The proportion of problem loans to total loans is the same as the proportion of liabilities accounted for by firms with suspended transactions with banks to the aggregate liability of all firms. The key underlying assumption, to

3. Notes are welcomed by the banks for two reasons: (i) they are self-liquidating (on the due date they are settled and the money loaned is automatically paid); (ii) when the original issuer is unable to meet the note, all subsequent endorsers (collectively) are also liable to the bank for the face value of the note (Kitagawa 1984). Japanese banks have an added motive. In the process of clearing these notes, banks can collect valuable up-to-date information on the general health of their corporate clients.

4. Additionally, since the bank acts purely as an agent and not as a fiduciary as in the case of loan arrangements, there is little scope or incentive for the banks themselves to under or overreport the incidence or the amount of note default.

5. It would be reasonable to expect that movements in *BANKRTLIAB* would closely track changes in the aggregate level of bad loans. However, these data are available only on an annual basis.

TABLE 2

RELATIONSHIP BETWEEN CORPORATE BANKRUPTCY AND SUSPENSIONS OF BUSINESS TRANSACTIONS WITH BANKS, JAPAN
1968.Q2–1992.Q4

DEPENDENT VARIABLE	EXPLANATORY VARIABLE	COEFFICIENT	ADJUSTED R^2	D.W.	P. VALUE OF Q
BANKRLIAB	$SUSPLIAB_t$	1.01***	0.89	2.5	0.17
	$SUSPLIAB_{t-1}$	0.43			
BANKRLIAB	GNP_t	−0.98***	0.38	1.9	0.75
	GNP_{t-1}	2.2			
BANKRLIAB	GNP_t	0.13	0.89	2.6	0.68
	GNP_{t-1}	−0.04			
	$SUSPLIAB_t$	1.07***			
	$SUSPLIAB_{t-1}$	0.17			

NOTE: *BANKRLIAB* is the total liability of the firms that went bankrupt in a given year, *SUSPLIAB* is the aggregate liability of firms whose business transactions with banks have been suspended due to defaulting on notes, and *GNP* is the real year-over-year growth rate of GNP. All series are logged and first differenced; *** denotes a marginal significance level of 1 percent.

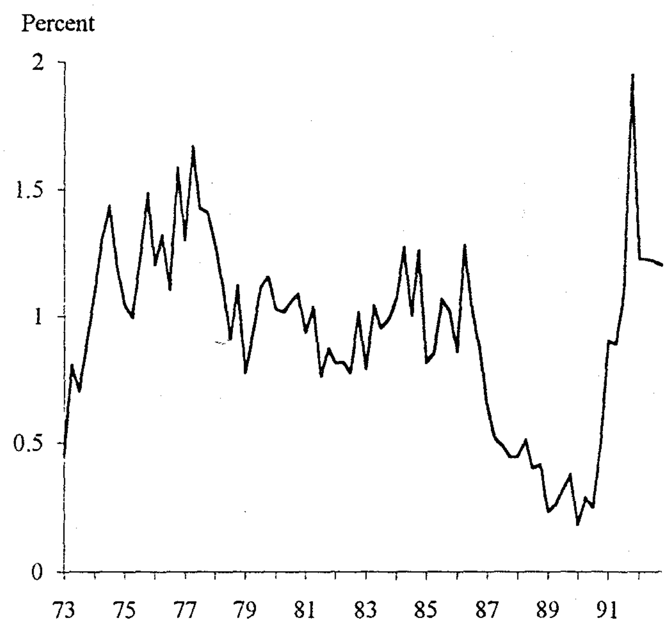
reiterate, is that firms that default on notes are also likely to be the ones defaulting on bank loans.[6]

Figure 1 presents the estimated bad loan rate (*BLR*) for Japan for the sample period of 1973 to 1992.[7] Three noteworthy patterns emerge in the series. First, the bad loan rate rose sharply during the 1970s. It first peaked in 1974 at about 1.5 percent, in the wake of monetary and fiscal tightening in early 1973 geared to restrain inflation and the October 1973 oil crisis. The rate rose to yet higher levels in 1977, apparently reflecting the slump in export-dependent industries triggered by a sharp appreciation of the yen.[8]

Second, the series does not exhibit any discernible trend from the late 1970s through the mid-1980s. That is, no marked increases in bad loan problems appear to have been triggered by the second oil shock in 1979, the recession of the early 1980s, or the sharp appreciation of the yen after the Plaza Accord of 1985.

FIGURE 1

BAD LOAN RATE ESTIMATE: JAPAN



6. Our estimate might overstate somewhat the actual magnitude, to the extent that banks generally secure loans with some tangible asset and recover some of the loan after the eventual liquidation.

7. Our sample begins in 1972 and not earlier because the Bank of Japan changed the reporting criteria for note default in October 1971. See *Economic Statistics Monthly,* November 1971.

8. The yen/dollar exchange rate appreciated from about 290 at the beginning of 1977, to a peak of 170 in October 1978.

Third, the bad loan rate declined markedly during the bull market (the so-called bubble economy) of the second half of the 1980s, reaching a low of 0.25 percent at the end of 1989. The rate then sharply reversed trend, soaring to an all-time high of nearly 2 percent in 1991. This surge coincides with the steep decline in asset prices since late 1989 and the onset of Japan's current recession, which many now consider the most severe in the postwar period. Our estimate of the bad loan problem corroborates this view in a striking way. The severity of problem loans appears to have subsided somewhat in 1992 but no definitive statement can be made without more up-to-date data.

It is important to note that our estimates are of new bad loan rates for each year. To the extent that banks may carry some or even a substantial part of bad loans from previous periods over time, the actual bad loan rate may be better approximated by a cumulative measure. To explore this possibility, we cumulated the bad loan estimate from 1990.Q1 to 1992.Q4, the latest period for which data are available. The rationale for this experiment is to see how severe the current bad loan problem is in Japan, assuming that banks have not been able to write off any portion of nonperforming loans since 1990.[9] According to this worst possible scenario, bad loans in Japan would have totaled some ¥43.8 trillion, or 10.4 percent of total outstanding (short-term plus long-term) bank loans at the end of 1992. This estimate is remarkably close to some private sector estimates reported in the financial press in recent months.[10]

Bad Loan Estimate: Korea

Due to the lack of data on liabilities of suspended firms (*SUSPLIAB*), the bad loan rate for Korea was estimated using a slightly different equation:

$$(2)\ BLR_t^K = \left(\frac{BL_t}{BB_t}\right) = \left(\frac{DEFNOTE_t}{TOTNOTE_t + DEFNOTE_t}\right)$$

where *DEFNOTE* is the aggregate value of defaulted notes and *TOTNOTE* is the total amount of notes outstanding. The equation simply states that the bad loan rate is equal to the rate of default on notes issued.[11,12] Again, as in Japan, this method of estimating the bad loan rate rests on the premise that firms that default on notes also are likely to be the ones defaulting on bank loans.

Figure 2A shows the estimated bad loan rate for Korea.[13] Several noteworthy patterns emerge. First, Korea's bad loan rate is significantly higher than Japan's estimate—typically more than double—and is also more volatile. We will discuss possible reasons for this in Section III.

Second, as in Japan, a local peak in bad loans occurred after the first oil shock. Unlike Japan, however, the bad loan problem appears to have been most severe in the early 1980s, with the rate exceeding 7 percent at its peak in 1981–1982. This surge in bad loans can be reconciled with several adverse shocks to the Korean economy around that time. For one, Korea's GNP shrank by almost 5 percent as a result of the drought-induced recession of 1980. Weak domestic economic conditions were compounded by the world recession after the second oil shock, pushing many highly leveraged firms into insolvency.[14]

Third, as in Japan, the bad loan rate trended downward in the second half of the 1980s, though in Korea's case the decline was punctuated by a minor surge in 1987. This surge coincides with the well-known episode in 1987 when many Korean construction companies went bankrupt as a result of cancellations of large overseas contracts.

9. According to Japanese practices, loans are not considered delinquent until six months without a payment, and even then a bank may accept a token payment, so the troubled debt may ride another six months. The implicit assumption here is that prior to 1990, Japanese banks were capable of writing off bad loans. The situation changed after the onset of the steep decline in asset prices; it wiped out a significant portion of banks' hidden reserves, which otherwise could have been used to write off bad loans. For further details on the effect of stock price movements on Japanese bank capital and lending, see Kim and Moreno (1994).

10. Many financial analysts maintain that, by U.S. standards, total bad loans in Japan may be as high as ¥30 trillion. See *Wall Street Journal*, January 20, 1994.

11. The Bank of Korea's *Financial Statement Analysis* does not provide data on notes issued for all industries. We therefore estimated *TOTNOTE* by summing notes issued in manufacturing, construction, wholesale, retail, and electricity. These industries collectively accounted for about 90 percent of total corporate bank borrowing. By contrast, *DEFNOTE* data pertain to defaulted notes in all industries. Therefore, our estimate of the default rate on notes has a slight upward bias.

12. As noted earlier, unlike other forms of liability, such as bank borrowing, bad notes are netted out of total notes outstanding (*TOTNOTE*) quite promptly. We added *DEFNOTE* to the denominator since dividing by *TOTNOTE* alone, which is a net amount, would yield an overestimate of the extent of the bad loan rate.

13. The sample begins in 1973 because of limited data availability for earlier years and a sharp break in the data due to the Presidential Emergency Decree in 1972. The Decree essentially came in response to widespread financial distress in the corporate sector in the early 1970s. To lighten the corporate debt burden, the government placed a moratorium on all loans in the informal credit market (curb market) and slashed the bank loan rate from 23 percent per annum to 15.5 percent, when the inflation rate was as high as 16 percent. The Decree also converted approximately 30 percent of high interest rate short-term commercial bank loans into long-term loans at concessional rates.

14. Industries that were particularly hard hit during this time included overseas construction, shipping, textile machinery, and lumber. Concern over unemployment and financial instability prompted the government to bail out many of these troubled firms. See Cho and Kim (1993) for details.

