Economic Review

Federal Reserve Bank of San Francisco

1994 Number 2

The Federal Reserve Bank of San Francisco's Economic Review is published three times a year by the Bank's Research Department under the supervision of Jack H. Beebe, Senior Vice President and Director of Research. The publication is edited by Judith Goff. Design, production, and distribution are handled by the Public Information Department, with the assistance of Karen Flamme and William Rosenthal.

For free copies of this and other Federal Reserve publicatons, write or phone the Public Information Department, Federal Reserve Bank of San Francisco, P.O. Box 7702, San Francisco, California 94120. Phone (415) 974-2163.

Printed on recycled paper with soybean inks.

The Persistence of Bank Profits: What the Stock Market Implies

Mark E. Levonian

I am grateful to Elizabeth Laderman, Philip Lowe, Jonathan Neuberger, David Pyle, Sherrill Shaffer, Paula Worthington, and seminar participants at the University of Melbourne for helpful suggestions; I am also grateful to Jennifer Soller for competent research assistance.

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:

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

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

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.

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: $\lambda \geqslant 0$ 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:

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

(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:

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

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:

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

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:

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

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

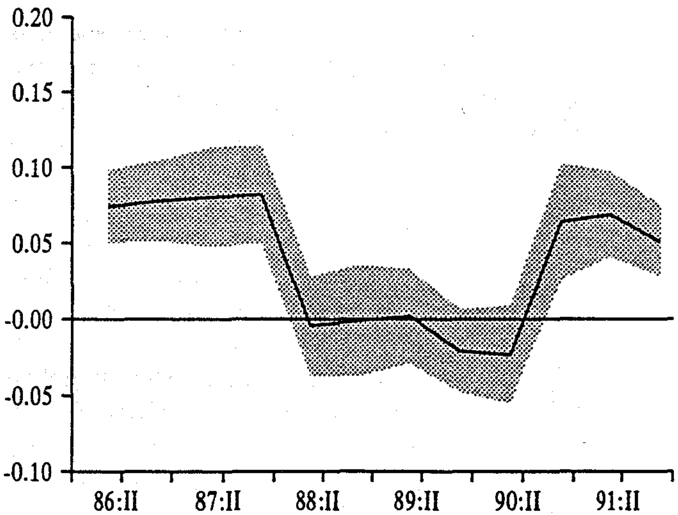
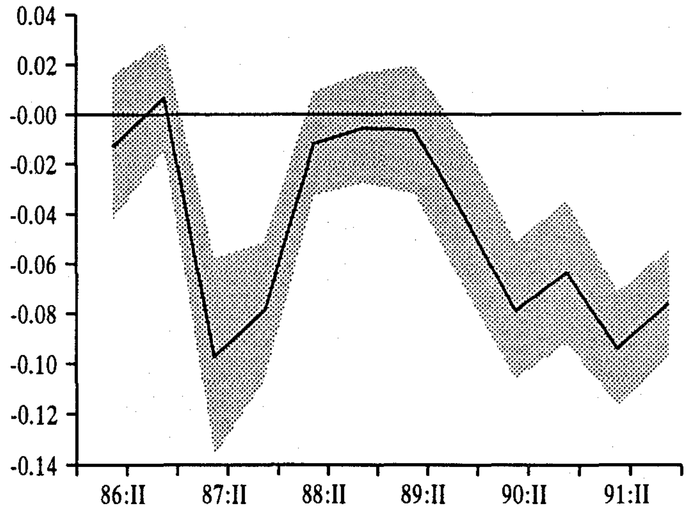


