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Fair Value Accounting and Regulatory Capital Requirements

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Abstract

There are some concerns regarding fair value accounting and regulatory capital requirements under fair value: Bank earnings and regulatory capital ratios based on fair values for investment securities are likely to be more volatile than those based on historical cost. Because this increased volatility does not reflect the underlying economic volatility of banks' operations, inefficient capital allocation decisions by investors and inappropriate regulatory intervention will result. The purpose of our study is to investigate these critics' assertions by applying the method used in previous research in the USA (Barth, Lansman and Wahlen <1995>) to data on Japanese banks. We also conduct an empirical study of regulatory risk in the capital requirements associated with fair value accounting, focusing on banks with low Basle capital adequacy ratios, which is a different approach from that of Barth, Landsman and Wahlen (1995). We find that bank earnings based on fair value accounting are more volatile than those based on historical cost. Whether the additional volatility in earnings associated with fair value accounting is reflected in bank share prices or not depends on the banks' capital adequacy ratios. As for banks with low capital adequacy ratios, the additional volatility in earnings is reflected in bank share prices and therefore we cannot reject the possibility of increases in regulatory risk associated with fair value accounting having some impact on capital allocation decisions and banks' behavior.

However, this does not mean that regulatory capital requirements are irrelevant under fair value accounting. The Basle capital adequacy formula partly adopts the concept of fair value accounting in the sense that it allows the inclusion of unrealized gains of investment securities in the calculation of capital (the numerator). However, when the inclusion of such unrealized gains is chosen, those gains should also be included in the calculation of assets (the denominator).

Key words: Investment securities, Fair value accounting, Regulatory capital, Earnings.
JEL Classification codes: G18, G21, G28, M41,

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1. Introduction

Advocates of fair value accounting believe that fair values provide more relevant measures of assets, liabilities and earnings than historical costs provide. They advocate using fair value accounting, asserting that it better reflects underlying economic values. The perceived inadequacy of historical cost accounting also contributed to the discussion paper in March 1997 published by the International Accounting Standards Committee (IASC), which requires that all assets and liabilities be recognized at fair value. Under fair value accounting, changes in fair values, i.e., unrealized holding gains and losses, are recognized in current earnings. In contrast, under historical cost accounting, changes in fair values are not recognized until realized.

Even though the fair value accounting debate relates to all entities and all assets and liabilities, the focus has been on banks' securities. In the USA, the Financial Accounting Standards Board (FASB) issued Statement of Financial Accounting Standards (SFAS) No.115, 'Accounting for Certain Investments in Debt and Equity Securities', in May 1993. One intended effect of this standard was to recognize at fair value more investment securities than before. In Japan, fair value accounting has been introduced for the trading accounts of banks' securities since April last year, but investment accounts for securities of banks have not been recognized at fair value. The concept of fair value accounting has also been partly adopted in regulatory capital requirements based on the 1988 Basle Accord. In this framework, unrealized profits of investment securities can be included only in capital (the numerator).

However, on the other hand, there are some critics of fair value accounting who express concern that the precipitous adoption of market value accounting will have adverse effects on both banks and the financial system as a whole. In particular, they express concern that earnings based on fair values for investment securities are likely to be more volatile than those based on historical cost. They assert that this increased volatility is not reflective of the underlying economic volatility of banks'operations and that investors will demand an excessive premium, thus causing inefficient allocation of funds by investors.

Critics also assert that using fair value accounting for investment securities is likely to

cause banks to violate regulatory capital requirements more often than is economically appropriate, resulting in excess regulatory intervention or leading to costly actions by bank managers to reduce the risk of regulatory intervention. Actually, the lending behaviors of Japanese banks after the bubble period were said to be affected excessively by regulatory capital requirements based on the 1988 Basle Accord. After the bubble period, Japanese banks experienced a sharp reduction in unrealized gains from equities, a fact which is considered to have led banks to adopt excessively cautious lending behaviors in order to reduce the risk of regulatory intervention.

In the USA, Barth, Landsman and Wahlen (1995) have already investigated the empirical validity of the above mentioned concerns about fair value accounting by using data on US banks. They found no strong evidence to justify these concerns. Concretely, they found that: (1) Fair-value-based earnings are more volatile than historical cost earnings, but share prices do not reflect the incremental volatility. (2) Banks violate regulatory capital requirements more frequently under fair value than under historical cost accounting. Fair-value-based violations help predict actual regulatory capital violations, but share prices do not reflect this potential increase in regulatory risk.

