BANK DIVIDEND POLICY AND THE PREDICTION OF FUTURE BANK ACCOUNTING RETURNS

By

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Working Paper No. 12-83

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March, 1983

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I. Introduction

When a banking firm earns profits, it may divide its earnings among dividend outlays, a capital surplus account (which counts toward the bank's legal lending limit but from which dividends cannot be paid) and an undivided profit account (which, until recently, did not count toward the lending limit but from which dividend payments could be made). Despite the fact that this division can have important consequences for capital formation and adequacy, as well as future levels of dividend payments and market valuation, there has been virtually no research regarding this decision process and, in fact, there is scant evidence on bank behavior concerning any facet of this decision process.[1]

The purpose of this paper is to develop and test a positive model of the bank dividend and capital structure decision. We are guided in this effort by the insights on firm dividend behavior provided by Lintner (1956) and others (e.g., Fama and Babiak (1968)) and suggested by bank researchers (e.g., Jessup (1980), Hempel and Crosse (1980), Wemhoff (1982)). The formal model is based on the principle of safety first and the product of this analysis is an explicit relationship between the expected future returns to invested capital, the declared dividend and the maintained level of retained earnings available to support dividend payments should income prove to be inadequate to cover the dividend outlay. Thus, the model provides a testable relationship between dividend payments, capital structure decisions and the expected profitability of the banking firm.

This paper is organized as follows. In Section II the underlying assumptions of the theoretical framework and the pertinent institutional details are described. It is demonstrated that empirical observation of bank dividend behavior and legal restrictions on the banking firm make a safety first approach to the problem appropriate. This is followed by development of the model and derivation of its testable implications. In Section III the data and methodology employed to test the predictive relationship are described and the results of the analysis presented. Our findings indicate that the information provided by dividend and capital structure decisions enables a significant improvement on the earnings predictions of naive (i.e., fixed time series) models and thus provide support for our theoretical model. Section IV focuses on the 1976 decision of the Comptroller of the Currency to include undivided profits in the calculation of the legal lending limit. Given this (ceteris paribus) decrease in the opportunity cost of maintaining undivided profits, the performance of the model after 1976 provides a test as to whether the lending limit regulation imposed a constraint on bank behavior and, in addition, can be viewed as an indicator of the effectiveness of capital markets vis-a-vis regulations in influencing capital decisions. The results suggest that the regulation was binding, but that capital markets assert a similar influence on bank capital structure decisions. Section V contains our conclusions and a discussion of the implications of our findings.

II. A "Safety First" Model of Dividend Policy and Capital Structure Decisions

The positive model developed in this section is predicated on three assumptions. The first of these is based on observed dividend behavior. Lintner (1956) reported that firms were generally hesitant to raise dividend payments until they were confident that the higher level could be maintained and that firms demonstrated great reluctance to reduce dividends. The statements and actions of contemporary scholars, firm managers and capital market agents indicate that Lintner's main observation remains valid: dividend reductions are generally viewed as catastrophic, and treated as such by managers and investors.[2] Bank researchers in particular (Jessup, p. 371; Hempel and Crosse, p. 100) have emphasized the need to select a payout ratio that is low enough to assure maintenance of dividend payments if earnings decline. In a survey presented by Wemhoff (1982), bank managers cited maintenance and continuity of dividends as the most important factor in determining dividend policy. Consistent with this is the principle of safety first, which involves building a safety stock (reserve) for dividend payments.[3] This principle is incorporated into our model by the assumption of (A1) the existence, for each bank, of some maximum tolerable probability, denoted P^*, that a declared dividend rate cannot be maintained indefinitely.

The second assumption is based on institutional detail. Bank earnings initially appear on balance sheets in an account denoted undivided profits. Dividends may be paid as long as undivided profits exist and undivided profits are reduced by the amount that dividends exceed current earnings. For certain purposes, however, the various regulatory authorities do not treat undivided profits as capital. These purposes include, prior to 1976, the calculation of legal lending limits and, to the present date, determination of limits on capital note issues. The underlying rationale is that since dividend payments reduce undivided profits, the latter lacks the permanence necessary to be classified as capital. To qualify retained earnings as capital, a costless but (virtually) irreversible transfer from undivided profits to an account known as surplus must be voted by the board of directors. Dividend payments that would reduce the surplus account, however, are prohibited. Given this, our second assumption is the restriction implied above that (A2) dividend payments may not exceed the sum of current income and undivided profit.

Note, however, that the use of undivided profits to provide a safety stock for the payment of dividends is costly. The cost is the foregone opportunities for leveraging the bank (the capital note-capital adequacy effect) and serving loan markets with larger customers (the legal lending limit effect).[4] From an empirical standpoint the regulatory distinction between undivided profits and surplus provides an almost ideal setting for testing the safety first principle and, intuitively, a formal model should permit use of both declared dividends and undivided profits to forecast future earnings.

The third assumption involves the desired ratio of dividend outlays to income. Most discussion of bank dividend behavior involves a target payout ratio (Jessup, p. 371; Mason (1979), p. 177) that implies maintenance of a dividend payment in proportion to expected earnings. In the survey by Wemhoff, bank managers most frequently cited a target payout ratio as accurately describing their dividend policy. We assume that (A3) the firm's objective is to maximize dividend outlays so that its desired payout ratio is one. This assumption is consistent with Shiller's (1981) argument that the price of a firm's stock is based on the discounted present value of its expected dividend stream. This assumption is not crucial; it could have been assumed that the desired target payout ratio is less than unity but this would only complicate the presentation of the model and would not change its implications.

Our model is thus based on the bank maximizing dividend outlays (A3) subject to the constraint that dividend payments not exceed current income plus undivided profit (A2) and the constraint (A1) that the probability of a future reduction in dividends is no greater than P*. To formalize this requires the following notation:

K Total capital;

S Capital surplus;

$(K - S)$	Undivided profit;
r	The uncertain rate of return to be earned per unit of capital available to support earning assets, characterized by a normal distribution; i.e., $r \sim N(\mu, \sigma^2)$.
d	The declared dividend;
P^*	The maximum tolerable probability that d must eventually be reduced;
J	$\equiv -\frac{1}{2} \ln(P^*)$;
R	$\equiv S/(K - S)$.

