A Comparative Study of Japanese GAAP and U.S. GAAP from a Valuation Perspective

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Abstract

The main purpose of this study is to test whether either the Japanese accounting system or the U.S. accounting system is more useful than the other in estimating firms' value by using a new method of comparing alternative accounting systems. This method examines whether one accounting system is superior to another accounting system with its ability to correctly measure a firm's worth, represented by the prevailing market price of its stock. Specifically, the analysis employs accounting-based valuation models developed by Ohlson (1995) and extended by Penman (1997).

The sample used in this study consists of Japanese firms that are listed on the stock exchanges in Japan and that prepare consolidated finanical statements on Japanese GAAP. For this sample, attempts are made to translate Japanese-GAAP based numbers to U.S. GAAP-based numbers.

This study applies accounting-based valuation models by using these two sets of accounting numbers. The valuation error, defined as the difference between the market value of the firm and its intrinsic values calculated by the valuation models, serves as the benchmark of the usefulness of the accounting system for its users in their decision making.

The findings of this study suggest that translating Japanese GAAP into U.S. GAAP increases the usefulness of accounting numbers, which is consistent with a view that Japanese accounting principles need a major overhaul, which is currently under way.

1 Introduction

1.1 Purpose of This Study

The main purpose of this study is to test whether either the Japanese accounting system or the U.S. accounting system is more useful than the other in estimating a firm's value. In the United States, the main issue in international accounting harmonization is whether to accept non-U.S. accounting standards, especially the IAS, as alternative sets of accounting standards for filing by non-U.S. firms. Currently, the Securities and Exchange Commission (SEC) requires non-U.S. firms that wish to be listed on U.S. exchange(s) to submit Form 20-F, which (1) contains financial statements prepared under U.S. Generally Accepted Accounting Principles (GAAP) or (2) contains financial statements prepared under their "home" GAAP along with reconciliation from home GAAP to U.S. GAAP. The SEC imposes this requirement to ensure that the disclosures by non-U.S. firms are comparable to those by U.S. firms, are useful to U.S. investors, and protect those investors' interests.[1] Once the International Accounting Standards Committee (IASC) finalizes the IAS, the SEC will decide whether to accept the IAS as an alternative for foreign firms' filings. Repeatedly, however, representatives of the SEC made it clear that the IAS has to be of *high quality* in order to be considered as an alternative to U.S. GAAP (e.g., Hunt 1997).

The current study tests whether U.S. investors are better off by having U.S. GAAP-based financial statements of foreign firms in valuing firms' worth. If non-U.S. GAAP financial statements provide sufficient information for investors to make investment decisions, then the argument for mandating foreign firms to report U.S. GAAP financial statements is diminished. In order to achieve this objective, this study employs accounting-based valuation models.[2] The use of accounting-based valuation models is a significant improvement over prior literature on the comparative study of accounting systems.

A good accounting system has the ability to produce information that is useful for decision making.[3]

[1] This study, being consistent with the view of the SEC, treats investors as the main beneficiary of an accounting system. Other users such as security analysts and corporate managers are also the beneficiary of the usefulness analyzed in this study.

[2] The models are discussed in detail in Section 3.

[3] *Statement of Financial Accounting Concepts No. 2* states, "The better [accounting] choice is the one that, subject to consideration of cost, produces from among the available alternatives information that is most useful for decision making.(para. 30). International Accounting Standards has a similar statement in its *Framework for the Preparation and Presentation of Financial Statements* (para 26). It is interesting to report that Japanese GAAP does NOT have an equivalent statement.

Investors are one of the most important groups of decision makers that use accounting information. Therefore, one can consider that an accounting system that helps investors value firms in a better way is better than an accounting system that does not. In this study, the usefulness of an accounting system is defined as the extent to which accounting numbers can explain the market value of a firm. If accounting numbers can explain the market value well, then the usefulness of the system is considered high. This measure of usefulness is consistent with SEC's position that their disclosure requirement for non-U.S. firms is useful to U.S. investors and protects their interests (Tokar 1998).[4]

U.S. standard setters are seeking comparative studies on the overall usefulness of accounting systems, because some critics argue that the current Form 20-F requirements are a barrier to potential non-U.S. registrants and are putting U.S. stock exchanges at a disadvantage that eventually will hurt the U.S. economy in general (Cochrane et al. 1995). For example, Lynn E. Turner, the Chief Accountant of the SEC, issued an open letter to the International Accounting Section of the American Accounting Association which calls for studies that help standard setters to determine whether the current IASC core standards are acceptable for the U.S. in terms of the quality of the standards (Turner 1999). Researchers have so far found conflicting evidence on this question. Harris and Muller (1999) found that U.S. GAAP is more value relevant[5] than the IAS, whereas Chan and Seow (1996) found that home-country GAAP is more useful than U.S. GAAP. One possible reason for such conflicting findings is the lack of explanatory power of traditional models based on the information perspective that associates security returns with earnings and/or book value.[6]

Dietrich et al. (1997) recommends the use of accounting-based valuation models for evaluating alternative accounting rules in a domestic context. The current study applies their recommendation in an international context. Accounting-based valuation models enable researchers to evaluate the usefulness of accounting systems directly. Further, because the valuation models in this study use multiple-year accounting numbers, it is likely that the issue of recognition versus measurement is better taken care of by a valuation approach than by traditional empirical research methods, which use the accounting numbers

[4] Of course, there are other uses of accounting information, such as contracting. They are beyond the scope of this study.

