CAPITAL POSITIONS OF JAPANESE BANKS

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ABSTRACT

This paper measures and analyzes two types of hidden capital at Japanese banks: (1) the net undervaluation present in accounting measures of on-balance-sheet assets and liabilities and (2) the net economic value of off-balance-sheet items. A model is constructed that explains changes in both types of capital as functions of holding that explains changes in both types of capital as functions of holding-period returns earned in Japan on stocks, bonds, yen, and real estate. The model is applied to annual data covering 1975-1989 and a four-class size/charter partition of the Japanese banking system. For each type of hidden capital and each class of bank, the model develops estimates of the stock-market, interest-rate, foreign-exchange, and real estate sensitivities of returns to bank stockholders.

Only the stock-market sensitivities prove significant at five percent. This finding leads us to investigate what happens when we analyze Japanese bank stock returns by means of stationary and split-sample market models. Time-series regressions show that very large Japanese banks have developed stock-market betas in excess of two and that the value of a bank's beta has come to increase with measures of its size and accounting leverage.

Future research will investigate the sensibility of our results to different ways of pooling data from individual banks and to more-sophisticated methods for estimating various parameters. We also plan to extend the analysis by imbedding it in a model of how variations in bank-customer contracting arrangements in Japan affect the returns that can be earned by bank stockholders.

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I. Introduction

In recent years, Japanese banks have become major players in world finance. Many apparently knowledgeable observers attribute this development to the maintenance of inappropriately low capital requirements by Japanese authorities (Corrigan, 1987; Pettway, Kaneko, and Young, 1990). However, Japanese banks are not undercapitalized. Their stocks show market capitalizations that average several times the value of the banks' accounting net worths (Kane, 1987; Baer and Mote, 1989).

Divergences between accounting and stock-market estimates may be described as "hidden capital." Kane and Unal (1990) develop a method for testing hypotheses about the determinants of two types of hidden capital: the misvaluation of on-balance-sheet items (post-acquisition gains and losses that, although they remain unbooked, are bookable upon the sale of the item under Generally Accepted Accounting Principles, GAAP) and intangible values which GAAP currently designates to be unbookable off-balance-sheet items.

This paper shows that Japanese banks are highly capitalized on a market-value basis and tests hypotheses about the determinants of hidden capital at Japanese banks. We first develop estimates of a valuation ratio, k, by which to adjust the book value of a firm's net worth and of the net market value of unbookable equity elements, U. These parameters are estimated by regressing cross-sectionally the market value of the institution's market capitalization on the book value of its accounting net worth. This regression equation forms the heart of what Kane and Unal (1990) call the Statistical Market Value Accounting Model, SMVAM.

A second block of the model endogenizes changes in k and U as functions of ex post holding period returns on stocks, bonds, yen, and Japanese real estate. This formulation permits us not only to test hypotheses about the determinants of both forms of hidden capital, but to use the model to explain variation in the market, interest, foreign-exchange, and real-estate sensitivities of an institution's stock.

The analysis extracts market, interest-rate, foreign-exchange, and real-estate sensitivities from a time series of cross-section regressions that use accounting and rate-of-return information to explain the market value of stockholder equity claims. The first block of the model is estimated for each of the 15 years 1975-1989 for four categories of Japanese banks. The four-class partition of the banking system represents a conventional Japanese classification that uses the names city banks, long-term credit banks, trust banks, and regional banks. This classification closely approximates a size-based partition, with city banks having the largest average asset size and regional banks the smallest average asset size throughout the period we study.

II. Model and Diagnostic Checks

The SMVAM is estimated separately at each date for members of each class of institution:

$$MV = U_t + k_t BV + e. \qquad (1)$$

MV and BV denote the market and book value of firm equity. U is interpreted as the market value of unbookable equity, while k is the valuation ratio that serves to adjust the value of bookable items to market. These coefficients measure the de facto deceptiveness of the Japanese accounting system. Unless both $U = 0$ and $k = 1$, the accounting or book value of a bank's capital represents a biased estimate of the market value of stockholder equity. If the estimated intercept is significantly positive (negative), unbookable assets and liabilities serve as a net hidden source of (drain on) institutional capital.

Equation (1) assumes that a single mark-up or mark-down ratio, k applies to all accounting values reported by the institution. In effect, a single valuation ratio k is assumed to apply to every component of each institution's book equity. We test this restriction by estimating different coefficients for aggregate assets and aggregate liabilities for each class of bank. However, except for regional banks, the hypothesis of a common k proves impossible to reject. Even for regional banks, significant differences between asset and liability valuation ratios emerge only after 1985.

A second diagnostic check is to test for nonlinear terms in SMVAM. In particular, we investigate the effect of introducing a squared or quadratic term in BV. The coefficient of the squared term proves insignificant at 5 percent for city banks in all years. However, although we choose not to pursue the issue here, the evidence suggests that a nonlinear specification may be appropriate in some years and especially for smaller institutions.

Long-term credit and trust banks show significant and positive coefficients for BV^2 in years 1982-84 and 1988. For regional banks, the BV^2 coefficient proves significantly negative in 1977 and 1981-83, but becomes positive and significant in later years, 1985-88.

The parameters of the linear SMVAM are U and k. When returns on competitive assets change over time, these parameters should respond. Using an annual observation period, we approximate this response by a linear model of market returns, interest rates, dollar investments in yen, and returns on Japanese real estate:

$$U_t - U_{t-1} = \beta_0^u + \beta_m^u R_{mt} + \beta_r^u R_t + \beta_f^u R_{Ft} + \beta_L^u R_{Lt} + v_t, \qquad (2)$$

$$k_t - k_{t-1} = \beta_0^k + \beta_m^k R_{mt} + \beta_r^k R_t + \beta_f^k R_{Ft} + \beta_L^k R_{Lt} + w_t. \qquad (3)$$

R_{mt}, R_t, R_{Ft}, and R_{Lt} represent holding-period returns on a stock-market index, a bond index, dollar investments in yen, and Japanese real estate, respectively. We include R_{Ft} and R_{Lt} to test the often-heard conjecture that Japanese bank stock has benefited greatly from appreciation in the yen and in Japanese real estate. The v_t and w_t are stochastic error terms. The slope coefficients measure the market, interest-rate, foreign-exchange, and real-estate sensitivity of SMVAM's parameters.