This paper conducts an empirical study of fair value accounting applying the analytical methods of Barth, Landsman and Wahlen to data on Japanese banks. It also conducts a further study of regulatory risk in capital requirements associated with fair value accounting, focusing on banks with low Basle capital adequacy ratios, which is a different approach from that of Barth,Landsman and Wahlen. In the USA, the latter calculated capital ratios on a fair value accounting basis with unrealized profits of securities, and using these figures they tested how fair- value-based violations help predict actual regulatory capital violations and to what extent this potential increased regulatory risk is recognized by investors. This paper investigates, using actual Basle adequacy ratios, the regulatory risk in capital requirements associated with fair value accounting. Our study is as follows:

(1) We examine how fair value accounting affects earnings volatility and whether any incremental volatility is reflected in bank share prices. If this is the case, we investigate whether investors view fair value earnings volatility as a better proxy for economic risk

than historical cost earnings volatility. (2) Regulatory risk is one component of total economic risk for banks. We examine the effect of fair value accounting on the volatility of regulatory capital ratios and whether any increase in regulatory risk associated with fair value accounting is reflected in share prices. Concretely, focusing on banks with low Basle capital adequacy ratios, we examine how far the incremental volatility associated with fair value accounting is reflected in bank share prices. (3) Lastly, we seek a better formula for Basle capital adequacy ratios using the concept of fair value accounting. Concretely, we compare the volatility of capital adequacy ratios using the current Basle Accord formula (only capitals are calculated using the unrealized gains of investment securities), the formula using historical cost accounting and the fair value formula (in which both capitals and assets are calculated using the unrealized gains of investment securities).

We find that: (1) Bank earnings based on the fair values of investment securities are significantly more volatile than earnings based on historical cost securities gains and losses. (2) However, the assertion that investors generally demand an excessive premium because of the increased volatility associated with fair value accounting, therefore raising banks' cost of capital, is not supported by any strong empirical evidence. (3) On those critical occasions, when investors value low capital ratio banks' shares, the volatility in fair value earnings incremental to that in historical cost earnings is also priced at risk and this finding indicates that the choice of accounting formula adopted in regulatory capital requirements is very important. (4) The Basle capital adequacy formula partly adopts the concept of fair value accounting in the sense that it allows the inclusion of unrealized gains of investment securities in the calculation of capital (the numerator). However, when the inclusion of such unrealized gains is chosen, those gains should also be included in the calculation of assets (the denominator). From the practical point of view, this assertion is also be supported by the fact that the fair value formula (both capital and assets are calculated using the unrealized gains of investment securities) is less volatile than the current formula.

The remainder of this paper is organized as follows: Section 2 describes our data and sample banks. Sections 3 and 4 present our empirical findings related to earnings

volatility and regulatory risk associated with fair value accounting. In section 5 we seek a better formula for BIS capital adequacy ratios using fair value accounting. Section 6 concludes the study.

2.Data and sample banks

The sample comprises annual data from FY 1988-1996 for 87 Japanese banks which have adopted capital adequacy ratios based on the 1988 Basle Accord more than once during this period. Our estimation includes banks which have adopted Basle capital adequacy ratios only during a limited period because of their fragile financial condition. However, banks which have defaulted during the period are excluded (even though the property of these banks has been handed over to other banks).

As for fair value estimates of investment securities[1], the focus in this study is listed investment securities, because only unrealized gains for listed securities are calculated in capital adequacy ratios based on the 1988 Basle Accord. These estimates are obtained from annual statements of accounts. We can estimate annual fair value profits/losses of investment securities during the FY1989 -FY1996 period, using data from annual statements of accounts in which unrealized gains and losses for listed securities data are disclosed since FY1990 and unrealized securities gains calculated in BIS capital adequacy ratios are disclosed since FY1989.

3.Earnings volatility

We address two specific questions in this section. First, are earnings more volatile using fair value accounting for investments rather than historical cost? Second, if so, is the increased volatility perceived by investors, and therefore reflected in banks'share prices as an additional risk premium? This will be the case if volatility in earnings based

[1] The size of investment securities of 149 Japanese banks (including city banks, long-term credit banks, trust banks, regional banks, regional banks Ⅱ), on average, accounts for 15.4 percent (1996) of that of their total assets.

on fair values for investment securities is a better proxy for economic risk than that based on historical cost.