[5] SFAC2 states that value relevance is one of the two components of usefulness. Reliability, which is the other component, has rarely been tested in an international context in prior studies. This study deals with usefulness, the combination of the two (Dietrich et al. 1997).

[6] R^2's of regressions that use security return as a dependent variable rarely exceeds 20%.

of a single year. This is because the difference between measurement and recognition is expected to be less significant over a long time horizon as these two actions will eventually occur on each transaction.

Given the clean surplus relation,[7] the valuation models described in Section 3 are exact in infinite horizon regardless of the accounting systems. However, because one can use only finite horizons in valuing firms, the usefulness of an accounting system can be evaluated by either of the following. First, one can compare pricing errors[8] or the explanatory power of each accounting system by using the same time horizon of, say, five years. In this case, the accounting system with smaller pricing errors and more explanatory power is considered to be more useful. Second, one can calculate how long it takes each accounting system to satisfy a given threshold (e.g., pricing error). In this case, the accounting system that meets the threshold more quickly is considered to be more useful. This study uses the former method because the latter requires longer time series of data that are very difficult to obtain.

This study also has implications for financial statement analysis. Typical financial statement analysis courses include the analysis of non-U.S. firms. To analyze them, restatement of financial statements into U.S. GAAP (or another "benchmark" GAAP) is suggested (e.g., Bernard 1995a; Brown and Stickney 1992). This study examines whether such restatement increases the usefulness of financial statements. The use of accounting-based valuation models in this study fits this objective, because valuing firms' worth is one of the ultimate goals of financial statement analysis.

This study uses Japanese firms that are listed on at least one of the stock exchanges in Japan and that prepare consolidated financial statements based on Japanese GAAP. Because few Japanese firms use Japanese GAAP as their basis of Form 20-F filings, it is impossible to use Japanese firms' Form 20-F's in this study. This study attempts to restate their financial statements into U.S. GAAP. Tests on this sample show whether such restatement adds value for investors.

1.2 Contributions of This Study

This study contributes to the accounting literature in the following ways. First, the study implements a framework that can be used to value empirically the *overall* usefulness of accounting systems in an inter-

[7] Clean surplus relation means that the change in book value between two dates equals earnings minus dividends (Ohlson 1995).

[8] In this study, pricing error is defined as the difference between the intrinsic value of a security calculated by the valuation models and the market value of the security. Section 4 discusses more details on pricing errors and other measures used in this study.

national context. Most prior studies used descriptive approaches in comparing accounting systems, while a few studies empirically tested the value of *incremental* information such as that provided in Form 20-F filings. Second, by using the framework presented above, this study shows whether an accounting system based on U.S. GAAP is more useful than other accounting systems. This has important implications for international accounting harmonization in the United States, because typical U.S. opponents of the IAS claim that U.S. GAAP is superior to other accounting rules, including the IAS, for U.S. investors. Third, this study demonstrates whether restatement of foreign GAAP-based financial statements into U.S. GAAP adds usefulness or not. This has implications for the teaching and practice of financial statement analysis.

1.3 Organization of This Study

Section 2 reviews the relevant literature. Section 3 develops research hypotheses and the research design. Section 4 reports empirical results. Section 5 concludes this study.

2 Literature Review

2.1 Accounting-based Valuation Models in International Accounting Research

Accounting researchers have found that the valuation framework proposed by Ohlson (1995) is quite useful for empirical research (Bernard 1995b). While analytical research extends the understanding of the relationship between the value of a firm and accounting numbers (Feltham and Ohlson 1995; Penman 1997; Ohlson and Zhang 1998, 1999; Zhang 1997), empiricists are testing the valuation models (Bernard 1995b; Penman and Sougiannis 1998; Sougiannis and Yaekura 2000; Francis et al. 1997) and are applying the models to answer specific research questions (Frankel and Lee 1998, 1999; Lee et al. 1999; Amir and Sougiannis 1999; Harris and Kemsley 1997). These studies report that accounting-based valuation models are more closely associated with security prices than are either the traditional dividend discount model or the cash-flow discount model. Also, researches have found that the valuation approach generally has more explanatory power than the approach that associates accounting numbers with security returns.