FIGURE 2

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*

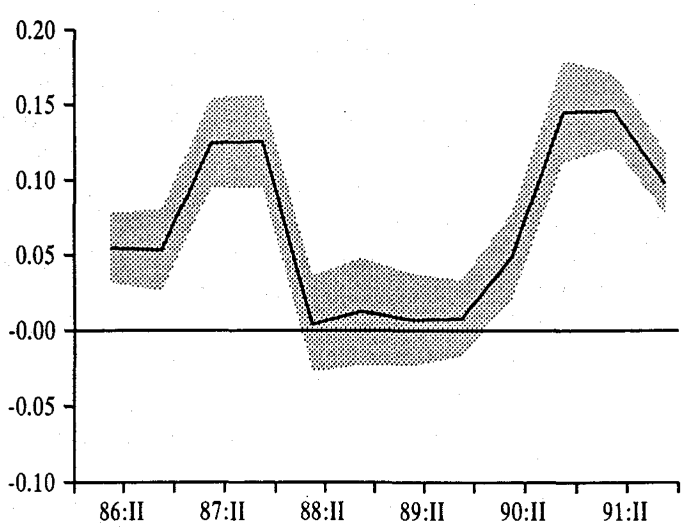
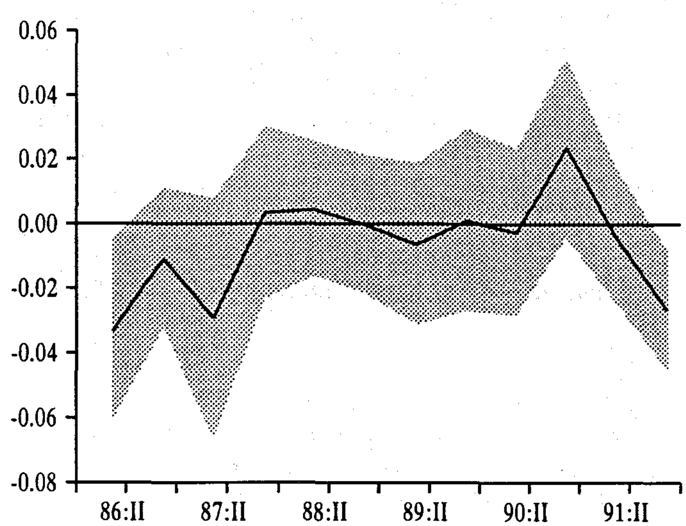


FIGURE 4

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.

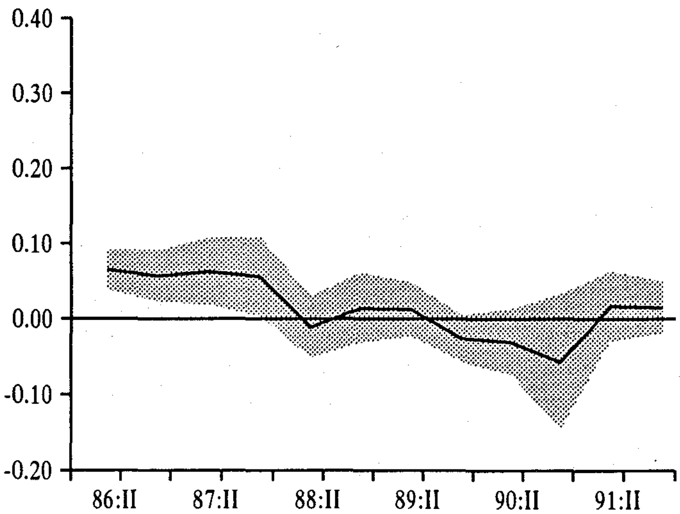
20. The results cited here are for banks in the \$500 million to \$33 billion range, the only group in Gup, et al., for which any banks diverge from the median *ROA* state.

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

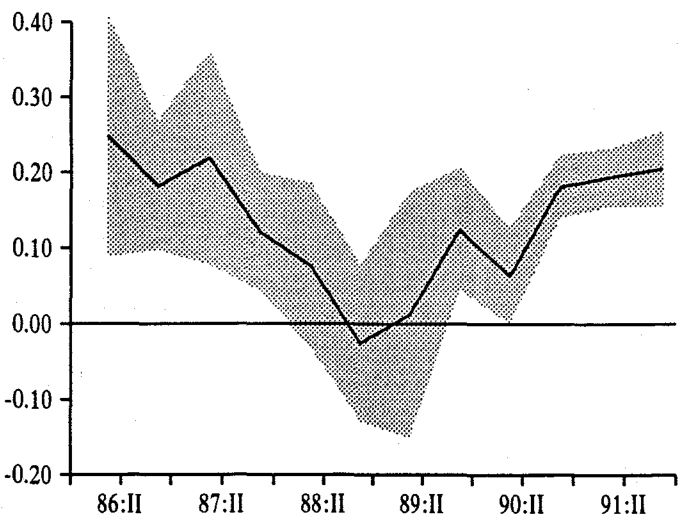
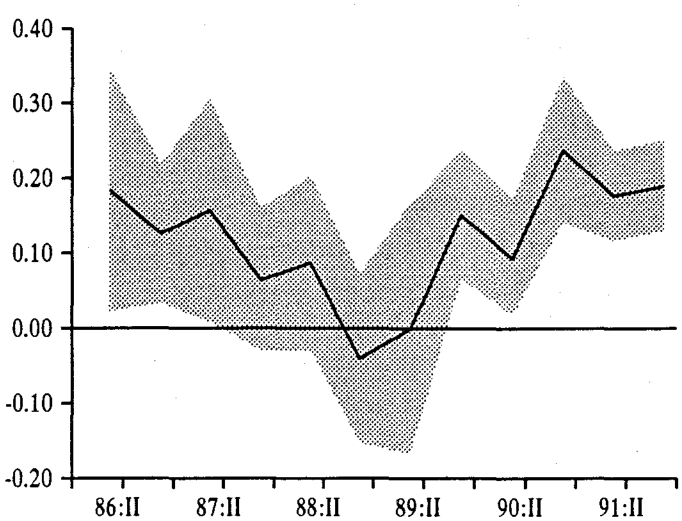