The condition that must be satisfied if dividends are to be paid continuously prior to and at time n is

$$\sum_{t=1,\ell} (r_t S - d) > -(K - S) \text{ for } \ell = 1, n \tag{1}$$

where the subscript t denotes the time period of operation. That is, the dividend stream will be maintained to time n only if the cumulative difference between prior periods' earnings and dividends has not exhausted the safety stock, K - S, at any time. The probability that (1) is not satisfied for at least one period of N successive periods is identical to the probability that it is not satisfied for the worst of the N periods:

$$\text{Prob}\left\{\min_{n < N}\left[\sum_{t=1,n} (r_t S - d)\right] < -(K - S)\right\} . \tag{2}$$

As $N \to \infty$, the probability in (2) becomes[5]

$$\hat{P} = \exp\left\{\frac{-2(\mu S - d)(K - S)}{S^2\sigma^2}\right\} . \tag{3}$$

Equation (3) can also be written

$$\hat{P} = \left[\exp\left\{\frac{2(\mu S - d)}{S\sigma}\right\}\right]^{-(K-S)/S\sigma} \tag{4}$$

Equation (4) gives the probability of eventual passage to zero of a variable starting at K - S and undergoing jumps of random magnitude determined according to a normal distribution with mean μ and variance σ^2. For the problem at hand, $\hat{P}$ is the probability that the dividend will eventually be reduced (or missed), an event equivalent to K - S being depleted.[6]

Suppose P* is the maximum tolerable probability of a subsequent reduction in d. It is evident that the maximum permissable value of d will increase with P. Since greater d is preferred, P* will always be the actual probability associated with the chosen value of d. Then from equation (4), the possible combinations of choices of d and S, for fixed values of K, μ and σ^2 are given by

$$d = S\mu - \frac{JS^2\sigma^2}{K - S} \tag{5}$$

where $J = -\frac{1}{2}\ln(P^*)$. The problem faced by the decision maker is to choose S to maximize d, which yields as a first order condition

$$\mu - \frac{2JS\sigma^2}{K - S} - \frac{JS^2\sigma^2}{(K - S)^2} = 0 \tag{6}$$

or

$$\mu/J\sigma^2 = \overline{R}^2 + 2\overline{R} \tag{7}$$

where $\overline{R}$ is the optimal value of S/(K - S). From equation (5), aided by the envelope theorem, it can be shown that

$$\frac{\partial d}{\partial (K - S)}, \frac{\partial d}{\partial \mu} > 0 \text{ and } \frac{\partial d}{\partial \sigma^2} < 0 .$$

The magnitude of the penalty acompanying a subsequent reduction of d whatever its nature might be, is unlikely to be directly dependent on μ and σ^2, so it is reasonable to assume that P* is independent of μ and σ^2. Since, by assumption, the decision maker's wellbeing increases with d, it must also increase with μ and decline with σ^2.

Equations (5) and (6) imply a relationship between dividend payments, capital structure and returns to investment that is the focus of our empirical tests:

$$\frac{d}{S} = \mu\left[1 - \frac{\overline{R}}{\overline{R}^2 + 2\overline{R}}\right] . \qquad (8)$$

It is important to note that the expression for d/S does not involve P* directly. If the decision maker has preferences over values of P*, he will still choose S to maximize the value of d associated with each value of P*. The relationship expressed in equation (8) will obtain no matter whether P* is predetermined or endogenous. Thus the unobservable variable, μ, is implied by the observable variables according to

$$\mu = d/S\left[1 - \frac{\overline{R}}{\overline{R}^2 + 2\overline{R}}\right]^{-1} . \qquad (9)$$

On the assumption that actual rates of return are unbiased measures of μ and that S and d are observed at their desired values, equation (9) provides a means of forecasting future changes in profits from current changes in dividends and in the allocation of capital between undivided profits and surplus. The line of causation in the model is from expectations about rates of return to current decisions. The decisions embedded in equation (9) can be used to forecast what actual future returns will be because they reflect what current expectations are.

III. The Empirical Relationship Between Dividends, Capital Structure and Income

The analysis of the preceding section resulted in a derived relationship among expected earnings, dividends and capital structure decisions which is reproduced below in a form more convenient for subsequent discussion:

$$\mu = DC \qquad (10)$$

where $D = d/S$ and $C = [1 - \overline{R}/(\overline{R}^2 + 2\overline{R})]^{-1}$. DC is posited to be an observable measure of the unobservable expectation of future returns, μ. We test this proposition by determining whether knowledge of DC can improve upon forecasts of rates of return on invested capital derived from a time series analysis. To do so, we analyze for each bank, the performance of the following equation:

$$\ell nA_t = \beta_0 + \sum_{j=1}^{n} \beta_j \ell nA_{t-j} + \alpha \ell nDC_{t-1} + \ell n\varepsilon_t \qquad (11)$$

where A_t is the actual rate of return in period t and ℓn denotes natural logarithm. Of particular concern are the sign and significance of the coefficient α and the validity of the restriction that $\alpha = 0$. It should be noted that in addition to testing the model, we are simultaneously testing the assumptions that the decision variables expressed in (11) are observed at their desired levels and that expectations are rational.[7,8]

To estimate (11) we use quarterly financial data from 1969.1 to 1979.2 for 138 banks found on Standard and Poor's Bank Compustat File. The sample includes all banks with sufficient data to estimate a time series with lags up to four quarters. Although the sample represents only a small proportion of the more than 14,000 U.S. banks, total assets of these banks exceed half the assets of the entire banking system. Much of our analysis focuses on a subsample of 30 banks for which all data were available for every quarter in the sample period. The subsample, hereafter the Select sample, is important in its own right since it contains the major U.S. money center banks and accounts for the majority of the assets in our sample. A list of the Select sample banks and their asset size for the (mid-sample) quarter 1974.1 is presented in Table 1.