The applications of the models found that valuation models are extremely useful. With the notable exception of Frankel and Lee (1999), however, accounting-based valuation models have not been applied to international accounting research.

Frankel and Lee (1999) investigated the performance of accounting-based valuation models in twenty countries. They used Global Vantage and applied the models to actual earnings and book values. They found that, overall, accounting-based valuation models performed reasonably well in all the countries tested. But the degree of performance varied across markets, suggesting that the difference in accounting systems causes varying levels of association between security prices and accounting numbers. The inference drawn from their study, however, depends on critical assumptions that are discussed in the next section and warrants further investigation.

2.2 Comparative Studies of Accounting Systems

Accounting researchers have been trying to apply empirical tests in an international accounting context.[9] Many of those efforts focused on comparative studies of different accounting systems across jurisdictions. There have been two distinct types of research designs, as discussed below.

The first stream of research deals with how security prices and returns in each domestic market relate to accounting information based on respective domestic GAAP. In this setting, researchers examine the association between accounting information and market reactions (i.e., security price and/or return) in each country. For example, UK market returns to UK accounting information of UK firms are compared with U.S. market returns to U.S. accounting information of U.S. firms. Then the degree of association is used as the measure of the usefulness of accounting systems. This type of research includes Alford et al. (1993), Harris et al. (1994), Hall et al. (1994), Frankel and Lee (1999), Cheung et al. (1997), Cho et al. (1997), and Auer (1997). For example, Alford et al. used the accounting data of firms from seventeen countries to compare value relevance of accounting information across countries. Using the United States as a benchmark, they examined the association between the domestic security price and accounting information in each country, including running regressions of security returns on earnings. They found substantial differences in the timeliness and value relevance of accounting information across

[9] Another line of research on comparative accounting systems that is not discussed here is descriptive studies. See Wallace and Gernon (1991) for a review.

countries. Other studies listed above generally agree with their conclusion. However, this stream of research relies upon at least two critical assumptions. The first is that the security pricing structure is identical in all markets examined. When economic and cultural differences (among others) are considered across markets, it is possible that this assumption was violated. Another critical assumption is that the research design correctly captured relevant timing. In an event study type of research, the timing difference along with (non-)synchronous trading can affect the inference (see Yaekura 1997). This problem is difficult, if not impossible, to solve. On the other hand, if one employs a long time horizon, then an identical information environment over time must be assumed. This is also unlikely because the timing and the frequency of information release, such as earnings announcements, are quite different across markets. Therefore, internal validity of this line of research is very low, while external validity might also be questioned because often the sample is limited to those firms whose data are electronically available.[10]

The second stream of research uses firms that produce more than one set of financial statements. These studies include Pope and Rees (1992), Amir et al. (1993), Godwin et al. (1995), Rees (1995), Barth and Clinch (1996), Chan and Seow (1996), Cheng and Hsu (1996), Herrmann et al. (1996), Harris and Muller (1999), and Yaekura (1999). Most of these studies use SEC Form 20-F, which requires non-U.S. firms listed in the United States to provide reconciliation from home GAAP to U.S. GAAP. In this setting, researchers compare market reactions to two different sets of accounting information on the same set of firms. This is an ideal environment for a comparative study because researchers can observe two sets of financial statements based on different GAAP but from the same firms. This setting fits a comparative study of accounting systems very well, because one can control most, if not all, of the variables other than accounting information while observing that the prices of cross-listed stocks are virtually the same across markets. The internal validity of this line of research is higher than the first line of research discussed in the previous paragraph, but external validity may be a concern because firms that file Form 20-F are a limited subset of firms of each country.

With the exception of Harris and Muller (1999), Chan and Seow (1996), and Yaekura (1999) the studies listed above focused on *incremental* information content of one GAAP (usually U.S. GAAP) over

[10]There are two reasons that the use of electronically available data leads to a biased sample. The first is that the coverage of the database is not as comprehensive as COMPUSTAT in the United States. The second is that the representativeness of listed firms may differ across countries, because some markets have far fewer listed firms than others do.

another (usually non-U.S. GAAP). Although researchers seem to agree that the reconciliation included in Form 20-F has incremental information content, all the above studies tested only one-way reconciliation (i.e., from non-U.S. to U.S.). Whether the accounting numbers based on non-U.S. GAAP have incremental information content over the accounting numbers based on U.S. GAAP has not been tested. Without this "counter-examination," one cannot infer whether one accounting system is better than the other is. Because U.S. firms rarely use a non-U.S. GAAP to disclose their financial statements, however, it is difficult to test the usefulness of reconciliation from U.S. GAAP to non-U.S. GAAP.