3.1.Empirical measures of earnings volatility

Table 1 presents descriptive statistics for selected earnings variables in per share form. The four earnings variables are historical cost earnings (*ordinary income*), HCE, historical cost earnings plus unrealized annual gains and losses for investment securities, i.e., fair value earnings, FVE, realized securities gains and losses, RSGL, and unrealized securities gains and losses, URSGL. Realized investment securities gains and losses are recognized under historical cost accounting. Under fair value accounting, banks recognize as investment securities gains and losses the sum of RSGL and URSGL[2].

Obviously, URSGL is more volatile than RSGL, and the effect of unrealized securities gains and losses on ordinary income in any given year can be large. Table 1 shows the standard deviations over the period 1989-1996 measured for the cross-sectional mean in fair value earnings and that in historical cost earnings. The former (σ of Mean: 168.8) is more than five times greater than the latter (σ of Mean: 29.8).

[2] Under the current accounting rules in Japan, banks' investment securities are recognized at historical cost (equity securities are recognized at lower of cost or market), and estimates of their fair values are disclosed. In this paper, on the assumption that disclosure and recognition are informationally equivalent we make fair value estimates by adding unrealized gains and losses to realized gains and losses.

TABLE 1

Cross-sectional descriptive statistics of earnings under historical cost and fair value accounting, realized and unrealized securities gains and losses using a sample of 87 Japanese banks over the period 1989-1996.

		HCE		FVE		RSGL		URSGL	
Year	N	Mean	σ	Mean	σ	Mean	σ	Mean	σ
89	87	105.1	157.8	-207.1	333.0	25.5	62.3	-312.2	457.7
90	87	97.5	146.3	-104.5	238.3	43.1	101.5	-202.0	332.6
91	87	82.5	124.6	-212.9	565.9	0.4	43.6	-295.3	623.4
92	87	83.9	133.2	107.6	320.4	5.7	54.1	23.7	261.3
93	87	67.8	116.6	146.1	226.5	30.1	70.0	78.3	143.7
94	87	74.9	144.8	-129.4	315.8	16.2	98.8	-204.3	333.0
95	87	26.0	156.0	197.1	360.3	86.2	161.0	171.2	250.1
96	87	26.2	203.0	-171.6	448.0	4.4	80.0	-197.8	365.2
Mean		70.5		-46.8		26.5		-117.3	
σ of Mean		29.8		168.8		28.2		182.2	

N=8

HCE = historical cost earnings (ordinary income) per share;
FVE =historical cost earnings plus unrealized annual gains and losses for investment securities, per share (i.e., fair value earnings per share);
RSGL = realized securities gains and losses per share;
URSGL= unrealized securities gains and losses per share;
σ denotes standard deviation.

3.2.Earnings variability and share prices

The increased earnings volatility associated with fair value accounting for investment securities documented in Table1 raises the question: Does the market perceive this increased volatility as additional risk?

To address this question, we estimate the following relationship:

$$P = \alpha_0 + \alpha_1 PREE_{it} + \alpha_2(\sigma_{HCit} \times PREE_{it}) + \alpha_3[(\sigma_{FVit} - \sigma_{HCit}) \times PREE_{it}] + \varepsilon_{it} \quad (A)$$

where P is the bank's end-of-fiscal year[3] share price, PREE is earnings per share before securities gains and losses, and i and t represent banks and years. σ_{HCit} and σ_{FVit} are the standard deviations of historical cost and fair value earnings per share for each bank

[3] Banks' annual statements cannot be obtained at the end of the fiscal year. However, investors can be considered to infer those figures at this stage to some extent, by judging from forecast figures in the semi-annual statements, movements of interest rates and the stock price index(*Nikkei Heikin*) and other information sources such as rating firms. Therefore, the bank's end-of-fiscal year share price can be considered relevant. Incidentally, the treatment by Barth, Landsman and Wahlen (1995) regarding US banks (using end of year data) is the same as that in our paper.

measured over the recent four years. Because σ_{HC} and σ_{FV} are computed using four years of data, this analysis extends only from FY 1992 through FY 1996.[4] However, this estimation period covers the entire duration of the Basle capital adequacy ratios, excluding the trial period. Using this estimation we can investigate regulatory risk associated with fair value accounting in accordance with the Basle Accord 1988, which is dealt with in section 4. Eq.(A) is based on a valuation model where price is determined as earnings divided by the cost of equity capital. The model assumes that a firm's equity value equals an earnings multiple times permanent earnings, where risk is one of many determinants of the earnings multiple. The earnings multiple is assumed to be negatively related to risk (See Appendix).