Finally, as in Japan, Korea's bad loan rate increased sharply in 1990, reaching a level comparable to that observed in the early 1980s. Part of the increase may be attributed to the cyclical downturn in the Korean economy in 1992, when GNP growth slowed to 4.6 percent. But the cyclical downturn alone cannot account for the jump in the bad loan rate. For one, the slowdown in 1992, albeit the worst since 1980, was relatively mild compared to the recession of 1980, or to Japan's current recession. Moreover, the Korean economy has not been plagued by a drastic asset price deflation as in Japan. These observations suggest that the recent surge in Korea's bad loan problem may reflect more fundamental factors, which we explore in the next two sections of the paper.

We noted earlier that our estimated series, which are net annual rate, may significantly understate the actual extent of the bad loan problem if banks are constrained in writing them off in a timely manner. This discrepancy is likely to be especially sizeable in Korea since, under government directives, banks usually have been carrying large amounts of nonperforming loans on their books over very long periods.

Figure 2B presents the cumulative bad loan rate under two alternative scenarios. First, we derived an upper bound estimate using an average annual write-off rate of 5 percent, i.e., we cumulated 95 percent of new bad loans each year over the entire sample period 1973.Q1–1992.Q4. This series is represented by the solid line in Figure 2B. To derive a lower bound estimate, we employed an arbitrary average annual write-off rate of 10 percent. This series is represented by the dotted line.

According to the upper bound estimate, the cumulative bad loan rate climbed steadily from the early 1970s to a peak of 36.7 percent in 1984.Q1. The situation eased somewhat during the balance of the 1980s, but then deteriorated sharply after 1990.Q3. As of 1992.Q4, some 36.7 percent of total outstanding loans in Korea were nonperforming. Carrying out the same exercise using the annual write-off rate of 10 percent yields essentially a similar pattern, though the estimated cumulative rate is, of course, lower, at 26.5 percent in 1983.Q4 and 27.1 percent in 1992.Q4. By either measure, however, the bad loan problem in Korea appears significant both in absolute terms and relative to Japan.

Are these high bad loan rates indeed plausible? Chung's (1991) study, which is based on internal Bank of Korea data, allows a partial check for the benchmark year of 1988. For purposes of comparison, Table 3 reproduces his

FIGURE 2A

BAD LOAN RATE ESTIMATE: KOREA

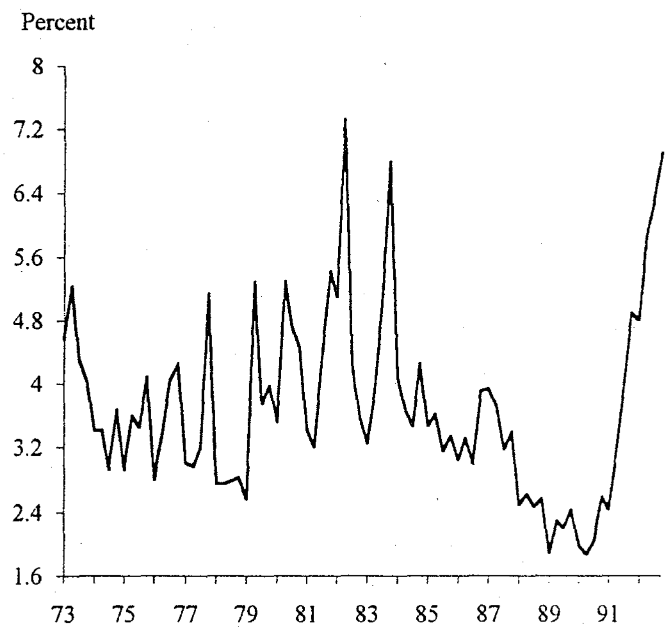


FIGURE 2B

CUMULATIVE BAD LOAN RATE: KOREA

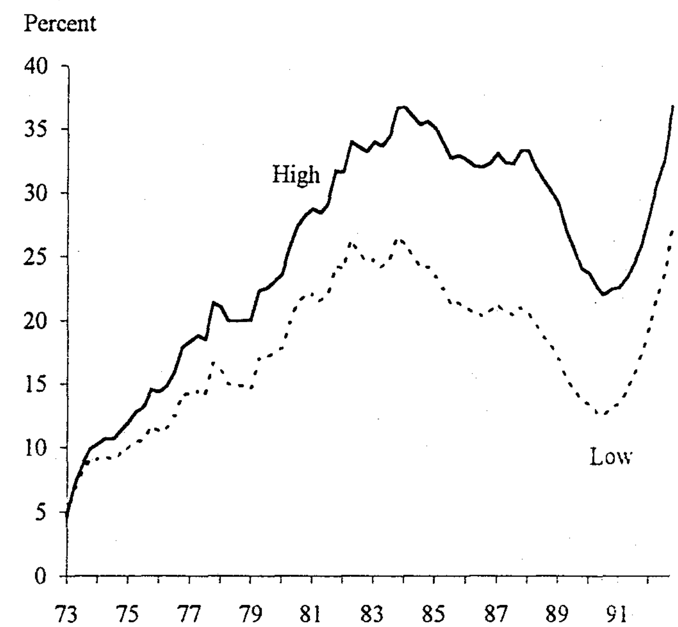


TABLE 3

Nonperforming Loans of Major Korean Commercial Banks
1988

Banks	Total Credit and Discount	Performing Loans	Nonperforming Loans by Type: Type A Amount	%	Type B Amount	%	Total Amount	%
Group I	5,502	4,041	335	6.1	1,125	20.5	1,461	26.5
Group II	447	401	3	0.6	43	9.6	46	10.2
Total	5,949	4,443	338	5.7	1,168	19.6	1,507	25.3

Source: Chung (1991 Table 1-1, p. 16).
Note: Data other than percent are in billion won. Type A refers to loans that are almost surely not recoverable; Type B are loans with over three month's delay in payment or loans to firms with sufficient deterioration in credit quality to warrant explicit loan principal recovery measures.

main results. Chung's sample consists of eight major nationwide banks divided into two groups. Group I consists of six banks that have been in business since the 1950s or 1960s, and Group II is made up of two newer banks established in the early 1980s. Problem loans also are reported in two categories. Type A are loans whose probability of repayment is virtually nil, and Type B includes loans with over three months' delay in payment and loans extended to companies whose credit conditions have deteriorated so markedly as to warrant explicit loan principal recovery measures.

Based on the strictest definition (i.e., Type A), some 5.7 percent of the total sample of eight banks' outstanding loans as of year-end 1988 were bad loans. When the broader definition of problem loans are added (Type B), the bad loan rate swells to 25.3 percent. The bad loan problem appears significantly more severe for Group I banks, which are older and hence more exposed to bad loan overhang problems. By contrast, Group II banks have had the benefit of a relatively clean slate. These newer banks, however, cannot be taken as representative of Korea's banking industry.

Our estimates of the cumulative bad loan rate appear reasonably close to Chung's. As of 1988.Q4, our bad loan rate was 17.9 percent using the 10 percent write-off rate and 30.2 percent using the 5 percent write-off rate. It would appear, therefore, that for 1988 at least, the (broadly measured) actual bad loan rate falls between the lower and upper bounds of our cumulative estimate. We have no reason to believe that this should not hold for other years as well.

III. Why Have Bad Loan Rates Been Higher in Korea?[15]

The modern theory of financial intermediation emphasizes the special role of banks as information producers. By acting as delegated monitors on behalf of numerous and scattered depositors, banks eliminate needless duplication of monitoring which is costly (Diamond 1984). Also, given the public goods aspect of monitoring, delegating the task to one intermediary potentially can help avoid the free-rider problem that arises when many lenders finance a single borrower. We say potentially because, as Diamond pointed out, banks themselves must be provided with proper incentives to monitor. Depositor discipline is one incentive against banks that shirk on monitoring.[16] Another is for the bank to hold a substantial share of a borrower's debt so that it internalizes a substantial portion of the externality generated by its monitoring.

15. The mean bad loan rate estimate for the sample period 1973.Q1–1992.Q4 was 3.9 percent for Korea and 0.9 percent for Japan, with standard deviations of 1.5 percent and 0.4 percent, respectively. To see whether the difference between the two estimates is different from zero with a statistical significance, the following tests were carried out. First, the difference between the two series (i.e., $diff_t$ = *BLR(Korea)* – *BLR(Japan)*) is calculated. Second, various univariate autoregressive regressions with a constant term are run using the $diff_t$ series. Then the statistical significance of the constant term is examined. For AR(1) through AR(6) specifications, the constant term remains positive and significant at the significance level of 10 percent or less.

16. To the extent that a bank holds a diversified loan portfolio, its overall return will serve as a relatively noiseless signal of the level of monitoring effort. This, in turn, enables depositors to induce banks to monitor efficiently.

Both Japan and Korea have relied intensively on the banking sector to finance growth. The banking sector's incentive structure to screen and monitor borrowers, however, appears to have diverged significantly between the two countries.

For Japan, a large number of studies suggest that its banking system, in particular the so-called main banking system, has been highly effective in mitigating informational and other imperfections in capital markets (e.g., Aoki, et al., 1993, Hoshi, et al., 1990, 1991, Kim 1993, and Lichtenberg and Pushner 1992). A distinguishing feature of the main banking system is that although the main bank identified with a particular firm that is not its sole lender, it is usually the only bank that undertakes the task of monitoring.[17] Two additional features of the system suggest that powerful incentives were present for the main bank to be diligent in carrying out this task.