Harris and Muller (1999) and Chan and Seow (1996) tried to overcome this problem by examining *relative* information content instead of incremental information content. Both studies set up models between security prices/returns and accounting numbers. Then they performed statistical tests on relative information content based on their models. The use of relative, not incremental, tests is a better research design for comparing the usefulness of competing accounting systems. However, the empirical results so far have been mixed. As was discussed in the introductory Section, Harris and Muller (1999) reported that U.S. GAAP amount was more closely associated with security returns than were the IAS amounts, whereas Chan and Seow (1996) claimed that those earnings on foreign non-U.S. GAAP were more closely associated with contemporaneous stock returns than were earnings reconciled to U.S. GAAP. One of the possible reasons for this conflict is that the models employed in these studies are not well specified.[11] The valuation models used in the current study are better specified than the ones used in those studies. Also, the current study uses valuation models based on multiple-year accounting numbers, unlike other studies which use up to two years of accounting numbers. These two changes are potentially significant improvements over previous studies.

The current study, along with Yaekura (1999), extends Frankel and Lee (1999) by using two different sets of accounting numbers for the same firms. This study is the first attempt in the literature to apply accounting-based valuation models by using multiple sets of publicly available accounting numbers of the same firms.[12] The study shares research questions with Harris and Muller (1999) and Chan and

[11] Another possible reason for disagreement is that sample size tends to be small because the number of non-U.S. firms listed in the United States is limited. For example, Harris and Muller (1999) used 89 observations on 31 firms, whereas Chan and Seow (1996) used 144 observations on 45 firms. This is an unavoidable limitation when using Form 20-Fs.

[12] Barth and Clinch (1996) regressed stock price on owner's equity. Their model is not rigorous enough to qualify as an application of the accounting-based valuation model.

Seow (1996), but extends their studies by using better model specification, while using the same relative information content approach.

2.3 Studies on Restatement of Financial Statements

Restatement of accounting numbers from one GAAP to another has been the subject of research interest having at least two objectives. The first objective is to compare the effect of different accounting rules on accounting measures such as earnings (Weetman and Gray 1991; Cooke 1993; and Koga 1996) and return on asset/equity (Hellman 1993; Brown et al. 1994). These studies typically analyze two different sets of accounting numbers of the same firm. Unfortunately, the small sample size does not allow them to perform robust statistical tests. Rather, these studies provide a description of the differences between two GAAPs. The second objective is to try to reconcile seemingly different levels of financial ratios, such as Price-to-Earnings (P/E), by the difference in accounting rules. These studies, including Bildersee et al. (1990), French and Poterba (1991), and Brown et al. (1993), compare two groups of firms in different countries. Their intention is to adjust financial ratios so that the effect of different accounting rules is removed and then test whether those financial ratios are still different across markets.

Among the studies cited above, only the second set tried to translate GAAPs without the help of Form 20-F or similar formal filings. All the studies in the first set used restatements as given by the filings. On the other hand, those three studies that did their own restatements chose to create the "third and hypothetical" GAAP to achieve comparability. For example, Bildersee et al. (1990) added several expenses back to earnings of both Japanese and U.S. firms to simulate the use of the same GAAP by both groups of firms. This method of creating a GAAP "somewhere in the middle" may enhance comparability of earnings numbers, but it does not fit well with the research question of the current study. Instead, this study attempts to restate Japanese GAAP-based accounting numbers into U.S. GAAP-based numbers. The purpose of this restatement is to produce two different sets of accounting numbers for the same firm, an objective that cannot be reached by creating a third GAAP. The author is not aware of any previous studies that used self-translated accounting numbers as a basis of empirical comparison of accounting systems.

3 Research Hypotheses

3.1 Valuation Models

This study employs accounting-based valuation models in three different forms: Residual Income Model (RIM), Capitalization Model (CM), and Combination Model (COMBO). These models converge toward each other (and toward the dividend discount model and the discounted cash-flow model) as the time horizon approaches infinity. In a finite horizon, however, the models are expected to differ from the "true" value of a firm. A good accounting system is expected to minimize the differences by having the "future" incorporated into current observable accounting figures (Penman 1997; Zhang 1997).

Following Penman (1997), Penman and Sougiannis (1998), and Sougiannis and Yaekura (1997), this study uses three valuation models derived from the Ohlson model. The models are:

$$RIMModel: P_t^T(RIM) = B_t + \sum_{\tau=1}^{T} \rho^{-\tau} E[\widetilde{X}^a_{t+\tau}] \quad (1)$$

$$CMModel: P_t^T(CM) = (\rho^T - 1)E[\sum_{\tau=1}^{T} \widetilde{X}_{t+\tau} + \sum_{\tau=1}^{T} \widetilde{d}_{t+\tau}(\rho^{T-\tau} - 1)] \quad (2)$$

$$COMBOModel: P_t^T(COMBO) = B_t + \sum_{\tau=1}^{T-1} \rho^{-\tau} E[\widetilde{X}^a_{t+\tau}] + \frac{\rho^{-\tau}}{\rho - K_S} E[\widetilde{X}^a_{t+T}] \quad (3)$$

Where:

P_t^T = value of equity at time t, using forecasts for the next T years;
B_t = book value of a firm at time t;
$\widetilde{X}_t$ = earnings forecast for period t;
$\widetilde{X}^a_t$ = forecasted residual income for period t $(= \tilde{X}_t - (\rho - 1)B_{t-1})$
$\widetilde{d}_t$ = forecasted dividend for period t;
K_S = expected growth rate of market premium over book value (Penman 1997);
ρ = (one plus) discount rate.