The variables required for estimation of (11) are A, d, K and S. The dividend commitment, d, is measured by Cash Dividends Declared on Common Stock. The safety stock, K - S, is taken to be Undivided Profits. Total Book

Value, the sum of all common equity accounts including reserves for contingencies, is used to measure K. Net Income Available for Common Stock is used in conjunction with the capital investment variables to calculate A. These definitions are consistent with the theoretical model and the view that the capital structure decision is subsumed in the treatment of μ as a rate of return on equity capital.

Table 2 presents the cross-sectional means of A, d/S and (K - S)/S, for both the Select sample and other banks, at yearly intervals from 1969 to 1979 and quarterly between 1976 and 1978. The quarterly results correspond to the period of time surrounding the date when the relevant capital qualification regulation changed (1977.1). Data from the two subsamples are similar in that both show an upward trend, probably reflecting inflation and firm growth, and in the lack of seasonality, as evidenced by the quarterly data. Further, the mean values for any variable do not significantly differ across the subsamples with any more frequency than could reasonably be expected by chance. Beyond these observations, however, the samples are markedly different. The mean values of A and d/S are less for the Select sample in almost every quarter and (K - S)/S is always less in the Select sample by a stable amount.

In terms of estimation, however, the differences in means do not matter. To use the Select sample as a diagnostic sample to determine, for example, the appropriate lag length of A requires only a similar relationship (correlation) among the variables. If the correlations are similar, it is appropriate to rely on the Select sample as the primary data source since it contains the most complete data. Further, similar correlations across the two subsamples are at least suggestive evidence of a similar relationship among banks in general and, therefore, with the generalizability of our model and results. The within sample correlations among the variables are presented in

Table 3. These correlations are quite similar and we view this as support for utilizing the Select sample for diagnostic tests and emphasizing the results from this 30 bank sample.

As a first test, equation (11) is estimated over the pre-regulatory change period 1969.1-1976.4. During this period the regulatory distinction between S and K - S was more severe. Preliminary tests with the Select sample, as well as the total sample, indicated that lagged values of A beyond two quarters did not significantly contribute to the explanatory power of the equation, so that all equations are estimated based on n = 2.[9] The results of estimation for the Select Sample are reported in Table 4. Note that the autocorrelation coefficients are small and distributed symmetrically around zero, suggesting that serial correlation is not a problem.[10]

Contemporaneous correlation of the disturbance terms across banks may be large, however, since industry-specific factors most likely affect bank returns. In this case, OLS estimates are not minimum variance but they are unbiased. To account for this, equation (11) was reestimated for each bank using generalized least squares.[11] With 30 firms and only 29 time series observations, the complete variance-covariance matrix could not be estimated without introducing a singularity. Therefore, the first and last 28 equations were included in separate systems. Of the results reported in Table 5, parameter estimates for the banks ABKP and BAM come from one system, the others all from a second system. These results differ very little from the OLS results contained in Table 4 and since the latter results actually bias against support for the model, we use these more conservative estimates.

The OLS estimates indicate that equation (11) explains a significant and high proportion of movements in A. The coefficient on ℓnDC, α, has the theoretically expected sign (+) for 23 of the 30 banks and is significant at the ten percent level in 9 cases. In only one case is a negative value of α significant. The probability of the proportion of positive to negative values of α observed if coefficient estimates greater than or less than zero are equally likely is less than one-half of one percent. The final column of Table 4 gives the R^2 of the ℓnA against ℓnDC, i.e., equation (11) with the restriction $\beta_1 = \beta_2 = 0$ imposed. This simple regression performs well and, although lagged values of A are not redundant given DC, the opposite statement is also true. We suspect, in fact, that the evidence provides even stronger support for the model than these numbers suggest because DC is probably frequently not observed at desired levels but rather at amounts that correspond to partial adjustment from one desired level to another.

Table VI provides a breakdown of the estimates of α for the entire sample of banks. For 89 of the 138 banks, the estimate of α has the proper (positive) sign. Few of the coefficients are significant, in part for the reason stated above and in part because the time series are quite small for many of these banks. Of the 28 significant values of α, 24 have the proper sign. The probability of observing this distribution of α if there is no relationship between A and DC is less than .005.

IV. The Effects of Regulatory Change

Since 1977, the Comptroller of the Currency has treated surplus and undivided profits as equivalent for the purpose of computing legal lending limits. Most state regulatory agencies have adopted similar rules. A comparison of pre- and post-1977 behaviors enables two propositions to be tested as well as further general evaluation of the model. First, we can test whether the regulatory constraint was binding in the earlier period. Second, we can examine whether the capital markets impose a discipline on banks similar to that previously demanded by regulatory constraints and whether that discipline is sufficient to sustain the predictive model.

It is likely that market forces are a good substitute for the legal lending limit regulation and, therefore, that the regulatory constraint was sufficient but not necessary to make the retention of undivided profits costly and induce some transfer to surplus. The requirement that undivided profit be sufficient to cover dividends is extant so that allocations to surplus should be viewed by lenders to a bank as favorably affecting the security of their positions. Although long-term lenders can include provisions limiting dividend payments among the covenants of the bond indenture, the costs of negotiating and monitoring such provisions may be high. For non-long term lenders and depositors unprotected by the FDIC the costs are likely to be prohibitive. In this case, the bank may experience lower borrowing costs in response to allocations to surplus. This commitment not to exhaust the allocated reserves through dividend payments is a low-cost substitute for formal agreements with lenders and the costs of monitoring are borne by the regulator.