Eq.(A) permits the coefficient on earnings to vary with two risk proxies based on earnings variability. If historical cost accounting earnings and its variance are good proxies for permanent earnings and risk, then the expected sign of α_2 is negative. Because we are trying to determine whether the market perceives the variance associated with fair value accounting as risk incremental to historical cost earnings variance, our test is whether or not α_3 equals zero. Finding that α_3 is significantly different from zero is consistent with any difference between fair value and historical cost earnings variance being perceived by the market as risk.

Note that the sign of α_3 depends on the sign of the difference between σ_{HC} and σ_{FV}. Because Table 1 reports that the variance of fair value earnings, σ_{FV}, exceeds the variance of historical cost earnings, σ_{HC}, we expect the sign of α_3 to be negative. To be consistent with the going concern assumption in the underlying valuation model, we eliminate observations with negative earnings, PREE.

Table 2 presents regression estimates from fixed-effects estimation using 87 banks over the period FY 1992 ~ FY 1996. Table 2 shows regression summary statistics from estimating three fixed effects models that pool observations across years and time.
Panel A contains the regression summary statistics for Eq.(A). Panel B and C present

[4] The four-year calculation period reflects the tradeoff between having a sufficient number of observations to estimate the earnings variance efficiently and having a sufficient number of observations to estimate efficiently Eq.(A).

regression summary statistics from estimating versions of Eq.(A) that include either the volatility of historical cost earnings or fair value earnings, each interacting with earnings before securities gains and losses, but not both.

Panel A indicates that volatility in fair value earnings is not associated with a reduced earnings multiple assigned by investors. The coefficient on (σ_{FVit}- σ_{HCit}) $\times$ $PREE_{it}$, α_3, is insignificantly different from zero(t=0.40), indicating that the volatility in fair value earnings incremental to that in historical cost earnings is not priced at risk.

The findings in Panel A are not consistent with fair value accounting critics' assertions that increased volatility associated with fair value earnings directly affects capital allocation decisions by investors. The findings are consistent with investors perceiving volatility in historical cost earnings to be a better measure of economic risk than volatility in fair value earnings. The fact that bank share prices do not reflect the incremental volatility of fair value earnings is consistent with the findings using US bank data over the 1976-1990 period in Barth, Landsman and Wahlen (1995).

In order to eliminate collinearity between the two volatility measures, we also estimate each measure alone. Panel B and Panel C indicate that each measure has a significant dampening effect on the earnings multiple. The coefficients representing the effect of historical cost earnings volatility and fair value earnings volatility on the earnings multiple each are significantly negative with *t*-statistics of -4.47 and -2.07. Thus, both volatility measures are proxies for risk, and findings in Panel A also indicate that historical cost volatility dominates fair value earnings volatility as a risk proxy.

TABLE 2

Estimates of the relationship between bank share prices and earnings before securities gains and losses, volatility in reported earnings, and volatility in fair value earnings. Regression estimates are from fixed-effects estimation using 87 banks over the period 1992-1996(N=302), t-statistics are in parenthesis.

Panel A

$P_{it} = \alpha_{0i} + \alpha_{0t} + \alpha_1 PREE_{it} + \alpha_2(\sigma_{HCit} \times PREE_{it}) + \alpha_3(\sigma_{FVit} - \sigma_{HCit}) * PREE_{it} + \varepsilon_{it}$

coefficient estimates: $\alpha_1 = 1.40$ (t=3.55)

$\alpha_2 = -0.01$(t=−4.13) F-test: F(82,216)=78.646, P-value=[.0000]

$\alpha_3 = 0.0002$ (t=0.40) Hausman-test: CHISQ(3)=155.28, P-value=[.0000]

Panel B

$P_{it} = \alpha_{0i} + \alpha_{0t} + \alpha_1 PREE_{it} + \alpha_2(\sigma_{HCit} \times PREE_{it}) + \varepsilon_{it}$

coefficient estimates: $\alpha_1 = 1.47$ (t=4.11) F-test: F(82,217)=87.120, P-Value=[.0000]

$\alpha_2 = -0.01$ (t=−4.47) Hausman-test:CHSQ(2)=107.33, P-value=[.0000]

Panel C

$P_{it} = \alpha_{0i} + \alpha_{0t} + \alpha_1 PREE_{it} + \alpha_3(\sigma_{FVit} \times PREE_{it}) + \varepsilon_{it}$

coefficient estimates: $\alpha_1 = 1.07$ (t=2.69) F-test:F(82,217)=74.363, P-value=[.0000]

$\alpha_3 = -0.0007$(t=−2.07) Hausman-test:CHISQ(2)=145.78,P-value=[.0000]

P = price per share;

PREE = earnings per share before securities gains and losses;

σ_{HC} = standard deviation of historical cost earnings per share for each bank measured over the recent four years;

σ_{FV} = standard deviation of fair value earnings per share, calculated as historical cost earnings plus unrealized gains and losses for investment securities, for each bank measured over the most recent four years;

i = bank i;

t = year t.

