Accounting Disclosure and Information Environment:

A Comparative Study of U.S. and Japanese Security Markets with Dynamic Modelling

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Abstract

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Considerable efforts have been made by accounting researchers in the last three decades to investigate whether there is a stable and significant association between stock prices and accounting earnings. This study seeks to shed light on this issue by adding to the price-earnings regression accounting earnings from both past and future periods. The pattern of response coefficients is expected to be different for past versus future earnings, and different firms that are operating in different informational and institutional environments. This study applies the analysis of changes in regression coefficients to a comparative study between the U.S. and Japan. Two aspects of information asymmetry between investors and management are identified and proxied in this study: (1) the availability of information, and (2) the willingness, resources, and ability to process the available information. The models used to test the above-mentioned proxies of information asymmetry are developed from the notion that current stock prices are associated with both current and future earnings, and accounting earnings include a surprise component and a stale component. The resulting indefinite lead/lag combined model is operationalized into two definite lead/lag models and an autoregressive model. The study finds that the U.S. and Japanese information environments are significantly different, evidenced by systematic differences in the patterns of coefficients from different samples and subsamples. It is also found that in general, investors in large firms are better informed about firms' future opportunities than those investing in small firms. The same phenomenon is also observed for institutional versus individual investors, and for Japanese versus U.S. investors. The U.S. markets are characterised by the availability of abundant information from competing sources, especially for large firms, and by the capability of investment institutions. On the other hand, The Japanese investors seemingly have more confidence in the persistence of the reported earnings than U.S. investors.

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Chapter 1
Introduction

The need to understand the role of accounting information in different markets and countries has never been greater than at present. Recent advances in telecommunications and information technology have resulted in a continuous increase in international business. However, our understanding of both the preparation and the use of financial accounting information in an international context has not experienced corresponding progress. On the other hand, an increasing effort is being made at both international and regional levels to harmonise international accounting standards without an adequate understanding of nation-specific information environment. This study seeks to fill the vacuum by focusing on the difference in the use of accounting information in both the United States and Japan. These two countries are selected because of the importance of their security markets in the world economy, and because of the substantial difference in their information environments.

This study seeks to understand how accounting earnings from different periods are reflected in security prices, and whether there exists any systematic difference in the price/earnings
association between the U.S. and Japan. In particular, this study is aimed at finding out whether the information environment plays an important role in determining the price/earnings association in both countries. Two improvements on the traditional methods used in the price/earnings association studies are made in this study to meet the above-mentioned objectives. First, this study focuses on the issue of how information asymmetry that may exist between investors and management, and between more-informed and less-informed investors differentially affect the price/earnings association

in both countries. Second, accounting earnings from past and future periods are added to the price/earnings association modelling in order to demonstrate the impact of information environment on the price/earnings association.

Two aspects of information asymmetry between investors and management, and between more-informed and less-informed investors are identified in this study: (1) the availability of information, and (2) the willingness, resources, and ability to further process the available information. Following Freeman (1987), this study assumes that more information is available on large firms versus small firms. Following Kim *et al.* (1993), investors' ability to process the information is proxied in this study by the ownership structure (i.e., percentage of shares held by individual versus institutional investors). It is assumed in this study that institutional investors are more capable of further processing and utilizing the available information than individual investors due to the resources available to them.

Regression models are used to analyze whether the availability of information (proxied by firm size) and processing ability of information (proxied by ownership structure) actually capture different aspects of information asymmetry, and whether the price/earnings association is systematically different between the two countries. The models are developed from the notion that the current stock prices are associated with both current and future earnings, and accounting earnings include a surprise component and a stale component. The inclusion of future earnings is supported by the long-observed phenomenon that accounting earnings lag behind stock prices because value-relevant events are not recorded in accounting in a timely fashion. As a result, current market prices are associated with future accounting earnings. In this regard, the inclusion of future earnings is within the tradition of previous studies in this area (Collins, Kothari, and Rayburn, 1987; Collins and Kothari, 1989; Collins *et al.*, 1994; and Kothari and Zimmerman, 1995). This study extends existing studies by modelling a multi-period lead/lag price/earnings association which includes both past (lag-terms) and future (lead terms) earnings as well as current earnings. The inclusion of past earnings is rooted in the intuition that past earnings must have once been a surprise component, thus it must already be reflected in market prices. This intuition is consistent with resulting models developed in this study.

Although the inclusion of both past and future earnings is expected to lead to an improved price-earnings association, this is not the primary concern of the study. Rather, this study focuses mainly on comparing the response coefficients between two consecutive periods to investigate how coefficients change or decay along the time horizon, and how this pattern of change is different between a pair of samples or subsamples. An analysis of the differences in the pattern of regression coefficients between the two samples/subsamples allows for a better understanding of the financial reporting process and its underlying information environment regarding different aspects of information generation, distribution, and utilization in both the U.S. and Japan.

The model development process results in an indefinite lead/lag combined model, which is further operationalized into two testable models: the definite lead/lag model and the autoregressive model. The definite lead/lag model regresses the current stock prices on current earnings **and** earnings from two (or three) past and two (or three) future periods. The autoregressive model is a direct transformation of the indefinite lead/lag model, and is developed specially for this study. The autoregressive model regresses current stock prices on stock prices from one past and one future period, plus current accounting earnings.

Compared to the United States, Japanese accounting and financial disclosures are widely regarded as being limited in scope and of poor quality (Bloom *et al.*, 1994). Japanese investors are therefore less likely to predict future earnings with the accounting and non-accounting data available to them than their U.S. counterparts. However, researchers also found that Japanese managers have less incentives and opportunities to pursue short-term profit at the cost of long-term growth. As a result, Japanese financial reporting may carry more value-relevant information than U.S. financial reporting does (Jacobson and Aaker, 1993). In addition, some Japanese investors may have special connections with the company, and have direct access to insider information (Cooke and Kikuya, 1992). These special investors are well aware of the company's future profitability, and are therefore able to predict future earnings with great accuracy. These seemingly conflicting conclusions suggest that whether Japanese financial reporting is more informative than that available in U.S. remains an unresolved empirical question. To investigate this issue, it is hypothesized in this study that, when controlled for firm size and ownership structure, U.S. investors are less capable of anticipating future earnings than Japanese investors. It is further hypothesized that the significance of regression coefficients associated with U.S. accounting disclosures will decay more quickly from period t to period $t+k$ ($k \geq 1$).

The differences between Japanese and U.S. investors are analyzed in this study in terms of (1) the magnitudes of the coefficients associated with current, future, and past earnings, (2) the length of future and past periods from which significant response coefficients are observed, and (3) the ratios of coefficients between two consecutive periods (i.e., the speed of decay).

Empirical market and accounting data for Japanese industrial firms (1985 - 1995) and

U.S. industrial firms (1976 - 1995) are used in this study. Major findings of this dissertation can be summarized as follows:

(1) In general, U.S. results are significantly different from Japanese results both in general comparisons between the two overall samples and in comparisons between size- and ownership-controlled subsamples. The information available to Japanese investors generally carries more future-relevant elements, supporting the notion that Japanese investors are more future-oriented in their investment decisions than U.S. investors.

(2) Firm size and ownership structure seem to capture different aspects of the information environment, and therefore should be proxied by different variables.

(3) Compared to small firm subsamples, the information on large firms is not only more abundant but also more future-oriented.

(4) Japanese institutional investors seem to predict future earnings better and for a longer period than individual investors.

(5) When controlled for firm size and ownership structure, the U.S. results are significantly different from the Japanese results. It is also clear that there is substantially more information available on large firms than on small firms. U.S. institutional investors seem to have either more resources or a greater ability to carry out earnings forecasts than their Japanese counterparts.

(6) The hypothesis of a pattern of gradually declining coefficients is only partially supported in regressions of some Japanese subsamples.

(7) The regression results also indicate that there are more competing sources of information available in the U.S. than in Japanese markets, especially on large U.S. firms.

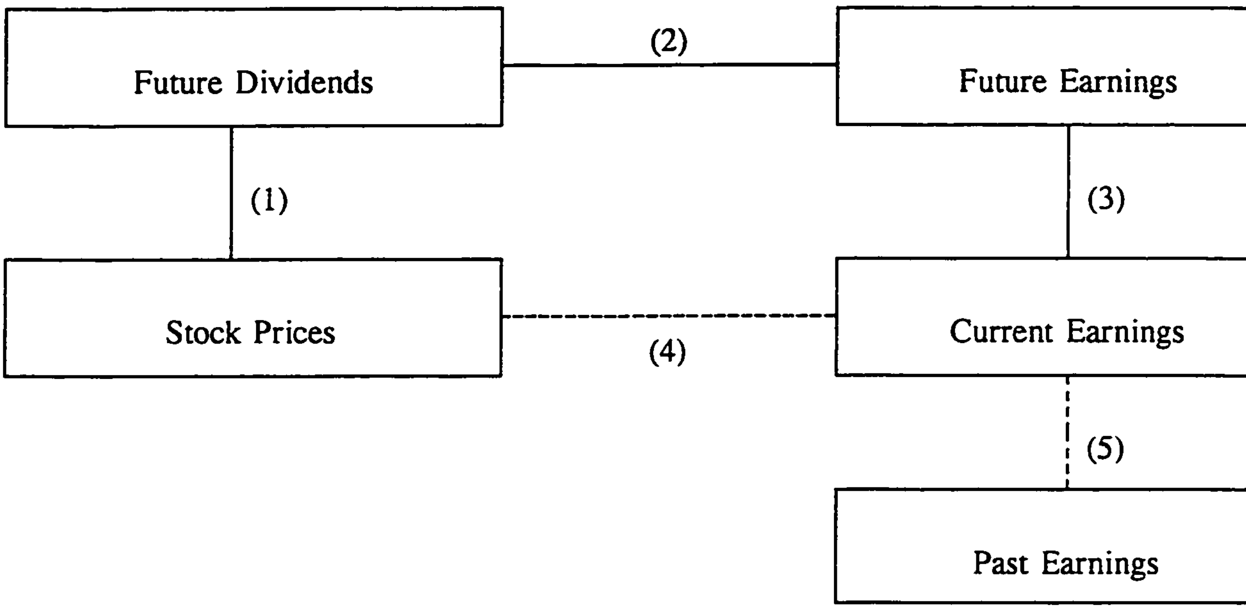
The rest of this study is arranged as follows. Chapter 2 develops research questions from the available literature. Chapters 3 summarises the existing literature on the research questions and the Japanese accounting and financial environment. Chapter 4 develops the research hypotheses. Chapters 5 and 6 deal with models and methodological issues. Chapter 7 describes the data and samples. Chapter 8 presents empirical findings and analyses. Chapter 9 concludes the study and points out possible limitations.

Chapter 2
Development of the Research Questions

§2.1 The association between market-based performance of common stock and accounting measures

It is widely recognized in both the finance and the accounting literature that stock prices reflect the market's expectations of firms' future dividend-paying ability. However, future dividends are not directly observable. In his influential book, Beaver (1989) adopted a three-link model to describe the association between current earnings and current stock prices (links (1) through (3) in Graph 1 below). Link (4) is added because this is the primary objective of most market-based accounting studies. This study expands on this model by adding link (5) which will be discussed latter.

Figure 2.1 *Association Between Stock Prices and Earnings*



Since both future dividends and future earnings are unobservable, assumptions have to be made in order to link current earnings with current prices.

The link between current stock prices and future dividends is supported by a well-defined dividend capitalization model that discounts a stream of future dividends or cash flow:

$$P_{it}=\sum_{\tau=1}^{\infty}(\frac{1}{1+r})^{\tau}E_t(D_{it+\tau})$$

With respect to link (2), future dividends are relevant to current prices only when future dividends are dependent on future earnings. Theoretical studies on link (2) can be differentiated by the assumptions underlying this link. Some studies assume that cash flows are jointly normally distributed[1] whereas other studies rely on time-series process of earnings with an explicit or implicit link between earnings and dividends[2]. Empirical results have also indicated a reliable correlation between earnings changes and dividends changes (Fama and Babiak (1968) and Watts (1973) are two classical examples).

With the links (1) and (2) being supported by either theoretical reasoning or empirical investigations, the task of defining the association between earnings and prices now largely becomes an issue of depicting the relationship between current and future earnings. Because current earnings contain both permanent and transitory components, and because only permanent earnings are expected to persist into future periods[3], forecasting future earnings from current earnings involves a significant amount of uncertainty and ambiguity. In this regard, the use of past earnings may assist in

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1. This approach is named by Cho and Jung (1991) as *the Use of Information Economics Based Valuation Models*; works belonging to this category include Holthausen and Verrecchia (1988), Lev (1989), Choi and Salamon (1990).

2. This approach is named by Cho and Jung (1991) as *the Use of Time-Series Based Valuation Models*, which include Beaver, Lambert, and Morse (1980), and Easton and Zmijewski (1989b).

3. As Beaver noticed (1989, p. 92), even permanent earnings for a given year may change as time passes. In this regard, permanent earnings may be viewed as a combination of 'real' permanent earnings and 'temporary' permanent earnings when the time horizon in question is long enough.

predicting future profitability. For this reason, Link (5) is added to Figure 2.1 to emphasize the fact that past earnings are also related, though indirectly, to stock prices. The relevance of current and past earnings for predicting future earnings will depend upon the degree of persistence of the current and past earnings into the future (Beaver, 1989, p. 93). Unfortunately, the usefulness of past earnings in assessing the persistence of current earnings is basically ignored in most market-based accounting studies because these earnings, described as a random walk in the literature, are believed to carry no useful information for predicting future earnings in the context of a semi-strong efficient market. However, a careful examination of the market efficiency hypothesis suggests that past earnings are related to current prices, although one cannot earn consistent abnormal returns based on information about historical earnings. In fact, investors who ignore historical earnings data in making their investment decisions may suffer negative abnormal returns simply because other market participants are taking advantage of these data. Recent finance research (e.g., Fama and French, 1992) also suggests that historical accounting-based ratios such as Book-Equity/Market-Equity ratio and Earnings/Price ratio predict future stock returns.

Moreover, markets may also be segmented in terms of participants' ability to access and process available information. Some market participants[4] may rely more on historical accounting earnings in making their decisions due to their disadvantageous position in receiving and interpreting future-related information. Hence, a test of the association between current market returns and past earnings will shed light on the issue of how

4. The words "investors" and "market participants" are used interchangeably in this study to refer to those who have invested, or have an intention to invest in the future, in companies' common stock to maximize their personal utilities.

investors assimilate accounting earnings over time. This study attempts to provide evidence that the degree of reliance on past earnings in assessing the persistence of earnings may vary from market to market, and may also vary within the same market between different segments.

It should be noted that although past earnings are reflected in current stock prices, price changes occur only when new information arrives in the market. The distinction between stock prices (P_t) and changes in stock prices (ΔP_t) is crucial in developing the models for this study.

§2.2 Earnings' lack of timeliness

In their seminal paper, Ball and Brown (1968) suggest that a significant part of the information content of current earnings is anticipated by the market before the earnings announcements. It is therefore expected that the stock price at a given point in time is a function of the anticipated future accounting earnings. Evidence from this line of research suggests that the information set reflected in market prices is richer than the information conveyed in accounting earnings. While stock price changes over a period of time reflect a revision in the market's expectations of future earnings, accounting earnings do not capture value-relevant events in a timely fashion (Kothari and Sloan, 1992, Collins *et al.*, 1994). Earnings' lack of timeliness is a result of applying accrual accounting and generally accepted accounting principles (e.g., objectivity, verifiability and conservatism) that delay the timely recognition of changes in future cash flows. Since accounting earnings capture future cash flows in a lagged fashion, the stock prices for a given period will be related to earnings of several future periods as well as the current period earnings. Both Kothari and Sloan (1992), and Collins *et al.* (1994) report significant increases in earnings response coefficients when future earnings are included as explanatory variables of market returns, which suggests that future earnings are partially captured by the market several years before they are announced by the firm.

Contrary to the common explanation for the association between current stock prices and future earnings offered by the literature, this study argues that the lack of timeliness of accounting earnings is not the only reason responsible for the existence of this association. Other possible causes may include:

(1) **The quality of earnings**: If accounting earnings are of high quality, they will contain mainly permanent earnings or value relevant components, and there will be little noise from the inclusion of transitory earnings. In this case, assuming no capital transactions, investors will have good reasons to believe that current earnings are likely to persist into the future, and are more representative of future earnings. As such, future earnings can be anticipated, to a certain extent, by analyzing current earnings.

(2) **The availability of non-accounting information**: Non-accounting information is not subject to GAAP regulations, rendering it usually more flexible and more timely than accounting output. The amount of non-accounting information available in the market will directly affect investors' ability to foresee future earnings, which in turn will determine the association between current stock prices and future earnings.

(3) **The scope of disclosure**: Sufficient disclosure will allow investors to clearly understand the items that have or have not been included in the current earnings, thus enabling them to be better aware of possible unreported future earnings.

It should be noted that the lack of timeliness of accounting earnings and the three factors above are interrelated. In this study, all four factors will be taken into consideration in discussing and analyzing the association between current stock prices and future earnings.