Moreover, potential free rider problems are avoided. Some lenders might rely on others to negotiate, enforce and bear the full costs of dividend restrictions. If no single lender is willing to bear the costs of designing and monitoring contracts to restrict payments, borrowers and lenders may be better off if a mechanism exists that permits a bank to make believable commitments to restrict payments. Allocations to surplus are such a commitment. The commitment is believable since it provides for monitoring and enforcement. In addition, it applies to every lender to the bank and need not be renewed with each transaction.[12]

The empirical implications of the regulatory change for the model are straightforward. If regulation was not binding, it must be that market-imposed costs of undivided profits were sufficient to account for the empirical support of the theoretical model reported in the previous section. In this case, the model should perform equally well over the pre- and post-change period. If the regulation was a binding constraint, either of two consequences of its relaxation are possible. Eliminating the constraint unambiguously reduces the cost of maintaining undivided profits but if market imposed costs are positive then an optimal allocation between undivided profits and surplus will exist at a higher level of undivided profits. After accounting for this shift in optimal allocation, the predictive ability of the model will be unchanged. If, on the other hand, the constraint was binding and market forces do not impose costs on maintaining undivided profits, the predictive content of the model will not survive the regulatory change.

To assess the impact of regulatory change, equation (11) was estimated for the Select sample over the entire sample period (1969.1-1979.4) The results of the OLS and GLS estimation are presented in Table 7. The explanatory power of the model remains impressive over the extended period. The OLS and GLS estimates are substantively similar and the autocorrelation coefficients provide no basis for concern. At first blush, then, the model seems equally appropriate for both periods.

A closer inspection of the error structure, however, indicates a severe problem over the post-change period. To assess the extent of the problem, the errors for each bank were individually standardized (using the estimated error variance from each regression) to a standard deviation of one (since they result from OLS, the estimated errors have mean zero). This prevents the dominance of any one bank in examination of pooled errors. The average standardized errors across banks are reported in Table 8. These results indicate a tendency for the estimated errors to be positive over the post-change period. This result is also evident in the comparison of the pre- and post-change average standardized errors provided in Table 9. Although in only four cases is this difference significant at the ten percent level, the observation of 21 of 30 greater than zero over the post-change period is significant at the one percent level against the null of zero difference.

Positive errors of this sort would occur if undivided profits substantially increased, thereby causing expected returns to be underestimated. This result is consistent with a reduced cost of undivided profits.[13] An additional test of the regulatory change is to test for a shift in intercept in equation (11). The results of estimating that model are reported in Table 9. The intercept shift is positive for 21 of the 30 banks and is positive and significant for 7 of the banks. We conclude from the evidence in Tables 7-10 that the regulatory constraint had been binding.

The final question to be addressed is whether capital market forces impose cost on maintaining undivided profits. If the market imposes (no) costs on the bank, then the model should (not) continue to have predictive power over the post-change period. To examine this issue, we compare the variances of the standardized errors in the pre-and post-change periods. The estimated errors were again standardized to unit variance for each bank. Since, by construction, a weighted average of the pre- and post-change variances of the standardized errors, where the weights are equal to the proportion of observations in each, must sum to one for each bank, the ratio of those variances provides an indication of the deterioration, if any, in the model's explanatory power. As reported in the last column of Table 10, 16 of those thirty ratios exceed one. This implies that the capital markets impose costs on the bank that serve as an effective substitute for regulation and, it can be argued, makes this type of regulation redundant.

V. Conclusions and Implications

This paper has attempted to shed light on the dividend-capital structure decision process of the banking firm. Toward this end, a theoretical model that accounted for observed bank behavior and institutional restrictions was developed based on the principle of safety first. This model yielded a testable relationship between the dividend-capital structure decision and the expected earnings of the bank. This relationship is a consequence of a reluctance to see dividends reduced. That reluctance makes desirable the use of undivided profits as a reserve from which payments can be made when income is insufficient to support dividends. The *ceteris paribus* increase in that reserve when it became less costly to maintain under the Comptroller's 1976 ruling and the continued superior (to a naive model) predictive performance thereafter lends support to the model.

The empirical results, as noted above, are consistent with the predictions of the model. Although we do not claim to have completely specified the relevant decision process, the model and results presented here do provide insight into this process and should aid regulators (and the capital markets) in assessing capital adequacy as well as providing insight into the banks' own expectations of their future earnings. The finding that the capital market provides an effective substitute for regulation suggests that regulatory authorities could eliminate some restrictions on bank behavior without jeopardizing the safety of the banking system.

The results of this paper also have consequences for research on the dividend policy of non-financial firms. Although several authors (Jensen and Meckling (1976), Miller and Scholes (1978), Ross (1977), Bhattacharya (1979)) have provided pathbreaking analyses on firm dividend behavior that may eventually lead to comprehensive theoretical models of dividend behavior, these models are highly stylized and have little, if any, empirical content. Perhaps by combining aspects of these models with the principles utilized in developing our positive model, a more robust framework of firm dividend behavior could be derived and tested. For non-financial firms, instead of employing the undivided profit-capital surplus relationship, one could utilize bond covenants as the relevant constraint on capital structure decisions. Indeed, Kalay's (1977) finding that firms typically build reserves in the presence of such arrangements rather than pay the maximum dividend permissable suggests the appropriateness of the safety first principle. Kalay's additional finding that the payout ratio is inversely related to uncertainty about future earnings is also consistent with our theoretical framework.

In addition, it is interesting to note that the empirical evidence satisfies a necessary condition for a rational expectations signaling equilibrium: predictions conditioned by dividend and capital structure decisions would be superior to those based on time series models of earnings. In our model, however, these variables indicate expectations as a natural "side-effect" of decisions made in the owners' interests and are not the result of a desire to convey information.[14] Indeed, our model suggests that simple time series models of earnings may yield spurious forecasts and also suggests a theoretical basis for what is empirically termed the "informational content of dividends."

Table 1

NATIONAL

Smbl	Bank	Total Assets[a]
BAM	Bankamerica Corp.	50547.5
CKN	Crocker National Bank	9400.1
CMB	Chase Manhattan Corp.	40063.5
COLC	Colorado National Bankshares	644.3
EQK	Equimark Corp.	2323.6
FB	First National Boston Corp.	8862.1
FNB	First Chicago Corp.	17048.6
FNC	Citicorp	46985.5
FNTL	First National Bancorporation	1364.3
FUBC	First Union Bancorporation	2052.6
MHC	Manufacturers Hanover Corp.	22571.2
MNBT	Mellon National Corp.	9561.0
MNTL	Manufacturers National Corp.	2840.7
MTD	Mercantile Texas Corp.	912.2
NBD	National Detroit Corp.	7335.8
PITS	Pittsburg National Corp.	2643.2
USBC	U.S. Bancorp	3285.2
WB	Wachovia Corp.	11715.8
WFC	Wells Fargo & Co.	