4.Regulatory risk

4.1.A comparison of regulatory capital measures

Based on the findings in Table 1, we expect regulatory capital ratios based on fair value accounting to be more volatile than those based on historical cost. This fact may also be true of Basle adequacy ratios, which partly adopt the concept of fair value accounting for investment securities. Table 3 shows the comparison of volatility between current Basle capital adequacy ratios and capital adequacy ratios calculated without unrealized profits for investment securities. Obviously, the former is more volatile than the latter.

Actually, in Japan the current Basle capital adequacy formula is sometimes criticized on the grounds that the inclusion of unrealized gains of investment securities in capital (the numerator) intensifies the volatility of capital adequacy ratios, thus having an inappropriate impact on banks' behaviors.

TABLE 3

Mean of the mean(μ) and the standard deviation(σ) measured for each bank over the period 1989-1996 using three formulae. These formulae are : Current Basle capital adequacy ratios (only capital calculated with unrealized gains from investment securities), capital ratios based on historical cost accounting, and capital ratios based on fair value accounting (both capitals and assets are calculated with unrealized gains of investment securities). Sample of 87 Japanese banks over the period 1989-1996.

	BIS-R	HC-R	FV-R
μ	9.17	7.33	8.81
σ	3.14	2.62	3.02

BIS-R = mean of the mean and the standard deviation measured for each bank over the period 1989-1996 using current Basle capital adequacy ratios (only capitals are calculated with unrealized gains of investment securities);

HC-R = mean of the mean and the standard deviation measured for each bank over the period 1989-1996 using capital ratios based on historical cost accounting;

FV-R = mean of the mean and the standard deviation measured for each bank over the period 1989-1996 using capital ratios based on fair value acounting (both capitals and assets are calculated with unrealized gains of investment securities).

4.2.Regulatory risk and share prices

Regulatory risk is one component of economic risk. Then we address another question: Is the increased volatility of capital adequacy ratios perceived by investors to be associated with fair value accounting and therefore reflected in banks' share prices as an additional risk premium? Now we investigate the pricing effect of regulatory risk by estimating the same Eq.(A) regarding banks with low Basle capital adequacy ratios.

Banks with low Basle capital adequacy ratios can be considered to have a greater possibility of regulatory capital violation affected by the volatility of unrealized profits for investment securities than banks with high capital adequacy ratios. If so, fair value earnings volatility is most likely to be priced incrementally to historical cost earnings volatility as far as banks with low Basle capital adequacy ratios are concerned. If the

fair value earnings volatility of banks with low capital adequacy ratios is reflected in their share prices, the regulatory risk associated with fair value accounting is considered to be recognized by investors.

Table 4 shows levels of Basle capital adequacy ratios and numbers of banks and we focus on banks with low capital adequacy ratios under 9.0%. Table 5 shows two coefficients, the volatility in historical cost earnings and the volatility in fair value earnings incremental to that in historical cost earnings. Table 5 reveals that the effects of the coefficients on the earnings multiple are significantly negative with *t*-statistics of -3.01 and -3.37, even though the coefficient of the former is larger than that of the latter. Thus, with regard to banks with low capital adequacy ratios[5], both volatilities are reflected in bank share prices and this finding indicates that the regulatory risk[6] associated with fair value accounting is recognized by investors. In this sense, we cannot reject the possibility of this increased volatility having some impact on capital allocation decisions and banks' behaviors. If this is the case, does it mean that regulatory capital requirements using fair value accounting are irrelevant? This issue will be dealt with in the next section.

[5] When simply conducting the same estimation with regard to high capital adequacy ratios, the coefficient of earnings per share before securities gains and losses, as well as that of the increased volatility of fair value estimates, is not significant. Presumably, this result is considered to be somewhat affected by the large-scale loan write-offs in the recent years: In this situation, high earnings are not necessarily positively valued, because myopic behavior, such as reporting high profits in the short run while deferring the write-offs of nonperforming loans, is negatively valued. The large scale write-offs have been conducted mainly by large banks such as city banks, which have relatively high capital ratios. At any rate, for this study we have to conduct the empirical estimation using other financial data such as the sum of write-offs and nonperforming loans, which we think will be the subject of future studies.