Equations (2) and (3) are offered as flexible functional forms that parameterize in an interpretable and parsimonious way revaluations that asset markets make continually. Results to be developed in later sections of this paper indicate that movements in U_t and k_t are explained predominantly by the first influence (stock returns), with the other variables having no significant effects. The Japanese stock-market index proves significant for every class of bank. This is consistent with a further finding that Japanese banks have come to own over 40 percent of the universe of Japanese corporate stocks. This makes investment in these banks' stock shares in large part a leveraged investment in the Japanese stock market as a whole.

To furnish a complementary perspective, we also estimate a traditional multi-index market model. Using this model, stock-market betas for large Japanese banks are shown to surge sharply upward after 1983.

III. Data and Sample Characteristics

The data set includes market and book values for the capital and total assets of every Japanese bank in existence during the 1975-1989 sample period. For regional banks, the sample size varies over the sample period, but 13 city banks, 3 long-term credit banks and 6 trust banks exist throughout. (A seventh trust bank exists, but its stock does not trade.) The number of regional banks sampled expands from 44 to 91.

Data are obtained from Nihon Keizai Shimbun America, Inc. Market values are determined in accordance with Japanese corporate reporting practices as of March 31st and calculated as the product of share price and number of shares outstanding. The book value of equity capital totals accounting entries for stock subscription, legal reserves and earned surplus at the same dates.

Chart 1 reports ratios of the book value of stockholder equity to total assets. Although these ratios are much lower than those reported by comparable U.S. banks, these banks cannot reasonably be characterized as lacking in capital. Chart 2 clarifies that over the sample period a high and rising ratio of mean market value to book value obtained for city banks, long-term credit banks, trust banks and regional banks.

These charts indicate that hidden capital expands greatly during the late 1980s. The MV/BV ratio first exceeds 2 for city banks and long-term credit banks in 1982 and for trust banks in 1984. The ratio continues to increase until 1987, when it peaks for the first three classes, at 8.9, 10.6, and 11.8, respectively. From these respective peaks, MV/BV declines to 5.8, 7.5 and 4.9 by 1989.

Compared to the other three classes, regional banks show a lower and less-volatile MV/BV ratio. The ratio does not exceed two until 1986, peaks at 3.28 two years later, and declines to 2.96 in 1989.

The indices needed to estimate equations (2) and (3) have to be approximated. Although data on dividend yields are lacking, Japanese dividend rates are reputed to be low and relatively stable. This makes it reasonable to approximate the holding-period return on a stock by its annual rate of price appreciation.

Chart 3 tracks annual percentage changes to the dates shown in the mean market capitalization of each class of bank. This price appreciation is the major portion of the return realized by stockholders in Japanese banks.

Chart 4 tracks percentage returns in four potential determinants of U and k. The 225-stock Tokyo index constructed by Nikkei (R_{mt}) is used as a proxy for the stock market as a whole. The Nikkei bond index is used to calculate a proxy holding-period return for bonds. The index reports a daily average yield on public and private debt securities. We derive annual holding-period returns from this index by treating the underlying bonds as consols whose coupon equals y_{t-1}, the yield observed at the end of the previous year. Specifically,

$R_t = y_{t-1} - (y_t - y_{t-1})/y_t.$

Returns on real estate come from Japan Real Estate Research Institute (JRERI). JRERI surveys 140 major cities in Japan twice a year (in March and September) and constructs a land price index. Again, lacking parallel data on periodic rents, the annual percentage changes in the index are treated as a proxy for real-estate returns in Japan. Data for the Nikkei stock-market and bond indices and the JRERI land price index are obtained from Nihon Keizai Shimbun.

Finally, yen returns (R_{ft}) are proxied by percentage change in the value of the yen against U.S. dollar, using data compiled by the World Bank.

IV. SMVAM Results

SMVAM's accounting equation has two parameters. Charts 5 and 6 display the pattern of annual cross-sectional estimates at each of the four bank classes. With only three banks in the long-term credit bank class, separate regressions for this class have only one degree of freedom and large standard errors. Nevertheless, covariance or dummy-variable analysis shows that these institutions differ so significantly from the other three classes that it is inappropriate to pool them with any other class.

To test the U = 0 and k = 1 hypothesis of "fully informative accounting values" for each class separately, we focus on the time series of coefficient deviations from the hypothesized values. Table 1 reports test results.The combined U=0 and k=1 condition which would make recorded equity an unbiased estimate of market value is rejected for city banks in all years and is accepted for long-term credit banks only in 1980. Accounting representations of trust banks prove deceptive in all but two years: 1980 and 1981. In contrast, accounting data for regional banks appear reliable through 1984. But after that date, the regional banks' k proves significantly greater than unity.

For city banks, the deviations of U and k retain a single sign throughout. U is negative and significant, indicating net unbookable items as a drain on equity. As a percentage of mean MV, this drain begins at 6 percent in 1975, peaks in 1984 at 40 percent, and decreases to 23 percent in 1989. The valuation ratio for bookable items proves significantly in excess of one and reaches very high levels in the late 1980s.

A high valuation ratio constitutes evidence of on-balance-sheet "hidden capital." Securities and real estate that are carried on bank books at historical cost become increasingly undervalued when market values trend upward. Throughout the late 1980s, unbooked but bookable capital gains appear substantial. If a market-value accounting system were used, increases (and decreases) in market values would be booked as earnings as they accrue and reflected in the book value of equity. However, if used as a basis for calculating taxable income, market-value tax accounting would simultaneously create an immediate tax liability on accrued gains. Under the system of cash-flow tax accounting that is in place, Japanese banks effect tax savings by not immediately realizing (i.e., encashing) their capital gains.