STATE

Smbl	Bank	Total Assets[a]
BBF	Barnett Banks of Florida	2212.9
BT	Bankers Trust New York Corp.	19938.9
CHL	Chemical New York Corp.	19816.2
DBNK	Detroitbank Corp.	2939.1
GIRA	Girard Co.	3812.3
HBC	Harris Bankcorp Co.	4018.0
JPM	Morgan (J.P.) & Co.	21592.2
USTC	U.S. Trust Co.	562.18
UVBK	United Virginia Bankshares	2272.5
ABKP	Arizona Bank Phoenix	915.1
BNHI	Bancorp Hawaii Inc.	1040.0

a) millions of dollars

Table 2

Differences Between Samples on Key Variables

	M		d/S		(K-S)/S		
Period	Others	Select Sample	Others	Select Sample	Others	Select Sample	Diff
1969	.049	.040	.019	.018	.448	.304	.144
1970	.057	.047	.021	.018	.608	.354	.254
1971	.050	.043	.020	.019	.673	.427	.246
1972	.057	.046	.021	.019	.768	.497	.271
1973	.059	.051	.023	.020	.856	.591	.265
1974	.060	.060	.024	.021	1.004	.764	.240
1975	.054	.050	.023	.021	1.233	.861	.372
1976	.058	.055	.023	.022	1.183	.939	.244
II	.059	.059	.024	.022	1.212	.967	.245
III	.064	.062	.023	.022	1.250	1.001	.249
IV	.068	.066	.029	.022	1.284	1.038	.246
1977	.068	.066	.024	.023	1.321	1.063	.258
II	.072	.071	.026	.024	1.335	1.109	.226
III	.076	.074	.025	.023	1.320	1.111	.209
IV	.071	.074	.033	.024	1.337	1.137	.200
1978	.077	.076	.025	.025	1.379	1.182	.197
1979	.086	.076	.027	.027	1.553	1.339	.214
Number of significant differences p=.05*	4		4		0		

*Tests of equal variances led to rejection in all cases, and use of unequal variance t-tests.

Table 3

Typical Within-Period Correlation

Matrices, Period = 1973.4

	Select Sample (N = 29)			Other Banks (N = 97)		
	μ	d/S	(K-S)/S	μ	d/S	(K-S)/S
μ	--	.606	.587	--	--	--
d/S	.606	--	.692	--	--	--
(K-S)/S	.587	.692	--	--	--	--
μ	--	--	--	--	.359	.494
d/S	--	--	--	.359	--	.580
(K-S)/S	--	--	--	.494	.580	--

Table 4

Results of Estimation of Restricted and Unrestricted Versions of Equation (11) on the Select Sample

	Smbl	B_1	B_2	α	α ρ-level	Auto-Correlation	R^2	R^2_2
	BAM	-.102	-.429	1.611	.0001	-.133	.916*	.889
	CKN	.137	.006	.310	.688	-.006	.024	.006
	CMB	.434	.009	-.343	.353	.019	.250*	.061
N	COLC	.654	-.004	.288	.145	.000	.584*	.347
A	EQK	.487	-.220	-.749	.034	.103	.295*	.083
T	FB	.505	-.055	-.014	.929	.044	.235*	.030
I	FNB	.524	-.027	.210	.202	.092	.666*	.447
O	FNC	.358	.272	.290	.169	.095	.880*	.830
N	FNTL	.436	.188	.105	.718	-.077	.354*	.195
A	FUBC	-.176	.204	.860	.008	.049	.563*	.539
L	MHC	.412	-.220	1.118	.026	.068	.708*	.671
	MNBT	.107	.014	1.094	.002	-.050	.692*	.708
B	MNTL	.308	-.229	.771	.002	.076	.695*	.650
A	MTD	.386	.528	.205	.628	-.160	.560*	.255
N	MBD	.413	.244	.254	.057	-.151	.658*	.496
K	PITS	.252	.009	.719	.009	.124	.775*	.782
S	USBC	.408	.322	.198	.353	-.096	.872*	.797
	WB	.086	.110	.087	.334	.040	.101	.097
	WFC	-.042	.183	1.500	.004	-.212	.773*	.771
	BBF	.322	.393	-.050	.889	.058	.434*	.155
	BT	.644	-.215	-.161	.678	.029	.322*	.011
	CHL	.536	.192	.326	.367	.004	.647*	.421
O	DBNK	.454	.197	.315	.183	-.038	.656*	.526
T	GIRA	.242	-.094	.190	.946	-.004	.058	.000
H	HBC	.352	-.051	.439	.123	-.022	.449*	.408
E	JPM	-.152	.075	1.280	.008	.022	.765*	.794
R	USTC	-.131	.774	-.006	.970	.415	.709*	.0001
	UVBK	.384	-.265	-.074	.887	-.010	.158	.001
	ABKP	.361	.024	.336	.194	-.019	.402*	.347
	BNHI	.009	.540	.244	.149	.039	.438*	.155

N = 29, for all equations.

*Significant at .10 level.

Table 5

Results From Estimation of Equation (11) On The

Select Sample, Using GLS.