[6] The risk investors recognize regarding capital adequacy ratios is not limited to the regulatory risk. Even without the regulatory capital requirements, investors monitor economic capital ratios of banks and, if these ratios decrease, they will demand an excessive premium. In this sense, we cannot easily draw the line between the regulatory risk and the risk regarding economic capital ratios. In this paper we focus on the former, as opposed to the latter, which includes such issues as the meaning of capital for shareholders and managers and internal capital allocation.

TABLE 4

Levels of Basle capital adequacy ratios and numbers of banks (87 Japanese banks over the period 1992-1996).

BIS-R(%)	1992	1993	1994	1995	1996
9.00 ～	59	70	50	59	61
8.75～9.00	15	8	12	8	6
8.50～8.75	12	8	13	7	3
8.25～8.50	1	1	9	9	8
8.00～8.25	0	0	1	1	2
7.75～8.00	0	0	0	0	0
7.50～7.75	0	0	0	0	0
7.25～7.50	0	0	0	0	0
7.00～7.25	0	0	0	0	0
～ 7.00	0	0	1	0	1

BIS-R = BIS regulatory capital ratio

TABLE 5

Estimates of the relations between bank share prices and earnings before securities gains and losses, volatility in reported earnings ,and volatility in fair value earnings. Regression estimates are from fixed-effects estimation. Sample of Japanese banks with low capital adequacy ratios under 9% over the period 1992-1996, t-statistics are in parenthesis.

$$P_{it} = \alpha_{0i} + \alpha_{0t} + \alpha_1 PREE_{it} + \alpha_2(\sigma_{HCit} * PREE_{it}) + \alpha_3(\sigma_{FVit} - \sigma_{HCit}) \times PREE_{it} + \varepsilon_{it}$$

coefficient estimates: $\alpha_1 = 8.43$ (t=5.33)

$\alpha_2 = -0.02$(t=－3.01) F-test:F(31,39)=30.472,P-value=[.0000]

$\alpha_3 = -0.008$ (t=－3.37) Hausman-test:CHISQ(3)=23.260,P-value=[.0000]

P = price per share;

PREE = earnings per share before securities gains and losses;

σ_{HC} = standard deviation of historical cost earnings per share for each bank measured over the recent four years;

σ_{FV} = standard deviation of fair value earnings per share, calculated as historical cost earnings plus unrealized gains and losses for investment securities, for each bank measured over the most recent four years;

i = bank i;

t = year t.

5.Appropriate accounting formula of capital adequacy ratios

In section 3, we found that the volatility in fair value earnings is not generally recognized by investors as a better risk proxy than that in historical cost earnings. On

the other hand, in section 4 we found that in critical circumstances, such as in the valuation of low capital ratio banks' shares, the volatility in fair value earnings incremental to that in historical cost earnings is also priced at risk.

How should we interpret these findings? Our interpretations are the following. (1) The assertion that investors generally demand an excessive premium because of the increased volatility associated with fair value accounting, thus raising banks' cost of capital, is not supported by any strong empirical evidence. (2) However, this does not mean that fair value earnings are value irrelevant. In fact, on those critical occasions, when investors value low capital ratio banks' shares, fair value earnings provide us with more useful information than historical cost earnings. (3) The perceived volatility in fair value earnings incremental to that in historical cost earnings in the valuation of low capital ratio banks' shares can be interpreted as regulatory risk associated with fair value accounting. Examined from a different angle, our findings indicate that the choice of accounting formula adopted in regulatory capital requirements is very important. If an inappropriate accounting formula is adopted, there is a possibility that the regulatory capital requirements mislead investors and lead to inefficient capital allocation decisions and inappropriate banks behavior.

Then, we address the next question: Is the current accounting formula used for capital requirements based on the Basle Accord 1988 really relevant? This question should be addressed in terms of the purpose of the bank capital standards. Broadly speaking, bank capital standards are aimed at limiting bank failures by decreasing the likelihood of bank insolvency, that is, decreasing the likelihood that banks have negative economic net worth, in which liabilities exceed assets. Therefore, banks' capital ratios should be measured as a good indication of the future probability of banks' negative net worth. When you grasp the future probability of banks' negative net worth, both assets and liabilities should be fair valued, reflecting future risk factors. Capital ratios based on historical cost cannot indicate the economic net worth accurately. There are cases where failed institutions report positive net worth in excess of regulatory requirements under historical cost accounting, even though these institutions already have negative economic net worth. Thus, regulatory capital requirements using fair value accounting can be considered to be

relevant in the sense that these formulas lead regulators to address the institutions' financial difficulties earlier.