This study recognizes the hypothesized association between current stock prices and both current **and** future accounting earnings. While Kothari and Sloan (1992), and Collins *et al.* (1994) are more concerned with the **magnitudes** of earnings response coefficients, this study focuses on the **pattern of changes** in earnings response coefficients before and after the current period.

§2.3 Information asymmetry between market participants and firms' management

The economics and accounting literature has documented a positive relation between the availability of information and the informativeness of market prices (Grossman 1976, and Verrecchia 1979). Kim and Verrecchia (KV, 1991a) suggest that information asymmetry may exist through private information gathering in advance of anticipated public announcements. More recently, KV (1994) found that earnings announcements provide information that allows certain traders to make informed judgments about a firm's performance that are superior to the judgments of other traders. As a result, there may be more information asymmetry at the time of an announcement than in nonannouncement periods. Although KV's analysis centres on the information asymmetry between traders and market makers, their model has empirical implications in analyzing information asymmetry between market participants and firms' management. This study provides an empirical test of KV's proposition by examining the pattern of changes in information asymmetry before, during, and after earnings announcements.

KV's model demonstrates (KV 1991a and 1991b) that while all investors have equal access to public information such as earnings announcements, they acquire private predisclosure information of different degrees of precision. Thus, it is investors' private information that induces predisclosure information asymmetry. Therefore, private information may be regarded as a product of further processing and interpretation of publicly accessible information. As such, the information asymmetry resulting from private information acquisition may be viewed as a result of (1) the availability of publicly accessible information, and (2) investors' willingness to acquire costly private information as well as their ability to analyze and interpret this information.

These two different aspects of predisclosure information asymmetry provide different implications, and have not been treated separately in previous studies. For example, Bamber and Cheon (1995) used the number of financial analysts providing earnings forecasts to publicly accessible databases, such as I/B/E/S, as a proxy for information asymmetry. Atiase (1980) suggests that firm size may be a more direct and effective proxy because incentives for acquiring private predisclosure firm-specific earnings-related information are an increasing function of firm size. Kim *et al.* (1993) argue that the fraction of institutional ownership is a better proxy for the level of information asymmetry because empirical findings indicate that small individual investors and large institutional investors differ systematically in their reaction to earnings announcements (Cready 1988, Cready and Mynatt 1991, and Lee 1992).

However, this study argues that it is important to recognize the fact that the proxies used in the above-mentioned studies actually proxy two different aspects of information asymmetry. While firm size and the number of financial analysts providing earnings forecasts serve as proxies for the availability of information, the fraction of institutional ownership actually proxies investors' willingness and ability to further process the available information.

§2.4 Cross-country comparative study

The need to understand the role of accounting information in different markets and countries has never been greater than at present. In the last 10 years we have witnessed rapid advances in telecommunications and information technology, coupled with opportunities offered by the recent liberalization of financial markets in many countries. These changes have resulted in a continuous increase in cross-country stock listings and an unprecedented growth in international business. However, our understanding of both the preparation and the use of financial accounting information in an international context has not experienced corresponding progress. Accounting researchers in North America have long been concentrating on domestic issues, and usually no further efforts are made to see if their findings are universally valid. Although market-based international studies started to appear in academic journals in recent years, these studies usually have a narrow focus relating mainly to the preparation of financial statements, and descriptions of current accounting standards in different countries, telling us very little about how financial accounting data are being used by market participants in these countries.

On the other hand, an increasing effort is being made at both international and regional levels to harmonise international accounting standards without an adequate understanding of nation-specific environmental influences in providing the explanation or justification for international differences in accounting systems and practices. Even at the national level, a lack of such understanding may lead to inefficient and/or ineffective accounting standards. The low acceptance of Western-style consolidated financial statements in Japan is a good example of possible costs resulting from a poor understanding of differences in the use of financial information between the two countries (see McKinnon, 1985). The appropriateness of any accounting practice to a specific nation must be evaluated in the context of its specific environment, including both accounting and non-accounting factors which determine the way people interpret and utilize accounting information.

This study seeks to fill the vacuum by focusing on the difference in the use of accounting information in both the United States and Japan. These two countries are chosen for several reasons. First, the New York Stock Exchange (NYSE) and the Tokyo Stock Exchange (TSE) are the two largest stock exchanges in the world in terms of market capitalization and trading volumes. Nevertheless, previous market-based accounting research in North America has paid little attention to the Japanese market. As a result, there is a lack of empirical evidence as to how different Japanese investors use financial reports. Second, the importance of the Pacific Rim region in which both the U.S. and Japan are situated justifies this selection. If the 19th and 20th centuries were regarded as the European and American centuries respectively, all evidence seems to suggest that the 21st century will be the Pacific Rim century (Mueller *et al.*, 1994). As the two biggest players in this region, the U.S. and Japan will have a very significant influence on the economic development in the Pacific Rim region. Therefore, the importance of the region in the future will, to some extent, depend on the business and investment relations between these two countries, which in turn will depend on whether smooth communication and reconciliation can be achieved between these two economic giants. Third, given the uniqueness of the Japanese society and market, findings from this study will allow us to evaluate the external validity of existing studies using U.S. data as their input.

However, this study will not stop at describing the differences between U.S. and Japanese markets in terms of the informativeness and usefulness of current accounting earnings. Rather, it will attempt to explore what the nature of this difference will be if the time horizon is extended into the future and the past, and it will also suggest some possible reasons for these differences.

§2.5 Earnings Response Coefficients (ERCs)

Finally, as a secondary objective, this study also attempts to improve on traditional studies relating to the *earnings response coefficient* (ERC). Although the focus of traditional ERC-related research centres on "whether the earnings determination process captures in a meaningful and timely fashion the valuation relevant events" (Collins and Kothari, 1989), little attention has been given to the issue of how accounting information from different periods is used in determining market prices. The existing literature (Kothari and Sloan, 1992; Collins *et al.*, 1994) suggests that including accounting earnings from future periods can significantly increase the explanatory power of regression models. However, how ERCs will behave when both future and past periods are incorporated is still unknown. By using a different regression model which includes accounting earnings from periods that precede and follow the announcements, the significance of ERCs will be tested from a different angle, and new and insightful observations may be achieved.

§2.6 Research Question

Based on the above reasoning, the overall research question being asked in this study can be stated as follows: **Is the association between market prices and accounting earnings, in terms of response coefficients, systematically different between the U.S. and Japan? If so, can this difference be explained by differences in the information environments between the two countries?**

This overall question can be broken down into the following components:

- ☐ Does the accounting information from different periods (current, past and future) play a different role in both the U.S. and Japanese markets? Is there a significant difference in the pattern of market response to accounting information from different periods between the U.S. and Japanese markets?
- ☐ When the time horizon extends from period t to period $t \pm k$ ($k = 1, 2, 3, \ldots, \infty$), does the response coefficient decrease (decay) gradually? Is the speed of decay significantly different before and after the current period? Is the pattern of decay significantly different between the U.S. and Japanese markets?
- ☐ Does the availability of information, which is proxied by firm size, capture an important aspect of information asymmetry in both the U.S. and Japanese markets? When the regression is controlled for firm size, is there still a significant difference between the two countries?
- ☐ Does the ability to process information, which is proxied by the percentage of shares held by institutional versus individual investors, capture another important aspect of information asymmetries in both the U.S. and Japanese markets? When the regression is controlled for ownership structure, is there still a significant difference between the two countries?

Chapter 3
Review of Relevant Literature

In this chapter accounting research in related areas will be reviewed to the extent that is relevant to this study.

§3.1 Earnings' lack of timeliness

In their seminal paper, Ball and Brown (1968) examined the security return behaviour of firms in the 12-month period up to and including the month of annual earnings announcement. Their findings show that firms whose earnings had increased(decreased) during the period experienced a 5.6% - 11.3% abnormal return in the 12-month period. However, most of the change in the abnormal return occurs prior to the earnings announcements. Based on their findings they conclude that accounting earnings have information content because about half of the information related to a particular firm is captured by the income number. However, the annual income report cannot be regarded as a timely information source because 85% - 90% of its information content is captured by more prompt media (p. 176).

The Ball and Brown study opened up an important research area in the accounting and finance literature. One issue addressed in subsequent research is the determinants of the sign and magnitude of abnormal security returns preceding interim or annual earnings release. Foster (1986), McEnally (1971), and Beaver, Clarke, and Wright (1979) report significant contemporaneous correlations between the magnitude and sign of unexpected annual earnings changes and abnormal returns in the period preceding the earnings announcements. Foster, Olsen, and Shevlin (1984) extended these studies to interim earnings, and found similar results.

The intuitive appeal of the price-leads-earnings notion suggested in Ball and Brown was addressed in a functional form in Beaver, Lambert and Morse (BLM, 1980), a study regarded by Bernard (1989) as the most influential in this line of literature during the 1980s, and one of the most influential in all of capital market research. The BLM study lends strong support to the price-lead-earnings intuition, and moreover, it introduced a formal approach to modelling the price/earnings relation.

Ever since Ball and Brown and BLM, this issue (i.e., earnings lag behind stock prices) has been examined intensively by succeeding studies, including Collins *et al.* (1987), Marsh and Merton (1987), Freeman (1987), Collins and Kothari (1989), Easton *et al.* (1992), Kothari and Sloan (1992), and Collins *et al.* (1994), among others. These studies have demonstrated that "earnings' lack of timeliness is an important contributor to the low contemporaneous return-earnings association " (Collins *et al.*, 1994).

Foster (1986) suggested some reasons for the timing difference between the concept of earnings implicit in security price and the concept of earnings implicit in generally accepted accounting principles. First, accounting earnings are based on accounting notions such as realization and conservatism. With these notions, there are restrictions on both the scope and the timing with which events are reflected in the reported earnings. Second, the time focus of GAAP earnings series is for a past period, whereas the time focus of the earnings concept implicit in security prices is for a future period. This difference can give rise to two types of divergence: (a) past earnings that are reflected in reported GAAP earnings but are not expected to occur in the future, and (b) events that did not occur in the past but are expected to occur in the future (p.438).

All the above-mentioned studies implicitly assume that the degree of lack-of-timeliness of earnings is cross-sectionally constant. However, since information asymmetry between investors and firms' management varies significantly across firms, industries, and countries, earnings' timeliness is likely to vary cross-sectionally as well.

While the notion of earnings lagging behind prices is supported by empirical findings, the movements underlying the exact linkage between current prices and future earnings remain to be explored. This leads to questions regarding (1) the number of future periods for which earnings may be anticipated; (2) whether this number is constant or stable across firm sizes, industries, and geographic regions; and (3) whether the anticipated earnings for each future period are of the same magnitude; if not, what is the pattern of change in anticipated earnings represented by regression coefficients. These questions have not been addressed by previous research because the above-mentioned studies were designed to improve the explanatory power of earnings-return regressions rather than to explore the relation between current prices and future earnings.

§3.2 Firm size and information asymmetry

The finance literature has documented that several cross-sectional differences, including size difference, are related to differences in stock returns1. The size effect studies in accounting go back to Grant (1980) who examined differential return volatility between large and small firms. In an effort to find out the reasons for low explanatory power of conventional earnings-return association studies, Atiase (1985) added firm size into his regression model and found that firm size, measured as market capitalization, and information content are inversely related. Both authors attribute the differences to the

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[1]. Classical examples of studies on the size effect include: Basu (1977) **Investment performance of common stocks in relation to their Price-Earnings ratios: A test of the efficient market hypothesis** (*Journal of Finance* 32, No.3), Banz (1981) **The relationship between return and market value of common stocks** (*Journal of Financial Economics* 9, No.1), Reinganum (1981) **Misspecification of capital asset pricing** (*Journal of Financial Economics* 9, No.1).

differential information environment between large and small firms. This finding has been confirmed by succeeding studies including Freeman (1987), Collins, Kothari, and Rayburn (1987), and Ro (1988). These studies suggest that there are greater amounts of information available for large firms than for small firms. Atiase (1980) provides evidence that the Wall Street Journal publishes fewer items concerning small firms than large firms. The hypothesis that price changes will provide a more accurate and efficient estimate of permanent earnings changes for large firms than for small firms has been confirmed by empirical results (Freeman 1987, Collins *et al.* 1987). Freeman found, for example, that security prices of large firms begin to reflect reported earnings earlier than small firms' security prices. Freeman *et al.* (1988) further suggest that firm size may also proxy the quality of the available information. The most commonly offered explanation is that firm size is a surrogate for the amount of publicly available information prior to earnings announcements, since large firms attract more media attention and following by more analysts (Dempsey, 1989; Meek, 1991). Generally speaking, the more information investors have at their disposal, the better able they presumably are in monitoring a company, and the less surprised they should be when the annual earnings amount is announced. In other words, the earnings announcement may have less 'information content' when there is more information about the firm and a larger number of analysts following it (Meek, 1991). However, this does not explain why price leads earnings only for large firms but not for small firms.

To answer this question, Freeman *et al.* (1988) attempt to provide an economic rationale for the differential ERC by proposing two hypotheses, the differential forecast precision and the differential revised expectation hypotheses. They argue that prices of large firms reflect more precise forecasts of future earnings than those of small firms. Therefore, measurement error in the empirical proxy for unexpected earnings decreases as firm size increases. Their second hypothesis relates to earnings persistence which argues that the ratio of permanent to transitory earnings is likely to increase with firm size, and thus, the earnings surprise associated with large firms is more likely to lead to a revision of expected future dividends than the earnings surprise associated with small firms.

Easton and Zmijewski (1989a) investigated the correlation between firm size and ERC, and found that the correlation was not significant in every case they examined. Collins and Kothari (1989) used size as an additional variable in their reverse regression, providing evidence that the size variable has no incremental explanatory power over risk and growth.

However, while providing insights into the relation between non-earnings information and ERC, the above-mentioned studies do not directly relate the firm-size effect to information asymmetry. As discussed in Chapter 2, information asymmetry may be very different prior and subsequent to disclosure. Moreover, information asymmetry between market participants and firms' management, and between more informed and less informed investors may relate to different aspects of the issue: the former is more concerned with the availability of the information whereas the latter is closely related to users' willingness, resources and ability to acquire and to process private information. In order to examine their roles in determining the price/earnings association, these two types of information asymmetry should be treated separately, and be proxied by different measures. However, this has not been done in previous studies.

Another possible weakness in previous studies relates to the static approach used in analysing information asymmetry or information environment. Information asymmetry is usually assumed to exist prior to earnings announcements only. By adding a firm size dummy variable, researchers examine whether the information environment, as proxied by firm size, plays an important role in determining the earnings/price association around earnings announcements. Jacobson and Aaker (1993) made a notable improvement by linking information asymmetry not only to the current earnings/price association, but also to the anticipation of future earnings made in the current price. A dynamic relationship between information asymmetry and earnings/price association is thus established. However, the dynamic relationship in Jacobson and Aaker is somehow incomplete because they do not explain whether information asymmetry observed from a different degree of anticipation of future earnings will lead to a different degree of reliance on historical earnings.

§3.3 Earnings Response Coefficients (ERC) studies

Market-based accounting research on the association between accounting earnings and stock returns started from general tests on overall information content, initiated by the seminal work of Ball and Brown (1968) and Beaver (1968). Studies in this period found that accounting earnings do have information content, but the association is weaker than that predicted by theoretical models. Studies also found that the earnings/price association is cross-sectionally and/or temporarily different, although the underlying reasons for the variation remained unknown at that time. In the 1980s, researchers started to introduce some firm characteristics into their models in order to explain cross-sectional differences in the earnings/price relation. The firm characteristics examined in these studies include firm size (Atiase, 1985; Freeman, 1987; Collins, Kothari and Rayburn, 1987), predictability of earnings (Pincus, 1983), stock exchange market (Grant, 1980), industry (Bowen, 1981), and earnings persistence (Kormendi and Lipe, 1987).

In the late 1980s, researchers started to investigate a new area, the earnings response coefficient (ERC). Theoretically, the earnings response coefficient is defined as "the price change induced by a one-dollar shock to current earnings" (Collins and Kothari, 1989), and typically measured as a slope coefficient in a regression of stock return on unexpected earnings. While the conventional earnings/price studies focused on overall market reactions to earnings announcements, the ERC studies are more concerned about the nature of the information in reported earnings, and how it relates to firm valuation (Kormendi and Lipe, 1987).

The theoretical framework of ERC studies relies on a valuation model that discounts future dividends or cash flow. Although some dissimilarities are found among valuation models in their assumption about a link between current and future earnings, they are largely similar in their fundamental aspects (Cho and Jung, 1991).

The methodology used in empirical ERC studies depends on the research question and objective. An **event study** approach is used to examine whether a particular event, usually an earnings announcement causes investors to revise their expectations (as revealed by stock price changes following the event). Since the release of information in the market is a continuous process, the effect of each information release on the market is usually short-lived, and will be superseded by newly-arrived information. The event study, by its nature, has to adopt a short window (typically 2-3 days around the announcement). Examples of this line of research include Foster (1977), Hagerman, Zmijewski, and Shah (1984), Wilson (1986), and Easton and Zmijewski (1989a).