	Smbl	B_1	B_2	α	α ρ-level*
NATIONAL BANKS	BAM	-.16	-.42	1.706	.000
	CKN	.052	-.029	.782	.104
	CMB	.475	.029	-.466	.027
	COLC	.548	.042	.272	.000
	EQK	.505	-.187	-.876	.000
	FB	.479	-.033	-.088	.136
	FNB	.501	-.031	.168	.000
	FNC	.347	.264	.290	.000
	FNTL	.347	.087	.321	.007
	FUBC	-.180	.133	.844	.000
	MHC	.393	-.183	1.036	.000
	MNBT	.092	-.007	1.077	.000
	MNTL	.263	-.240	.803	.000
	MTD	.383	.632	.203	.105
	MBD	.315	.268	.284	.000
	PITS	.176	-.049	.774	.000
	USBC	.399	.284	.225	.015
	WB	.039	.179	.070	.075
	WFC	-.135	.213	1.589	.000
OTHER	BBF	.361	.343	-.041	.502
	BT	.673	-.211	-.372	.051
	CHL	.584	.174	.090	.577
	DBNK	.451	.233	.283	.003
	GIRA	.266	-.091	-.124	.944
	HBC	.359	-.109	.318	.008
	JPM	-.052	-.004	1.151	.000
	USTC	-.234	.742	.044	.705
	UVBK	.388	-.220	-.160	.393
	ABKP	.382	.122	.236	.000
	BNHI	.014	.552	.171	.023

*A value less than .001 is indicated as .000.

Table 6

Estimates of α For The Entire Sample

Total Sample	89	49	.001	Significance level at which the hypothesis of equal likelihood of +/- signs of α can be rejected.
Significant Estimates	24	4	.001	
Select Sample	23	7	.001	
Significant Estimates	9	1	.001	

*at .10 level of significance

Table 7

Results of Estimation of Equation (11) for the Select Sample,

Pre and Post Change Data Pooled

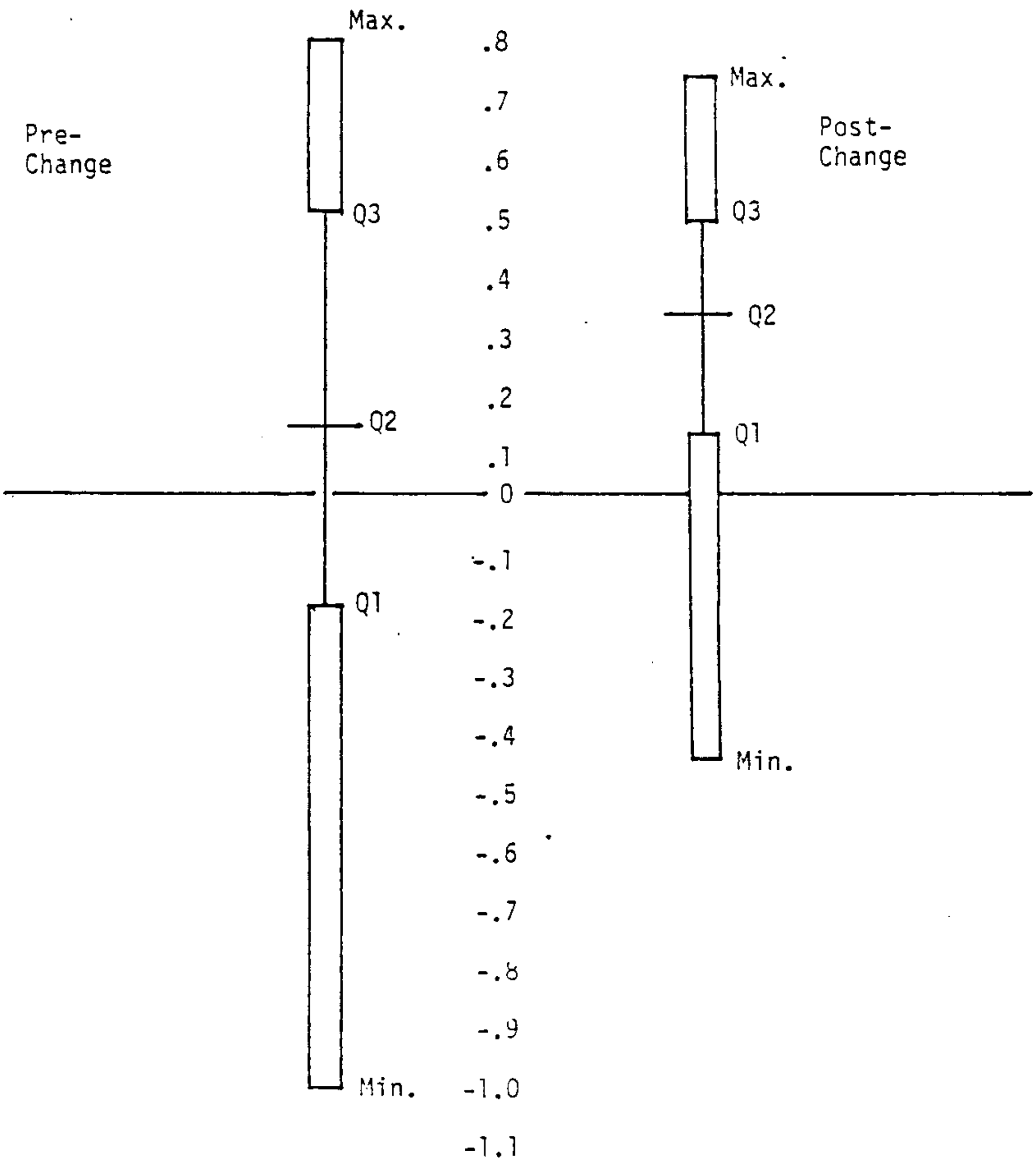
		OLS			GLS
	Smbl	α	R^2	Estimated Auto-Correlation	α
	BAM	1.482*	.941	-.027	1.503*
	CKN	1.062*	.550	-.070	1.179*
	CMB	.291	.580	.025	.239
N	COLC	.283	.859	-.020	.195*
A	EQK	-.400	.439	.048	-.654*
T	FB	.088	.695	-.006	.087
I	FNB	-.238	.624	.060	-.174*
O	FNC	.785*	.875	.062	.625*
N	FNTL	.291	.240	-.061	.331*
A	FUBC	-.003	.683	-.088	-.005
L	MHC	.827*	.809	.057	.856*
	MNBT	.982*	.891	-.009	1.074*
B	MNTL	.652*	.670	.058	.539*
A	MTD	.349	.751	-.136	.213
N	MBD	.265*	.848	-.154	.260*
K	PITS	.818*	.901	.116	.682*
S	USBC	.179*	.869	-.071	.204*
	WB	.016	.353	-.020	-.025
	WFC	.370	.856	-.091	.695*
	BBF	.283	.670	.029	.331*
	BT	.523	.727	.014	.309
	CHL	.612*	.772	.005	.407*
O	DBNK	.352*	.686	-.020	.234*
T	GIRA	1.966	.146	.007	1.711
H	HBC	.317*	.349	-.020	.207*
E	JPM	1.066*	.849	-.097	.916*
R	USTC	-.095	.204	.092	-.200
	UVBK	.822*	.485	.061	.564
	ABKP	.639*	.680	-.033	.618*
	BNHI	-.018	.570	.103	-.065