This study uses all three models in the analysis. Although these models are identical in the infinite horizon, they differ in the finite horizon.[13] In addition, although the COMBO model has been shown to generally outperform the other two models, it has been shown that the choice of the best model depends on the firms' underlying fundamentals (Sougiannis and Yaekura 2000). Using all three models is expected to reduce the possibility that any inference from this study is due to the varying fundamentals, not the

[13] The difference depends upon the relationship between the prevailing stock price and the firm's book value at the end of the estimation period. This theoretical difference is incorporated into the models discussed in the next section.

accounting systems.

3.2 Research Hypotheses

The main purpose of this study is to test whether the U.S. accounting system is more useful than other accounting systems in security valuation. Therefore, the main hypothesis in the null form is:

> H1: The usefulness of the U.S. accounting system in estimating firms' value is the same as other accounting systems in other countries.

To operationalize this hypothesis, this study tests the following hypotheses:

> H1a: The pricing errors based on the U.S. accounting system are the same as those of other accounting systems.
>
> H1b: The explanatory power of regressions using valuations based on the U.S. accounting system is the same as those of other accounting systems.

Following Dietrich et al. (1997), the current study assumes that all publicly available information, including accounting information, is impounded into stock price (i.e., semi-strong form market efficiency) in testing these hypotheses. It is well known that any test of an asset pricing model is actually a joint test of market efficiency and an asset pricing model. One cannot test one of these two without assuming the other. Because the current study tests asset pricing assuming some degree of market efficiency is unavoidable. In this study, however, inference from pricing errors holds as long as the market price is on average unbiased with respect to the available information. As long as the price is unbiased, the (in)efficiency of the market does not affect the difference between the market price and intrinsic value calculated from valuation models.

4 Research Design and Results

4.1 Data

The main sources of data used in this study are PACAP-Japan Database, issued by the University of Rhode Island, and the Nikkei NEEDS database. Ex ante numbers (i.e., analysts' forecasts) of Japanese

firms in the U.S. GAAP are difficult to find, and the author cannot find them at this time. This study uses ex post (actual) earnings, assuming perfect foresight. Ex post numbers are expected to be less prone to measurement error and are, by definition, unbiased. Actual earnings therefore provide the model with the best measure of earnings. Because the main focus of this study is to compare accounting systems and not to establish a profitable trading strategy, the use of ex post numbers should not be a major concern.

The sample consists of firms that are listed on at least one of the stock exchanges in Japan and that prepared consolidated financial statements based on Japanese GAAP. This study tests whether the restatement of Japanese GAAP-based financial statements into U.S. GAAP increases usefulness to investors. The current study chooses Japanese firms for the following reasons. First, because accounting principles between the United States and Japan are very different, it is possible that the restatement of financial statements results in added usefulness. Indeed, most of the literature discussed in section 2.3 focuses on restating Japanese financial statements. Second, studying these two accounting systems has an important implication for accounting harmonization, because the United States and Japan are expected to be among the last to accept the IAS. This sample includes a large number of firms. At the same time, the restatement is likely to add noise to the analysis because the restatement requires certain assumptions that cannot be verified. If the restatement is found to increase usefulness, then it is interpreted as evidence that investors would have been better off by using U.S. GAAP than Japanese GAAP for valuing a firm's worth by using publicly available information other than Japanese GAAP-based earnings in making their investment decisions.

The firms used in this Section are Japanese firms listed on stock exchanges in Japan between 1978 and 1996. To be used in the analysis, the firms must meet several criteria. First, consolidated financial statements based on the Japanese GAAP are available on the Nikkei NEEDS database. Second, the fiscal year end month was unchanged during the years for which financial statement data are available. Third, the firm is not a subsidiary of another firm in the sample. Stock prices at the Tokyo Stock Exchange are taken from PACAP-Japan database, supplemented by Kabuka Soran issued by Toyo Keizai Shimpo Sha. This study uses the stock prices at the end of the firms' fiscal year as this is consistent with the way accounting-based valuation models are derived. The Nikkei-NEEDS database started coverage in 1978 when consolidated financial reports were first implemented. Its coverage increased significantly in

1983 when equity method for equity investment became mandatory (See Table 1: Panel A). Historical risk-free interest rates and stock market indices are taken from PACAP-Japan database.