First, if a firm monitored by a given main bank faces financial distress, that main bank is also expected to assume the bulk of the burden in restructuring it or bailing it out. If conditions are sufficiently bad to warrant bankruptcy, the main bank usually absorbs a larger proportion of losses than its loan share.[18] Bearing this disproportionate burden when projects go awry would act as an effective deterrent against shirking on monitoring.[19] Second, the main bank also faces positive incentives to monitor due to the claims structure it holds: The main bank typically not only is the largest lender, but also is an important shareholder, usually the largest among banks. Presumably, the large debt and equity stakes that the main bank simultaneously holds help it internalize a significant part of the externalities associated with monitoring the firm.[20]

As in Japan, banks have played a dominant role in financing Korea's economic growth. This came about largely as a result of conscious policy design. Following Japan's model in the 1960s, the Korean authorities sought to use the banking sector as a conduit of preferential credit to sectors deemed strategic to Korea's economic growth.[21] The use of preferential access to credit at subsidized interest rates (known as "policy loans") intensified in the 1970s when the government made a major push to establish a heavy and chemical industries (HCI) sector in Korea.[22] According to one estimate, policy loans on average accounted for over 65 percent of all bank loans in 1973–1981 (Cho and Kim 1993). The actual share of government-directed loans would be even higher if one included loans that were not extended through explicitly earmarked programs and hence were more difficult to measure.[23]

Compared to Japan, the Korean government appears to have wielded a much more direct control and much tighter control over the banking sector. Most notably, unlike in Japan, the Korean government until recently has been the major shareholder in all major Korean banks. This has had far-reaching ramifications on how the banking system has operated. To quote Cho and Kim (1993, pp. 51-52): "The banking system was used as the government's treasury unit to finance development projects to manage risk sharing of the economy and bankers were treated as civil servants. Their performance was evaluated based on their compliance to the government guidance rather than their efficient management of assets and liabilities."

Tight government control of the banking sector gave rise to two types of moral hazard problems in Korea's credit markets. On the supply side, banks had little discretion or incentive to control risk by screening projects and monitoring corporate performance. Declaring any sizeable industrial enterprise as bankrupt or writing off bad loans on

17. Main banking therefore has been characterized by Sheard (1989) as a system of "delegated monitor among monitors," in contrast to Diamond's (1984) model where monitoring is delegated by depositors to an intermediary.

18. This is extensively documented in case studies by Sheard (1985, 1989).

19. This immediately raises the question: What prevents the main bank from reneging on this commitment? One possible explanation is that banks enter into arrangements for reciprocal delegated monitoring as well as for reciprocal subordination in financial distress, with loss of reputation as a deterrent against defection (Aoki, et al., 1993).

20. Kim (1993) provides a more detailed analysis on this and related issues.

21. It was not until the early to mid-1980s when nonbank financial institutions (NBFIs) emerged as an important alternative source of financing in addition to the traditional commercial bank and curb markets. For overviews of the postwar Korean financial system and policies, see Kang (1990), Kwack and Chung (1986), Hong and Park (1986), Cho and Kim (1993), and Cho and Cole (1992).

22. The government also used the banking system to guarantee foreign financing of investments in HCI. Foreign loans accounted for a sizeable share of external funds of Korea's corporate business sector, averaging 37.9 percent of the total in 1965–1969, 23.3 percent in 1970–1974, and 20.4 percent in 1975–1979. As the capital-intensive HCI investment drive waned and supplies of loans from foreign banks dwindled, the share of foreign loans declined sharply to 6 percent in the first half of the 1980s.

23. Another way to assess the relative importance of policy loans is to look at the sectoral allocation of credit. According to Cho and Kim (1993, p.39), the manufacturing sector received 46 percent of total domestic bank loans in 1970, while its contribution to GDP was only 21.3 percent. Within manufacturing, HCI accounted for 22.6 percent of total bank loans, while its GDP share was only 8.5 percent. By 1980, HCI's share of total bank credit increased to 32.1 percent while its GDP share increased to 16.5 percent. This reflects in part the longer gestation period of HCI investment.

banks' balance sheets required the explicit consent of the government. In practice, the government averted bankruptcy at large enterprises by directing banks to provide relief loans or rescheduling debt.

Extreme control and guidance of banking institutions had adverse incentive effects on the demand side of the loan market as well. The socialization of bankruptcy risk, combined with the strict low interest rate ceilings, made the cost of debt financing very cheap for firms in the targeted sectors.[24] This encouraged firms to take on excessively high levels of debt. According to data in the Bank of Korea's *Financial Statement Analysis*, the rate of total liability to net worth in Korean manufacturing more than quadrupled, from about 84 percent in the mid-1960s to over 365 percent in the late 1970s.

High leveraging made the corporate sector as a whole very vulnerable to external shocks and economic fluctuations. This problem grew to especially alarming proportions by the end of the 1970s, as excessive investment in HCI bred large idle capacities, and enterprises began encountering difficulties servicing their debt.[25] The government responded by taking greater involvement in banks' credit allocation to bail out troubled firms and industries, with the result that banks were saddled with ever growing amounts of de facto nonperforming loans.[26]

Mounting problems in the financial sector prompted the Korean government to reorient its policies in the early 1980s toward giving banks greater discretion in setting interest rates and allocating loans. To this end, the government began divesting its shareholding in commercial banks and established the so-called principal transaction bank system. The system sought to regulate bank credit extended to large corporations through their principal transaction banks. The basic aim was to reduce corporate leverage and to improve the quality of monitoring of the financial conditions and investment activities of corporations.[27]

Pervasive government control of the banking sector persists, however. Interest rates at all banks are still regulated. Banks that are saddled with high proportions of nonperforming loans continue to depend on the Bank of Korea for low-cost funds to support their outstanding loans, the bulk of which are still policy-related. This has left banks little choice but to heed government directives even though they have nominally shifted to private ownership (Cho and Cole 1992). Finally, an autonomous bank-customer relationship has yet to develop in Korea due to continued government intervention in credit allocation. As a result, principal transactions banks have had little incentive to monitor corporations. Nor has a principal transaction bank's evaluation of a corporate investment and financing plan had any significant effect on corporate behavior (Nam and Kim 1993).

To summarize, our review of the Japanese and Korean banking system highlights a fundamental difference. In Japan, the cost of corporate bankruptcy ultimately fell onto the (main) banks. The internalization of bankruptcy costs would have induced banks to be diligent in controlling bankruptcy risk through screening corporate borrowers as well as investment projects. Additionally, as significant corporate shareholders, Japanese banks also would have a strong incentive to monitor corporate performance on an ongoing basis. By contrast, these private incentives were muted in Korean banks due to the government ownership of banks until recently and due to continued heavy intervention despite nominal privatization. Other things equal, this lower incentive faced by Korean banks to monitor undoubtedly accounts for a significant part of the higher bad loan rate estimated for Korea.

IV. DETERMINANTS OF THE BAD LOAN RATE

Our institutional explanation of the higher bad loan rate in Korea assumes the usual ceteris paribus condition. This section attempts a more systematic way to control for factors other than different monitoring incentives that may account for the observed difference in bad loan rates between Japan and Korea. To implement this idea statistically, we estimated the following regression,

$$BLR_t = \alpha_t + \sum_{j=1}^{n} \sum_{i=1}^{l} \beta_i^j x_{t-i}^j + \epsilon_t$$

where x^j is a set of economic variables (with lag structure denoted by l, $l=4$ for Japan, $l=6$ for Korea) that plausibly will affect the bad loan rate in the economy.[28] We estimated three models. The first model consisted only of financial variables derived from the aggregate balance sheet. For both Japan and Korea, these variables were the aggregate leverage ratio of the corporate sector, defined as the ratio of

24. According to Cho and Cole (1992), the real cost of bank credit was negative throughout most of the 1970s.

25. Cho and Kim (1993) estimate that almost 80 percent of all fixed investment in the manufacturing sector during the late 1970s was directed to HCI. Many subscribe to the view that this was an overinvestment. See for example Hong (1979), Amsden (1989), and Stern et al., (1992).

26. The launch into HCI itself was preceded by a major government bail out of the corporate sector which already was highly leveraged. See footnote 14.

27. See Nam and Kim (1993) for a detailed analysis of this system.

28. In addition to the variables listed in (1), the proper number of lagged dependent variables were added to remove serial correlations. Also an intercept dummy variable was added in the three equations for Japan to

total liabilities to total assets, the ratio of bank borrowing in total liabilities, and the growth rate in bank loans. The second model included "real" macroeconomic variables. For Japan, the set consisted of the Nikkei stock market index, real GDP growth rate, the nominal yen-dollar exchange rate, oil price, and the variability in industrial production growth. The Korean equation did not include a stock market index and used the real instead of nominal won-dollar exchange rate.[29] The third model included both sets of financial and real variables.

The motivation underlying this exercise is simple. If our hypotheses on the behavior of Japanese and Korean banks are correct, and if our estimate of the bad loan rate is reasonably accurate, then we would expect the regression equation to be statistically more significant in Japan compared to Korea. The rationale is that because of lower incentives facing Korean banks to control risk through screening and monitoring corporate borrowers, the conventional explanatory variables will explain less of the movement in the Korean bad loan rate. Alternatively, one can think of the adverse incentive effects on banks as forcing the economy to operate inside the risk-return efficiency frontier, thereby loosening the link between the bad loan rate and the explanatory variables.

As evident in Table 4 which reports the results for Japan, the exclusion tests are generally significant for all three models, with roughly 75 to 80 percent of changes in the bad loan rate explained by the right hand side variables. In the model featuring financial variables alone, individual exclusion tests show that leverage and loan growth are statistically significant in explaining changes in the bad loan rate, while the rate of bank borrowing to total liability is not. A joint exclusion test of the three balance sheet variables, however, is significant at the 5 percent level.