On the other hand, an **association study** approach is used to explore earnings' ability to absorb information released from sources other than accounting announcements (Easton and Zmijewski, 1989a)2. Association studies recognize that market participants also utilize nonaccounting information throughout the period to search for value-relevant events, and then revise their expectations of future cash flow from the firm accordingly. Therefore, association studies attempt to understand whether nonaccounting information is absorbed and summarized in accounting earnings, and whether accounting earnings are consistent with nonaccounting information releases that are already reflected in stock prices. Association studies use long windows (usually fiscal quarters or years) to capture valuation relevant events reflected in different information releases. Examples of this line of research include Beaver, Lambert, and Morse (1980), Beaver, Lambert, and Ryan (1987), and Collins and Kothari (1989).

However, the results from empirical ERC studies are somewhat disappointing because they have not produced evidence of an impressive correlation between returns and earnings; the R^2 rarely exceeds 10% and the estimated earnings' coefficients are implausibly small (Easton, Harris and Ohlson, 1992). Bernard (1989) and Lev (1989) note that these findings are robust across alternative econometric specifications and estimation procedures, and that the source of the problem is thus unlikely to be econometric in nature (Easton, Harris and Ohlson, 1992). Several efforts have been made to increase the explanatory power of ERC studies. In order to control for error-in-variable and 'imperfect' earnings problems, Easton, Harris and Ohlson (1992) extended the length of time period (event window) for calculation of returns and earnings, and achieved impressive and consistent results. The explanatory power of the return/earnings regression increases from 5% for a one-year return interval to 63% for a ten-year interval. However, as the authors correctly pointed out, this extended return interval

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[2]. The association study is defined somehow differently in Cho and Jung (1991). According to them, the main focus of association studies is to identify the determinants of earnings response coefficients.

approach may not be applicable to other studies because empirical research designs should be motivated by the questions asked, and not by the magnitude of correlation measures. Collins *et al.* (1994) tested the "earnings' lack of timeliness" hypothesis and the "earnings contain noise" hypothesis, and found empirical support for the first hypothesis only.

§3.4. Accounting research related to Japanese security markets

Despite the rapid growth and the relative importance of the Japanese stock markets, there are very few market-based empirical studies on Japanese accounting published in Anglo-American accounting journals. Among those limited studies, Japan is sometimes treated merely as one of the several foreign countries being compared with the United States (e.g., Alford *et al.* [1993], Meek [1991]). Consequently, the comparison is limited both in its scope and its depth. Therefore, it remains unclear, to a certain extent, whether conclusions based on the U.S. domestic setting necessarily hold true internationally, especially with regard to a country like Japan whose information environment and social structure are so different from the U.S.

Deakin, Norwood, and Smith's study (1975) is a replication of Beaver's (1968) study using Japanese data to test the price and volume reactions of securities traded on the Tokyo Stock Exchange to the release of earnings information. While the volume reactions were similar to Beaver's findings, price reactions did not conform to the U.S. pattern. As one of the pioneering empirical market-based accounting studies using Japanese data, Deakin *et al.* provided first-hand findings on a market which was virtually unknown to accountants in Western countries at that time. However, as merely a replication, their study did not provide a meaningful comparison between the two markets. Therefore, the influence of that study is very limited.

Ferris, Hiramatsu and Kimoto (1990) investigated the issue of whether financial reports appear to convey information on risk on a consistent basis in both Japanese and U.S. markets. Results from their experiments indicate that traditional accounting measures of risk explain substantial variation in the average risk perceptions of financial analysts in both countries; however, while the accounting measures were related to market beta in the U.S., no such association was observed for the Japanese sample. Ferris *et al.*'s study is weak in its research design which collects data from an experiment on Japanese financial analysts, and then compares the results of the experiment with the U.S. data discussed in a previous study. Since the two sets of results may not be directly comparable, their findings may be somehow less convincing than they claim to be.

Meek (1991) examined U.S. security market reactions to annual earnings announcements by a sample of non-U.S. multinational corporations and compared it to a control sample of U.S. firms. The non-U.S. sample is a mix of multinational corporations from five countries — Israel, Japan, Netherlands, Philippines, and the United Kingdom. Since individual countries in this culturally diversified sample were mixed and not individually identifiable, the findings cannot be used to derive comparative analysis between the U.S. and any of these five countries.

Alford *et al.* (1993) compare the information content and timeliness of accounting earnings in 17 countries using the U.S. as a benchmark. Japan is one of the 17 countries being compared with the U.S. They found that in Japan the information reflected in earnings is impounded in prices much more slowly than in the United States. However, they finally concluded that when Japan is compared with the U.S., the information content and timeliness of accounting earnings is not conclusive.

Hall, Hamao, and Harris (1994) examined associations between accounting measures of earnings and stock returns in Japan over varying windows (one, four, seven, and twenty years) and compared them to those for the United States. Their results are consistent with the view that Japanese investors utilize less accounting information in their pricing of equities than do their U.S. counterparts. This was particularly evident in the 'boom' period of the mid- to late 1990s when the fundamental values conveyed by accounting measures appear to have been largely ignored. The association increases with the inclusion of 1991, suggesting a return to a greater emphasis on fundamentals in the recent decline in stock prices.

While most empirical Japanese-related accounting studies suffer from insufficient tests and analyses, Jacobson and Aaker (1993) is a remarkable exception because they adopted a model which allowed them to further analyze the underlying reasons for the difference in the earnings-price association between Japan and the U.S. The Jacobson and Aaker study has directly influenced the motivation of this study, therefore, it needs to be discussed in detail.

Jacobson and Aaker hypothesize that Japanese investors are better informed than their U.S. counterparts. Their hypothesis is supported by the findings that the ratio of the effect of future-term to current-term business performance on stock returns is greater for the Japanese stock market than for the U.S. stock market. They further argue that this is attributable to the fact that a substantial proportion of Japanese investors also have business links with the companies which provide them with access to information, a fact which increases their awareness of future business prospects than their U.S. counterparts. Trading on inside information will lead the market to reflect the information in stock prices, thus making the market more efficient (strong form of efficiency). Since the market is aware of companies' future business potential, Japanese managers are less inclined to undertake myopic strategies designed to enhance current-term profit (pp. 402-403).

The empirical model used in Jacobson and Aaker is:

$$StkR_{it} = \beta_1 AccP_{it} + \beta_2 AccP_{it+1} + \varepsilon_{it}$$

where $StkR_{it}$ is the stock return for firm i in period t, $AccP_{it}$ and $AccP_{it+1}$ are accounting performance measures for firm i in periods t and $t+1$, respectively. The accounting performance measures used in Jacobson and Aaker are return on investment and sales growth. However, their focus is not on the individual coefficients β_1 and β_2, but on the ratio of future- to current-term effects, i.e., the relation between β_1 and β_2. For this reason, the above equation is rewritten as:

$$StkR_{it} = \beta_1 (AccP_{it} + \delta AccP_{it+1}) + \varepsilon_{it}$$

where δ is the ratio of the future-term effect to the current-term effect, i.e., $\delta = \beta_2/\beta_1$.

It should be noted that the present study shares the following common aspects with Jacobson and Aaker's study:

- ☐ The main focus of the study is not on the individual coefficients from the regressions, rather, the analysis will be centred at the relations between coefficients.
- ☐ Stock prices in the Japanese market are hypothesized to be more informative about future accounting earnings than stock prices in the U.S. market; the difference is further assumed to be linked to the difference in information asymmetry between the two countries.
- ☐ An association study approach with an annual return window is used in both studies.

- ☐ Empirical findings are analyzed in relation to the environmental differences between the two countries.

However, the present study differs from Jacobson and Aaker's study in the following important respects:

- ☐ This study not only analyzes the ratio of future- to current-term effects, but also investigates how this ratio changes over time, i.e., it examines what is the speed of decay along the time horizon.
- ☐ In Jacobson and Aaker's study, analysis is limited to the current period plus one future period, and the results are not generalizable to periods beyond this two-period time span. The present study will adopt an infinite time span, which will allow us to view the issue more broadly.
- ☐ Earnings from periods prior to the current one are added in an autoregressive model specially developed for this study. The inclusion of prior periods is derived from the model.
- ☐ Although Jacobson and Aaker attribute Japan's high future- to current-term earnings-return association effect to a low level of information asymmetry between Japanese firms' managers and market participants, this intuition was not tested in their study. This study will explicitly proxy and test the two aspects of information asymmetry to investigate whether the difference in the information asymmetry between the two countries can explain the differences in their earnings-price associations, and examine the roles of the two aspects of information asymmetry in this regard.
- ☐ Different models are used simultaneously on the same data set in this study to control possible methodological limitations and weaknesses.

§3.5 Characteristics of Japanese accounting and financial reporting

The uniqueness of Japanese accounting and financial reporting, and Japanese information environment are summarized in this section.

3.5.1 Cross-holding and direct access to information

The form of corporate cross-holding in Japan is characterized by each corporation holding a portion of the share capital of a number of other corporations in the group. Typically, such intercorporate shareholdings are small (e.g., each holds 10% or less) (McKinnon, 1985). However, in the aggregate these small holdings may sum to a large fraction of the firm's outstanding shares (Hodder and Tschoegl, 1993). Studies of cross holdings (e.g., Dodwell Marketing Consultants, Tokyo) indicate that the percentage of the total share capital of listed corporations within the group held by other group corporations is, on average, less than 50%. Nevertheless, the group members are often among the 10 largest shareholders of other member companies to ensure a close relationship. Apart from the cross-holding within the group, the relationship leading to Japanese shareholders being regarded generally as a related party to the company may take a variety of other forms. Shareholders from the family which founded the company are also influential and often have access to directorate and information sharing. Banks with significant lending in the company usually also hold shares to become an affiliate to the company. Companies' directors and managers, may or may not come from the founding family, and usually are among major shareholders. Although all these special or related shareholders have access to company information, and thus are well aware of the future growth opportunities, the degree of involvement may be different among different types of special shareholders.

One unique consequence of cross-holding among Japanese companies is the existence of dominant special shareholders. These shareholders have a stable or permanent interest in the company, and consequently, are more concerned about long-run performance and growth rather than short-run profits. The management of Japanese companies, therefore, have less incentives and opportunities to increase short-run profit at the cost of long-run performance than their U.S. counterparts do (Okimoto and Rihlen, 1988; Jacobson and Aaker, 1993). These shareholders often put "their own people" in responsible company positions. Therefore, to evaluate a company's progress, the principal Japanese shareholders tend to rely on "networking" with people whom they know and trust. Direct, inside access to information means external reports are likely to be interpreted with insider information (Bloom *et al.*, 1994).

3.5.2 Japanese accounting regulations and practices

The Japanese government has been a major influence on all aspects of accounting in Japan, and government institutions are directly involved in the accounting standard-setting process (Radebaugh and Gray, 1993). Japanese GAAP emanates from two sources. The Japanese Commercial Code sets forth the required accounting disclosure by firms in their annual reports to shareholders. The Ministry of Justice is responsible for the application of the Commercial Code. On the other hand, the Ministry of Finance is responsible for the Securities and Exchange Law which stipulates the form and content of financial statements filed with the Ministry of Finance.

The regulatory framework of Japanese financial accounting is legalistic in orientation. Within such a framework, accounting is not primarily oriented toward the decision needs of capital providers. Instead, it is usually designed to satisfy government-imposed requirements. This biased regulatory focus has a significant effect on the information distribution among interested parties, because "the actual users of financial reports (nonrelated investors) are relegated to secondary status by a system of power relationship (among elite bankers, major corporate and government bureaucrats) which promotes information asymmetry through formal and informal access to financial information" (Hudack and Orsini, 1992).

In Japanese accounting practice, there is more emphasis on conservatism, meaning an understatement of net assets and income. As a consequence: (a) there is a considerable emphasis on historical cost; (b) the emphasis is on accelerated depreciation and shorter lives for depreciation purposes; (c) goodwill often is not capitalized, and when capitalized, is subsequently amortized over a much shorter period (a maximum of 5 years) than in the U.S. The strict application of historical cost and the emphasis on conservatism in Japanese accounting is reminiscent of Germany; but in practice it translates into a more extreme form of accounting that is uniquely Japanese.

Despite these differences, Jacobson and Aaker (1993) found that the divergent accounting practices between Japan and the U.S. are insufficient to explain the magnitude of the difference reported in their regression analysis.

3.5.3 Availability of accounting information in Japan

Despite the increasing significance of the stock market, the accounting tradition in Japan does not give preference to the information needs of investors (Radebaugh and Gray, 1993). It is widely believed that the availability of financial statements to the general public is very limited in Japan, which reflects the cultural characteristic of secrecy (Cooke and Kikuya, 1992).

A comparison of accounting standards between the U.S. and Japan also reveals that financial disclosure is less comprehensive in Japan than in the United States. For example, segmental information is only briefly disclosed in Japan. No information is required on segments' assets, capital expenditures, or accounting policies. The disclosure level on long-term investments is also low in Japan. There are no requirements on disclosure of subsidiaries' activities, location, and percentage of ownership, nor is there any requirement on the disclosure of the method used for business combinations.

On the other hand, different kinds of relationships may develop into mutual trust and information sharing in Japan. Consequently, informal information sharing among individual companies within a corporation group, and among employees within an individual company makes the formal financial reporting less important than it is in Western countries. As primary owners, special shareholders such as banks, related parties and employees have direct or indirect access to inside information, which allow them to interpret much more accurately reported financial data than their counterparts in the U.S. Therefore, although publicly available accounting information is probably less comprehensive in Japan than in the U.S., cross-holding of shares allows many Japanese investors access to companies' accounting and non-accounting information which is not available to the general public.

Furthermore, the evidence suggests that Japanese managers are less inclined to undertake myopic strategies designed to enhance current-term profits (Jacobson and Aaker, 1993). Because many Japanese investors have access to firms' insider information, they are more likely to be able to distinguish between myopic and permanent earnings increases than investors in the U.S. Moreover, long-run earnings and growth of a firm, not short-run performance, are usually emphasized in performance evaluations in Japan. Hence, Japanese managers have less incentives and opportunities to pursue short-term profit at the cost of long-term performance. As a result, accounting earnings should carry less value-irrelevant components in Japan than in the U.S.

In summary, we observe a dilemma in Japanese financial reporting. On one side, financial information reported in Japan is viewed by some researchers as having poorer quality, less sophisticated, and therefore less informative than that of the United States. For example, Bloom *et al.* (1994) observed that Japan has fewer standards, and they tend to be ambiguous. On the other hand, many shareholders have some direct access to 'insider' information regarding companies' future performance and opportunities, and thus have a better chance to link the financial reports to future profitabilities and growth opportunities in making their investment decisions (Jacobson and Aaker, 1993). Therefore, whether general Japanese investors are better informed about firms' performance and growth opportunities than U.S. investors remains an unresolved empirical question, which directly inspires this study.

Chapter 4
Research Hypotheses

§4.1 The overall hypothesis

There are two factors which have been widely recognized in the literature as supporting the argument that Japanese stock prices better reflect future accounting earnings (e.g., Okimoto and Rihlen, 1988; Jacobson and Aaker, 1993). The first such factor is that primary Japanese shareholders have a stable or permanent interest in the company, and consequently, are more concerned about long-run performance and growth rather than short-run profits. Japanese managers, therefore, have little incentives and opportunities to increase short-run profit at the cost of long-run performance. As a result, there are fewer transitory or value-irrelevant components in Japanese accounting earnings relative to the U.S., making Japanese accounting earnings more informative of firms' future profitability than U.S. earnings. The second factor relates to the emphasis on conservatism in Japanese accounting. Revenue recognition, for example, is delayed whenever possible under strict conservatism, although this revenue may already have been contracted for and announced. Consequently, a timing difference between the revenue recognized in accounting and the revenue reflected in market prices is created by this emphasis on strict conservatism. This timing difference will be reflected in a statistical association between current stock prices and future accounting earnings.

On the other hand, it is also recognized (e.g., Bloom *et al.*, 1994; Cooke and Kikuya, 1992) that Japanese financial reporting is less sophisticated than that of the United States, and should be regarded as less informative. Besides, there is less non-accounting information available in the Japanese market because of a tradition of secrecy in the Japanese culture (Cooke and Kikuya, 1992). Consequently, it is less likely that future earnings can be predicted from analyzing current earnings. Contrary to claims made in previous studies, whether Japanese accounting earnings are generally more useful in predicting future earnings (i.e., whether there is a stronger association between current stock prices and future earnings) than U.S. accounting earnings remains an unresolved empirical question.

This study takes a different approach to investigate this issue. First, the issue of timeliness of accounting earnings is related to information asymmetry between investors and firms' management, and it is assumed that lesser information asymmetry will allow investors to better predict future earnings from analyzing current earnings, indicated by a stronger association between current stock prices and future earnings. Secondly, unlike previous studies, it is not assumed in this study that Japanese investors are homogeneous as far as information asymmetry is concerned. Instead, it is believed that Japanese investors are segmented such that they are responsive to different information sets with different degrees of precision. Therefore, it makes little sense to treat Japanese investors as a single group. Accordingly, analyses of the Japanese market in this study will be conducted on each type of investor (individual or institutional) to the extent that the data are available.

In Japan, the type of ownership adopted by the company will generally affect the relationship between the management and shareholders, thus affecting shareholders' ability to anticipate future earnings from current earnings. In this study, Japanese companies are first classified into two large groups: (1) companies whose majority shares are owned by **individual investors**, and (2) companies whose majority shares are owned by **institutional investors**. In addition, two **special investor** categories will be set up which include Japanese companies whose shares are controlled by either the 10 largest shareholders, or by shareholders who have a special interest in the company, defined as either the 10 largest shareholders who are not institutional investors, or the issuing company's directors, respectively.