For large banks, off-balance-sheet equity proves large and negative in many instances, especially in the later years of our sample. The pattern of secular fall and 1988-89 recovery mirrors the rise and fall of the MV/BV ratios reported in Chart 2. This is consistent with the hypothesis that observed negative off-balance-sheet positions can be conceived predominantly as reserves for deferred taxes on unrealized gains in stock and real-estate holdings. U must also capture the capitalized value of the implicit net subsidy or tax associated with restrictions or advantages conferred on banks by the Japanese Ministry of Finance (MOF). We hold that movements in tax reserves dominate U because it is unlikely that the net advantageousness of MOF restrictions could change as rapidly from year to year as our estimates of U do.

We turn now to the revaluation equations (2) and (3), which are estimated in Tables 2 and 3. For every bank class, results are qualitatively the same. Off-balance-sheet equity decreases as stock returns increase (significantly so for city and long-term credit banks). It also decreases with bond and foreign-exchange returns and rises with land returns, but not significantly. The valuation ratio k for on-balance-sheet items shows in each case an opposite pattern, and again only the stock return ever achieves significance. However, because error terms are apt to be correlated within and across bank classes, ordinary-least-squares estimates of standard errors are biased upward. More-efficient estimation methods might well render real-estate, foreign-exchange, or bond returns significant in at least some cases.

During the first quarter of 1990, while the Nikkei 225 index declined by roughly 25 percent, the market capitalization of individual city banks declined by as much as 33 percent. To the extent these banks represent a leveraged investment in the stock market as a whole, a massive stock-market decline could rapidly undermine the strength of large Japanese banks' capital positions.

V. Results for the Multi-Index Market Model

Tables 2 and 3 assign R_m and the other index variables opposite effects on U and k. The hypothesis that U may be interpreted principally as a reserve for deferred taxes implies that these variables' effects through k should strongly outweigh their effects through U.

Fitting a multi-index market model (MIMM) provides a straightforward way to check this. The version of MIMM that we fit expands the basic market model by adding bond returns, real-estate returns, and returns on dollar investments in yen. We include returns on yen and real-estate even though they prove insignificant in Tables 2 and 3, because we want to allow for the possibility that effects operating through U and k might cumulate to significance. The MIMM stochastic return-generating process specifies that the return R_p on portfolio p is:

$$R_{pt} = \beta_0 + \beta_{mp} R_{mt} + \beta_{rp} R_t + \beta_{fp} R_{ft} + \beta_{Lp} R_{Lt} + z_t. \qquad (4)$$

In (4), β_{mp}, β_{rp}, β_{fp}, and β_{Lp} measure the portfolio's systematic market, interest-rate, foreign-exchange and real-estate risk.

We construct R_{pt} as an equal-weighted portfolio of returns for every bank in each class. For each class, Table 4 reports pooled time-series, cross-section estimates of equation (4).

For each class, the net sensitivity of bank stock price appreciation to market returns turns out to be positive and significant. For the largest three size classes, stock-market betas all exceed two. Because Charts 3, 5, and 6 suggest a mid-1980s shift in return-generating processes for banks, we experiment with relaxing the assumption of stationarity by fitting the model separately to 1975-83 and 1984-89 under the restriction β_{fp} and β_{Lp} equal zero.[1] In these runs, betas prove negative for the three largest size classes in the early years and positive and large during the 1984-1989 period only.[2]

The striking feature of the various runs is the sky-high level of market risk toward which the average member of the first three bank size classes evolved. These betas range from 2 to 3, which is two to three times the magnitude of the estimates both for regional Japanese banks and of parallel estimates for large U.S. banks obtained by Unal and Kane (1988) with quarterly 1975-1985 data. These high betas confirm the hypothesis that, when a leveraged institution has a large diversified position in the stock market, its market capitalization moves by a multiple of the price movements observed for the market as a whole.

In the Japanese stock-market decline of the first quarter of 1990, the prices of the high-beta bank stocks fell more rapidly than the overall Japanese market index. This has important implications for policymakers. The

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[1] Support for the timing of this sample partition may also be found in regulatory events. Pettway, Tarpley, and Yamada (1988) associate a post-1983 expansion of bank risk-taking with a reduction in administrative guidance, while Cargill and Royama (1988) note an acceleration in money-market development.

[2] Experiments not reported here allow each of R_{fp} and R_{Lp} to be the second index and confirm the usefulness of going on to allow for structural shifts in (2) and (3) as well.

capital position of banks that invest heavily in corporate stock is more volatile than the stock market itself. The market capitalization of high-beta bank stocks can decline suddenly and markedly. In a world where governments insure de facto all of the debts of large domestic banks, this volatility implies that, to protect Japanese taxpayers, risk-based market-value capital requirements should be designed to increase with the size of each bank's market beta.

Individual-Bank Runs. To investigate within-class variation in market betas, Table 5 reports the results of estimating the one-index version of equation (4) for the individual banks in each class for which we have data for all 15 years. Although we do not report results for the four-index model, R, R_L, and R_f prove significant in time-series runs for only few of these banks.

The market betas found for most members of each of the three largest size classes prove to be of the same order of magnitude as in the pooled run. The 24 regional banks that show significant market betas appear to follow portfolio strategies that are more similar to those followed by larger institutions than to those pursued by fellow members of their charter class.

When we allow for a possible structural shift in individual market betas after 1983, high market betas develop only during the later subsample. A visual inspection of the data reveals that high betas are typically driven by 1985, 1987 and 1988 observations. In these years, the market capitalizations of institutions show extraordinary increases relative to the market. These beta estimates are much higher than those reported by Pettway, Tapley and Yamada (1988). Pettway, Tapley and Yamada cover different sample years (1982-1983 and 1984-1986) and use daily data. Neglecting data from 1987-89 would tend to lower our beta estimates substantially. To some degree, these authors' lower betas may also reflect downward bias due to employing daily data on stocks that fail to trade daily.