Four out of the five variables in the second model—the Nikkei index, GDP growth, oil price, and the variability in industrial production—are all statistically significant. The joint exclusion test of all five real macroeconomic variables is also significant at the 1 percent level. The third model performs the best, suggesting that both financial and real variables are relevant, and hence both sets should be included.[30]

TABLE 4

EXCLUSION TESTS OF EXPLANATORY VARIABLES OF THE BAD LOAN RATE, JAPAN 1968.Q2–1992.Q4

$$BLR_t = \alpha_t + \sum_{j=1}^{n} \sum_{i=1}^{4} \beta_i^j x_{t-i}^j + \epsilon_t$$

	MODEL SPECIFICATIONS		
	Financial Variables Only $j=1,2,3$	Real Variables Only $j=4,5,6,7,8$	Financial and Real Variables $j=1$-8
ADJUSTED R^2	0.74	0.77	0.80
EXCLUDED VARIABLES:	Exclusion test: H_0: $\beta_i^j=0$ for all i's and j's		
1. *LEV*	0.01		0.01
2. *BB*	0.66		0.49
3. *LOANGR*	0.08		0.65
4. *NIKKEI*		0.09	0.08
5. *GDPGR*		0.00	0.04
6. *FOREX*		0.31	0.17
7. *OIL*		0.05	0.04
8. *IPVAR*		0.14	0.36
1, 2, 3	0.02		0.03
4, 5, 6, 7, 8		0.01	0.00
1-8			0.00

NOTE: The dependent variable *BLR* is the estimated bad loan rate. The explanatory variables are: leverage ratio (*LEV*), bank borrowing to total liability ratio (*BB*), loan growth rate (*LOANGR*), Nikkei stock market index (*NIKKEI*), real GDP growth rate (*GDPGR*), nominal yen-dollar exchange rate (*FOREX*), oil price (*OIL*), and variability in industrial production growth (*IPVAR*), defined as the standard deviation of the quarterly industrial production growth rate over the immediately preceding three years. For *NIKKEI*, *FOREX*, and *OIL*, we used year-over-year growth rates. Four lags of all explanatory variables were used except for *IPVAR* (one lag). To correct for serial correlation, the right-hand-side also included the dependent variable lagged up to four quarters. To control for the change in the Bank of Japan's reporting procedure in 1971 on notes default data, we also included dummy variables (not reported), with $D=1$ for $t=1968.Q1$ to 1972.Q4, and $D=0$, otherwise.

The regressions for Korea are reported in Table 5. One immediately notes the significantly lower adjusted R^2 in Korea, ranging from 0.62 to 0.68. The exclusion test corroborates the poor fit. In the first model, which is restricted to financial variables, only leverage is significant (at the 5 percent level); the joint exclusion test statistic is

account for the level shift in the break in the key data at 1971.Q4. This is done to allow for a major accounting rule change regarding suspension and bankruptcy in late 1971.

29. This helps account for the much larger inflation differential that prevailed between Korea and the U.S. than Japan and the U.S. Also, for Korea, we did not include a stock market index variable because the market was underdeveloped until at least the mid-1980s.

30. We also ran the same set of regressions limiting the sample period up to the end of 1989, i.e., we excluded the period of the steep asset price deflation and the current recession. Interestingly, the exclusion test for the Nikkei was not statistically significant for this shorter sample period, while that for the variability in industrial production was. The main thrust of the results did not change, however.

only marginally significant at 0.10. None of the variables in the second model is statistically significant, either individually, or jointly. As was the case for Japan, combining the two sets of variables does improve the result somewhat, with the joint exclusion test for the financial variables significant at 5 percent and that for all seven variables significant at 10 percent. Overall, however, it is safe to say that all models fare considerably less well for Korea.

TABLE 5

EXCLUSION TESTS OF EXPLANATORY VARIABLES OF THE BAD LOAN RATE, KOREA
1973.Q1–1992.Q4

$$BLR_t = \alpha_t + \sum_{j=1}^{n} \sum_{i=1}^{6} \beta_i^j x_{t-i}^j + \epsilon_t$$

	MODEL SPECIFICATIONS		
	Financial Variables Only $j=1,2,3$	Real Variables Only $j=4,5,6,7$	Financial and Real Variables $j=1\text{-}7$
ADJUSTED R^2	0.63	0.62	0.68
EXCLUDED VARIABLES:	Exclusion test: H_0: $\beta_i^j=0$ for all i's and j's		
1. *LEV*	0.02		0.06
2. *BB*	0.49		0.97
3. *LOANGR*	0.13		0.01
4. *GDPGR*		0.31	0.22
5. *RFX*		0.55	0.04
6. *OIL*		0.96	0.38
7. *IPVAR*		0.76	0.49
1, 2, 3	0.10		0.03
4, 5, 6, 7		0.85	0.20
1-7			0.09

NOTE: The dependent variable *BLR* is the estimated bad loan rate. The explanatory variables are: leverage ratio (*LEV*), bank borrowing to total liability ratio (*BB*), loan growth rate (*LOANGR*), real GDP growth rate (*GDPGR*), real won-dollar exchange rate (*RFX*), oil price (*OIL*), and variability in industrial production growth (*IPVAR*), defined as the standard deviation of quarterly industrial production growth rate over the immediately preceding three years. Six lags of all explanatory variables were used except for the *IPVAR* (one lag). To correct for serial correlation, the right-hand-side also included the dependent variable lagged up to six quarters.

IV. CONCLUSION

We attempted to measure the bad loan rate based on indirect data for Japan and Korea to shed some light on the implications of different institutional and risk-sharing arrangements observed in the two economies. The estimated measure appears to be a reasonable approximation based on several grounds. First, there is a general conformity between the overall pattern of our measure to the past business cycle patterns of the two economies. Although the empirical relationship is weaker for Korea than for Japan, the bad loan measure for Korea still seems to behave in a reasonable manner following identifiable shocks. Second, our estimate matches quite closely an independent study that measures the bad loan rate directly for Korea in 1988 and 1989. Third, consistent with our expectation, the bad loan rate estimate is substantially higher in Korea than in Japan. Finally, a much tighter linkage is observed between the bad loan rate estimates and a plausible set of economic variables for Japan. These results, in turn, suggest that while banks can make a substantial contribution to economic growth, heavy government intervention also can substantially impair banks' incentive to monitor and control risk. The higher bad loan rate in Korea is but one manifestation of the associated costs of "unduly" repressing the banking system. Our estimate reveals, especially in the case of Korea, that such costs can be substantial.

APPENDIX

Data Sources

Data for Japan were collected from the *Quarterly Report of Incorporated Enterprise Statistics,* published by the Ministry of Finance (MOF). The *Report* provides aggregated quarterly balance sheet data for manufacturing and nonmanufacturing firms, excluding financial institutions and insurance companies. The sample consists of 1,850 firms with capital in excess of ¥10 million, which would include most of Japan's publicly listed firms, and 15,000 firms drawn from various size groups below the ¥10 million capital threshold. The Report therefore provides a fairly comprehensive coverage of the entire spectrum of Japan's corporate sector.

Data for Korea were collected from *Financial Statement Analysis*, published annually by the Bank of Korea (BOK). This data source is ideally suited for purposes of comparison with Japan since it is modeled closely after the MOF Report both in its method of collection and the variables covered. The BOK's sample consists of some 1,400 firms with the number split roughly evenly between small and large enterprises (listed or unlisted, with capital in excess of W10 billion). One notable difference is that the Korean data are only available on an annual basis. We therefore estimated quarterly data series by interpolation between two annual data points. Table 1 presents an example of typical balance sheet data that are used.

Data on the default rates on the business notes and outstanding loans were compiled from monthly issues of *Economic Statistics Monthly* (BOJ), and *Monthly Statistical Bulletin* (BOK). Monthly series were aggregated to derive quarterly series (business note default) and end of quarter (outstanding loan and discount) data.

Japanese data on notes payable are not reported separately from accounts payable in MOF's *Quarterly Report of Incorporated Enterprise Statistics*. We estimated notes payable by using aggregate corporate sector balance sheet data which report these items separately. We computed the ratio between the two and multiplied it to the MOF series to arrive at an estimate of notes payable.

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Wealth Effects of Bank Holding Company Securities Issuance and Loan Growth under the Risk-Based Capital Requirements

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This paper tests a two-part hypothesis: first, that during the period between publication of the risk-based capital requirements in early 1989 and the end of 1992, bank holding companies (BHCs) faced a statistically significant decrease in stock returns if they issued new common stock; second, that this discouraged new common stock issuance and therefore, in effect, forced BHCs with Tier 1 and/or leverage capital-to-assets ratios below the regulatory minima to decrease loans outstanding more than did BHCs deficient only in their total capital ratios. Empirical evidence supporting both parts of the hypothesis is presented.

In December 1992, pursuant to the Basle accord, capital requirements for banks and bank holding companies (BHCs) changed. For the first time, the minimum amount of capital that a banking organization was required to hold depended on the riskiness of its asset portfolio as well as its size. Various types of assets were assigned weights, according to their perceived riskiness, with commercial loans receiving the highest weight and U.S. government securities the lowest. Banks and BHCs were required to hold at least 4 percent of their *risk-weighted* assets in so-called Tier 1 capital and 8 percent of their risk-weighted assets in Tier 1 plus supplementary (Tier 2) capital, which includes, for example, mandatory convertible debt and subordinated debt. For BHCs, the bulk of Tier 1 capital was required to be common shareholders' equity plus retained earnings. In addition to the new risk-based requirements, a new minimum Tier 1 capital-to-unweighted asset ratio of 4 percent was established.

When the new capital requirements were first made public in early 1989, some BHCs found themselves in a potentially deficient position. In order to meet the various new capital requirements by the December 1992 deadline, they would have to increase capital and/or decrease risk-weighted, or perhaps unweighted, assets. Some of the BHCs deficient in Tier 1 capital found that they would have to increase common shareholders' equity in particular or decrease assets. However, it has been well established that for a variety of firm types, the announcement of the intention to issue common stock tends to decrease a firm's stock value. This paper finds that this type of effect also existed for BHCs in the period following publication of the new capital requirements. The paper then argues that, given the presence of such an effect, BHCs deficient in common equity had a significant incentive to meet the capital requirements by decreasing asset growth rather than issuing new common stock.

The argument implies that BHCs deficient only in supplementary capital did not decrease asset growth as much. This is because, in contrast to the "constrained" BHCs that had to issue common stock, these "unconstrained" but still deficient BHCs could redress their capital insufficiency by issuing those types of securities that do not lead to negative wealth effects. Deficient but unconstrained BHCs could therefore afford greater asset growth. Of particular interest in this context is loan growth, given that much has been written about the effects of the risk-based capital requirements on bank lending and that commercial loans receive such a high risk weighting. Therefore, I test the hypothesis that "constrained" BHCs exhibited lower loan growth than unconstrained but deficient BHCs during the two years prior to December 1992. Consistent with this hypothesis, I find that constrained BHC loan growth was statistically significantly lower, even after controlling for the size of each BHC's capital deficiency.