In short, this study assumes that Japanese companies have different types of ownership structure, leading to the informativeness of Japanese financial reports differing significantly across companies. Many large Japanese companies are mainly owned by those who have special connections with the company (i.e., the founding family, banks, member companies in the same corporate group). These special shareholders have direct access to 'insider' information regarding companies' future performance and opportunities, and thus have a better chance to link the financial reports to future profitabilities and growth opportunities in making their investment decisions. Once the insider information is used in trading, this information will be reflected in the stock price, thus leading to a strong association between the current stock price and future accounting earnings. On the other hand, small Japanese firms or firms that are owned mainly by individual investors may not be closely followed by the markets. Because of the poor quality of Japanese financial reports, and because of a lack of significant insider trading, the stock prices are little indicative of firms' future earnings, which in turn will result in a weak association between the current stock price and future accounting earnings.

The institutional environment in the United States is very different from that of Japan. Although large companies are also more closely followed by the markets than small firms, insider trading is less likely to take place in the U.S. than in Japan. In this regard, the security market for the large- or mainly-institutionally-held firms is less efficient in the U.S. than in Japan because little, if any, insider information is likely to be reflected in market prices in the U.S. The reverse argument (i.e., less efficient Japanese markets) can be made for all other market segments.

When the stock prices are more indicative of future earnings, investors tend to rely less on historical earnings data to make their investment decisions. While the linkage between current stock prices and future earnings is weak, investors may have to rely heavily on historical earnings data to estimate how sustainable the current earnings are likely to be in future periods. The above argument leads to the following overall hypothesis:

When controlled for firm size and the structure of firms' ownership, the price/earnings association in terms of explanatory power and the pattern of regression coefficients is systematically different between Japan and the United States due to the difference in their institutional and information environments.

It may be argued that the price/earnings associations in terms of R^2 and regression coefficients are different between the U.S. and Japan because of both economic factors and accounting differences. Therefore, it is difficult to distinguish one from the other. For example, the discount rate might affect the relative coefficients on price/earnings association and may be unrelated to any accounting and financial reporting issues. However, while the difference in price/earnings association between the two countries may be attributed to many factors, evidence reported in previous studies suggests that the difference in accounting practices such as conservatism is an important factor that leads to cross-national differences in the price/earnings association (Cheung *et al.*, 1996). Hall *et al.* (1994) also argue that although economic factors may affect the estimated coefficients, they should not necessarily affect the degree of association as reflected in R^2. Moreover, this study focuses mainly on the pattern of coefficients rather than on the interpretation of individual parameters. Therefore, the existence of possible economic factors are not likely to affect overall conclusions.

The overall hypothesis is further broken down into a set of empirically testable sub-hypotheses.

§4.2 Hypothesis I

Before any detailed analysis can be performed, it is necessary to understand the overall difference in price/earnings associations between the two countries. The first hypothesis is designed to test whether the price/earnings association is systematically different between Japan and the United States. Based on previous research findings that the extent of information asymmetry is smaller in Japan than in the U.S. because Japanese investors may have direct access to firms' insider information (Jacobson and Aaker, 1993), the first hypothesis states:

H1: More significant response coefficients on earnings will be found on current and future periods in the price/earnings regression for Japanese firms than for U.S. firms. In contrast, more significant response coefficients on earnings will be found on past periods in the price/earnings regression for Japanese firms than for U.S. firms.

§4.3 Hypothesis II

The information asymmetry between shareholders and the management of a firm may be narrowed down when private information is acquired and processed by investors to anticipate the firm's future earnings. The degree of information asymmetry depends on (1) the availability of information, and (2) investors' willingness, ability, and resources that allow them to further process the acquired information. Since all investors are not equal in acquiring and processing information, another type of information asymmetry—information asymmetry between informed and less-informed investors— will arise. While the two aspects of information asymmetry are not distinguished in previous studies, this study suggests that two different measures should be used to proxy these aspects. The validity and necessity of detailed comparative analyses designed for this study depends largely on this assertion. In order to lay the groundwork for further analyses, the second hypothesis directly tests whether the firm size and the nature of ownership actually capture different aspects of the information environment.

In this study, the availability of accounting information is proxied by the firm size. It is assumed that there is more value-relevant and future-oriented information available in the market on large firms than on small firms because large firms are usually followed by more financial analysts. The ability to process information is proxied by the nature of a firm's ownership (i.e., the percentage of shares held by institutional versus individual shareholders). It is assumed that institutional shareholders are more able to precisely interpret and utilize reported financial information than individual investors. The second hypothesis states:

H2: In both the U.S. and Japan, when controlled for firm size and ownership structure, more significant response coefficients on earnings will be found on current and future periods in the price/earnings regression for large (mainly institutionally held) firms than for small (individually held) firms. In contrast, more significant response coefficients on earnings will be found on past periods in the price/earnings regression for large (mainly institutionally held) firms than for small (individually held) firms.

This hypothesis is expected to be supported because previous studies (e.g., Atiase, 1980; Kim *et al.*, 1993) have demonstrated that differences in firm size and ownership structure have a considerable impact on the information asymmetry, as stated in the hypothesis.

§4.4 Hypothesis III

Jacobson and Aaker (1993) suggest that when investors are well informed about a firm's future profitability, one should observe a strong association between currently observed stock return and future accounting rates of return, because this future-related information is promptly and unbiasedly captured by stock prices.

The third hypothesis attempts to analyze whether in general Japanese investors are better informed about future earnings than their U.S. counterparts, given the different availability of publicly accessible financial reports in the two countries. It is assumed that regression coefficients on current and future earnings will be significantly high when investors have access to future-oriented accounting information. However, when future-oriented information is not readily available, investors are more likely to use historical earnings data to assess the persistence of current earnings. Therefore, a comparison of regression coefficients pertaining to past and future periods provides a straightforward indicator of differences in the information environments between the two countries.

This study argues that whether Japanese investors are better informed about firm's performance and future profitability than their U.S. counterparts is still an unresolved empirical question. On one hand, if the arguments that (1) Japanese managers do not have incentives to pursue short term profit at the cost of long-run performance, and (2) many Japanese investors have direct access to a given company's accounting and other information are supported, one should observe higher regression coefficients on future periods' earnings than on earnings related to past periods. On the other hand, if Japanese financial reports are actually of poor quality as some researchers suggested, and if the

Japanese tradition of secrecy is reflected in the country's accounting and reporting practices, one should observe lower regression coefficients on future periods' earnings than on earnings related to past periods. The third hypothesis tests this conjecture as follows:

H3: When controlled for firm size and ownership structure, more significant response coefficients on earnings will be found on current and future periods in the price/earnings regression for Japanese firms than for U.S. firms. In contrast, more significant response coefficients on earnings will be found on past periods in the price/earnings regression for Japanese firms than for U.S. firms.

§4.5. Hypothesis IV

Although Japanese shareholders are treated as a homogeneous group in previous studies (e.g., in Jacobson and Aaker [1993]), they are possibly different among themselves in terms of the purposes of ownership and accessibility to insider information. Such differences will be reflected in stock prices when trading on the information available to them in the Japanese security market.

The database used in this study identifies the percentage of shares owned by four types of Japanese investors: (1) the ten largest investors, (2) special investors (either the 10 largest shareholders who are not institutional investors, or the issuing company's directors), (3) institutions, and (4) individual shareholders[1]. The first two types of

[1]. It should be pointed out that these groups of shareholders are not necessarily mutually exclusive due to possible overlap between subgroups. The same shareholder may be classified into more than one subgroup, for instance, an investment institution may hold the largest percentage of shares in a company, thus being included in both the 'ten large holders' and 'institutional holders' subgroups. This overlap, however, does not create an analytical problem for this study because the overall earnings-price association in this study is not the sum of results

investors differ from individual shareholders in two important aspects: stable (indefinite) ownership and access to insider information. The former aspect suggests that special shareholders are motivated by permanent business relations rather than short-term investment returns, thus reducing managers' incentive for pursuing short-term profit (i.e., myopic behaviour). The latter reduces the opportunity of management to maximize short-term profit at the cost of long-term performance, because such a manipulation would be unlikely to take place without being noticed by well-informed shareholders. However, because of their permanent interest in the company, these two types of shareholders may not frequently trade in the market. Thus, their information may not be efficiently reflected in stock prices.

The third type, the institutional investors may not have direct access to insider information. However, they usually have the resources and willingness to acquire and to further process private information. Thus, institutional investors have a significant information advantage over individual investors.

H4: When the Japanese market is segmented by types of share ownership, firms that are mainly owned by the first three types of will demonstrate:

a. more significant response coefficients on earnings of current and future periods in the price/earnings regression, and

b. less significant response coefficients on earnings of past periods in the price/earnings regression

than firms that are mainly owned by individual-shareholders.

This hypothesis is expected to be supported because of the above arguments. However,

from individual types of holders.

if no significant difference is found between special and individual shareholders, a further analysis of each type of special shareholders is necessary.

§4.6. Hypothesis V

Although information from different periods is incorporated into current investment decisions, the weight attached to each period's information is possibly different. Investors' foreseeability of future earnings is likely to decline when the time horizon is extended from t to $t+k$ ($k \geq 1$). As the time horizon advances into the future, the prediction of earnings becomes less accurate. On the other hand, when historical data are useful in making investment decisions, the usefulness of earnings from each past period is expected to be different. More recent earnings information, in general, should be more representative of future earnings than outdated information if earnings changes follow a random walk pattern. This observation has been confirmed by previous studies such as Easton *et al.* (1989a), and Jacobson and Aaker (1993); both studies report that information content diminishes along the time horizon from period t to period $t+k$ ($k = \pm 1$). With an extended infinite horizon ($t+k$, $k \geq |1|$), the fifth hypothesis states:

H5: **The weight attached to each period's information decreases along the time horizon for both Japanese and U.S. markets; the closer the time period is to the current time (t), the higher is the weight.** That is:

$b_{t+k} < b_{t+k-1}$, when $k \geq 0$, and

$b_{t+k} > b_{t+k-1}$, when $k < 0$.

where b represents an earnings response coefficient in a multiperiod price/earnings regression.

This hypothesis mainly tests whether or not information decay from period t to period

$t \pm k$, ($k \geq 1$). It is expected that, for both countries and all subsamples, the highest price/earnings association will be a contemporaneous one, and the significance of regression coefficients will decline along the time horizon from period t to period $t \pm k$ ($k \geq 1$). Tests of this hypothesis will also show the length of time period upon which a statistically significant price/earnings association is reported. If Japanese accounting information is of poor quality, it is less likely that a significant price/earnings association will be found over a long period. The opposite should be observed if Japanese investors are well informed about firms' future profitability as Jacobson and Aaker (1993) suggested.

Although it is expected that both Japanese and U.S. companies will exhibit a declining trend in regression coefficients both before and after period t, the speed of decline (decay) is possibly different between the two countries, and between periods before (i.e., $t-k$) and after (i.e., $t+k$) the current period. This conjecture will be further elaborated upon in the next hypothesis.

§4.7. Hypothesis VI

When information available for anticipating future earnings is significantly more relevant for period t than for period $t \pm k$ ($k \geq 1$), we would expect to observe a significantly stronger association between the current price and current earnings (i.e., b_t) than that between the current price and earnings from period $t+1$ (i.e., b_{t+1}). Statistically, the slope coefficient b_t should be significantly larger than b_{t+1}. The ratio of b_{t+1} to b_t indicates how fast the predictability of current stock prices declines from period t to $t+1$, and is referred to in this study as the **speed of decay of response coefficients**. In general, if current earnings are more informative of future earnings, or there is more non-accounting information available in the market for predicting future earnings, we should observe a slower decay of regression coefficients after period t. If, on the other hand, accounting earnings contain too much noise, or there is little non-accounting information available in the market, the speed of decay on coefficients b_{t+k} will be high because the predictability declines quickly as the time horizon increases. In this regard, the speed of decay of coefficients b_{t+k} after the current period indicates how well the market predicts future earnings from current accounting information plus other information which is reflected in earnings.

A similar argument can be made for coefficients b_{t-k} prior to the current period. If accounting earnings contain mainly value-relevant items and are expected to persist into the near future, investors will rely heavily on historical earnings to predict future earnings. In this case, the coefficients will gradually decline from period $t\text{-}k$ to period $t\text{-}k\text{-}1$, i.e., a slow speed of decay will exist. If, on the other hand, historical earnings are not useful in predicting future earnings, or investors do not need to rely on historical earnings to predict, the decay of the coefficients b_{t-k} will be rapid. As such, the speed of decay of the coefficients b_{t-k} prior to the current period indicates how much investors rely on historical earnings to predict future earnings in making their investment decisions.

Jacobson and Aaker (1993) suggest that information asymmetry is less severe in Japanese markets, and Japanese investors are better aware of the firms' future cash flow; their future-oriented time horizon will be considerably longer than that of U.S. investors. If this is the case, we should observe a slower speed of decay after the current period for Japanese investors than for U.S. investors. The same analysis applies to periods prior to the current one. Given the existence of information asymmetry of a considerable magnitude, U.S. investors, especially those investing in small companies, may have to rely on historical results, and their backward time horizon may be significantly longer than that of Japanese market participants. However, as discussed earlier, comparing U.S. investors with Japanese investors in a general way does not necessarily provide new insights, because there is a dichotomy between general Japanese investors with access only to poor Japanese financial reporting and significant special shareholders with access to insider information. Meaningful conclusions, therefore, can only be drawn from individual analyses based on different types of investors for both countries. Accordingly, the last hypothesis states that:

H6: **The speed of decay is slower for non-individual Japanese investors after period t+1 than that for U.S. investors, which in turn is slower than that for individual Japanese investors. A reverse relationship will appear for periods prior to the current one.**

Chapter 5
Model Development

Considerable research has focused on the association between stock market returns and accounting earnings to assess the information content of the latter. Typically, the price-earnings specification is estimated in the accounting literature as[1,2]:

$$P_t = \alpha + \beta X_t + \varepsilon_t \qquad (1)$$

where P_t is the current stock price, X_t is an accounting performance measure[3] such as earnings per share. Usually, inferences regarding the information content of earnings are based on the significance of the slope coefficient and explanatory power (R^2) of the model.

The existing accounting literature suggests that the excess of the current period's return over the expected return (i.e., abnormal return) is generated by the unanticipated portion of the current period's earnings[4] and information influencing the market's expectations about future periods' earnings. Campbell and Shiller (1988a, b) characterize the impact of new information in terms of changes in expected dividend **growth rates**. Collins *et*

1. The price-earnings specification is modelled in several different ways in the accounting literature. Two basic models are the price model and the return model (Kothari and Zimmerman, 1995). Although the argument made in this section is based on a price model, the conclusion will remain unchanged if a return model is used instead.

2. In market-based accounting research, cumulative abnormal returns (CAR) and unexpected earnings (UX) are usually used to replace raw market returns and earnings. The selection of a proper return and earnings metric will be discussed in the next chapter.

3. Although this accounting performance measure is generally labelled as 'earnings', it is not necessarily limited to the bottom-line figure from the income statement. In this study, the term 'earnings' is used in a broad way, and may refer to items such as sales growth, investment in R&D, etc.

4. It should be noted that this characterization is based on a well-accepted assumption that there exists a proportionate relation between dividends and earnings. The interested reader is referred to Beaver (1989) for an interesting discussion of such a relationship.

al. (1994, p.295) argue that given earnings' lack of timeliness, only a part of the current period's earnings growth or change is a surprise to the market. Moreover, investors will look beyond the current earnings numbers to other sources of information to revise their expectations. Based on this argument, Collins *et al.* (p. 295) suggest the following model:

$$R_t=\beta_0+\beta_1 UX_t+\sum_{k=1}^{\tau}\beta_{k+1}\Delta E_t(X_{t+k})+e_t \tag{2}$$

where $UX_t = X_t - E_{t-1}(X_t)$ is the unanticipated earnings growth rate; Δ represents change, and E is an expectation operator. $\Delta E_t(X_{t+k})$ is the expected earnings growth in future periods. In previous return-earnings regressions, revisions in expectations of future earnings are estimated using time-series models (e.g., ARIMA models). However, as Collins *et al.* (p. 296) argued, since the market's expectations are conditioned on a richer information set than simply past earnings, time-series models no doubt measure the market's expectations and revisions therein with considerable error. For this reason, Collins *et al.* replaced the unanticipated earnings growth rate with the "ex post growth rate". Following Collins *et al.*, the models developed in this section also use lead periods' actual earnings as *ex post growth rates* to estimate the market's revisions.

Many studies since Beaver, Lambert, and Morse (1980) demonstrate that prices lead earnings, i.e., prices reflect economic events earlier than earnings. Because of earnings' lack of timeliness, market price represents a richer set of information than accounting earnings. In other words, some accounting earnings (A_t) are anticipated before their announcements, and therefore, A_t lags behind P_t. This notion is modelled by Collins *et al.* as:

$$P_t = b_0 + b_1 A_t + \sum_{k=1}^{\tau} b_{1+k} A_{t+k} + \varepsilon_t \qquad (3)$$

Note that the only difference between equation (2) and (3), apart from a change from the return model to the price model, is the **growth rate**. Equation (2) uses market expectations and equation (3) uses actual earnings from future periods (*ex post* growth rate). Note also that the error term (ε_t) represents value-irrelevant noise assumed to be normally distributed with $N(0, \sigma_e^2)$, and has the property cov (A_t, ε_t) = 0 for all values of t.