FIGURE 7

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.

REFERENCES

Copeland, Tom, Tim Koller, and Jack Murrin. 1990. *Valuation: Measuring and Managing the Value of Companies.* New York: John Wiley & Sons.

Fama, Eugene F., and Kenneth R. French. 1993. "Common Risk Factors in the Returns on Stocks and Bonds." *Journal of Financial Economics* 33(1) pp. 3-56.

Fisher, Franklin M., and John J. McGowan. 1983. "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits." *American Economic Review* 73(1) pp. 82-97.

Flannery, Mark J., and Christopher M. James. 1984. "The Effect of Interest Rate Changes on the Common Stock Returns of Financial Institutions." *Journal of Finance* 39(4) pp. 1141-1153.

Geroski, Paul A., and Alexis Jacquemin. 1988. "The Persistence of Profits: A European Comparison." *Economic Journal* 98 (June) pp. 375-387.

Gup, Benton E., S.M. Lau, T.H. Mattheiss, and John R. Walter. 1992. "An Empirical Analysis of Growth in Banking: A Markovian Approach." Unpublished.

Hannan, Timothy H., and Allen N. Berger. 1991. "The Rigidity of Prices: Evidence from the Banking Industry." *American Economic Review* 81(4) pp. 938-945.

Ibbotson Associates. 1991. *Stocks, Bonds, Bills and Inflation.* Chicago.

Keeley, Michael C. 1990. "Deposit Insurance, Risk, and Market Power in Banking." *American Economic Review* 80(5) pp. 1183-1200.

Lambson, Val Eugene. 1992. "Competitive Profits in the Long Run." *Review of Economic Studies* 59, pp. 125-142.

Leibowitz, Martin L., and Stanley Kogelman. 1990. "Inside the P/E Ratio: The Franchise Factor." *Financial Analysts Journal* (November-December) pp. 17-35.

Marcus, A., and I. Shaked. 1984. "The Valuation of FDIC Deposit Insurance Using Option-pricing Estimates." *Journal of Money, Credit, and Banking* 16(4) pp. 446-460.

Mueller, Dennis C. 1986. *Profits in the Long Run.* Cambridge University Press.

__________. 1977. "The Persistence of Profits Above the Norm." *Economica* 44, pp. 369-380.

Neumark, David, and Steven A. Sharpe. 1992. "Market Structure and the Nature of Price Rigidity: Evidence from the Market for Consumer Deposits." *Quarterly Journal of Economics* (May) pp. 657-680.

Ronn, Ehud I., and Avinash K. Verma. 1986. "Pricing Risk-Adjusted Deposit Insurance: An Option-Based Model." *Journal of Finance* 41(4), pp. 871-896.

Tobin, James, and William C. Brainard. 1977. "Asset Markets and the Cost of Capital." In *Economic Progress, Private Values, and Public Policy,* eds. Bela Balassa and Richard Nelson, (Chapter 11). Amsterdam: North-Holland.

Wilcox, Jarrod W. 1984. "The P/B-ROE Valuation Model." *Financial Analysts Journal* (January/February) pp. 58-66.

Worthington, Paula R. 1989. "On the Distinction Between Structure and Conduct: Adjustment Costs, Concentration, and Price Behavior." *Journal of Industrial Economics* 38 (December) pp. 235-238.