*Significant at the .10 level

Table 8

Distributions of Period-by-Period Average Standardized Errors

Pre-and Post-Regulatory Change



Min. = Minimum Value; Max. = Maximum Value; Q1 = 25th Percentile;

Q2 = 50th Percentile (mean). Q3 = 75th Percentile.

Table 9
Differences in Pre-and Post-Change
Average Standardized Errors by Bank

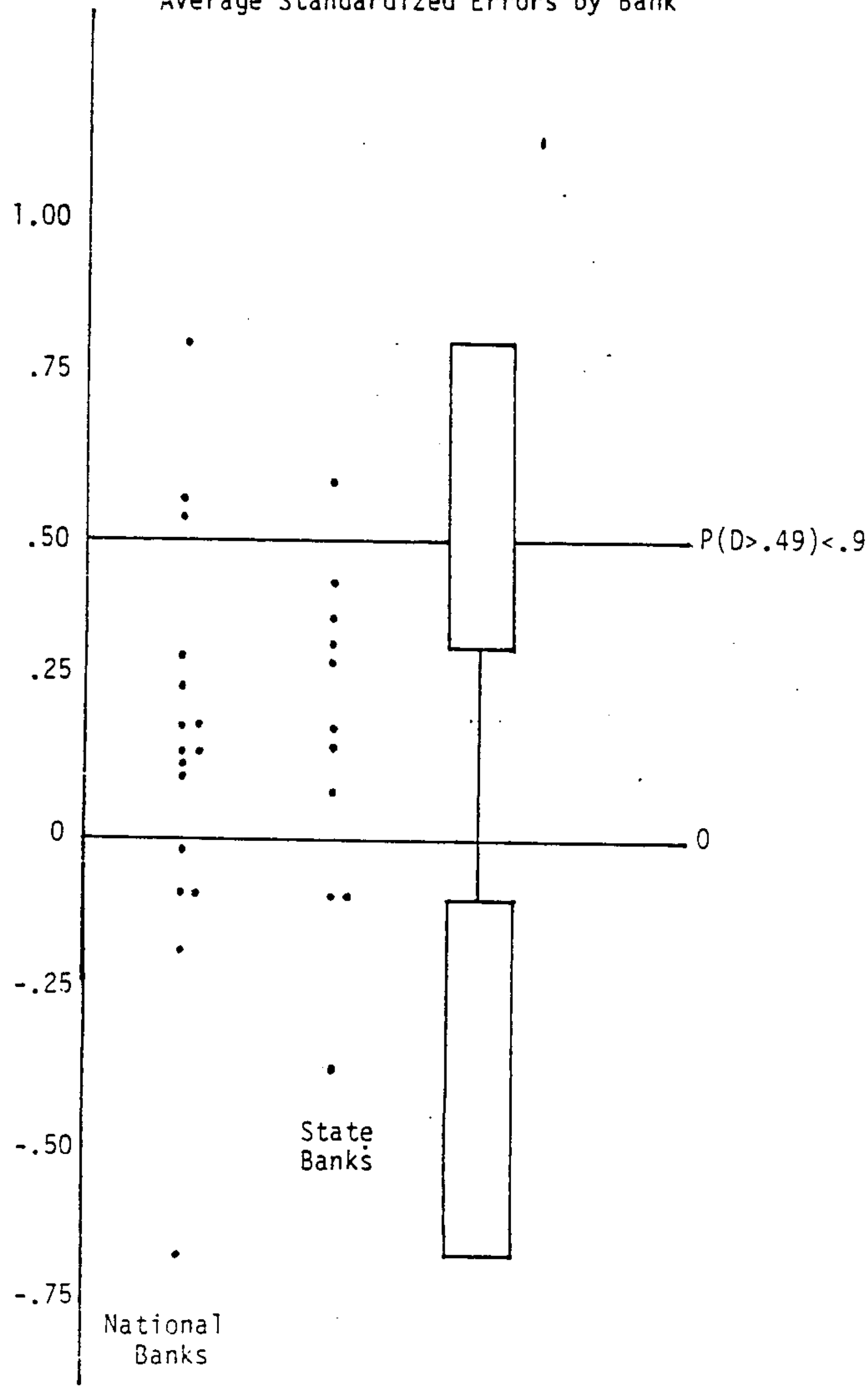


Table 10

Results of Estimation of Model Providing
For Change in Intercept Pre- to Post-Regulatory Change

	Smbl	Estimated Shift In Intercept	Improvement in R^2	Ratio of Post- to Pre-Change Error
NATIONAL BANKS	BAM	.046	.001	.479
	CKN	.376*	.044	8.667
	CMB	.301*	.057	3.154
	COLC	.138	.004	3.000
	EQK	-.333*	.087	.856
	FB	.234*	.048	1.535
	FNB	-.053	.012	.401
	FNC	.001	.000	.246
	FNTL	.055	.005	.300
	FUBC	.100	.010	11.196
	MHC	-.071	.003	13.813
	MNBT	-.037	.001	4.155
	MNTL	.075	.004	.180
	MTD	-.006	.000	5.000
	MBD	.049	.002	1.584
	PITS	.037	.001	1.324
	USBC	.017	.001	1.309
	WB	.204*	.170	.845
	WFC	-.042	.001	1.185
OTHER	BBF	.232	.021	24.796
	BT	.154	.016	.891
	CHL	.027	.001	.729
	DBNK	.097	.008	.213
	GIRA	.548	.020	122.700
	HBC	-.202	.050	1.125
	JPM	-.022	.001	.786
	USTC	-.035	.001	.116
	UVBK	.372*	.046	.799
	ABKP	.277*	.055	3.256
	BNHI	.125*	.055	1.283