It is always difficult to estimate the cost of equity capital[14]. This study uses the estimated cost of equity based on the data from Japanese equity market. This study employs Capital Asset Pricing Model (CAPM)-based time-and-firm-specific cost of equity. Market equity premium is calculated on the basis of the historical difference between the risk-free rate and stock market return[15].

Because it is not clear how long the time horizon (i.e., T in equations (1) through (3)) should be, this study uses several alternative time horizons in the statistical tests. The maximum length of the time horizon is ten years due to the availability of data.

Table 1 reports selected descriptive statistics of the sample firms used in this study.

4.2 Statistical Analysis

The usefulness of an accounting system is measured in three ways. First, the differences between calculated security prices (intrinsic value) and actual security prices are compared following Sougiannis and Yaekura (2000). This is the most direct test of the usefulness of accounting systems, as (at least, one of) the ultimate goal(s) of an accounting system is to measure the value of a firm. The pricing errors are calculated as follows:

$$Signed \quad Valuation \quad Error \quad = \quad \frac{Actual \quad Price - Intrinsic \quad Value}{Actual \quad Price} \tag{4}$$

$$Absolute \quad Valuation \quad Error \quad = \quad |Signed \quad Valuation \quad Error| \tag{5}$$

This pricing error test (and the following regression tests) is done in three ways. The first is by using all the available data. The second is by partitioning the sample by the year because it is expected that the usefulness of the accounting system may have changed over time. The last is to partition sample firms by firm size, ownership concentration, and foreign ownership. This test is done because information environment of the firm may have affected the results of the primary tests.

[14] However, it is less of a concern in this particular study because the same interest rate is applied to two sets of accounting numbers, which makes the result being neutral to the choice of estimation method.

[15] The tests were run by using 1) time-specific but not-firm-specific cost of equity and 2) fixed rate (10%) for all firm-years. The result was qualititavely similar and not reported here.

Firm size, measured by the market capitalization, is used as a proxy for the overall information environment of the firm. If a firm is in a "rich" information environment, it is less likely that the choice of accounting system affects the investor's decision making. In this case, neither non-U.S. GAAP or U.S. GAAP is expected to have an advantage over the other. The other two ownership characteristics are chosen because they might affect the findings of the analysis. Non-Japanese ownership is expected to be negatively correlated to the performance of Japanese GAAP in the analysis because Japanese investors are more likely than non-Japanese investors to depend on Japanese GAAP-based information. Ownership concentration is expected to work in the same manner as firm size. This is because a closer relationship between the firm and its owners will allow the owners to obtain private information not included in the financial statements, making their decision making less dependent on accounting numbers.

The second test of usefulness, which is similar to the test used by Frankel and Lee (1999), is a regression test run on three valuation models. The explanatory powers of the regressions are used as the measure of the usefulness of an accounting system.

$$Market\,Value = \alpha + \beta * Intrinsic\,Value \tag{6}$$

This test is expected to be less direct than the first test, because this test does not consider pricing errors. For example, if the intrinsic values are uniformly twice as much as the market values (i.e., β equals 0.5), the R^2 will be 100%, whereas the pricing error is 100%, too. The regression coefficients that are different from their theoretical values (i.e., one) pose a difficulty in implementing valuation models for the users because one cannot *a priori* know what the regression coefficients are. Investors cannot use the valuation models without knowing what the coefficient will be in the future. Therefore, this study treats this regression as secondary.

Third, the association between security returns and earnings is tested by using the following regression (Easton and Harris 1991):

$$Security\ Return = \alpha + \beta_1 * Earnings + \beta_2 * \Delta Earnings \tag{7}$$

The explanatory power of the regressions is used as the measure of usefulness of an accounting system. This last regression has been used in the literature; however, the noise in security returns is expected to reduce the power of the test. Taking long time horizons reduces this problem (Easton et al. 1992),

although the sample becomes smaller as the time horizon is extended.

In regression tests, this study uses the relative information content test developed by Siegel and Biddle (1994). This test can be used to compare competing non-nested models and is recommended over similar tests such as the ones proposed in Davidson and MacKinnon (1981) and Vuong (1989).[16]

4.3 Restating Japanese GAAP-based Accounting Numbers to U.S. GAAP-based Numbers

In this study, Japanese GAAP-based accounting numbers are restated into U.S. GAAP-based numbers based on publicly available data. Below is a list of major differences between the Japanese GAAP and the U.S. GAAP and how U.S. GAAP-based numbers are estimated.