The remainder of the paper falls into five sections. Section I reviews literature related to the wealth effects of security issuance. Section II discusses the data and the empirical methodology used for estimating the effects of BHC announcements of common stock and supplementary capital securities issuances on common stock returns. This section also presents the empirical results of this estimation. Section III discusses the implications of a negative common stock wealth effect for common stock deficient BHCs and presents comparative summary statistics for capital sufficient and constrained and unconstrained capital deficient BHCs. Section IV presents the data, methodology, and results for a regression testing the effect of the Tier 1 capital requirements on constrained BHC loan growth. Section V concludes.

I. The Shareholder Wealth Effects of Security Issuance: Literature Review

In this section, I review the literature related to the wealth effects of security issuance. Included will be a discussion of various theories explaining why common stock issuance may lower common stock returns. This section will serve as conceptual background for the empirical estimation of the wealth effects of BHC security issuances and for the ensuing discussion of the interaction between negative wealth effects, capital requirements, and loan growth.

Modigliani and Miller (1958) show that, in the absence of tax effects, information asymmetries, or other distortions, the value of a firm should be independent of its capital structure and therefore unaffected by the issuance of new debt or equity. However, in the real world there are tax effects and information asymmetries. Accordingly, several researchers, including Asquith and Mullins (1986), Smith (1986), and Mikkelson and Partch (1986), have found empirical evidence that a firm's stock price typically falls upon the announcement of upcoming issuances of new common stock. In addition, economists have found that some, but not all, non-common stock security types also show statistically significant effects—some negative and some positive.

Miller and Rock (1985) attribute these results to information asymmetries. Specifically, they hypothesize that the market concludes that a firm that is seeking external financing must be expecting lower earnings. The reason is that, in the presence of information asymmetries, inside financing (e.g., increased retained earnings) usually would be less expensive. However, Miller and Rock's theory does not explain why announcements of issuances of different types of securities would have different effects.

Myers and Majluf (1984) offer a possible explanation. They argue that managers have an incentive to issue equity when the firm's stock is overvalued and debt when its stock is undervalued. This is because when a firm issues equity, it sells a portion of its existing assets but acquires, for its existing stockholders, a share in the net present value of the new project to be undertaken. If the firm's existing assets are significantly undervalued by the market, the dilution suffered by existing stockholders can be greater than any gains they receive from undertaking the new project, in which case no new equity will be issued. However, the project may be financed through debt, because the tradeoff for existing stockholders between losing share in existing assets but gaining a share of the new project will be more favorable if debt is issued. On the other hand, as stock becomes overvalued, financing a new project through stock issuance rather than debt issuance begins to look more favorable to existing stockholders. Therefore, the choice between raising funds through equity or debt will be more likely to favor equity when the stock is overvalued and more likely to favor debt when the stock is undervalued. If there is information asymmetry such that managers have inside information regarding the value of the firm that market participants do not have, then the issuance of equity will impart new information to the market. In particular, investors, knowing managers' incentives, will interpret the issuance of new equity as a signal that the stock is overvalued, and the price will fall.

Therefore, a synthesis of the Miller and Rock and Myers and Majluf theories would say that equity issuance announcements should have negative effects, while debt issuance announcements should have less negative or maybe even positive effects on common stock returns.

The first part of this paper's thesis is that, during the period after publication of the risk-based capital standards in early 1989, BHC's common stock issuance announcements created negative wealth effects. (Again, the second part is that the wealth effect combined with the risk-based capital requirements to discourage common stock issuance and encourage loan growth cutbacks among certain undercapitalized BHCs.) Wansley and Dhillon (1989), Keeley (1989), Polonchek, Slovin, and Sushka (1989), Wall and Peterson (1991), and Cornett and Tehranian (1994) all have investigated the existence of negative wealth effects for BHCs. At least for some subset of BHCs, all found statistically significant negative abnormal returns associated with common stock issuance. Although the time period for these studies differed from the time period used in this paper, it is important to review these studies' results.

Wansley and Dhillon examine the stock market response to public security offerings by BHCs between 1978 and 1985. Using an event study methodology, they find a statistically significant decrease in common stock prices at the time of the announcement of an upcoming common stock issue.

Keeley investigates the period from 1975 to 1986 in addition to two subperiods—January 1, 1975 through November 30, 1981, and December 1, 1981 through December 31, 1986. The two periods are distinguished by the imposition of specific objective capital requirements in 1981. (Prior to 1981, capital requirements were more subjective and nebulous.)

For the whole period, Keeley finds a statistically significant negative announcement effect for common stock and a statistically significant positive effect for perpetual preferred stock. He also finds statistically significant negative effects for debt and common stock together in the earlier period and for mandatory convertible debt in the later period and a significant positive effect for perpetual preferred stock in the later period.[1]

In addition, Keeley finds a statistically significant negative announcement effect for common stock in the earlier period, but not in the later period. However, when he confines his sample to BHCs he classifies as capital deficient, he finds statistically significant negative common stock effects for both periods. In contrast, he finds a statistically significant negative effect for his capital sufficient subset in the earlier period only. Therefore, it appears that the difference in the results for the two periods for the group as a whole largely is driven by a difference in the results for the capital sufficient BHCs.

In explaining his results, Keeley entertains three hypotheses. First, he rejects the hypothesis that the difference in the results across periods for the entire sample is due to a Myers and Majluf signaling effect. It is logical to suppose that the institution of objective capital standards made equity offerings more predictable and therefore diminished their information content. However, Keeley argues, this also would imply that capital deficient BHCs would exhibit less negative common stock issuance wealth effects than capital sufficient BHCs, whose issuances should be more voluntary. But, as he shows, this is not the case. In both the earlier and later periods capital deficient BHCs showed more negative wealth effects, and the difference between the effects for the two groups of BHCs was statistically significant.

Keeley then suggests that the results for the two types of BHCs differ because common stock issuance diminishes the value of banks' deposit insurance guarantee. This is especially true for banks with relatively low capital-to-asset ratios.[2] However, this explanation is somewhat unsatisfactory in that it does not adequately explain the difference in results across time periods for the sample as a whole and for the capital sufficient BHCs.

Moreover, the deposit insurance hypothesis implies that there should be a negative relationship between the increase in the capital-to-assets ratio and the announcement effect; a larger common stock issuance (relative to assets) should be associated with a more negative announcement effect. Keeley's results only weakly support this inference: He finds the implied negative relationship for the capital deficient BHCs only in the later period, and even then it is not statistically significant.

Keeley's third explanation is the most satisfactory. Here, he suggests that the issuance of common stock reveals private information held by regulators. As Keeley explains, market participants can tell when a BHC may be under regulatory pressure to increase its capital ratio by looking at its balance sheet. However, the market does not necessarily know the future prospects of the BHC or the method the BHC will use to augment capital.

Therefore, investors may view common stock issuance by capital deficient BHCs as a sign that the BHCs are under regulatory pressure not to issue securities that require increased payouts from earnings, such as debt or preferred stock; thus, Keeley suggests, it also may be a signal of management and regulator skepticism about the BHC's ability to generate sufficient future earnings to meet the cash flow requirements of additional debt or preferred stock or to generate cash flow sufficient to permit the accumulation of retained earnings to meet the new capital requirements. On the other hand, if regulators and

1. Actually, Keeley has no observations for perpetual preferred stock or mandatory convertible debt for the earlier period and no observations for simultaneous debt and common stock announcements for the later period.

2. See Furlong and Keeley (1987 and 1989).

bank management believe that the BHC's future earnings prospects are very good, retained earnings rather than a security issuance can be used to meet higher capital requirements. Moreover, he says, this explains why common stock issuance by a capital sufficient BHC might not provide a negative signal.

The inside information hypothesis provides a plausible explanation for all of Keeley's major findings concerning common stock issuance. First, it can explain the difference between common stock announcement effects for his capital deficient and capital sufficient subsets. Second, it can explain the difference between announcement effects for his capital sufficient subset in the earlier and later periods. As Keeley says, prior to the institution of specific minimum capital requirements, market participants might have been unsure whether a BHC's common stock issuance were due to regulatory pressure. Since there was some chance that it was, there was a small mean negative announcement effect even for capital sufficient organizations. However, he explains, after specific capital requirements were introduced, market participants could be confident that a common stock issue by a capital sufficient BHC was not a signal that regulators viewed the firm's earning prospects unfavorably. Therefore, common stock issuance announcements no longer lowered stock prices for this group. Third, the insider information hypothesis also provides a plausible explanation for the difference between the earlier and later period results for his capital sufficient subset as well as for the full sample.

Polonchek, Slovin, and Sushka's results basically are consistent with Keeley's results. These authors also examine a pre-1981 period (January 1975 to November 1981) and a post-1981 period (December 1981 to December 1984), as well as an aggregated 1975 to 1984 period. They find statistically significant negative common stock announcement effects only for the earlier period by itself.

Wall and Peterson examine the announcement effects of BHC's securities issuances between 1982 and 1986. These authors improve on prior studies by using information from the *Dow Jones News Wire* (*DJNW*) rather than the *Wall Street Journal* (*WSJ*) to identify announcement dates. The news wire is a more accurate source of when the market first gets the news of an impending securities issue, which may be a day or more before the news appears in the *WSJ*. Wall and Peterson also find that common stock announcements have statistically significant negative effects on common stock returns.

Finally, Cornett and Tehranian study the wealth effects of BHC announcements of issuances of various types of securities during the period June 1983 through December 1989. The imposition of specific capital requirements for multinational BHCs, which had previously been exempted from objective capital standards, marks the beginning of the period. Also, the "acceptable" total capital-to-asset ratio (greater than the "minimum" total capital-to-asset ratio) was increased from 6.5 percent to 7 percent in June 1983.