So, what is "fair value" in the context of capital adequacy ratios? Theoretically, the assertion that all assets and liabilities should be calculated using fair value (including not only market risk factors but also other risk factors such as credit risk factor, liquidity risk factor, etc.) is considered to be valid. However, realistically, capital adequacy ratios using fair value accounting calculating all risks on all assets and liabilities are difficult to put into practice at the present stage, and there is much room to be explored on this matter.

In this paper, risk factors or fair value accounting in general associated with Basle capital adequacy ratios are not dealt with. Our study provides evidence to support the assertion that inappropriate or incorrect fair value adopted in regulatory capital requirements should be revised, because of the possibility that it will cause inefficient capital allocations by investors and inappropriate banks' behaviors. From this point of view, the current Basle capital adequacy formula allows biased treatment[7], at least theoretically, of the calculation of unrealized gains from investment securities. The current formula allows the inclusion of unrealized gains of investment securities only in the calculation of capital (the numerator), but when this inclusion is chosen, assets (the denominator) should also be calculated including unrealized gains from investment securities.

This is not only justified by the theoretical argument. Practically, this assertion is appropriate, because this alternative formula calculating unrealized gains of investment securities for denominators as well as numerators has the effect of mitigating the volatility of capital adequacy ratios. Table 3 shows a comparison of the volatility of capital adequacy ratios using the current Basle Accord formula (only capitals are calculated using the unrealized gains from investment securities), the formula using historical cost accounting and the fair value formula (both capitals and assets are calculated using the

[7] With regard to the treatment of unrealized gains from investment securities, it is left to each country's regulator. In Japan, banks are allowed to include unrealized gains from investment securities. In the following section, we consider mainly the treatment of unrealized gains in Japan.

unrealized gains of investment securities). Under the fair value formula, 45 percent of unrealized gains of investment securities are calculated on the capital side (the numerator), which follows the treatment under the current formula, taking into account the concept of tax effect accounting[8]. However, the asset side includes 100 percent of unrealized gains of investment securities. This treatment can be considered to be relevant, because under the tax effect accounting profits can be adjusted but the asset side remains unchanged. Obviously, the current formula and the fair value formula are more volatile than the historical cost formula, but between the two former formulae, the fair value formula calculating unrealized gains from investment securities mitigates the increased volatility.

In Japan, the current Basle capital adequacy formula is sometimes criticized on the grounds that the inclusion of unrealized gains of investment securities in capital (the numerator) intensifies the volatility of capital adequacy ratios, thus having an inappropriate impact on banks' behaviors. The findings in Table 3 show that, even from the critics' point of view, the fair value formula (both capital and assets are calculated using the unrealized gains from investment securities) is more appropriate than the current formula .

6.Conclusion

We investigate the assertions of the critics of the use of fair value accounting to estimate the value of investment securities and also conduct a further study of the regulatory risk associated with capital adequacy ratios based on fair value accounting. We address these questions using earnings calculated using disclosed fair value estimates of banks' investment securities and Basle capital adequacy ratios, which partly adopt the concept of fair value accounting. We find the following.

(1) Although earnings are more volatile under fair value accounting, this increased

[8] To be precise, under the current formula, the figure "45 percent" is considered to be determined not only by the viewpoint of tax effect accounting , but also by the fact that not all of unrealized profits can be realized. At any rate, regarding the inclusion of unrealized gains in the calculation of capital, we adopt the figure "45 percent" in the calculation of the fair value formula in order to make a clear comparison with the current formula.

volatility does not necessarily represent a proxy of economic risk.

(2) On the other hand, in critical circumstances, where investors value low capital ratio banks' shares, the volatility in fair value earnings incremental to that in historical cost earnings is also priced at risk.

Compared with the findings of Barth, Landsman and Wahlen (1995), our finding (1) is consistent with their results when using data on US banks. However, our finding (2) is different from their empirical results. Presumably, this difference can be considered to have been brought about partly by differences in regulation and in banks' behaviors.

In the USA, basically, banks are not allowed to hold equity securities[9] and their size is limited. On the other hand, in Japan the size of equity securities is much larger[10], thus causing volatile unrealized gains which can be considered to have more impact on investors' valuation of banks' shares under critical circumstances than in the USA.