Tracking Variation in Market Betas at Individual Banks. Pettway, Sicherman, and Yamada (1990) contrast an observed tendency for market betas of Japanese corporations to increase with size against the stylized tendency for market betas to decline with size for U.S. firms (Reinganum, 1981; Chang and Prinegar, 1989). These authors attribute this differential behavior to presumed differences in management objectives at U.S. and Japanese corporations. While U.S. corporations' internal diversification is believed to increase with size, in Japan agency costs associated lender influence on decisions by corporate managers are held to rise with size. Agency costs in Japanese banking relationships are studied by Hoshi, Kashyap, and Scharfstein (1989).

The following ad hoc regression equation supports the hypothesis that Japanese banks with high market betas are larger and more highly leveraged than other banks:

$$\beta_{jm} = \underset{(-.43)}{-.81} \quad \underset{(1.98)}{-\ 32.1} \ (\overline{BV}_j/\overline{TA}_j) + \underset{(2.06)}{0.22} \ (\ln \overline{TA}_j), \quad R^2 = 22. \qquad (5)$$

In (5), t-values are reported in parenthesis, β_{jm} is bank j's market betas from Table 5, while $\overline{BV}_j$ and $\overline{TA}_j$ denote the j^{th} bank's average book-value and total assets over 1975-1989.

When the market model and the ad hoc equation (5) are fitted separately to 1975-83 and 1984-89, the magnitude and significance of the slope coefficients may be traced entirely to the 1984-89 period. Before 1984, leverage does not significantly affect a Japanese bank's market beta. As with U.S. banks, betas significantly decline with size. Hence, this divergence between U.S. and Japanese bank behavior is of recent origin.

I. Opportunities for Future Research

Although the ordinary-least-squares estimates reported in this paper seem reliable enough to support qualitative inferences, more sophisticated econometric procedures may be able to establish a role for bond, land, or foreign-exchange returns. In future research, we plan to use seemingly unrelated regression, crossed regression, nonlinear formulations, simultaneous-equation models, and heteroskedasticity adjustments. We also plan to use covariance analysis to disaggregate regional banks into high-beta and low-beta groups and to test whether SMVAM equations for banks with similar betas can be pooled across charter types.

We further plan to analyze contracting arrangements inherent in Japanese financial institutions and markets. The goal of this investigation is to help us to sort out how contracting arrangements between and among banks and related and unrelated corporations affect the size and distribution of agency costs in Japan.