Cornett and Tehranian separate their sample into "voluntary" and "involuntary" issues of securities. They classify an issue as voluntary if the BHC's total capital ratio is above 7 percent at the end of the year prior to the security issue, involuntary if not. These authors find statistically significant negative wealth effects for common stock for the voluntary issues. For the involuntary issues, one type of statistical test indicates a statistically significant negative effect, while a second type indicates a lack of statistical significance. In addition, the negative announcement effect for the voluntary issuers is larger in absolute value than is the estimated effect for involuntary issuers, and the difference between the effects for the two groups is statistically significant. These results contrast with Keeley's results regarding his capital deficient and capital sufficient subsets; Keeley found significant negative effects for his capital deficient BHCs, but *not* for the capital sufficient BHCs. Cornett and Tehranian also found a statistically significant positive announcement effect for involuntary issues of straight (not convertible into common stock) debt.

Cornett and Tehranian attribute their results to the capital structure signaling model found in Ross (1977). Similar in spirit to Myers and Majluf's later paper, Ross's paper has managers possessing inside information about the prospects for the firm issuing equity when prospects are poor and debt when prospects are good. As Cornett and Tehranian explain, this is because a firm with poor prospects will want to share its downside with new claimants and thus prefers financing via stock issuance, whereas a firm with good prospects will not want to share its upside with new claimants and thus prefers debt financing.

Investors recognize these incentives, and therefore the stock price falls upon announcement of an impending voluntary equity issuance. However, Cornett and Tehranian reason, equity issuances perceived by market participants as involuntary need not necessarily imply poor prospects and therefore need not depress stock returns.

Several methodological differences between Keeley's and Cornett and Tehranian's approaches may help to explain the differences in results. First, it is possible that Cornett and Tehranian's sample of security issuances gives a positive bias to their involuntary issuance results. In contrast to Keeley, Cornett and Tehranian do not exclude issuances that are not publicly announced. Instead, these authors use the Securities and Exchange Commission filing (registration) date as the announcement date for security issuances not located in the *Wall Street Journal Index*. It is likely that nonpublicly announced security issuances have a weaker effect on the market than those that are publicly announced. Because Cornett and Tehranian's involuntary issuers are on average smaller than their voluntary issuers, the involuntary issuers are less likely to announce publicly.[3] Therefore, if common stock announcement effects for all BHCs tend to be negative, Cornett and Tehranian's methodology might have biased the effects for involuntary issues upward.

Another distinction between the two studies concerns the definition of undercapitalized BHCs. Keeley's distinction between capital deficient and capital sufficient BHCs depends on their capitalization as of a fixed date, December 1981, and its status does not change over time. This means that Keeley's classification of a security issuance announcement depends only on the identity of the announcing BHC. In contrast, Cornett and Tehranian's designation of involuntary versus voluntary issues depends on the issuing BHC's capitalization at the end of the year before the security offering. Therefore, their classification of a security issuance announcement depends partially on the identity of the issuer and partially on the timing of the issue.

Because BHCs can change their capital-to-assets ratios over time, Cornett and Tehranian's procedure seems more intuitively appealing than Keeley's. Cornett and Tehranian's method more likely correctly identifies security issuance announcements by BHCs that had relatively low levels of capital at the time of the announcement. It is somewhat puzzling, however, that Cornett and Tehranian look at BHC capitalization at the end of the year before the security issuance rather than at the end of the year before the security issuance announcement.

Keeley and Cornett and Tehranian also use different capital ratios for their classifications. Keeley uses a 5.5 percent primary capital ratio cutoff, and Cornett and Tehranian use a 7 percent total capital ratio cutoff.[4] This may be an important distinction, but it would not, a priori, tend to yield the particular differences in results that we see.

Finally, as Cornett and Tehranian point out, their sample size is considerably larger than Keeley's. By itself, this lends credence to Cornett and Tehranian's results. In particular, it may explain why Keeley did not find a statistically significant negative common stock announcement effect for his capital sufficient BHCs in the post-1981 period, whereas Cornett and Tehranian did.[5] Also, neither study mentions excluding security issuance announcements contaminated by the concurrent announcement of other important news, such as ratings changes or merger agreements. Although not removing contaminated announcements would not, a priori, bias results in one direction or the other, it might lead to spurious conclusions. This would more likely be a problem with small samples such as Keeley's.

II. Announcement Effects: Methodology, Data, and Results

Methodology

This section reexamines the effect of the announcement of an upcoming issuance of securities on BHC stock returns. Studies cited above did not estimate announcement effects for the period of time relevant to this paper—after publication of the risk-based capital guidelines. Given the regulatory regime shift and the dependence of this paper's thesis on the continued existence of a negative common stock wealth effect, it is important to examine the post-1989 period in particular.

The announcement effect of a security issuance is the change in the announcing firm's common stock return resulting from the announcement, or the "abnormal return." To calculate abnormal returns, some estimate of "normal" returns must be made. In this paper, I use the market model to estimate normal, or expected, returns.

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3. The mean value of assets for BHCs issuing voluntarily was (in millions) $38,289.6, and the median was $16,488.5, while the corresponding figures for those issuing involuntarily were $29,809.6 and $12,236.2.

4. In 1981, specific minimum primary capital-to-total assets ratios were set for BHCs based on their size. The minima were 6 percent for BHCs with assets of $1 billion or less and 5 percent for BHCs over $1 billion. The 17 largest banking organizations, the multinationals, were treated on an individual basis. Also in 1981, the Federal Reserve set up "zones" of adequacy for regional banking organizations, based on total capital-to-assets ratios. An "acceptable" total capital-to-assets ratio was deemed to be 6.5 percent, and banking organizations in this zone were subject to minimum regulatory supervision. The minimum was set at 5.5 percent.

In June 1983, the 6.5 percent cutoff for acceptable total capital was increased to 7 percent, and the 5 percent primary capital requirement was extended to the multinationals. Cornett and Tehranian use the 7 percent total capital requirement as their cutoff for involuntary issues.

In 1985, regulators introduced a minimum primary capital-to-assets ratio of 5.5 percent and a minimum total capital-to-assets ratio of 6 percent for all BHCs. Keeley argues that these 1985 rules were the ultimate goal as early as 1981, so he designates any BHC with a primary capital ratio in December 1981 of less than 5.5 percent as capital deficient.

5. Keeley had only five observations in his post-1981 sample of common stock issuance announcements by capital sufficient BHCs, whereas Cornett and Tehranian had 61 observations in their sample of voluntary common stock issuances.

Under the market model,

$$(1) \qquad R_{jt} = \alpha_j + \beta_j R_{mt} + \epsilon_{jt} ,$$

where R_{jt} is bank j's common stock return on day t and R_{mt} is the market return on day t. I estimate the market model for each bank and for each announcement event for a 120-day period. The first part of the estimation period begins 79 trading days before the security issuance announcement and ends 20 days before it; the second part begins 20 days after the announcement and ends 79 days after it.[6] The "announcement day" is defined as the day that news of the planned issuance appears on the *DJNW*. The abnormal return, or prediction error, PE_{ji} for bank j on announcement day t_{ji}, is then the difference between the actual return and the predicted return as given by the market model

$$(2) \qquad PE_{ji} = R_{ji} - (\alpha_{ji} + \beta_{ji} R_{m,ji})$$

where R_{ji} is bank j's common stock return on day t_{ji}, α_{ji} and β_{ji} are the coefficients estimated from equation (1) for bank j and announcement event i, and $R_{m,ji}$ is the market return on day t_{ji}.

I calculate an average prediction error for various security types. The average prediction error simply adds together the prediction errors for events associated with a particular security type, and averages this sum across all events (for all BHCs) of that type. Let {K} be the set of all events associated with security type k, and let K be the number of events of type k. Then the "average prediction error" for security type k, APE_k is defined as:

$$(3) \qquad APE_k = (\frac{1}{K}) \sum_{k \in \{K\}} PE_{ji} .$$

The average prediction error indicates the size of the abnormal return. A test of the statistical significance of the abnormal return requires a transformation of the prediction error into the "standardized prediction error," defined as

$$(4) \qquad SPE_{ji} = \frac{PE_{ji}}{S_{ji}} ,$$

where

$$(5) \qquad S_{ji} = \sqrt{V_{ji}^2 (1 + \frac{1}{120} + \frac{(R_{m,ji} - \bar{R}_{m,ji})^2}{\sum_{t=1}^{120} (R_{mt} - \bar{R}_{m,ji})^2})} .$$

In (5), V_{ji} is the residual variance from the market model regression for bank j and event i, $R_{m,ji}$ is the market return on event day t_{ji}, R_{mt} is the market return on day t of the market model estimation period, and $\bar{R}_{m,ji}$ is the mean market return in the estimation period associated with bank j and event i.

The "average standardized prediction error" for security type k, $ASPE_k$, is defined as

$$(6) \qquad ASPE_k = \frac{1}{K} \sum_{k \in \{K\}} SPE_{ji} .$$

Under reasonable assumptions, it can then be shown that the statistic

$$(7) \qquad Z = \sqrt{K} (ASPE_k)$$

has a standard normal distribution (Mikkelson and Partch 1986).

Data

Although the risk-based capital requirements were not fully implemented until the end of 1992, final guidelines were issued in March 1989. Therefore, this data set covers 1989 through 1992.[7] A list of BHC securities issuances was obtained from Securities Data Company (SDC). Most of the issuances on the SDC data set include the SEC filing date (registration date) for the offering. Relatively few have missing filing dates. The SDC data also include the security type, the date the security was offered to the market, and the dollar amount raised by the offering.

The filing date given on the SDC data set was used to locate the announcement date on the *DJNW*. Usually, the first announcement was on the day of or day after the filing or, rarely, soon before the filing.[8] Given the widespread coverage offered by the *DJNW*, issuances for which no *DJNW* announcement could be located were assumed to be not publicly announced and were omitted from the sample.

Security issuances that are filed as shelf registrations also were omitted from the sample. A shelf registration permits a firm to issue at any time in the future and is therefore a weaker signal than a non-shelf registration that the firm intends to issue in the near future. (Common stock issuances in the SDC data set were never filed as shelf registrations, so the omission of shelf registrations does not affect prediction error estimates for common stock.)

6. I use post-event data in addition to pre-event data to estimate the market model because the event itself may alter stock price volatility.