In Collins *et al.*'s original model the length of the time horizon (τ) was limited to 3 periods for "*a priori* and empirical reasons". However, this restriction may suffer from many drawbacks. For example, there is no theoretical guide as to what is the desirable length of the lag; the degrees of freedom are restricted by the length of the lag, making statistical inference somewhat shaky. This restriction is relaxed in our model so that the discussion will be more generalizable. Although the market return is used as the dependent variable in Collins *et al.*, the model can be rewritten in the form of a price model without loss of its generality.

Typically, current accounting earnings are modelled as the sum of two conponents: (1) a surprise to the market and (2) a 'stale' component that the market had anticipated in earlier periods (e.g., Collins *et al.*, 1994, Kothari and Zimmerman, 1995):

$$A_t = A_t^s + \sum_{k=1}^{\tau} \lambda_k A_{t,t-k} \qquad (4)$$

where A^s_t is the surprise component in current earnings, $A_{t,t-k}$ (k = 1, 2, 3, ...τ) is the component that was anticipated by the market in previous periods, and the coefficient λ_k

on previously anticipated earnings $A_{t,t-k}$ represents a precision parameter.

Replacing A_t in equation (3) with the decomposed elements A^s_t and $A_{t,t-k}$, we obtain:

$$P_t = b_0 + b_1 (A^s_t + \sum_{k=1}^{\tau} \lambda_k A_{t,t-k}) + \sum_{k=1}^{\tau} b_{1+k} A_{t+k} + \varepsilon_t \tag{5}$$

Note that in equation (5) the market price is reacting to A_t as a whole rather than responding to each component. For this reason, we have a single coefficient (b_1) on both the earnings surprise and the previously anticipated earnings. Note also that the decomposition is *ex post* so that anticipations of future earnings from previous periods would have different degree of accuracy. Using a simple algebraic manipulation, equation (5) can be reexpressed as:

$$P_t = b_0 + b_1 A^s_t + \sum_{k=1}^{\tau} b_1 \lambda_k A_{t,t-k} + \sum_{k=1}^{\tau} b_{1+k} A_{t+k} + \varepsilon_t \tag{6}$$

Now let us rename coefficients $b_1\lambda_k$ as b_{-k}, and restate the equation as:

$$P_t = b_0 + b_1 A^s_t + \sum_{k=1}^{\tau} b_{-k} A_{t,t-k} + \sum_{k=1}^{\tau} b_{1+k} A_{t+k} + \varepsilon_t \tag{7}$$

Note that previously anticipated earnings ($A_{t,t-k}$) were part of the earnings surprise at time t-k when the information was released in A_{t-k}, i.e., $A_{t,t-k} \in A^s_{t-k}$. If we assume that only the future-oriented component $A_{t,t-k}$ was a surprise to the market at time t-k, we shall have $A_{t,t-k} = A^s_{t-k}$. Accordingly, Equation (7) can be expressed as:

$$P_t = b_0 + b_1 A^s_t + \sum_{k=1}^{\tau} b_{-k} A^s_{t-k} + \sum_{k=1}^{\tau} b_{1+k} A_{t+k} + \varepsilon_t \tag{8}$$

However, the earnings surprise is not directly observable but contained in the earnings announcements. This relationship can be stated formally as $A^s_{t-k} = \rho A_{t-k}$, and $A^s_t = \mu A_t$. Parameters ρ and μ represent the proportion (in terms of a percentage) of the released earnings which is a surprise to the market at the time of the announcement. When A^s_{t-k} and A^s_t are replaced by ρA_{t-k} and μA_t, respectively, we have:

$$P_t=b_0+\mu b_1 A_t+\sum_{k=1}^{\tau}\rho b_{-k}A_{t-k}+\sum_{k=1}^{\tau}b_{1+k}A_{t+k}+\varepsilon_t \tag{9}$$

To simplify the equation, let's restate coefficients μb_1 and ρb_{-k} as σ and ω_{-k}. Thus, we have:

$$P_t=b_0+\sigma A_t+\sum_{k=1}^{\tau}\omega_{-k}A_{t-k}+\sum_{k=1}^{\tau}b_{1+k}A_{t+k}+\epsilon_t \tag{10}$$

Equation (10) gives us an important message based on which the current study is operationalized: **prices at time t are linked to accounting earnings from the current periods (t) as well as lead (t+k) and lag (t-k) periods**. In other words, market prices reflect not only earnings information that is already disclosed, but also information that will be disclosed in the future periods, because some future earnings can be anticipated by the market in advance of its disclosure. However, this anticipation is not perfect. The accuracy of the anticipation is usually decreasing along the time horizon from t to $t+k$ ($k \geq 1$). Market prices will be revised upon the arrival of new information for unexpected earnings. It should also be noted that earnings from previous (lag) and future (lead) periods carry different types of information. Earnings from lag periods are used by the market to evaluate the "earnings persistence5", while future earnings represent "an *ex post* growth rate" (Collins *et al.*, 1994).

In fact, equation (10) is an indefinite lead/lag combined model which consists of three parts: (1) a simple price model which relates current market price with current earnings; (2) a lag model which relates current market price to previous earnings; and (3) a lead model which relates current market price to future earnings. It should be noted that the reasoning underlying the lag part and the lead part is quite different. For the lead part, it is assumed that **future earnings** are anticipated based on the current and previous accounting earnings, as well as non-accounting information, in the current period. That is, **current** measures provide additional information as to the future performance of the business. For the lag part, however, past measures are used **along with** the current accounting information to predict the future performance in the current period.

To facilitate further operationalization, equation (10) is rewritten as:

$$P_t = a + b_0 A_t + b_{-1} A_{t-1} + b_1 A_{t+1} + b_{-2} A_{t-2} + b_2 A_{t+2} + \cdots + \varepsilon_t \qquad \textbf{(11)}$$

where the regression coefficients are identified by b for ease of reference and the subscripts of the b coefficients correspond to the respective lag or lead period.

---

5. Foster (1977) suggested a time series model using quarterly accounting earnings to estimate earnings persistence. When quarterly earnings are used, the model would be:

$$E_{it+1} - E_{it-3} = \gamma_{il} + \beta_i^a (E_{it} - E_{it-4}) + \varepsilon_{it}$$

where β^a is the earnings persistence measure. This model suggests that the earnings persistence measure is based on the relationship between current and previous earnings.

To understand how accounting earnings from different periods play a different role in the market, coefficients from equation (11) are decomposed in equation (12) so that a speed of decay can be obtained.

$$P_t = a + b_0 A_t + b_0 \gamma_{-1} A_{t-1} + b_0 \gamma_1 A_{t+1} + b_0 \gamma_{-2} A_{t-2} + b_0 \gamma_2 A_{t+2} + \cdots + \varepsilon_t \tag{12}$$

where $\gamma_k = b_k/b_0$ ($k = \pm 1, \pm 2, \ldots$). b_0 can be interpreted as the response coefficient, and γ_k reflects the speed of decay implicit in investors' reliance on information pertaining to period $t+k$.

Although equations (11) and (12) are straightforward and easy to interpret, it is not feasible to empirically estimate the model in its infinite form. To actually estimate equations (11) and (12), the models have to be modified in one of the following ways: either (a) define arbitrarily a definite time horizon (i.e., determine the number of periods for the tests), as was done in Kothari and Sloan (1992) and Collins *et al.* (1994); or (b) convert the indefinite model into an autoregressive model. This study will attempt both of these approaches.

To determine the length of the time horizon for the tests, this study follows Kothari and Sloan (1992) and Collins *et al.* (1994) using a three-year period (i.e., three years before the current and three years after the current, for a total of seven years). To avoid losing too many observations, a two-year period will also be used. Realizing that this approach lacks both theoretical and empirical support in selecting the length of the time horizon, I will also convert the indefinite model into an autoregressive model. However, the existing econometric literature does not provide any autoregressive model for lead/lag combined periods. Rather, all available autoregressive models, including the Koyck transformation, the adaptive expectations model, the partial adjustment model, and the Almon approach, deal only with either lag or lead periods, but not both. It is, therefore, necessary to develop my own methodology to transform the indefinite model into an autoregressive model.

The transformation starts with defining three instrument variables, α, β, and γ which have a relation with another instrument variable θ as follows6:

$$\theta_0=\gamma[1+2\alpha\beta+\binom{4}{2}\alpha^2\beta^2+\binom{6}{3}\alpha^2\beta^2+\cdots]$$

$$\theta_{-1}=\gamma[\alpha+\binom{3}{2}\alpha^2\beta+\binom{5}{3}\alpha^3\beta^2+\binom{7}{4}\alpha^4\beta^3+\cdots]$$

$$\theta_1=\gamma[\beta+\binom{3}{1}\alpha\beta^2+\binom{5}{2}\alpha^2\beta^3+\binom{7}{3}\alpha^3\beta^4+\cdots]$$

$$\theta_{-2}=\gamma[\alpha^2+\binom{4}{3}\alpha^3\beta+\binom{6}{4}\alpha^4\beta^2+\binom{8}{5}\alpha^5\beta^3+\cdots]$$

$$\theta_2=\gamma[\beta^2+\binom{4}{1}\alpha\beta^3+\binom{6}{2}\alpha^2\beta^4+\binom{8}{3}\alpha^3\beta^5+\cdots]$$

$$\theta_{-3}=\gamma[\alpha^3+\binom{5}{4}\alpha^4\beta+\binom{7}{5}\alpha^5\beta^2+\binom{9}{6}\alpha^6\beta^3+\cdots]$$

6. Helpful comments on the transformation procedures from Professor Minggao Gu are gratefully acknowledged.

$$\theta_3=\gamma[\beta^3+\binom{5}{1}\alpha\beta^4+\binom{7}{2}\alpha^2\beta^5+\binom{9}{3}\alpha^3\beta^6+\cdots]$$

....

Since the use of information is diminished along the time horizon, we assume the time series is convergent, i.e., $|\alpha| + |\beta| < 1$. By utilizing a forward operator F (i.e., $FA_{t-1} = A_t$) and a backward operator B (i.e., $BA_{t+1} = A_t$), equation (12) can be rewritten as:

$$P_t=\gamma[1+(\alpha B+\beta F)+(\alpha B+\beta F)^2+\cdots+(\alpha B+\beta F)^\tau]A_t+\epsilon_t \tag{13}$$

which can be re-expressed as:

$$P_t=\frac{\gamma}{1-\alpha B-\beta F}A_t+\epsilon_t \tag{14}$$

or equivalently:

$$P_t-\alpha P_{t-1}-\beta P_{t+1}=\gamma A_t+\zeta_t \tag{15}$$

where $\zeta_t = \varepsilon_t (1 - \alpha B - \beta F)$. Based on equation (15), I develop a lead/lag combined autoregressive model:

$$P_t=\alpha P_{t-1}+\beta P_{t+1}+\gamma A_t+\zeta_t$$

The autoregressive model presented in equation (16) can be estimated to find consistent estimates of the parameters α, β, and γ, and their standard errors. These parameters can then be used to estimate θs and test the research hypotheses developed in chapter 4.

Chapter 6
Methodological Issues

This chapter is devoted to discussions of some methodological and econometric issues relating to the model developed in chapter 5.

§6.1 Selection between return and price models

The debate in the accounting literature on whether to use return models, in which returns are regressed on a scaled earnings variable, or price models, in which stock prices are regressed on earnings per share has remained inconclusive. While some researchers believe that return models are theoretically superior to price models (e.g., Gonedes and Dopuch, 1974), others are more favourably disposed towards price models (e.g., Landsman and Magliolo, 1988). Still others believe that these two models are complementary rather than competitive. In a recent paper, Kothari and Zimmerman (1995) found that the slope or earnings response coefficients are substantially less biased in price models than in return models. Coefficients from the price model, but not the return model, imply cost of capital estimates that are more in line with those observed in the market. Also, the time series of implied cost of capital estimates from cross-sectional price models more closely approximate long-term interest rates plus a risk premium than does the corresponding time series from return models. Nevertheless, price models do not unambiguously dominate return models. Price models more frequently reject tests of heteroscedasticity and/or model misspecification than return models do (p.157). Since each model has its weakness, researchers should be aware of their respective econometric limitations in designing research studies.

This study selects the price model to match one of its underlying assumptions which states that market prices lead accounting earnings, and consequently, market prices reflect not only information about current and past earnings, but also yet-unrealized future earnings. These anticipated earnings will become a "stale" component when earnings are announced in a future period. In the return model, the stale component is irrelevant in explaining current return and thus constitutes an error in the independent variable, biasing the slope coefficient on earnings toward zero (Brown *et al*, 1987). By contrast, the current stock price in the price model reflects the **cumulative effect of earnings information**, and thus varies due to both the **surprise** and **stale** components. Therefore, there is no error-in-variables bias in price-model regression. In brief, when only the information in the current and past earnings is used by the market in setting prices (i.e., price does not lead earnings), these two models are equivalent in the sense that they both yield a slope coefficient of 1/r, where r is the expected rate of return (Christie, 1987). However, when it is assumed that prices lead earnings, as is done in this study, the price models then produce a theoretically more justifiable framework, and less biased results.

Despite this, price models have inherent limitations. Intuitively, current earnings are uncorrelated with the information about future earnings contained in the current stock price. Econometrically, the price model thus has an uncorrelated omitted variable, which reduces explanatory power (Maddala, 1990). For this reason, Kothari and Zimmerman (1995) suggest that researchers exercise more care in drawing statistical inferences. However, this problem is less crucial to our study because the focus of the study is not the values of explanatory power but the patterns of coefficients before and after the current period.

§6.2 Econometric issues related to the autoregressive model[1]

In the previous chapter the lead/lag combined model (equation 12) was transformed into an autoregressive model (equation 16). Though the transformation used in this study is different from all existing methods discussed in econometric literature (e.g., Koyck transformation, the adaptive expectations model, and the partial adjustment model), it does have at least one thing in common with these models: they are all autoregressive models. Therefore, it is necessary to look at the estimation problem of such models, because the classical least-squares procedure may not be directly applicable to our model.

Note that the classical least-squares procedure is based on the assumption that the independent variables either are non-stochastic or, if stochastic, are distributed independently of the stochastic disturbance term. Hence, we must find out if the new independent variables on the right-hand side, P_{t-1} and P_{t+1}, still satisfy this assumption. As a dependent variable, P_t, by its nature, must be stochastic because its expected value depends on the value of independent variables. Both P_{t-1} and P_{t+1} must also be stochastic, because they belong to the same time series as P_t does, and thus have the same nature. With some of the independent variables being stochastic, we must then examine whether P_{t-1} and P_{t+1} are serially correlated with the error term.

To determine whether the stochastic independent variables P_{t-1} and P_{t+1} are distributed independently from the new error term ζ_t, it is desirable to first know the properties of the original error term ε_t. It is assumed in this study, as in all other market-based accounting research, that ε_t satisfies all the classical assumptions, such as $E(\varepsilon_t) = 0$,

[1]. The discussion in this section is based in part on Maddala (1990), Pindyck and Rubinfeld (1991), Greene (1993), and Gujarati (1995).

$var(\varepsilon_t) = \sigma^2$ (the assumption of homoscedasticity), and $cov(\varepsilon_t, \varepsilon_{t+s}) = 0$ for $s \neq 0$ (the assumption of no autocorrelation). However, it is easy to see that ζ_t does not inherit all these properties, because the new error term ζ_t is obviously correlated with ε_t. From equation (15) we know that $\zeta_t = \varepsilon_t (1\text{-}\alpha B\text{-}\beta F) = \varepsilon_t - \varepsilon_t \alpha B - \varepsilon_t \beta F = \varepsilon_t - \varepsilon_{t-1}\alpha - \varepsilon_{t+1}\beta$, where F and B are forward and backward operators, respectively. Given the assumption underlying ε_t, it is easy to see that ζ_t is serially correlated because

$$
\begin{aligned}
E(\zeta_t \zeta_{t-1}) &= (\varepsilon_t - \varepsilon_{t-1}\alpha - \varepsilon_{t+1}\beta)(\varepsilon_{t-1} - \varepsilon_{t-2}\alpha - \varepsilon_t\beta) \\
&= \varepsilon_t\varepsilon_{t-1} - \varepsilon_t\varepsilon_{t-2}\alpha - \varepsilon_t\varepsilon_t\beta - \varepsilon_{t-1}\alpha\varepsilon_{t-1} + \varepsilon_{t-1}\alpha\varepsilon_{t-2}\alpha + \varepsilon_{t-1}\alpha\varepsilon_t\beta - \varepsilon_{t+1}\beta\varepsilon_{t-1} \\
&\quad + \varepsilon_{t+1}\beta\varepsilon_{t-2}\alpha + \varepsilon_{t+1}\beta\varepsilon_t\beta
\end{aligned}
$$

Since the covariance between ε's is zero by assumption, then

$$E(\zeta_t \zeta_{t-1}) = \varepsilon_t^2\beta - \varepsilon_{t-1}^2\alpha$$

which is generally different from zero.