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CHART 1: RATIO OF BV/TA

BY BANK TYPE

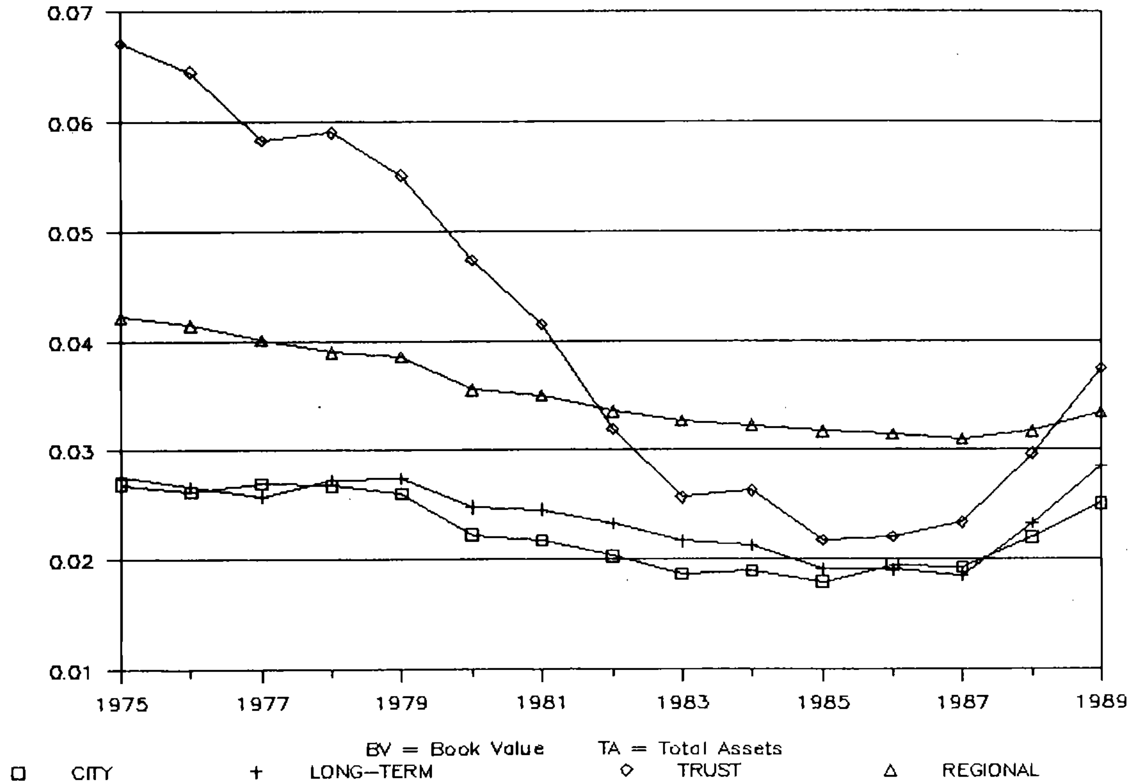

CHART 2: MEAN MV/MEAN BV

BY BANK TYPE

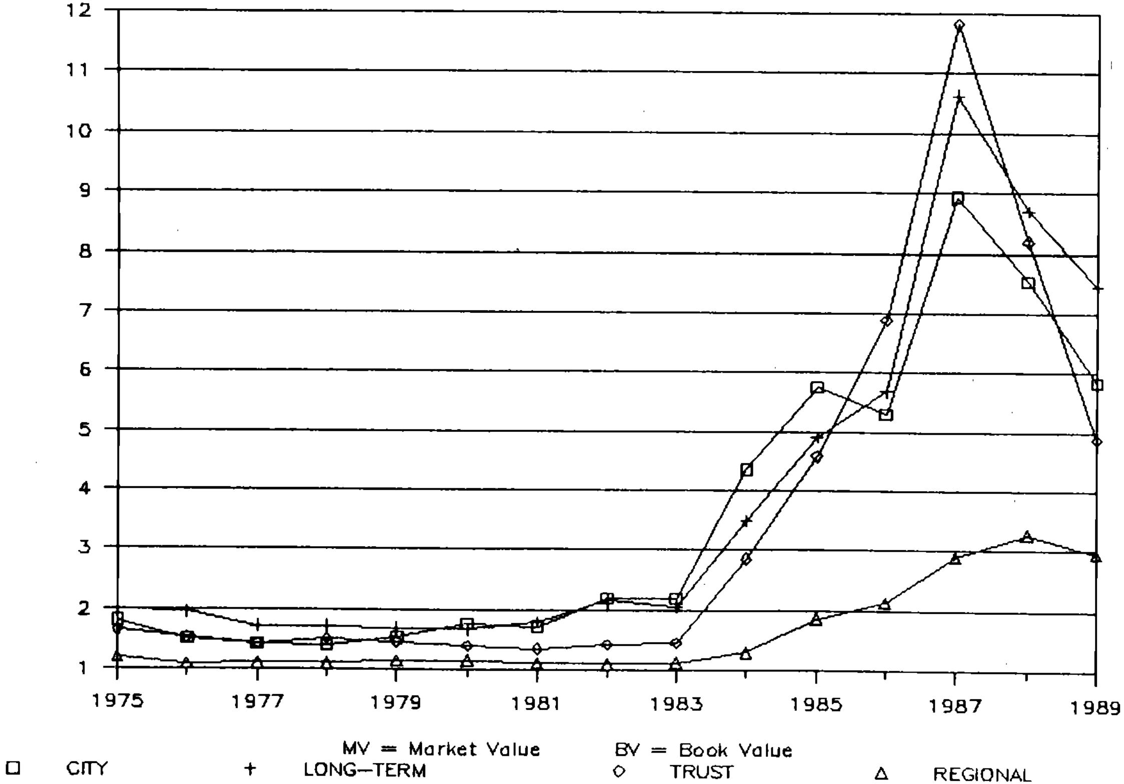

CHART 3: BANK RETURNS

BY TYPE