Deferred Tax

In Japan, the use of deferred tax in consolidated financial statement is optional while the use of it is prohibited in parent-only financial statements. In the sample of this study, approximately 20% of firms use deferred tax in their financial statements. On the other hand, recognition of deferred tax is mandatory under the U.S. GAAP. This study applies two tax rates on net income before tax to estimate the income tax expense using deferred tax. The first is 52%, which is the statutory corporate tax rate in Japan. The other is 28%, which is the mean effective tax rate of the firms that are recognizing deferred tax on their financial statements[17]. The results were qualititatively similar and the tables report the results with 52% tax rate.

Foreign Currency Exchange

During the sample period, the Japanese GAAP on foreign currency exchange was roughly equivalent to SFAS8 except for using asset and/or liability in recording exchange rate difference on certain investments. During most of the sample period, SFAS 52 was in effect in the U.S. This study reclassifies the net amount of asset and liability from exchange rate difference as part of owners' equity. There is not enough information to estimate the income statement effect of this GAAP difference.

Goodwill

[16] Examples of application of the Siegel and Biddle test in the accounting literature include Biddle et al. (1995) and Harris and Muller (1999).

[17] APB 11 was in effect during most of the sample period.

Under Japanese GAAP, amortization of goodwill cannot exceed five years whereas under U.S. GAAP the maximum years allowed are forty years. In restatement, this study modifies net income and goodwill on B/S as if twenty years was used as amortization period, which is more consistent with U.S. accounting practice[18].

Bonuses to Directors

Under Japanese GAAP, bonuses paid to directors are not included in calculating net income nor are tax deductible. Instead, the bonuses are reported in the statement of changes in owner's equity. In restatement, this study subtracts bonuses to directors from reported net income.

R&D Expense

Japanese GAAP allows certain R&D expenses to be capitalized and amortized within five years while such practice is not allowed under U.S. GAAP[19]. If all firms used same amortization period, this study estimates U.S. GAAP-based R&D expense by the following equation.

$$U.S.\ R\&D\ Expense_t = JPN\ R\&D\ Expense_t + R\&D\ Capital_t - R\&D\ Capital_{t-1} \tag{8}$$

Other Items

There are several items that were not translated due to lack of information and/or significance. The list includes lease, pension, warrant, inventory, and depreciation.

Among these items, inventory and depreciation were not translated as the choice of depreciation method is not mandatory in neither countries. Indeed, no company reported inventory and/or depreciation as the major difference between Japanese and U.S. GAAP in Form 20-F filings (Cooke 1993, Koga 1996).

4.4 Empirical Results(Pooled Sample)

4.4.1 Pricing Errors

Tables 2-1, 2-2, and 2-3 show the signed and absolute valuation errors. How the errors were calculated was explained in 4.2.

[18]This study calculates how many years it takes firms to amortize their intangible assets in the U.S. (Compustat Item #33/Item #65). The overall mean is 21.4 years.

[19]It is interesting to report that, contrary to popular belief, Japanese firms utilized R&D capitalization in less than 10% of firm year analyzed in this study.

For the pooled sample, the result shows that U.S. GAAP does a better job than Japanese GAAP in valuing Japanese firms. All three models show significant differences in signed and absolute valuation errors in favor of U.S. GAAP. The standard deviations of the valuation errors do not differ much for the sample. These results suggest that converting accounting numbers from Japanese GAAP-based to U.S. GAAP-based by using publicly available data increases the usefulness of the numbers to investors. It is reasonable to observe less significant difference in COMBO model, because the expected growth term in COMBO model (K_S in equation (3)) works toward capturing and neutralizing the effect of bias in accounting system. In other words, if there are differences in accounting treatments between two accounting systems, the growth term in COMBO model is designed to absorb such difference.

Table 2-4 reports rank correlations of valuation errors between the two GAAPs. The rank correlations are very high, especially with RIM and CM models. COMBO model reports slightlty lower rank correlations.

4.5 Price Regression

Price regression tests in Tables 3-1, 3-2, and 3-3 show that, in most cases, U.S. GAAP outperformed Japanese GAAP in explaining variation of stock prices. Among fourteen regressions in Tables 3-1, 3-2, and 3-3, U.S. GAAP has higher R-squares in eleven cases (nine cases are statistically significant). However, similar to the case with IAS, the regression coefficients are significantly different from their theoretical values. This again makes it difficult for us to infer relative usefulness of accounting information based on these tests because regression coefficients cannot be known *ex ante*. As a consequence, it is impossible to infer the superiority of either GAAP from this test.

4.5.1 Return Regression

The return regression tests in Table 4 show that U.S. GAAP is better associated with stock returns than is Japanese GAAP. However, again, the signs of regression coefficients are inconsistent with theoretical prediction (both should be positive). It is difficult to infer the superiority of either GAAP from this test.