When one or more independent variables are correlated with the stochastic error disturbance term, the OLS estimators are not only biased but also inconsistent; that is, even if the sample size is increased indefinitely, the estimators do not approximate their true population values. Therefore, estimation of the autoregressive model by the usual OLS procedure may yield seriously misleading results (Gujarati, 1995, p.603). Since OLS cannot be applied to our model, remedial measures are needed to resolve the estimation problem.

To test whether this study does actually have a problem of autocorrelation, the Durbin *h* test (Durbin, 1970) will be applied. The Durbin *h* test can be written as:

$$h=\hat{\rho}\sqrt{\frac{n}{1-n[var(\hat{a}_2)]}}$$

where n is the sample size, var(a_2) is the variance of the coefficient of the lag/lead variable, and ρ is the estimated first-order autocorrelation.

In this study, the OLS method will be applied to the autoregressive model, and the results will then be analyzed using the *h* statistic. If the null hypothesis that there is a first-order autocorrelation is rejected, no further remedies will be used. However, if the null hypothesis is not rejected, the Almon polynomial coefficients will be computed using an orthogonal reparameterization. It should be noted that the Almon approach applies only to the distributed lag model, while the autoregressive model used in this study includes both lead and lag terms. To apply the Almon approach, the lead terms must either be treated as lag terms or be ignored entirely. The coefficients resulting from the application of the Almon approach, therefore, may be severely distorted and are difficult to interpret. Fortunately, two definite lead/lag models which do not suffer from the same autocorrelation problem will also be used to test the same data sets. To make the regression results as rigorous as possible, tests of the autoregressive model in this study follow the procedures outlined below:

(1) Apply the OLS method to the autoregressive model;

(2) Perform the Durbin *h* test;

(3) If an autocorrelation problem is found, apply the Almon approach.

(4) Compare the results from the Almon approach with those from the OLS method. The output from the OLS method will be replaced by the Almon numbers only when the two sets of results lead to different conclusions.

In actual tests, only one autoregressive model is found to have very different results from the two approaches. In that case, results from the Almon approach are employed.

§6.3 Econometric issues related to the definite lead/lag model

The definite lead/lag model regresses prices on current earnings plus earnings from two or three past and future periods. Because all independent variables are from the same time series, multicollinearity may exist. This section discusses two related issues: (1) whether multicollinearity is a severe problem for this study, and (2) the likelihood that conclusions reached in this study may be distorted by multicollinearity.

It should be noted that multicollinearity is "a question of degree and not of kind" (Kmenta, 1986, pp.431). Almost all data samples have some degree of multicollinearity. The meaningful distinction is, therefore, not between the presence and the absence of multicollinearity, but between its various degrees. Kmenta (1986) also points out that multicollinearity is a feature of the sample and not of the population. Therefore, we do not test for multicollinearity, as we usually do for other model specification problems. All we can do is to measure its degree in a particular sample, and to analyze its possible consequence. Unfortunately, we do not have one unique method of detecting it or measuring its strength; what we have are some rules of thumb (Gujarati, 1995).

One commonly used rule is to construct a correlation matrix to see if independent variables are highly correlated. Tables 6.1 and 6.2 summarize correlation coefficients for the U.S. and Japanese samples. Because only three past/future terms are included in the model, the matrices in Tables 6.1 and 6.2 provide correlation coefficients between earnings for year t (X_t) and earnings for year t±k, $1 \leq k \leq 3$, ($X_{t\pm k}$). In summary, average correlation coefficients for the U.S. sample are 0.618 (X_t vs. $X_{t\pm 1}$), 0.436 (X_t

vs. $X_{t\pm2}$), and 0.282 (X_t vs. $X_{t\pm3}$). Average correlation coefficients for the Japanese sample are 0.607 (X_t vs. $X_{t\pm1}$), 0.524 (X_t vs. $X_{t\pm2}$), and 0.379 (X_t vs. $X_{t\pm3}$). It is recognized in the econometrics literature that a high value of correlation coefficients (about 0.8 to 0.9 in absolute value) indicates high correlation between two independent variables (Kennedy, 1985, pp.150). Results from Tables 6.1 and 6.2 suggest that, although certain degree of multicollinearity may exist, samples in the study may not suffer from severe multicollinearity problems. However, high correlation is a sufficient but not a necessary condition for the existence of multicollinearity because it can exist even though correlations are comparatively low (Gujarati, 1995, pp.336). Thus, additional analysis of the existence of multicollinearity is required.

Another rule of thumb is to see if a high R^2 is reported but only few significant *t* ratios are found (Gujarati, 1995; Kennedy, 1985). Regression results reported in Chapter 8 clearly indicate that most of *t* ratios in this study are greater than or close to 2, suggesting again that the existence of significant multicollinearity is not evidenced in our samples.

Although the above analysis on correlations and *t* values indicates that multicollinearity is not a severe problem for our samples, it is desirable, nevertheless, to discuss the probable impact of multicollinearity on our conclusions. It should be noted that even if multicollinearity is very high, the OLS estimators are still best linear unbiased estimators (BLUE). Because multicollinearity violates no regression assumptions; unbiased, consistent estimates will occur, and their standard errors will be correctly estimated (Achen, 1982, pp.82). However, the OLS estimators have large variances and covariances, and confidence intervals tend to be much wider, leading to the acceptance of the "zero null hypothesis" more readily. Consequently, the *t* ratios of one or more coefficients tend to be statistically insignificant but R^2 can be very high (Gujarati, 1995, pp.327). Recall that the analysis in this study focuses on the pattern of (or, the relation among) regression coefficients rather than on the significance of individual coefficients. This pattern is unlikely to be changed even if multicollinearity is very high. As Kennedy (1985, pp.151) argued, if the researcher's interest is centred on the linear combination of coefficients, multicollinearity need not be of concern. Therefore, our conclusions will not be distorted even if a considerable degree of multicollinearity is presented.

§6.4 Selection of the length of the window

Empirical studies of the association between stock prices and earnings can be generally classified into two categories: long-window association studies and short-window event studies. The association studies usually estimate regression coefficients over a forecast horizon that corresponds roughly with the fiscal period; while the event study approach usually uses a window of 2-3 days. The objectives of and methodological considerations for these two types of studies are quite different. Consequently, the coefficients resulting from the regression are interpreted differently. The coefficients from an association study indicate how closely the stock prices and accounting earnings are related to each other. In an event study, regression coefficients indicate the informativeness of accounting information, i.e., how likely it is that a particular event such as an earnings announcement may cause the market to revise its cash flow expectations. However, there is no consensus among researchers for a precise definition of either association or event studies. Cho and Jung (1991) believe that the association study approach is aimed at identifying factors that affect earnings response coefficients (ERC), consequently labelling studies using it as "ERC determinant studies". Easton and Zmijewski (1989b), however, define the approach in a broader way (which, incidentally, more closely fits the objectives of this study). They suggest that the association study does not examine the informational role of accounting earnings in valuation, rather, it examines the ability of accounting earnings to summarize the information that arrives during this period. This assertion is echoed by Collins and Kothari (1989) who claim that association studies recognize that market agents learn about earnings and valuation-relevant events from many nonaccounting information sources throughout the period. Thus, these studies investigate whether accounting earnings measurements are consistent with the underlying events and information set reflected in stock prices. Typically, causality is not inferred. Rather, the focus is on whether the earnings determination process captures in a **meaningful** and **timely** fashion the valuation relevant events.

As indicated in the discussion in Chapter 2, research questions of this study centred on the information asymmetry between investors and firms' management. This information asymmetry is assumed to be different between the U.S. and Japan, as well as between different types of investors who either have differential access to private, **non-accounting information**, or are different in their ability and willingness to further process this information. In other words, if the accounting earnings cannot capture most non-accounting information released during the period, the information asymmetry between investors and management, and between informed and non-informed investors would be regarded as being relatively high, everything else being equal. By using appropriate proxies, the difference in information asymmetry is expected to be reflected in our regression coefficients. This research objective is more likely to be achieved by using the association study approach.

Table 6.1

Pearson Correlation Coefficients

Time-Series of Accounting Earnings for U.S. Firms

1976 - 1995

t-3	t-2	t-1	t	t+1	t+2	t+3
-	-	-	1976	0.579	0.453	0.343
-	-	0.579	1977	0.469	0.442	0.380
-	0.453	0.469	1978	0.522	0.379	0.311
0.343	0.442	0.522	1979	0.834	0.624	0.307
0.380	0.379	0.834	1980	0.645	0.372	0.160
0.311	0.624	0.645	1981	0.487	0.393	0.314
0.307	0.372	0.487	1982	0.733	0.549	0.304
0.160	0.393	0.733	1983	0.583	0.425	0.146
0.314	0.549	0.583	1984	0.912	0.548	0.420
0.304	0.425	0.912	1985	0.641	0.287	0.212
0.146	0.548	0.641	1986	0.528	0.556	0.199
0.420	0.287	0.528	1987	0.512	0.276	0.287
0.212	0.556	0.512	1988	0.855	0.388	0.312
0.199	0.276	0.855	1989	0.463	0.429	0.267
0.287	0.388	0.463	1990	0.568	0.403	0.264
0.312	0.429	0.568	1991	0.572	0.463	0.294
0.267	0.403	0.572	1992	0.628	0.511	0.266
0.264	0.463	0.628	1993	0.757	0.354	-
0.294	0.511	0.757	1994	0.455	-	-
0.266	0.354	0.455	1995	-	-	-
0.282	0.436	0.618	Average	0.618	0.436	0.282

Table 6.2

Pearson Correlation Coefficients

Time-Series of Accounting Earnings for Japanese Firms

1985 - 1995

t-3	t-2	t-1	t	t+1	t+2	t+3
-	-	-	1985	0.637	0.502	0.398
-	-	0.637	1986	0.731	0.474	0.516
-	0.502	0.731	1987	0.565	0.550	0.307
0.398	0.474	0.565	1988	0.619	0.703	0.411
0.516	0.550	0.619	1989	0.592	0.521	0.361
0.307	0.703	0.592	1990	0.458	0.442	0.277
0.411	0.521	0.458	1991	0.502	0.518	0.403
0.361	0.442	0.502	1992	0.716	0.502	0.355
0.277	0.518	0.716	1993	0.435	0.500	-
0.403	0.502	0.435	1994	0.818	-	-
0.355	0.500	0.818	1995	-	-	-
0.379	0.524	0.607	Average	0.607	0.524	0.379

Chapter 7
Samples and Data

Both U.S. and Japanese companies are sampled for this study. The U.S. firms are selected for the sample from the 1995 Standard and Poor's Compustat annual U.S. industrial file containing both monthly market price and annual accounting data for 20 years up to 1995. Sample firms must satisfy the following specifications: (1) listing on either NYSE and AMEX; (2) data items required for this study must be available at least for three consecutive years without any missing items; (3) available data items are sufficient to calculate the required price, earnings and size measures, adjusted for stock splits and stock dividends; (4) the company's fiscal year end must be December 31; and (5) financial institutions such as banks, securities firms and insurance companies are excluded.

Based on these criteria, a total of 17,353 firm/year observations are obtained from the Compustat file. It should be noted that data required for autoregressive and lead/lag definite models are more restrictive than using single-year earnings. Missing data in one year, for example, will induce a loss of data for three years in my autoregressive model, and a loss of data for up to seven years for the lead/lag definite models. Therefore, after the required price, earnings and size variables are calculated for the models, the sample size has reduced to 14,512, 12,078, and 9,908 firm/year observations, respectively.

Japanese firms are selected from the ***Analysts Guide***, an annual database published by *Daiwa Securities* in Tokyo, Japan. The ***Analysts Guide*** contains detailed market and accounting information for five years — the current year plus four previous years. A total of 1099 Japanese companies listed on the first section of the Tokyo Stock Exchange

(TSE)[1] were covered in the 1995 edition. The number of Japanese companies covered in earlier editions is slightly smaller. The data set available to this study contains valid data for 11 years up to 1995. The criteria used in selecting the sample of Japanese firms is similar to the one used in selecting the U.S. sample firms with only one important difference: the fiscal year end is March 31 rather than December 31. We observed that the number of Japanese firms using March 31 as their year end has increased during the sample period (1985 - 1995). In 1995, about 90% Japanese firms surveyed in ***Analysts Guide*** have their year end at March 31. A total of 8,212 firm/year observations are obtained from the ***Analysts Guide***. After calculating the required price, earnings, and size measures for three models, the sample sizes are reduced to 6,429, 4,586, and 3,007 firm/year observations, respectively. However, both the U.S. and Japanese sample sizes for this study are comparable to Jacobson and Aaker (1993) which had 11,552 and 7,101 firm/year observations for their U.S. and Japanese samples, respectively. Descriptive statistics for both the U.S. and Japanese data are summarized in Table 7.1.

The percentages of different types of ownership are directly available for the Japanese sample from the ***Analysts Guide***. The percentage of institutional holdings for U.S. firms is obtained from Standard & Poor's ***Stock Market Encyclopedia*** (November 1995). A total of 662 firms are matched between the Compustat file and the ***Stock Market Encyclopedia***. These firms are sorted on the percentage of institutional holdings; firms from the top 25% (bottom 25%) form the "high (low) institutional holdings" sub-sample.

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1. The TSE comprises first and second sections. When listed on the stock exchange, a domestic company is originally assigned to the second section. The stock exchange subsequently examines whether the stock is qualified to be listed on the first section. At the end of 1990, the first section had 1,191 companies and 357 trillion yen (2.6 trillion U.S. dollars) of market capitalization. The first section was comparable to the New York Stock Exchange in its size and coverage. The second section had 425 companies and 14 trillion yen (103 billion U.S. dollars) of market value. This is comparable to AMEX which had 101 billion dollars (888 companies) (Hamao, 1991). Thus, the first section dominates the second section since the size of the second section is less than 10% of the first section in terms of market values and total assets.

The high institutional holdings sub-sample consists of 2,798, 2,454, and 2,112 firm/year observations for the three models respectively. The low institutional holdings subsample covers 2,514, 2,197, and 1,881 firm/year observations respectively. Since the ***Stock Market Encyclopedia*** does not provide information on individual holdings as the ***Analysts Guide*** does, it is assumed in this study that high institutional holding is equivalent to low individual holding, and vice versa.

In this study, the *number of shares outstanding* refers to the number of common shares outstanding at the end of each accounting period, on an ex-rights basis. The *adjusted stock price* refers to the closing stock price at the end of each accounting period, adjusted for stock dividends and capital transactions using the Dow Adjusting Factors. Following Atiase (1985) and Freeman (1987), this study uses the market value of common shares outstanding at the end of each accounting period as the size metric. Firm/years are sorted according to their sizes, from the smallest to the largest. The smallest 25% firm/years are selected as the small firm subsample, and the largest 25% as the large firm subsample. As a result of this aggregation procedure, data from the same company may be located in different subsamples.

Table 7.1

Descriptive Statistics

	Mean	Std. Deviation	Max.	Min.
U.S. firms (17,353 firm/year observations)				
Earnings Per Share ($)	24.9316	910.109	63,764.41	-
Size ($ million)	1,449.412	8183.674	576,879	
Institutional Shareholders (%)	53.853	16.785	96	
Japanese firms (8,212 firm/year observations)				
Earnings Per Share (¥)	21.0034	37.9990	833.60	-5
Size (¥10,000)	419,477.10	1,061,839	16,097,542	6
The 10 Largest Shareholders (%)	44.91	12.36	83.0	
Special Shareholders (%)	43.84	47.63	97.7	
Institutional Shareholders (%)	39.51	14.08	94.0	
Individual Shareholders (%)	32.24	269.49	95.2	

The 10 Largest Shareholders (%) is the average percentage of a firm's shares owned by the 10 largest shareholders of the firm. **Special Shareholders (%)** is the average percentage of a firm's shares owned by either the 10 largest shareholders who are not institutional shareholders, or the issuing company's directors. **Institutional Shareholders (%)** is the average percentage of a firm's shares owned by institutional shareholders such as financial institutions. **Individual Shareholders (%)** is the average percentage of a firm's shares owned by individual shareholders.

Chapter 8
Tests and Analyses

This chapter is devoted to data analyses and tests of hypotheses. After a preliminary test on the model selection, a general test of the similarity between the U.S. and Japanese samples is presented, followed by detailed tests on subsamples which are discussed in the form of comparisons. A dummy variable is constructed for each pair of subsamples to test whether the two subsamples involved are statistically significantly different. Full model regression results for each pair of subsamples are summarized in tables, accompanied by a stepwise analysis.

§ 8.1 Preliminary Tests on Model Selection

The preliminary test is designed to verify the validity of the inter-temporally (i.e., both time-series and cross-sectional) pooled regression to this study. Because the pooled regression may suffer from the underlying assumption that regression coefficients are constant both cross-sectionally and time-seriesly, the year-by-year cross-sectional regression is used to assure that the instability problem does not significantly affect the regression results. The year-by-year cross-sectional regression is performed using the autoregressive model on the U.S. and Japanese data. Table 8.1 reports the cross-sectional regression results using the autoregressive model. When compared to the pooled regression results, the Japanese sample exhibits similar results, as indicated by both the magnitudes of coefficients and the explanatory power. R^2s from the pooled method are 0.9211 and 0.8354 for the U.S. and Japanese samples, respectively; and R^2s from the cross-sectional regression are 0.9841 and 0.8850, respectively. Among the three independent variables (P_{t-1}, P_{t+1}, and X_t), both methods report the highest coefficient on current earnings (X_t). This fact suggests that the time-series data do not suffer from significant variation, and the pooled method is as reliable as the cross-sectional method.