7. To be included in the data set, the announcement had to be between 1989 and 1992, inclusive, and the actual issuance had to take place by the end of 1992.

8. The close on the New York Stock Exchange, the American Stock Exchange, and NASDAQ (National Association of Securities Dealers Automated Quotations System for stock traded over-the-counter) is at 4:00 p.m., Eastern time. Therefore, if the news came over the wire after 4:00 p.m., the announcement date was taken to be the next trading day.

In addition, if on the announcement day significant news other than the security issuance announcement appeared (for example securities ratings changes, unexpected changes in earnings or loan loss provisions, and merger announcements), that observation was dropped from the sample. Finally, initial public offerings and secondary offerings of securities were omitted.

Common stock returns for estimation of the prediction errors were obtained from two sources. Returns for BHCs whose stock trades on the New York Stock Exchange or the American Stock Exchange were obtained from the Center for Research in Securities Prices. Those for BHCs whose stock trades over the counter were calculated using stock prices obtained from Data Resources, Incorporated. The market return used in estimation of the market model was the return on a broad-based index, the Wilshire 5000 Index.

Results

Average prediction errors and their associated Z statistics were calculated for common stock, subordinated debt, and preferred stock. I also calculated prediction errors for two subcategories of preferred stock: auction-rate preferred stock and non-auction-rate preferred stock. The risk-based capital requirements state that common stock and non-auction-rate perpetual preferred stock count as Tier 1 capital for BHCs, while subordinated debt and auction-rate perpetual preferred stock count as supplementary capital.

Mandatory convertible debt and term preferred stock also count as secondary capital. However, neither the SDC data set nor the *DJNW* specified whether debt issuances were mandatory convertible or not, nor whether preferred stock was perpetual or term. Therefore, no prediction errors are provided for mandatory convertible debt. Also, all preferred stock was assumed to be perpetual (and, unless otherwise noted by SDC or the *DJNW*, was assumed to be non-auction-rate). Table 1 shows the number of securities issuance announcements in the sample, by year of announcement and type of security.

Table 2 contains the average prediction errors and their associated Z statistics for the various security types listed in Table 1. The results in Table 2 indicate that, on average, there are significant negative abnormal returns associated with the issuance of common stock. On average, the announcement of an impending issuance of new common stock decreases common stock returns relative to their predicted values by approximately 1.6 percentage points. Abnormal returns due to the announcement of the issuance of other types of securities are not statistically significant.

The magnitude of the announcement effect found for common stock is remarkably similar to those found by previous researchers. Wansley and Dhillon found a two-day announcement effect for common stock of –1.5 percentage points; Keeley found the same for his entire sample; Polonchek, et al., found a three-day announcement effect of –1.4 percentage points; and Wall and Peterson found a one-day announcement effect of –1.5 percentage points.

However, as discussed in the literature review in Section I, Cornett and Tehranian's results cast some doubt on the existence of a negative common stock wealth effect for relatively low-capital banking organizations. Therefore, given the focus of this paper, it is important to test for the existence of a negative common stock wealth effect for low-capital banks. I looked at BHCs' capital positions in

TABLE 1

SECURITIES ISSUES[a]

SECURITY TYPE	1989	1990	1991	1992	ALL YEARS
Common Stock	7	1	16	20	44
Subordinated Debt	1	1	2	2	6
Preferred Stock	3	2	7	7	19
Auction-Rate	3	0	1	1	5
Nonauction-Rate	0	2	6	6	14

SOURCE: Securities Data Company.
[a]Publicly announced, non-shelf registered issues only.

TABLE 2

AVERAGE PREDICTION ERRORS (*APE*)
1989-1992[a]

SECURITY TYPE	*APE*	Z	PERCENT NEGATIVE[b] (SAMPLE SIZE)
Common Stock	–.0155*	–4.17	77.3[c] (44)
Subordinated Debt	.0012	–.11	66.7 (6)
Preferred Stock	.00009	.009	63.2 (19)
Auction-Rate	.005	.35	60.0 (5)
Nonauction-Rate	–.0016	–.2	78.6 (14)

[a]Prediction errors are actual residual returns, not percentage point residual returns.
[b]The null hypothesis is that the proportion of negative prediction errors equals 0.5. I use the Wilcoxon signed-ranks test described by Daniel (1978).
[c]Signed-ranks test is significant at the 1 percent level.
*Significantly different from 0 at the 1 percent level.

December 1990 (the first date for which risk-based capital figures were available) and chose those that had to issue common stock to meet the well-capitalized risk-based capital guidelines.[9] There were ten common stock issuance announcements by such BHCs in 1991 and 1992. The average prediction error for this group was estimated to be –2.74 percentage points, which was statistically significant at the 1 percent level. In addition, nine out of the ten prediction errors were negative.

III. The Effect on Capital Deficient BHCs

BHCs that were capital deficient when the risk-based capital rules were published had to redress the situation or face tight regulatory supervision and perhaps closure. It is reasonable to suppose that capital deficient BHCs would not have chosen to meet the guidelines exclusively by issuing common stock given its negative wealth effect. For some BHCs, the alternatives to issuing common stock included decreasing assets and issuing other types of securities that, as shown in the last section, appear not to have negative wealth effects. I will refer to deficient BHCs with such options simply as "unconstrained" BHCs. For other deficient BHCs, the only alternative to issuing common stock was to decrease assets. I will refer to these BHCs as "constrained" BHCs. BHCs that meet the guidelines will be called "unaffected" BHCs.

Given their lack of attractive options, it is likely that, following the publication of the risk-based capital guidelines, constrained BHCs decreased assets more than did unconstrained BHCs. Whether this is in fact the case must be ascertained empirically. The first step in this exercise is to identify properly constrained and unconstrained BHCs, which depends on an understanding of the risk-based capital rules.

The calculation of Tier 1 capital for BHCs sums common shareholders' equity (including retained earnings), non-auction-rate perpetual preferred stock, up to a certain limit, and minority interests in equity accounts of consolidated subsidiaries. The rules then deduct "goodwill" and 50 percent of investments in unconsolidated banking and finance subsidiaries from this sum to obtain Tier 1 capital.[10] Non-auction-rate perpetual preferred stock is limited to 25 percent of Tier 1 capital exclusive of the deductions.

The calculation of supplementary (Tier 2) capital for BHCs sums allowance for loan and lease losses, perpetual preferred stock not eligible for inclusion in Tier 1 capital (including auction-rate perpetual preferred), hybrid capital instruments (e.g., mandatory convertible debt and perpetual debt), term subordinated debt, and intermediate-term preferred stock. Then, the other 50 percent of investments in unconsolidated subsidiaries is deducted. Finally, the rules set Tier 2 capital equal to this net amount or Tier 1 capital, whichever is greater.

Total capital is the sum of Tier 1 capital plus Tier 2 capital minus reciprocal holdings of other depositories' capital securities. The risk-based capital rules specify minima for three capital ratios. Stated differently, the rules require that different types of capital be equal to at least a certain percentage of risk-weighted or unweighted assets. Tier 1 capital is required to be equal to at least 4 percent of risk-weighted assets. Total capital is required to be at least 8 percent of risk-weighted assets. The "leverage ratio" requirement is that Tier 1 capital plus 50 percent of investments in unconsolidated subsidiaries be at least 4 percent of total tangible assets, not risk-weighted.

Although the risk-based capital requirements were first made public in early 1989, Tier 1 capital, Tier 2 capital, and risk-weighted assets figures were not all available until December 1990. Therefore, categorization of BHCs into capitalization groups is based on year-end 1990 data rather than early 1989 data. Capital ratio elements were obtained from the Consolidated Financial Statements for BHCs for all 1,119 BHCs reporting risk-weighted assets figures in December 1990.

Constrained BHCs were identified as those BHCs that did not meet the Tier 1 requirement, the leverage ratio requirement, or both, in December 1990, and would not be expected to meet them by the end of 1992, taking into account projected growth in retained earnings.[11] The risk-based rules required full compliance by the end of 1992. In devising a strategy to meet the guidelines by that time, capital deficient BHCs likely took into account probable growth in retained earnings. I assume that, at the end of 1990, BHCs projected that retained earnings growth during 1991 and 1992 would be the same as during 1989. Therefore, the group of constrained BHCs excludes those that would have been predicted to meet the Tier 1 and

9. To be considered well-capitalized under the risk-based capital rules, a BHC has to hold Tier 1 capital equal to at least 6 percent of risk-weighted assets. Total capital is required to be at least 10 percent of risk-weighted assets, and, under the leverage ratio requirement, Tier 1 capital must be at least 5 percent of unweighted assets.

10. Goodwill is an intangible asset that is entered on the books of a banking organization when it pays more than book value to acquire assets.

11. This group was filtered to remove those BHCs that might have met the Tier 1 and leverage ratio minima simply by issuing nonauction-rate perpetual preferred stock, taking into account the limit on the use of this type of security for Tier 1 purposes. However, no BHCs fell into this category.

leverage capital ratio minima by the end of 1992 simply through sustained retained earnings growth. Of 82 BHCs that failed to meet the Tier 1 ratio, the leverage ratio, or both, in December 1990, 15 were excluded by this means, leaving 67 constrained BHCs.

Unconstrained BHCs were defined to be those that met the Tier 1 and leverage ratio minima (or were projected to by year-end 1992), but not the total ratio minimum, in December 1990. Unaffected BHCs were defined to be those that met all three capital ratio minima in December 1990.

Table 3 gives various descriptive statistics for the subset of each of the three groups of BHCs that reported loans in both December 1990 and December 1992. Of particular interest is total loan growth between year-end 1990 and year-end 1992, the deadline for full compliance with the risk-based capital requirements. Because of the relatively high weighting given to loans in the calculation of risk-weighted assets, BHCs with inadequate Tier 1 or total capital ratios who chose to remedy the situation with a decrease in assets would have had a particularly strong incentive to decrease loans. Commercial business, commercial real estate, and consumer loans receive a 100 percent weight in the calculation of risk-based capital. Residential mortgages receive a 50 percent weight. U.S. government securities receive a zero weight. BHCs with inadequate leverage ratios may also have chosen to decrease loans.