*Significant at .10 level

FOOTNOTES

[1] In the case of banking, most empirical work (e.g., Magan (1971), Van Horne and Helwig (1967)) has been based on ad hoc assertions and has concentrated primarily on the determinants of small bank dividend policy. The model of large bank dividend behavior developed by Gupta and Walher (1975) is not grounded in a choice-theoretic framework nor do the empirical results provide much insight. Other studies (e.g., Pettway (1976)) have empirically examined the effect of bank payout ratios on stock price and returns, but provide no theoretical rationale. Nor do they adequately control for endogeneity of the variables.

[2] That dividend reductions or omissions result in substantial declines in stock market valuation has been documented by, for example, Aharony and Swary (1980).

[3] Kalay (1979) has reported that nonfinancial firms, when confronted with lending arrangements or bond covenants that limit the amount of earnings that may be paid out in dividends or retained for future payments, typically build a safety stock of reserves rather than pay the maximum permissable dividend.

[4] In truth, retained earnings in the form of either undivided profit or surplus is an equity account and does not provide funds or constitute an asset. The process that led to the recognition of retained earnings, however, produced an asset for the firm. More importantly, these accounts are crucial in the accounting that underlies various regulatory and legal constraints. While one cannot pay dividends from undivided profits, one may not pay dividends if no undivided profits exist.

Similarly, surplus cannot be invested. but the amount of surplus accumulated determines the extent of borrowing and lending a bank is permitted to undertake. Therefore, in a real sense, surplus earns a return while undivided profits do not. In the discussion that follows, we will approximate these relationships by assuming that surplus can be invested and undivided profits can be used to pay dividends. This simplification affects only the exposition of the model and not its predictions.

[5] See Cox and Miller (1965).

[6] The expression for $\hat{P}$ results from the solution of the continuous wager analog of the classic "gambler's ruin" problem (see Gnedenko (1962)). If a gambler with wealth W plays against an infinitely wealthy opponent, wagers one unit per trial, and enjoys odds in favor of success at any trial of π, then his probability of eventual bankruptcy is $\hat{P} = \pi^{-W}$. In equation (4), $(\mu S - d)/S\sigma$ might be viewed as π and $(K - S)/S\sigma$ as the player's standardized wealth.

[7] The test employed here is similar to that developed by Granger (1969) to test for causality between two variables. Specifically, Y is said to cause X if

$$\sigma(X|\overline{X},Y) < \sigma(X|\overline{X})$$

where $\sigma(X|\overline{X},\overline{Y})$ is the minimum predictive error variance of X given both past X and past Y and where $\sigma(X|\overline{X})$ is the minimum predictive error variance of X given only past values of X. Thus if we find the inclusion of DC increases the explanatory power of equation (12), DC can be said to Granger-cause A.

[8]A strict interpretation of the theoretical model would have $\alpha = 1$. That extreme can hardly be expected or demanded. More realistic expectations, given the purpose of the investigation, are that the sign of α be consistent with the theory and that $\alpha = 0$ be rejected by the data.

[9]The decision to use the same lag structure for all banks was not undertaken simply for convenience. If the assumption is valid, then a priori imposition of a true restriction across equations will produce estimators that are more efficient. If false, a bias may be introduced. The effect of imposing the restriction on tests of coefficients of variables known to belong in the equation (e.g., ℓnDC) may be favorable even if the rstriction is invalid. In fact, the choice of n seemed to have little effect on the signs and magnitudes of the estimates of the coefficient on ℓnDC for the banks in the Select sample.

[10]We also consider the autocorrelation coefficient to provide a simple test of the appropriateness of model specification and lag length. Specifically, the distribution of $\ell n\varepsilon$ is assumed to be normal with mean zero and constant variance for each bank. If the model incorporating a lag structure in ℓnA is properly specified then the error terms should not exhibit significant autocorrelation.

We also performed the h-test developed by Durbin to test for serial correlation. For some banks, however, due to the large variance of A_{t-1}, the h-statistic could not be calculated. We therefore also perform the asymptotically equivalent test by regressing ε_{jt} on ε_{jt-1} and the set of explanatory variables from equation (12), and testing the significance of the coefficient on e_{jt-1} by ordinary least squares procedures. See Johnston (1972, p. 313). For no bank did these tests suggest that serial correlation was a problem.

[11]Basically this procedure modifies the parameter estimates produced by ordinary least squares to incorporate information about the error structure across equations and improve the precision of the estimated parameters. Intuitively, if two equations are known to have positively correlated errors, then parameter estimates are chosen to minimize a function of the errors that gives less weight to errors consistent with the positive correlation than to errors inconsistent with the hypothesized error structure.

[12]Although the legal lending limit constraint seems the most important regulatory determinant of the undivided profit-surplus allocation, other regulatory influences may exist. There remains considerable latitude in the interpretation regulatory agents may put on capital adequacy constraints, certainly enough latitude to allow agents to treat capital as varying in quality. Also, quality of capital may be considered in determining the extent of debt to be permitted in the capital structure. These may contribute to the cost of maintaining undivided profits.

[13] Note that National and non-National banks are similarly affected, although only the former were directly subjected to the regulatory change. This is probably due to state regulatory authorities acting in a similar fashion to federal regulators.

[14] In fact, our model makes no provision for the separation of authority from beneficial interest and so has no role for signaling. In our view, a test of signaling--which we think is worthwhile--must focus on the motives of agents as well as their actions. Our analysis does not do so.

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