4.5.2 Summary

The pricing error tests in Table 2-1, 2-2, and 2-3 provide consistent results that that pricing errors are lower when (restated) U.S. GAAP is used instead of (original) Japanese GAAP, while the standard deviations of valuation errors are almost identical. This result is consistent across the model and time horizon used in the analyses. On the other hand, both of the regression tests fail to produce conclusive results. The next four sections check the sensitivity of the result of pricing error tests to year, firm size, ownership concentration, and foreign ownership.

4.6 Analysis of Sample Partitioned by Year

Tables 5-1, 5-2, and 5-3 show the result of pricing error test by partitioning the sample into three groups, 1978-83, 1984-89, and 1990-93 [20]. The first group consists of the years when the equity method was not mandated and few firms reported consolidated financial statements, thus treated separately from other observations. The rest of the sample is divided into two groups so that they represent pre-bubble-economy-era and post-bubble-economy era. The results are very consistent with the main results reported in section 5.2.1. U.S. GAAP-based valuation is almost always more accurate than Japanese GAAP-based valuation. It is safe to say that the main result is not dependent on the choice of sample year.

4.7 Analysis of Sample Partitioned by Firm Size

Tables 6-1, 6-2, and 6-3 show the result of pricing error test by partitioning the sample by the firm size. Small firms are defined as the firms whose market capitalization was smaller than the median market capitalization of the sample firms in the same year. Larger firms are defined similarly.

The results are very consistent with the main results reported in the previous section. U.S. GAAP-based valuation is almost always more accurate than Japanese GAAP-based valuation. It is safe to say that the main result is not dependent on the firm size. An interesting finding is that the accuracy of valuations seems to be dependent of firm size. Valuation of small firms is always more accurate than large firms within each model/time horizon. One possible explanation is that large firms were bought

[20] Because the estimation of firm value requires long time series, For T=10, the third group(i.e., most recent years) does not exist.

relatively too high compared to small firms. This is consistent with the firm size effect anomaly in finance literature. [21] Further investigation is warranted on this issue.

4.8 Analysis of Sample Partitioned by Ownership Concentration

Tables 7-1, 7-2, and 7-3 show the result of sensitivity check with respect to the degree of the ownership concentration. Ownership concentration is measured by the following ratio:

$$Ownership\ Concentration\ Ratio = \frac{\#\ of\ shares\ held\ by\ the\ 10\ largest\ shareholders}{\#\ of\ outstanding\ shares} \tag{9}$$

In each year, firms were partitioned into two groups depending on the degree of ownership concentration being lower than the median or not.

The results do not alter the main results. U.S. GAAP-based valuation is almost always more accurate than Japanese GAAP-based valuation. It is safe to say that the main result is not dependent on the degree of ownership concentration. The accuracy of valuations seems to have been unaffected by the degree of ownership concentration.

4.9 Analysis of Sample Partitioned by Foreign Ownership

Tables 8-1, 8-2, and 8-3 show the result of sensitivity check with respect to the degree of foreign (i.e., non-Japanese) ownership. Foreign ownership concentration is measured by the following:

$$Foreign\ Ownership\ Ratio = \frac{\#\ of\ shares\ held\ by\ non-Japanese\ investors}{\#\ of\ outstanding\ shares} \tag{10}$$

In each year, firms were partitioned into two groups depending on the foreign ownership ratio being lower than mean or not.

The results are very consistent with the main results. U.S. GAAP-based valuation is almost always more accurate than Japanese GAAP-based valuation. It is safe to say that the main result is not

[21] Kato and Schallheim (1985) reports the existence of size effect in Tokyo Stock Exchange.

dependent on the foreign ownership. The accuracy of valuations seems to have been unaffected by the foreign ownership, either.

5 Discussion and Conclusion

The tests that used Japanese data found that translating financial figures from Japanese GAAP-based to U.S. GAAP-based by publicly available information improves overall performance of equity valuation. The results of pricing error tests suggest that investors may be better off by using U.S. GAAP numbers in valuing Japanese firms. The findings are robust when the sample was partitioned by several firm charcteristics. Other two tests, price regression test and return regression test, could not provide concrete evidence whether investors are better off by using either U.S. GAAP or Japanese GAAP in making their investment decisions. The shortcoming of these two approaches were highlighted by the regression coefficients that are grossly different from their respective theoretical value and/or sign. From the valuation perspective, this is consistent with the view that accounting information provided by Japanese GAAP was not as useful as U.S. GAAP for investment decision making. Accounting principles in Japan is currently being overhauled to become more compatible with western standards. The findings of this study confirm that Japanese accounting principles are on the right direction.

There are several limitations of this study. First, the translation procedure can be improved should additional information become available. Second, although this study tests the possible benefit that the accounting system could have for investors, it could not measure the cost incurred in implementing one accounting system over another. Final decision making by the standard setters need to evaluate both the benefits and costs of accepting any accounting standards. Finally, using the accounting system other than for investors' decision making, such as for contracting, is not considered. Further extension of this study could overcome these limitations.

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