TABLE 3

Descriptive Statistics for 997 BHCs Reporting Risk-Weighted Assets in December 1990 and Loans in December 1990 and December 1992

	Assets[a] (millions)	Risk-Weighted Assets[b]	Total Loan Growth[c]
Unaffected BHCs (n = 906)			
Mean	$2,616.7	$2,603	10.28%
Minimum	$140.9	$18.2	−82.29%
Maximum	$110,728	$104,116.3	293.54%
Unconstrained BHCs (n = 52)			
Mean	$3,107.7	$2,815.1	11.54%
Minimum	$155.2	$79.8	−41.99%
Maximum	$45,389.9	$48,771.7	316.77%
Constrained BHCs (n = 39)			
Mean	$7,289.3	$7,604.3	−12.64%
Minimum	$152.7	$54.4	−84.16%
Maximum	$216,986	$245,556.6	173.72%

Source: Consolidated Financial Statements for BHCs.
[a]Book value of unweighted assets in December 1990.
[b]Book value of risk-weighted assets in December 1990.
[c]December 1990 to December 1992.

As can be seen from Table 3, the mean asset size of constrained BHCs was larger than the mean asset sizes of unconstrained and unaffected BHCs. More important, average loan growth for the constrained BHC group was considerably lower than for the unconstrained group. In addition, average growth for the unconstrained group was comparable to that for unaffected BHCs. This suggests that decreasing loans, although an option for unconstrained BHCs, was avoided as much as possible and was pursued only by the constrained BHCs. However, this result is not conclusive because it does not control for the extent of capital deficiency in the unconstrained and constrained groups, nor for changes in loan demand, both of which may influence loan growth. I will control for these factors when I compare loan growth for these two groups in the next section.

Table 4 compares the incidence of common stock issuance and the amounts raised through common stock issuance for the three groups of BHCs.

Given the negative wealth effects of common stock issuance, the incidence of common stock issuance seen for all three groups in Table 4 seems surprisingly high.[12] Apparently, despite its negative wealth effects, some BHCs have good reasons to want to issue common stock. An example might be issuing common stock for acquisition purposes. However, by itself, "having" to issue common stock to avoid a decrease in assets apparently was not a very good reason. All other things equal, one would have expected that the issuance rate for constrained BHCs, which had to issue common stock or decrease assets, would have been higher than for unconstrained or unaffected BHCs. However, the negative wealth effect seems to have been strong enough that constrained BHCs were not *especially* likely to issue common stock. As shown in Table 4, constrained BHCs were no more likely to have been common stock issuers than unconstrained BHCs and only slightly more likely than unaffected BHCs, although they did seem to raise somewhat larger amounts when they did issue.

12. The Consolidated Financial Statements data set covers a much wider universe of common stock issuers than does the SDC data set, but it has no information on filing dates or announcement dates. Only the larger BHCs with publicly traded securities are reported on the SDC data set. For 1991 and 1992, SDC reported 53 BHC common stock issuers, whereas the Consolidated Financial Statements reported 424 issuers.

TABLE 4

COMMON STOCK ISSUANCES BY SAMPLE BHCS
DECEMBER 1990–DECEMBER 1992

NUMBER OF BHCS	AMOUNT ISSUED[a]	
Unaffected BHCs	Mean	.67%
(382 out of 906, or 42.16%)	Minimum	.0006%
	Maximum	11.66%
Unconstrained BHCs	Mean	.99%
(24 out of 52, or 46.15%)	Minimum	.001%
	Maximum	8.75%
Constrained BHCs	Mean	1.49%
(18 out of 39, or 46.15%)	Minimum	.0007%
	Maximum	10.43%

SOURCE: Consolidated Financial Statements for BHCs.
[a]Amount raised as a percent of risk-weighted assets in December 1990. Statistics are based on issuing BHCs only.

IV. THE EFFECT OF THE TIER 1 CAPITAL REQUIREMENTS ON CONSTRAINED BHC LOAN GROWTH

In this section, I investigate whether the difference shown in Table 3 between constrained and unconstrained BHC loan growth is statistically significant, controlling for other factors likely to affect loan growth. I will test the hypothesis that constrained BHC loan growth between year-end 1990 and year-end 1992 was statistically significantly more negative than unconstrained BHC loan growth over the same period.

Given the results in Section II, I will assume that negative common stock wealth effects apply to constrained BHCs.[13] The simple regression that I will estimate has loan growth as a function of the BHC's maximum capital ratio shortfall. This is the maximum of the three differences between the three required minimum levels and the three corresponding actual ratios in December 1990.

For unconstrained BHCs, the maximum capital ratio shortfall is the percentage point difference between the total capital ratio minimum and the actual total capital ratio. For constrained BHCs, it is the difference between the total capital ratio minimum and the actual total capital ratio, or the difference between the leverage ratio minimum and the actual leverage ratio, whichever is greater. In making loan growth a function of the capital shortfall below the minimum, I assume that the minimum is the target for most BHCs.[14] In addition, I control for the possibility that lower loan growth by the constrained BHCs is simply the result of a greater capital deficiency, however capital is defined, and is not the result of a deficiency in common equity in particular.[15]

To control for changes in loan demand, the regression also includes economic growth in the BHCs' subsidiaries' states. This is the weighted average personal income growth between December 1990 and December 1992, in percent, in the BHC's subsidiary banks' states, weighted by the share of total BHC assets held by the BHC's subsidiaries in that state. I expect that there is a positive relationship between economic growth and loan growth.

A constant is included to help capture the effects of other influences on loan growth not stemming from the need to achieve regulatory capital minima. BHCs that reported loans in December 1990 but not in December 1992 are omitted from the regression. A dummy variable indicates whether or not the BHC is constrained or unconstrained.

The model was estimated using ordinary least squares regression on a sample of 75 unconstrained and constrained

13. The ideal approach would be to estimate common stock announcement effects for constrained BHCs for 1991 and 1992. (Announcements during 1991 and 1992 are relevant because the dependent variable in the regression will be loan growth between December 1990 and December 1992.) Unfortunately, the sample size was insufficient to permit such estimation. There were four common stock issuance announcements between December 1990 and December 1992 by constrained BHCs. Securities Data reported no filing dates for three of these, and therefore no announcement dates were located. The remaining announcement, by Riggs National Corporation, resulted in a 1.11 percentage point drop in the return on common stock. Therefore, results for constrained BHCs were proxied by the announcement effects reported in Section II for BHCs that had to issue common stock (or decrease assets) to meet the *well*-capitalized guidelines.

14. Furlong (1993) argues that, for many capital deficient BHCs, becoming well-capitalized, not just adequately capitalized, was the goal. Furlong examines changes in capital and risk-based assets between December 1990 and December 1992. Official requirements for being considered well-capitalized were not published until June 1992. However, it is reasonable to assume that these rules just codified unwritten rules already well-understood by BHCs. Therefore, it is reasonable to argue that many BHCs that did not meet well-capitalized guidelines in December 1990 intended to do so by December 1992. However, using the capital shortfall below the *minimum* rather than the well-capitalized level is consistent with the BHC group definitions and, in the regression, merely changes the relative sizes of the coefficients on the constant and the shortfall variable.

15. Strictly speaking, given a target ratio, the increase in capital and decrease in assets chosen to achieve the goal will depend on the shortfall *and* the initial levels of capital and assets. However, when initial levels for capital and assets were included in the regression, their coefficients were not statistically significant.

BHCs.[16] The dependent variable is percent growth in total loans outstanding between the fourth quarter of 1990 and the fourth quarter of 1992, as indicated on the Consolidated Financial Statements for BHCs. Table 5 reports the regression results.

The results in Table 5 support the hypothesis that constrained BHCs had statistically significantly lower loan growth over the 1991–1992 period than unconstrained BHCs, even controlling for differences in loan demand and general capital deficiency. The results indicate that, on average and with other factors held constant, loan growth at BHCs that were constrained either to issue common stock or to decrease assets was about 28 percentage points lower than loan growth at BHCs that could reach the minimum by issuing other types of capital instruments. This difference is comparable to, but somewhat larger than, the difference in mean loan growth between the two groups seen in Table 3. The capital shortfall and economic growth variables also have the expected signs and are statistically significant.

TABLE 5

Regression Results

Loan Growth between December 1990 and December 1992 for 75 Constrained and Unconstrained Bank Holding Companies

Explanatory Variable	Coefficient	t ratio
Constant	−48.878**	−2.046
Capital Ratio Shortfall	−2.83*	−1.865
Economic Growth in BHC Subsidiary States	7.157***	2.867
Constrained	−28.103***	−2.708
Adjusted R^2 = .164		

*Significantly different from zero at the 10 percent level.
**Significantly different from zero at the 5 percent level.
***Significantly different from zero at the 1 percent level.

V. Conclusion

This paper tests a two-part hypothesis. First, during the period between publication of the risk-based capital requirements in early 1989 and the end of 1992, BHCs faced a statistically significant decrease in stock returns—a negative shareholder wealth effect—if they issued new common stock. Second, this negative wealth effect discouraged new common stock issuance and therefore in effect forced BHCs deficient in common stock to decrease loans outstanding more than did BHCs deficient in other types of capital. Empirical evidence supporting both parts of the hypothesis was presented.

One interpretation of the results presented in this paper is that, had the risk-based capital rules not included a requirement for a certain level of common shareholders' equity, loan growth for the group of BHCs identified in this paper as constrained would have been considerably higher. This does not necessarily mean that it would therefore have been wise to reduce or eliminate requirements for common shareholders' equity. This type of capital arguably provides the best protection to the deposit insurance fund in case of bank failure. However, it does mean that if we are concerned about the flow of bank credit to the economy, we should take into account the type of effect described in this paper in weighing the likely costs and benefits of the design and enforcement of capital regulations.

16. The number is less than the sum of unconstrained and constrained BHCs indicated in Table 3 (91). The BHCs excluded are ones for which the required information on bank subsidiary location could not be located (including foreign BHCs), BHCs with no commercial bank subsidiaries, and individuals or pseudo BHCs.

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