Our findings suggest that: (1) The assertion that investors generally demand an excessive premium because of the increased volatility associated with fair value accounting, thus raising banks' cost of capital, is not supported by any strong empirical evidence. (2) However, this does not mean that fair value earnings are value irrelevant. In fact, on those critical occasions, when investors value low capital ratio banks' shares, fair value earnings provide us with more useful information than historical cost earnings. (3) The perceived volatility in fair value earnings incremental to that in historical cost earnings in the valuation of low capital ratio banks' shares can be interpreted as regulatory risk associated with fair value accounting and it indicates the importance of the accounting framework of the Basle capital adequacy formula. If an inappropriate accounting formula is adopted, there is a possibility that regulatory capital requirements will mislead investors and lead to inefficient capital allocation decisions and inappropriate

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[9] 【12 U.S.C.24 Seventh.】「------Except as hereinafter provided or otherwise permitted by law, nothing herein contained shall authorize the purchase by the association for its own account of any shares of stock of any corporation.------」

[10] The size of investment securities of US commercial banks (9,528), on average, accounts for 17.5 percent (1996), which is larger than that of Japanese banks(15.4 percent). However, the size of equity securities of banks accounts for only 2.7 percent of total holding securities, while that of Japanese banks accounts for 34.7 percent of total holding securities.

banks' behaviors. The Basle capital adequacy formula partly adopts the concept of fair value accounting in the sense that it allows the inclusion of unrealized gains of investment securities in the calculation of capital (the numerator). However, when the inclusion of such unrealized gains is chosen, those gains should also be included in the calculation of assets (the denominator), and this assertion can also be supported by the fact that the fair value formula (both capital and assets are calculated using the unrealized gains of investment securities) is less volatile than the current formula.

Appendix:Valuation model and capital asset pricing model

Suppose that the current price of a share is P_0, that the expected price at the end of a year is P_1, and that the expected dividend per share is DIV_1. We assume that the equity investors invest for both dividends and capital gains, and that expected return is r.

Our fundamental valuation formula is, therefore,

$$P_0 = \frac{DIV_1 + P_1}{1+r}$$

This formula will hold in each period as well as the present. That allowed us to express next year's forecast price in terms of the subsequent stream of dividends per share DIV_1, DIV_2,--. If dividends are expected to grow forever at a constant rate, g, then

$$P_0 = \frac{DIV_1}{r-g} = \frac{(1+g)DIV_0}{r-g}$$

We transform this formula into the following formula, where b is retention rate and E_0 is the current earnings per share.

$$P_0 = \frac{(1-b)E_1}{r-g} = \frac{(1+g)(1-b)E_0}{r-g} \equiv \theta E_0 \qquad (1)$$

We obtain the relation that equity value equals an earnings multiple(θ) times current earnings per share E_0.

Now, we focus on expected return r. By using the Capital Asset Pricing Model (CAPM), the following equation is obtained.

$$r_i = r_f + ß_i (r_m - r_f)$$
$$= r_f + \frac{\rho \sigma_{ri}}{\sigma_{rm}} (r_m - r_f) \qquad (2)$$

where r_f=risk free rate, r_m=expected return on the market index,

$$\rho = \text{covariance}\,(r_i, r_m) / \sigma_{ri}\ \sigma_{rm}$$

When we combine the equations(1) and (2), then we find the earnings multiple is described in the form $1/(A+B\,\sigma_{ri})$. If we assume that the portion of the earnings multiple attributable to risk can be disaggregated linearly from the total earnings multiple, then we obtain Eq.(A) in the main text.

References

Barth,M.E., W.H.Beaver, and M.A.Wolfson, 1990, Components of bank earnings and the structure of bank share prices, *Financial Analysts Journal* 46(May/June):53-60.

Barth,M.E., 1994, Fair value accounting: evidence from investment securities and the market valuation of banks, *The Accounting Review* 69(January):1-25.

Barth,M.E., W.R.Landsman, J.M.Wahlen, 1995, Fair value accounting: Effects on banks earnings volatility, regulatory capital, and value of contractual cash flows, *Journal of Banking and Finance* 19:577-605.

Daigo,S. (ed.),1995, *Jikahyouka to nihon keizai* (in Japanese), Nihon keizai shinbunsha.

Watts,R.L., J.L.Zimmerman,1986, Positive accounting theory, *Jisshoriron to shiteno kaikeigaku*(in Japanese, K.Suda,translator, Hakutou shobo, 1991).