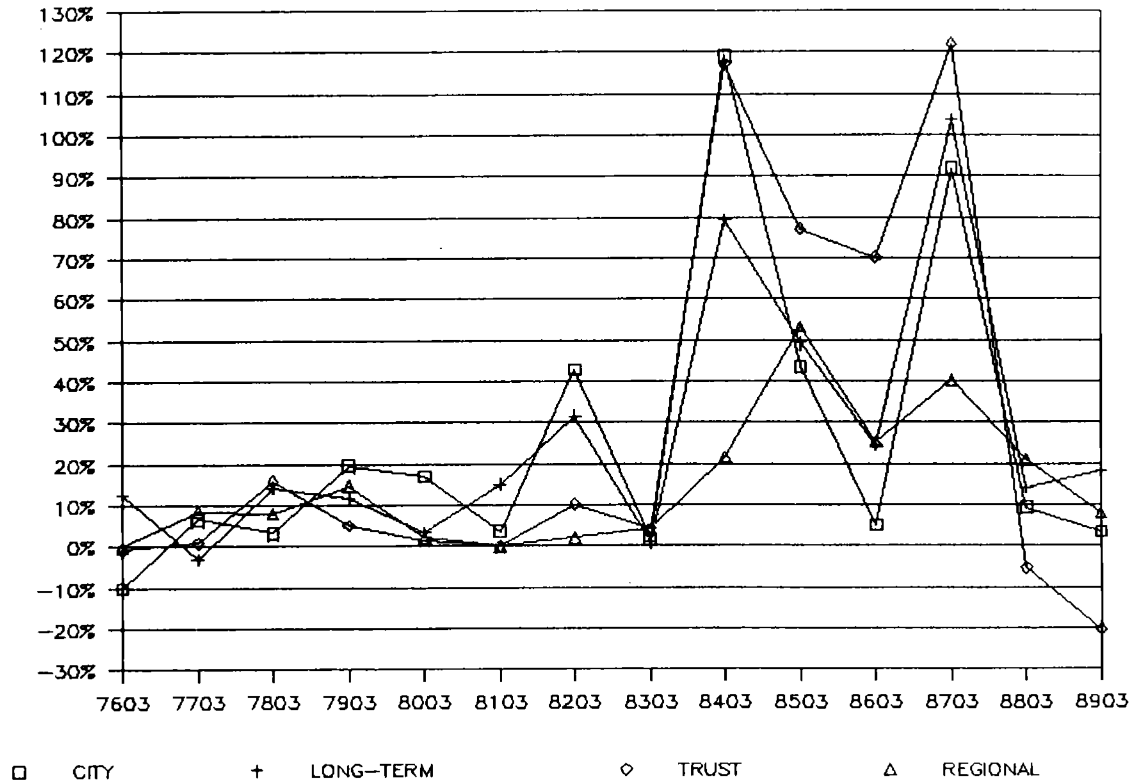

CHART 4: HOLDING PERIOD RETURN

FOR FOUR JAPANESE INDICIES

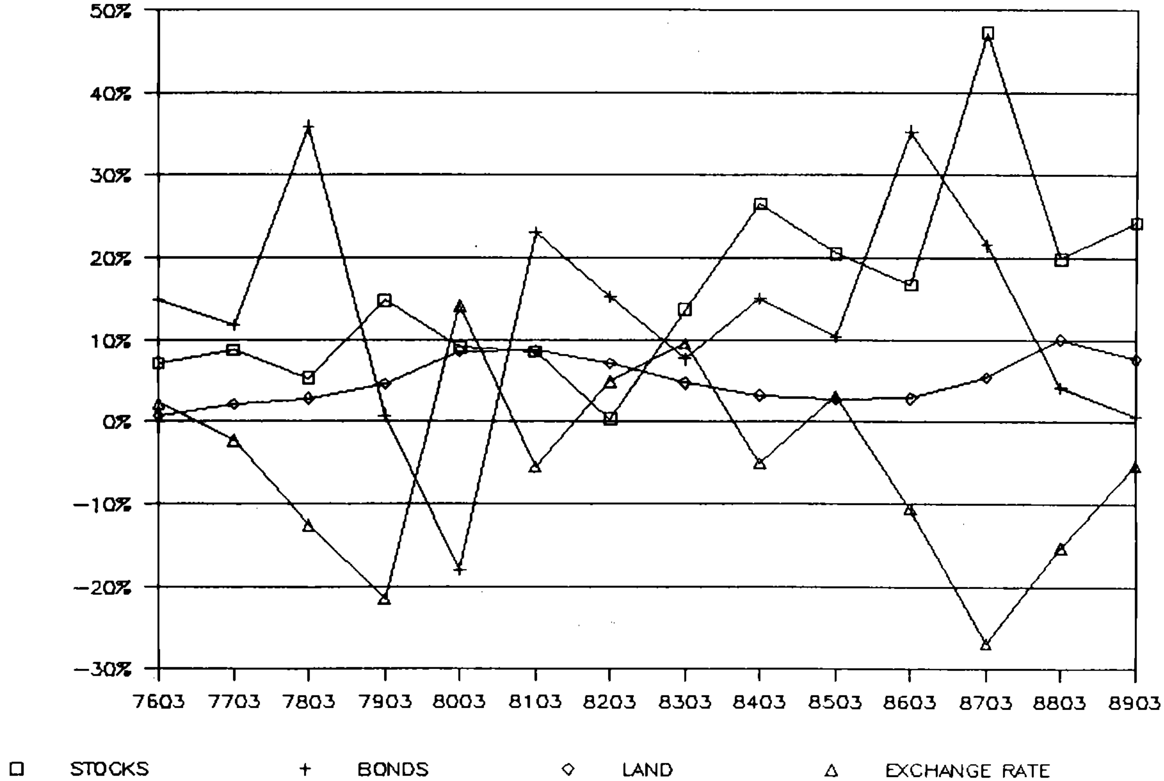

CHART 5: MV OF UNBOOKABLE EQUITY (U)

BY BANK TYPE

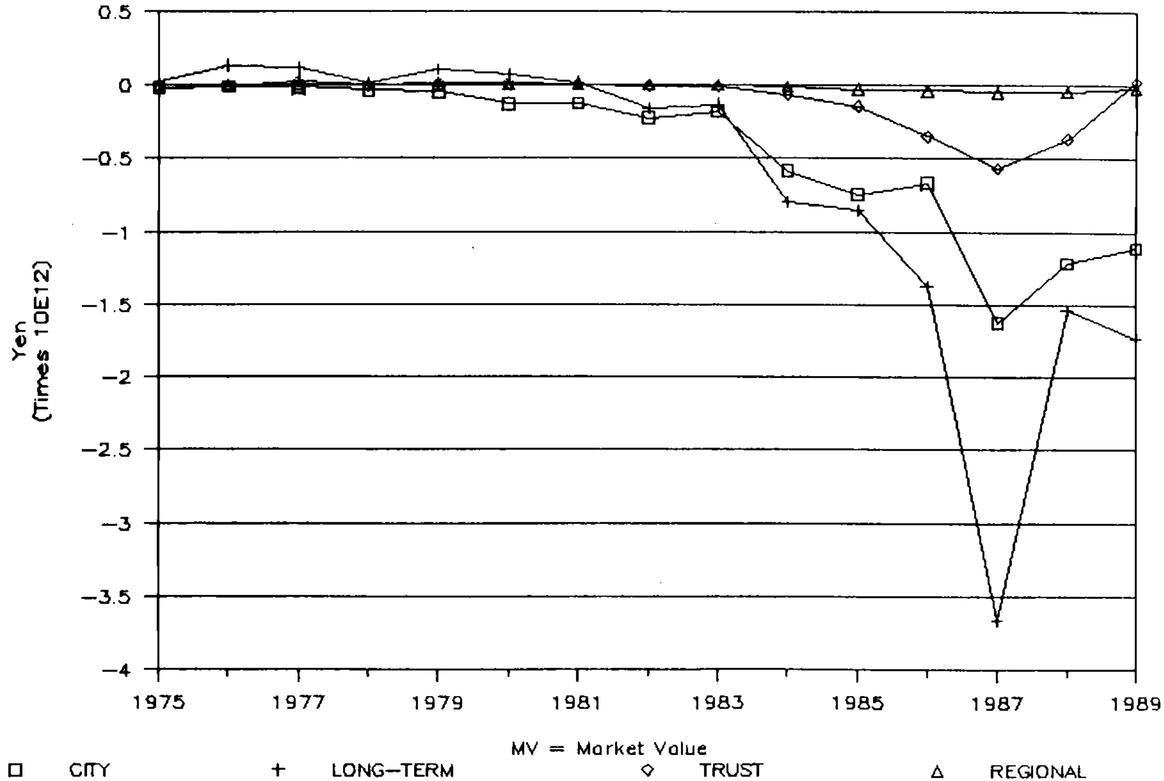

CHART 6: VALUATION RATIO (k)