Regression coefficients from Table 8.1 are plotted in Figures 8.1 and 8.2.

Figure 8.1 shows that the ERC experienced considerable volatility before 1983 for the U.S. sample, and became very stable ever since. The coefficients on lead and lag terms did not show similar volatility. A possible explanation for this volatility relates to the strict monetarist money supply policy adopted by the Federal Reserve during the 1979-1982 period in U.S. Under this money supply policy, control of the money supply, not the interest rate, was the main concern, which led to significant gyrations in interest rates during the period. Since ERCs are usually believed to be inversely related to the cost of equity, it is not surprising that they were significantly volatile in the same period[1]. Figure 8.2 indicates that ERC has been very volatile throughout this period for the Japanese sample, and no pattern can be found to characterize changes in ERC.

§ 8.2 Overall differences between the two countries: Test of Hypothesis I (Table 8.2)
Hypothesis I states that, when firm size and ownership structure are **not** controlled, Japanese firms will show more significant coefficients on earnings of current and future periods whereas U.S. firms will show more significant coefficients on earnings of past periods. Regression results from the autoregressive model fully support the hypothesis. The definite lead/lag models report greater coefficients for Japanese firms for all periods, indicating that Japanese earnings are generally more informative than that reported in U.S.

Table 8.2 summarizes regression results related to Hypothesis I. It is evident that the autoregressive model has greater explanatory power than the two definite lead/lag models as indicated by the R^2s of the respective models. This result is not altogether surprising,

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1. I am grateful to Professor Michel Magnan for suggesting this explanation.

since theoretically the autoregressive model covers an indefinite time horizon while the other two models are restricted to two (three) years before and after the current year. This fact also lends support to the validity of the model development procedure adopted for this study (as outlined in Chapter 6).

A dummy variable is added to the other variables in each of the three models to test whether the two samples are significantly different. The dummy variable regressions are:

Model 1: $P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + b_dD + e$

Model 2: $P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + b_dD + e$

Model 3: $P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + b_dD + e$

The dummy variable *D* is assigned a value of 1 for the first sample (or subsample) and 0 for the other. The coefficient b_d attached to the dummy variable *D* is the differential intercept which measures the difference between the intercepts related to the two samples.

With respect to the differences between the U.S. and Japanese samples, all three models show significant differences between the two samples (p-values 0.0235, 0.0001 and 0.0001, for models 1 to 3, respectively). The results of the stepwise regression for model 1 suggest that P_{t+1} (a future-oriented variable) plays the most important role in explaining the variations in the Japanese sample, whereas P_{t-1} does the same for the U.S. sample. Further, the Japanese sample also evidences a significantly larger coefficient on X_t (the current period's earnings) than the U.S. sample. These two findings are also clearly observed with respect to the two other models. In addition, results from model 3 report more significant coefficients on future periods for Japanese firms than for U.S. firms. In brief, results from model 1 indicate that Japanese earnings information, in general, are more future oriented than U.S. earnings.

Some other interesting observations can also be made from the results related to model 3. First, while the coefficients on earnings from current and future periods for the Japanese sample are all highly significant and clearly higher than those for the U.S. sample, the coefficients on the past terms are found to be more highly significant for the U.S. sample (all p-values are at 0.0001) relative to the Japanese sample (only one p-value is 0.0001). This indicates that information available to Japanese investors carries more future-relevant elements, rendering Japanese investors more future-oriented in their investment decisions. These findings are consistent with Jacobson and Aaker (1993). Second, the coefficient of X_t for the U.S. sample (0.3857) is markedly low, even lower than that of period t+1 (4.985). This could be explained by one of two possible reasons: (1) most of the information content relating to current earnings has already been anticipated by the market before the current earnings announcement, (2) the existence of other competing sources of non-accounting information that help investors effectively predict current earnings before the actual earnings announcement. However, as discussed earlier, Japanese investors are better informed about future earnings than U.S. investors, and consequently the former reason does not seem to be valid. Since there is a tradition of secrecy deeply rooted in Japanese culture, the availability of competing sources of accounting and non-accounting information is very restricted. This suggests that the differences between the respective information environments of the two countries is primarily responsible for the observed results.

§ 8.3 Information asymmetry: Availability vs. processing ability: Hypothesis II

Hypothesis II proposes that information asymmetry between management and investors should be examined by using two proxies for the two aspects hypothesized as being responsible for it, namely, information availability and the ability to process information. The results imply that two proxies suggested in this study actually capture different aspects of information asymmetry.

§ **8.3.1 Information availability - Firm size test** (Tables 8.3 and 8.4)

With respect to the U.S. sample, there is a significant difference between large and small firms — the dummy variable tests produce p-values of 0.0001 for all three models (Table 8.3). The R^2s obtained for the two subsamples (large vs. small firms) are strikingly different, especially for the two definite lead/lag models (36.62 vs. 92.71, and 52.30 vs. 94.28 respectively), indicating that the two subsamples possess different characteristics in processing earnings information.

Higher coefficients are obtained on earnings of future periods for the large firm subsample than for the small firms, especially in models 2 and 3 (range from 2.7061 to 5.9620 for large firms, from -0.8908 to 0.0871 for small firms), suggesting that information available for large firms in the U.S. allows investors to better predict these firms' future profitability. The large firm subsample also demonstrates a longer time horizon of significant regression coefficients both before and after the current period. This provides further support for the hypothesis that firm size efficiently proxies for differences in the availability of information. However, the sign and magnitude of the coefficient on the current period's earnings for the large firm subsample in model 2 is contrary to expectations, for which no explanation is readily available. For model 3 the same coefficient is positive, although obviously low. This may be explained by the fact that there is an abundance of non-accounting information available in the market from other sources for large firms only, since these firms are more likely to be followed by a large number of analysts through different media. The stepwise regression also suggests that time horizon of earnings information processing is longer for large firms than for small firms, since more future and past periods' earnings are included when the explanatory power of regression is maximized. In addition, stepwise regression also indicates that the explanatory power of the regression for small firms is mainly from past and current earnings, whereas most of the explanatory power for large firms is related to future earnings.

With respect to the Japanese sample (Table 8.4), the difference between the large firm and small firm subsamples is as significant as in the case of the U.S. sample. However, contrary to the U.S. sample, the coefficients of the current and future periods' earnings for large firms are markedly higher than those for small firms. For example, coefficients on current earnings for large Japanese firms are 11.9318, 26.8554, and 27.9626 for models 1 to 3, but are only 0.7308, 2.3120, and 2.0558 for small firms, respectively. This suggests that: (1) current earnings summarize more information for large firms than for small firms, and (2) the information available is more future-oriented for large firms than for small firms. However, the time horizon on which the significant coefficients reported is short for both large and small Japanese firms which covers only the current year plus one future and one past year. This fact suggests that although the availability of earnings information is different, the quality of the information may be very similar, which does not allow investors to predict earnings for a longer period. Notably, there are negative coefficients on the earnings of periods t-1 and t-2 for large firms from models 2 and 3. This may be interpreted as a reversal of the trend observed with respect to the unreasonably high price/earnings ratios in the late 1980s.

§ 8.3.2 Processing ability - Ownership structure test

The ownership structure refers to the relative proportion of shares held by institutional shareholders. Table 8.5 summarizes regression results relating to high versus low institutional holdings for the U.S. sample. The dummy variable tests of model 1 and 2 (p-values are 0.8066 and 0.0642, respectively) indicate that there is no significant difference between the high and low institutional shareholder subsamples, implying that the difference in their ability to process information is not reflected in market prices. This is echoed by the dummy variable test of model 1 for the Japanese sample (Table 8.6, p-value is 0.7089). The same test of other models (model 3 for the U.S. sample (p-value is 0.0199) and model 2 and 3 for the Japanese sample (p-values are 0.0015 and 0.0001, respectively) show significant differences between the high and low institutional shareholder subsamples. The mixed results, therefore, indicate that this part of the hypothesis is not conclusively supported. However, when sample firms are classified directly on the proportion of individual ownership, the hypothesis is overwhelmingly supported, as indicated in Table 8.7 (p-values from dummy variable tests are 0.0006, 0.0001, and 0.0004 for models 1 to 3, respectively). Unfortunately, this information is not available for our U.S. sample. Further research using finer data may produce more conclusive results.

Nevertheless, these tests provide some interesting findings for the Japanese sample. Results from model 2 (Table 8.6) provide overwhelming evidence that the information for the high institutional shareholders is clearly future-oriented, as can be seen from the significance and magnitude of the coefficients of the current and future periods' earnings. For example, none of coefficients of future earnings is significant for low institutional holding firms, whereas two coefficients are significant for high institutional holding firms. This pattern is also confirmed by coefficients on periods from t to $t+2$ which are

12.5205 (7.8636), 5.8142 (3.4528), 3.0577 (-0.9741) for the high (low) institutional holding subsample. On the other hand, the same model clearly indicates that the coefficients of the past periods' earnings for the low institutional holders (2.9283 and 2.6932) are much larger than those for the high holders (0.6318 and 0.3761), suggesting that low institutional holders rely more heavily on historical information relative to the high institutional holders. This difference in their information focus is also supported by the order of the variables selected by the stepwise analysis, which indicates that most of the explanatory power relates to earnings of future periods for the high holding subsample whereas most explanatory power for the low holding group relates to past earnings. Model 3 provides a somewhat different picture — although high coefficients are found for the high institutional shareholders, only current earnings maximize the explanatory power of the model using the stepwise algorithm. This suggests that while the information is future-oriented, current earnings have the highest explanatory power with respect to the observed variance.

The Japanese data provide additional information on the proportion of shares held by individual shareholders. Table 8.7 report regression results which generally confirm the findings from the analysis of institutional holdings, i.e., contrary to institutional shareholders, Japanese individual shareholders tend to rely more on historical information relative to current or future-oriented information. This is evidenced both by the number of periods on which significant coefficients are reported, and by the order of variable selection in the stepwise analysis. For example, in model 1, high individually-held firms show lower coefficients on current and future earnings (1.8933 and 0.4652, respectively) than the low holding group (7.4022 and 1.4445, respectively). The reverse pattern is found on past periods' earnings: high for the high holding group (0.4526) and low for the low holding group (0.3670). Similar results are also reported from models 2 and 3, although less overwhelming and less consistent.

§ 8.3.3 Information availability vs. processing ability - further comparison

To investigate whether firm size and ownership structure actually capture different aspects of the information environment, additional dummy variable tests are carried out to compare subsamples across these two aspects. The results are summarized below:

U.S. small firms vs. U.S. low institutional holdings: t-value=-7.911; p-value=0.0001.

U.S. large firms vs. U.S. high institutional holdings: t-value=-0.434; p-value=0.6645.

Japanese small firms vs. Japanese low institutional holdings: t-value=11.023; p-value=0.0001.

Japanese large firms vs. Japanese high institutional holdings: t-value=-4.573; p-value=0.0001.

The above results suggest that firm size and ownership structure generally capture different aspects of the information environment, except for U.S. large/institutionally-held firms. This can be explained by observing that shares of large U.S. firms are more likely to be held by investment institutions than small firms, and that, U.S. investment institutions are generally more interested in processing information on large firms than small firms. This interpretation is consistent with the different types of regression results relating to U.S. high institutional holdings which will be further elaborated in the following sections.

§ 8.4 Cross-national comparisons — Test of Hypothesis III

Hypothesis III proposes that, when controlled for firm size and ownership structure, more future earnings will be anticipated by Japanese investors, whereas more emphasis is placed on current and past earnings by U.S. investors. This hypothesis is generally supported by all three models.

In the two following subsections, comparisons will be made between the U.S. and Japanese samples with respect to the two hypothesized aspects of information asymmetry, information availability (proxied by firm size) and processing ability (proxied by ownership structure) respectively.

§ 8.4.1 Firm size test

When controlled for firm size, tests on small firms (Table 8.8) show that the U.S. sample is significantly different from the Japanese sample (p-values from dummy variable tests are 0.0001 for all models). The results (i.e., the magnitude of coefficients and the stepwise analysis) are again consistent with the finding that Japanese firms are overall more future-oriented than U.S. firms. For example, in model 1, U.S. firms show lower coefficients on current and future terms (0.0894 and 0.2464, respectively) than Japanese firms (0.7308 and 0.3647, respectively). The reverse pattern is found for past earnings: high for U.S. firms (1.2418) and low for Japanese firms (0.3056). Similar results are also reported from models 2 and 3. However, inconsistent with the foregoing discussion, for the U.S. sample, the coefficient of current earnings is not distinctly lower than the coefficients of both past and future earnings, indicating that the competing sources of information with respect to small firms are not significantly superior to the Japanese sample (Models 2 and 3). Tests from the two definite lead/lag models suggest that the time horizon on which significant coefficients are reported is relatively short for both samples, indicating that the information available on small firms allows investors to effectively predict earnings only for the period nearest to the current one, and also that historical earnings data before period t-1 is not very useful in predicting future earnings. These results indicate that the amount of earnings information available on small firms in both countries is generally not substantial. This again suggests that firm size captures an important aspect of information asymmetry as hypothesized.

With respect to large firms (Table 8.9), the U.S. sample is again significantly different from the Japanese sample (p-values from dummy variable tests are 0.0001 for all models). The results from the autoregressive model suggest that, in general, investors in large Japanese firms are more aware of future profitability than their U.S. counterparts, indicated by the high coefficients on both the current and future earnings (11.9318 and 2.3805 for Japanese firms, and 1.3036 and 0.4034 for U.S. firms). In sharp contrast to the small firm subsample, U.S. large firms show a very low coefficient on current earnings — not only lower than the corresponding coefficient from the Japanese sample, but also lower than coefficients of earnings of all other periods across the entire time horizon. This finding clearly suggests that considerable competing information sources exist for large U.S. companies only. These competing information sources also allow U.S. investors in the large firm sub-market to have a longer time horizon (up to period $t \pm 3$ in model 3) than those investing in large Japanese firms (only period t and period $t+1$ in model 3).

§ 8.4.2 Ownership structure test

When controlled for ownership structure, the U.S. sample is highly significantly different from the Japanese sample (p-values from dummy variable tests are 0.0001 for all models). The results from the autoregressive model (model 1 in Tables 8.10 and 8.11) suggest that, when controlled for ownership structure, Japanese firms with high institutional ownership exhibit clearly high coefficients on current and future earnings, evidencing a future-oriented information environment. However, firms with low institutional ownership exhibit a high coefficient only on current earnings, suggesting that for the low institutional ownership subsamples, cross-national differences are not as markedly evident as for the high institutional part. This observation is further supported by the results from the definite lead/lag model. For the high institutional shareholders, results indicate that U.S. investment institutions either have more resources or a greater ability to carry out earnings forecast than their counterparts in Japan (model 3 in Table 8.11).

Recall that in the absence of information on individual holdings for the U.S. sample, the study assumes that high institutional holdings correspond to low individual holdings, and vice versa. Results summarized in Tables 8.12 and 8.13 are generally confirmatory of the results discussed earlier with respect to cross-national comparisons of institutional holdings.

§ 8.5 Japanese within-sample analysis—Test of Hypothesis IV

Hypothesis IV which is related only to the Japanese sample, proposes that information processing ability is different when the nature of the ownership is different. The analysis first compares the subsample comprising firms mainly owned by the 10 largest (or special) shareholders with those firms with a diffuse ownership structure, and then makes this comparison across different categories, i.e. individual holdings versus the 10 largest shareholders' holdings.

Table 8.14 suggests that firms that are controlled by the 10 largest shareholders are distinctly different from other firms in terms of dummy variable tests (p-values are 0.0254, 0.0001, and 0.0001 for models 1 to 3, respectively). However, a careful analysis of regression coefficients does not reveal any systematic pattern. This is also true for the special shareholder group (reported in Table 8.15). This may be explained by the fact that many Japanese shareholders invest in related firms to show their support and permanent interest, rather than to obtain short-term capital gain (Jacobson and Aaker, 1993). The 10 largest shareholders and special shareholders usually have a permanent interest in the firm, which influences their approach to share ownership. These shareholders are more likely to hold shares in order to exercise a permanent influence or provide continuous inter-company support rather than seek capital gains like ordinary shareholders. Therefore, though these shareholders have access to insider information, their information is not reflected in the stock prices because they do not frequently trade on these shares.

Table 8.16 reports regression results on the comparison between individual holdings and the 10 largest shareholders' holdings. The dummy variable tests reveal that these two subsamples are significantly different (p-values are 0.0001 for all models). The results from the autoregressive model show that the 10 largest shareholders' group has slightly higher coefficients on the current and future earnings than the individual holdings subsample (2.6235 and 0.5267 vs. 1.8933 and 0.4652). This marginal future-oriented trend is also confirmed by the two other models. The similarities in the pattern of regression coefficients between individual holdings and the 10 largest shareholders' holdings may be explained by the fact that when the 10 largest shareholders are not active in trading, shares from these firms are likely to be traded mainly by small, individual shareholders, which is exactly the case observed in the individual subsample.