BY BANK TYPE

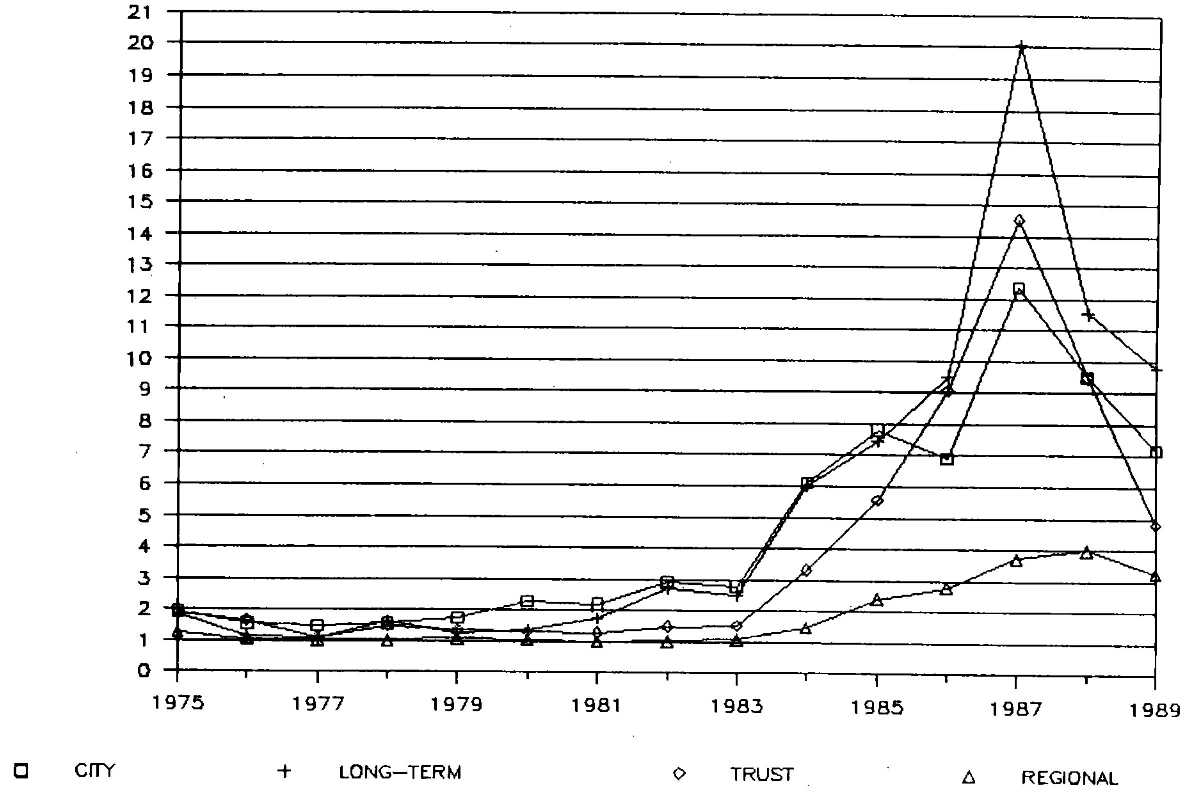

Table 1: Summary Outcomes at 5-percent Significance of Separate Tests of the Hypotheses that U Equals Zero and k Equals Unity

	City Banks		Long Term Credit Banks		Trust Banks		Regional Banks	
Year	U	k	U	k	U	k	U	k
1975	0	>1	0	>1	0	>1	0	>1
1976	0	>1	+	>1	0	>1	0	1
1977	0	>1	+	>1	0	1	0	1
1978	-	>1	0	>1	0	>1	0	1
1979	-	>1	+	1	0	>1	0	1
1980	-	>1	0	1	0	1	0	1
1981	-	>1	0	>1	0	1	0	1
1982	-	>1	-	>1	0	>1	0	1
1983	-	>1	0	>1	0	1	0	1
1984	-	>1	-	>1	0	>1	0	1
1985	-	>1	-	>1	0	>1	0	>1
1986	-	>1	-	>1	-	>1	0	>1
1987	-	>1	-	>1	-	>1	0	>1
1988	-	>1	-	>1	-	>1	0	>1
1989	-	>1	-	>1	0	>1	0	>1

Table 2: Estimates of the Full Repricing Model (2) and a Deleted Two-Index Model (TIM) for Changes in the Value of Off-Balance-Sheet Equity at Four Classes of Japanese Banks, 1975-1989

	Stock		Bonds	Land	Exchange Rate		
	β_0^u	β_m^u	β_r^u	β_L^u	β_f^u	R^2	ADJ R^2
City Banks							
Model (2):	172 (241)	-2024* (774)	-397 (664)	1873 (2880)	-581 (874)	.50	.28
TIM:	237 (129)	-1679* (587)	-376 (489)			.44	.34
Long-Term Credit Banks							
Model (2):	533 (734)	-5217* (2355)	-2171 (2021)	6457 (8762)	-2390 (2659)	.45	.21
TIM:	735 (407)	-3817* (1842)	-1982 (1535)			.35	.23
Trust Banks							
Model (2):	40 (132)	-363 (426)	-489 (366)	1358 (1586)	-273 (481)	.36	.08
TIM:	100 (72)	-194 (327)	-523 (272)			.27	.13
Regional Banks							
Model (2):	.97 (8.9)	-35 (28)	-23 (24)	98 (106)	-23 (32)	.32	.02
TIM:	5.0 (4.9)	-21 (22)	-24 (18)			.19	.04

Notes:

1. The holding-period return on bonds is approximated by the following formula:

$$R_t = \text{Bond Yield}_{t-1} - \left(\frac{\text{Bond Yield}_t - \text{Bond Yield}_{t-1}}{\text{Bond Yield}_t}\right)$$

2. Standard errors are stated in brackets and asterisks denote coefficients whose value differs significantly from zero at 5 percent.
3. Each intercept represents a trend term measured in billions of yen.

Table 3: Estimates of the Full Repricing Model (3) and A Deleted Two-Index Model (TIM) for Changes in the Valuation Ratio k for On-Balance-Sheet Equity at Four Classes of Japanese Banks, 1975-1989

	Stock		Bonds	Land	Exchange Rate		
	β_0^k	β_m^k	β_r^k	β_L^k	β_f^k	R^2	ADJ R^2
City Banks							
Model (3):	-.77	12*	2.4	-17	4.7	.41	.15
	(1.78)	(5)	(4.9)	[21]	(6.4)		
TIM:	-1.4	9.4*	2.5			.31	18
	(.9)	(4.4)	(3.7)				
Long-Term Credit Banks							
Model (3):	-2.4	23*	10	-30	10	.49	.26
	(3.1)	(10)	(8)	(37)	(11)		
TIM:	-3.3	17*	9.7			.38	.27
	(1.7)	(7)	(6)				
Trust Banks							
Model (3):	-1.0	12	8	-29	7	.48	.25
	(2.1)	(7)	(6)	(26)	(7)		
TIM:	-2.1	7	9			.33	.21
	(1.2)	(5)	(4)				
Regional Banks							
Model (3):	-.2	2.2	.8	-1.8	.59	.37	.10
	(.3)	(1.2)	(1.0)	(4.5)	(1.3)		
TIM:	-.2	1.9	.8			.34	.23
	(.19)	(.8)	(.7)				

Notes:

1. The holding-period return on bonds is approximated by the following formula:

$$R_t = \text{Bond Yield}_{t-1} - \left(\frac{\text{Bond Yield}_t - \text{Bond Yield}_{t-1}}{\text{Bond Yield}_t}\right)$$

2. Standard errors are stated in parenthesis and asterisks denote coefficients whose value differs significantly from zero at 5 percent.

Table 4: Estimated Multi-Index Market Models for Four Classes of Japanese Banks, 1975-1989

	Intercept	Stock	Bonds	Land	Exchange Rate	
	β_0	β_m	β_r	β_L	β_f	R^2
<u>City Banks</u>						
	-.09	2.3*	.30	-.66	.70	.42
	(.31)	(1.0)	(.87)	(3.7)	(1.1)	
<u>Long-Term Credit Banks</u>						
	-.17	2.3*	.76	.02	.58	.70
	(.18)	(.6)	(.51)	(2.2)	(.67)	
<u>Trust Banks</u>						
	-.2	3.4*	1.3	-3.4	1.2	.71
	(.2)	(.9)	(.7)	(3.3)	(1.0)	
<u>Regional Banks</u>						
	.04	.99*	.09	-1.1	.06	.54
	(.12)	(.38)	(.33)	(1.4)	(.43)	

<u>Notes</u>:

1. The holding-period return on bonds is approximated by the following formula:

$$R = \text{Bond Yield}_{t-1} - \left(\frac{\text{Bond Yield}_t - \text{Bond Yield}_{t-1}}{\text{Bond Yield}_t}\right)$$

2. Standard errors are stated in parenthesis and asterisks denote coefficients whose value differs significantly from zero at 5 percent.
3. Except for regional banks, the two-index model has the highest adjusted R^2 of all possible combinations. For regional banks, the third equation listed has the highest adjusted R^2.

Table 5: Time-Series Estimates of the Market Model
for Individual Japanese Banks, 1975-1989

$$R_{jt} = \beta_{j0} + \beta_{jm} R_{Mt} + u_{jt}.$$

	β_0	β_m
City Banks		
Bank of Tokyo	.03	1.35*
Dai-Ichi Kangyo Bank	-.04	2.05*
Daiwa Bank	-.29	3.33*
Fuji Bank	-.06	2.14*
Hokkaido Takushoku	-.03	1.52*
Kyowa Bank	-.02	1.36*
Mitsubishi Bank	-.07	2.11*
Mitsui Bank	.04	1.43
Saitama Bank	-.06	1.68*
Sanwa Bank	-.08	2.16*
Sumitomo Bank	-.02	1.89*
Taiyo Kobe Bank	-.09	1.85*
Tokai Bank	-.05	1.99*
Long-Term Credit Banks		
Industrial Bank of Japan	-.07	2.38*
Long-Term Credit Bank	-.01	1.62*
Nippon Credit Bank	-.02	1.55*
Trust Banks		
Mitsubishi Trust	-.14	3.05*
Mitsui Trust	-.05	2.01*
Nippon Trust	-.11	1.99*
Sumitomo Trust	-.15	2.92*
Toyo Trust	-.33	4.01*
Yasuda Trust	-.13	2.68*
Regional Banks		
Akita Bank	.18	.00
Aomori Bank	.12	.23
Ashikaga Bank	-.01	1.28*
Awa Bank	-.07	1.44*
Bank of Hiroshima	-.03	1.20*
Bank of Ikeda	-.01	.70
Bank of Iwate	.10	.47
Chiba Bank	.05	.98*
Chiba Kogyo Bank	.01	1.20*
Daishi Bank	.02	.79*
Eighteenth Bank	.08	.47
Fukui Bank	-.02	1.26
Gunma Bank	-.04	1.35*
Hachijuni Bank	.11	.67
Higashi Nippon	-.09	1.69*
Hokkoku Bank	.10	.47
Hokuetsu Bank	.04	.69
Hokuriku Bank	-.02	1.42*

Table 5 (continued)

	β_0	β_m
<u>Regional Banks</u>		
Hyakugo Bank	-.07	1.66*
Hyakujushi Bank	.03	.79*
Iyo Bank	.03	.74*
Joyo Bank	.11	.64
Juroku Bank	-.02	1.13*
Kagoshima Bank	.13	.22
Kanto Bank	-.14	1.68*
Keiyo Bank	-.06	1.77*
Kiyo Bank	.02	.96*
Musashino Bank	-.07	1.33*
Niigata Sogo	.04	.78
Nishi-Nippon Bank	.03	.94*
Ogaki Kyoritsu Bank	.06	.69
Oita Bank	.11	.14
Shikoku Bank	.02	.82
Shinwa Bank	.08	.43
Shizuoka Bank	.06	1.15*
Sugura Bank	.02	.86
Taiyheiyo Bank	-.11	2.32*
The 77 Bank	-.00	1.15*
Toho Bank	.14	.30
Tokyo Sowa	-.54	5.29*
Tokyo Tomin Bank	.07	.88
Yamagata Bank	.06	.68
Yamanashi Bank	-.08	1.88*

* Indicates market betas that differ significantly from zero at five percent.