§ 8.6 The declining trend in regression coefficients—Test of Hypothesis V

Hypothesis V proposes that information carried in accounting earnings will decay from period t to period $t \pm 1$. The hypothesis is only partially supported by our empirical data.

The test of Hypothesis V is relatively straightforward when the definite lead/lag models are used: a simple comparison of coefficients from the two consecutive periods will demonstrate whether a declining trend is present. However, if mixed results are found, it is difficult to draw a convincing conclusion since no statistical test can be applied in this case. It is, therefore, necessary to analyze the autoregressive model in order to work out a statistical test for the hypothesis.

Recall that when the indefinite lead/lag model (equation 11) was transformed into the autoregressive model (equation 16), the parameters b_0, b_1, b_{-1}, ······, b_k, b_{-k} were transformed into three new coefficients α, β, and γ on P_{t-1}, P_{t+1}, and A_t, respectively. However, to draw any statistical inferences on the regression coefficients α, β, and γ, the relation between the *b*s and the regression coefficients α, β, and γ must be carefully defined. This relationship can be defined around two issues which are the focus of the analysis with regard to the autoregressive model: (1) whether both past and future earnings are reflected in the stock prices, and (2) whether there is a decline in response coefficients from the current period t to periods $t \pm 1$, $t \pm 2$, ······, $t \pm k$.

The first question can be restated as to whether α (for past periods) and β (for future periods) are equal to 0. It is easy to see that if all *b*s are equal to 0, α and β must also equal 0. It is also obvious that only when γ equals 0 will all *b*s equal 0 (because we have a relationship such as $b_k = \gamma\chi$, where χ is a mathematical presentation of an assumed relationship between α/β and γ. However, even though we know that all *b*s will equal 0 when γ equals 0, it is still unclear whether the alternate statement holds, i.e., there is still insufficient evidence to conclude that if $\gamma \neq 0$ then *b*s $\neq 0$. In other words, $\gamma \neq 0$ is a necessary but not sufficient condition for the alternate statement of the question. The alternate statement is preferred only when $\gamma \neq 0$, and $\alpha > 0$, and $\beta > 0$ (i.e., $b_3 \neq 0$, $b_1 > 0$, and $b_2\beta > 0$ in the attached tables).

The second question suggests that if the regression coefficients decay along the time horizon, a relationship of $b_k > b_{k\pm1}$ should be observed. It is proved, in Appendix 8.1 at the end of this chapter, that when $\beta < 1/2$, we will have $b_k > b_{k\pm1}$, which is exactly the definition of a "declining distribution of response coefficients".

A review of regression results discussed in the previous sections shows that for all autoregressive model tests in this study, the hypothesized relationship (i.e., $b_3 \neq 0$, $b_1 > 0$, and $b_2\beta > 0$) is consistently presented. This fact lends strong support to the statement that historical earnings information is used along with the current earnings announcements to predict future earning in making investment decisions.

As to the declining trend of coefficients, review of the regression results reveals that the response coefficients decline (i.e., $b_2 < 1/2$) in all models except for the following three Japanese subsamples: large firm, high institutional holdings, and low individual holdings. The latter two are likely to overlap because institutional holdings are usually inversely related to individual holdings. It is, therefore, found that large Japanese firms and highly institutionally held firms do not present a declining trend in the response coefficients, i.e., at the end of period t, earnings from period t-2 may not be less useful than that from period t-1; and earnings for period t+2 may not be less predicable than that for period t+1. Although theoretically difficult to justify, the exceptions are actually confirmed by the results from the corresponding definite lead/lag models (see Table 8.17). Future research may take a different approach using finer data to investigate this issue.

§ 8.7 Speed of decay in response coefficients—Test of Hypothesis VI

This section does not deal with individual coefficients but the speed of decay which is defined as a ratio between two related coefficients, $b_{k\pm1}/b_k$. The value of the speed of decay, given the assumption of a declining distribution, is between 0 and 1. It is easy to see that this hypothesized relationship between coefficients can only be tested in the definite lead/lag model which provides individual parameters, but not in the autoregressive model in which only the parameters on lead and lag **prices** (not earnings) are given.

To examine the issue, a ratio is calculated which represents the speed of decay, denoted as Ds, in such a way that $D_1 = b_1/b_0$, $D_2 = b_2/b_1$, ..., $D_k = b_k/b_{k-1}$. Analysis is then focused on (1) if the declining distribution of regression coefficients discussed in the above section with regard to the autoregressive model is generally supported by the definite lead/lag model, and (2) if there is a systematic pattern in the speed of decay which can be compared between countries/submarkets. The first issue is tested by comparing D_{k-1} with D_k to see if, in general, $D_{k-1} < D_k$. The second issue is centred at the magnitude of the difference between D_{k-1} and D_k. This magnitude is expected to be different (a) between past and future periods, (b) between large and small firms, (c) between institutional and individual investors, and (d) between Japanese and U.S. markets. Table 8.17 reports decay ratios of regression coefficients for all 16 definite lead/lag models with these lead/lag terms. Ratios with a value larger than 1 are highlighted in the table to emphasise theoretically unjustifiable negative decay ratios.

In general, no clear overall patterns can be found for both the U.S. and Japanese subsamples. One third ratios for the U.S. subsamples show negative decay, indicating that the hypothesized declining decay ratio is not supported by the data. Most Japanese subsamples display a ratio lower than 1, indicating that earnings information decays along the time horizon in Japanese markets. While comparisons of most Japanese subsamples do not appear to reveal a clear pattern, two pairs (the 10 largest shareholders' holdings and special shareholders' holdings) demonstrate a distribution of decay ratios that is consistent with the hypothesis. Table 8.17 indicates that the earnings information decays consistently slower for the "high special shareholders' holdings" subsample than for the low holdings subsample throughout the whole period (from period t-3 to period t+3). This finding suggests that special shareholders may better predict future earnings for every future period from using past and current earnings than other investors, and the usefulness of historical earnings from every past period is greater for them than for regular individual investors. The same conclusion can also be applied to the 10 largest shareholders subsample. However, the results from other Japanese subsamples do not allow us to convincingly make a similar generalization.

In brief, Hypothesis VI is partially supported only by two pairs of Japanese subsamples. The analysis of the speed of decay does not seem to have the explanatory power as expected in providing new insights into the earnings-price association.

§ 8.8 Summary of the main findings

Empirical tests of the study have reached the following findings:

- ☐ In general, the U.S. sample is significantly different from the Japanese sample in most important aspects. The information available to Japanese investors generally carries more future-relevant elements, rendering Japanese investors more future-oriented in their investment decisions. General U.S. investors are more likely to rely on historical earnings information in making investment decisions.
- ☐ There are more competing sources of information, both accounting and non-accounting, available in the U.S. than in Japanese markets. However, competing information is usually available on large U.S. firms.
- ☐ Firm size and ownership structure seem to capture different aspects of the

information environment, and should therefore be proxied by different variables.

- There is more future-oriented information available on large firms than on small firms in both countries. Information available also allows investors to predict future earnings for a longer period for large firms than for small firms.
- Japanese institutional investors seem to predict future earnings better and longer than individual investors; and Japanese individual investors rely more on historical earnings information than institutional investors. However, the same phenomenon is not clearly observed for the U.S. sample.
- When controlled for firm size, the U.S. sample is significantly different from the Japanese sample. The amount of earnings information available on small firms in both countries is generally not substantial, and allows investors to predict future earnings only for the nearest future term. Investors in large Japanese firms are more aware of future profitability than their U.S. counterparts, indicated by the high coefficients on both current and future earnings. The evidence suggests that firm size captures an important aspect of information asymmetry, as hypothesized.
- When controlled for ownership structure, U.S. investment institutions seem to have either more resources or a greater ability to carry out earnings forecasts than their counterparts in Japan. However, for the low institutional ownership subsamples, cross-national differences are not as markedly evident as for the high institutional part.
- Japanese firms that are mainly held by the 10 largest (or special) shareholders do not show response coefficients that are systematically different from other firms. This fact is explained by the Japanese cultural tradition.
- Tests on the coefficients from the autoregressive model reveal that both past and current earnings are used in predicting future earnings. The usefulness of past

earnings, and the predictability of future earnings, in general, decline from period t to period $t \pm 1$.

- The decay of regression coefficients does not show a clear pattern for the overall U.S. and Japanese samples, as well as for most subsamples. The hypothesis of a coefficient decay is only supported by two pairs of Japanese subsamples.

Table 8.1

Year-By-Year Cross-Sectional Regression Results

Model: $P_t = b_0 + b_1 P_{t-1} + b_2 P_{t+1} + b_3 X_t + e$

Coeff.	Pooled Sample	Mean	Min.	Med	Max.
The U.S. sample: 14,512 firm/year observations.					
b_0	0.0144	0.7558	-6.2569	0.7773	10.4812
b_1	0.5155	0.4423	0.1182	0.4614	0.7676
b_2	0.3733	0.4706	0.1013	0.6026	1.0012
b_3	1.7755	0.4869	-1.1301	0.4724	3.4087
Adj. R^2	0.9211	0.9841	0.8409	0.9627	0.9999
Japanese sample: 6,429 firm/year observations.					
b_0	43.7394	35.0735	-120.2019	2.1593	524.5617
b_1	0.4364	0.4607	0.1722	0.5561	0.6635
b_2	0.4695	0.5223	0.2922	0.4903	0.9243
b_3	3.8006	1.7536	-0.3998	1.2929	5.9417
Adj. R^2	0.8354	0.8850	0.7704	0.9192	0.9672

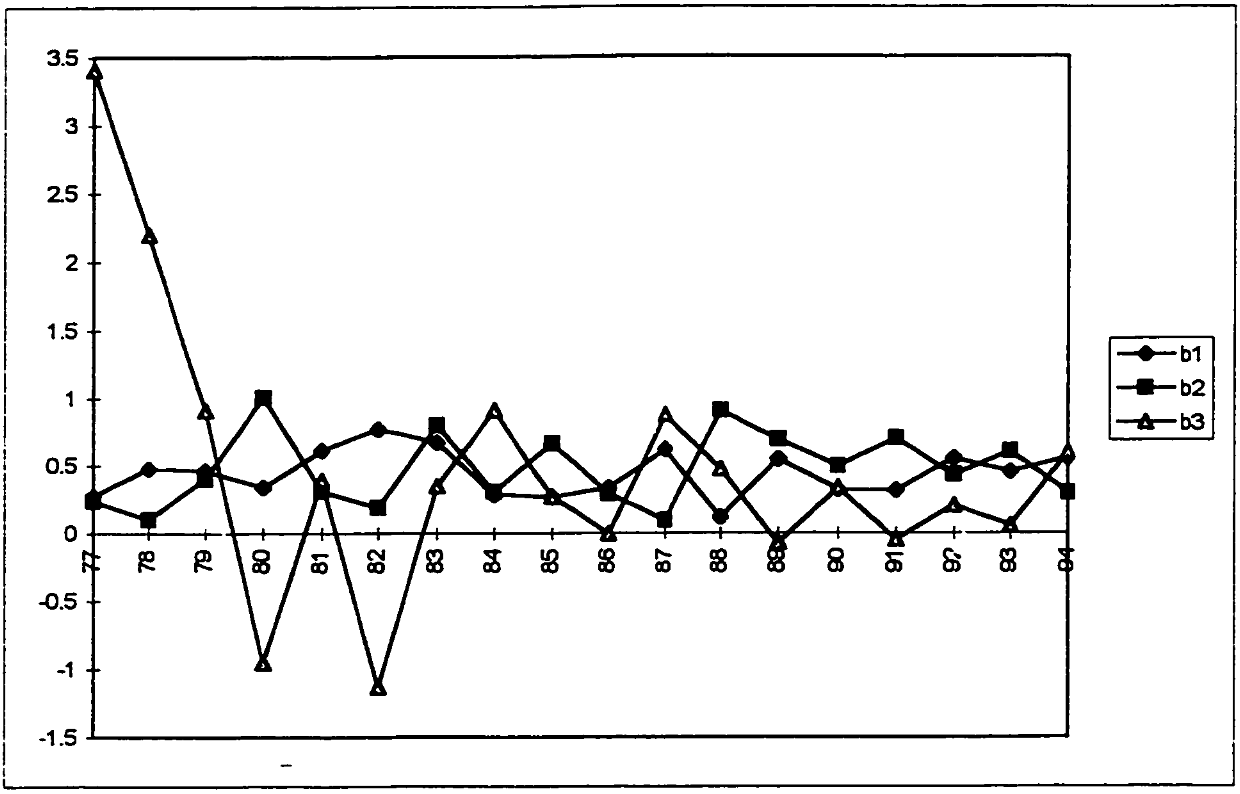
P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995. The model was run for every year cross-sectionally; the mean reflects a simple average.

The column "pooled sample" reports results from the inter-temporal regression using the same model. The data used for the inter-temporal regression pooled data both cross-sectionally and over time.

Figure 8.1

Year-By-Year Cross-Sectional Regression (I)
The U.S. Sample

Model 1: $P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$

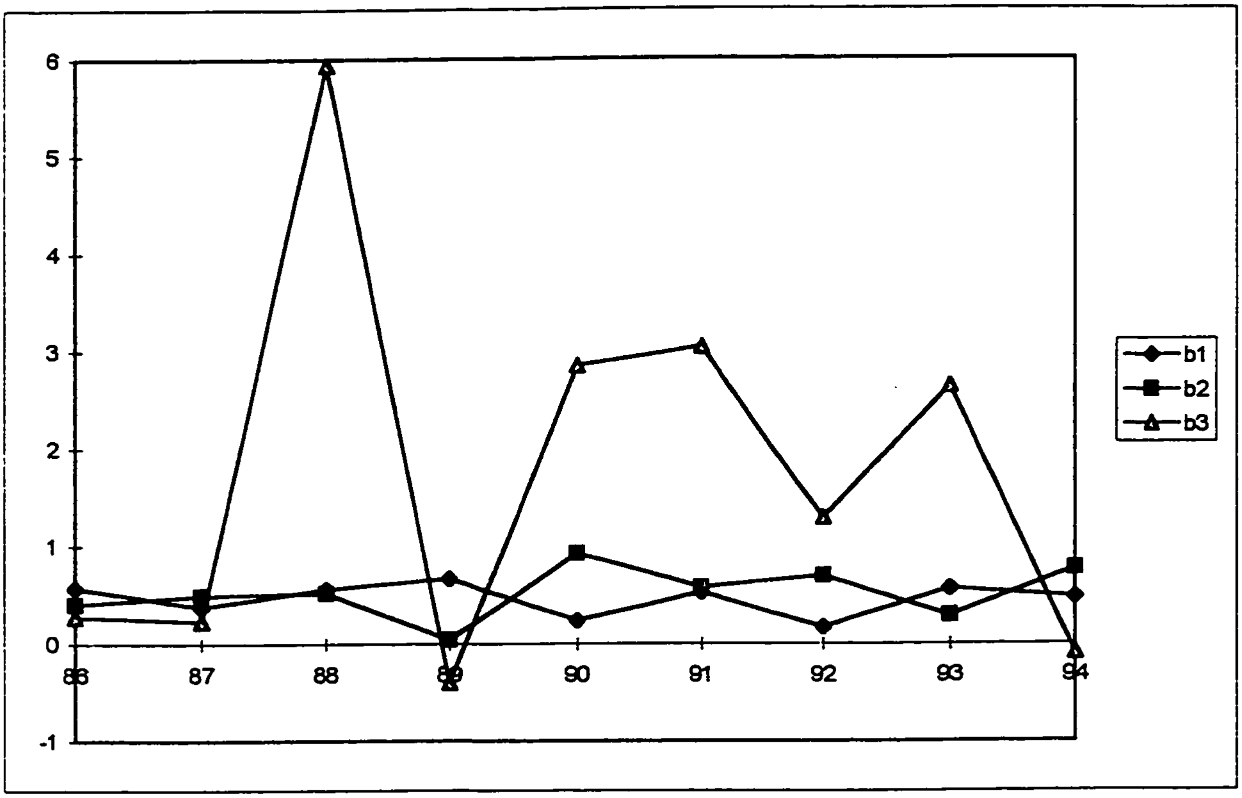


The U.S. Sample includes 17,353 firm/year observations for a 20-year period from 1976 to 1995. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t and X_t have been adjusted for stock splits and stock dividends.

Figure 8.2

Year-By-Year Cross-Sectional Regression (II)
The Japanese Sample

Model 1: $P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$



The Japanese sample includes 8,212 firm/year observations for a 11-year period from 1985 to 1995. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t and X_t have been adjusted for stock splits and stock dividends.

Table 8.2

General Comparison Between US and Japanese Firms

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	US Sample	Japanese Sample	US Sample	Japanese Sample	US Sample	Japanese Sample
Constant	0.0144 (0.3354)	43.7394 (0.0001)	6.3632 (0.0001)	587.328 (0.0001)	35.6729 (0.0001)	623.11 (0.0001
P_{t-1}	0.5155 (0.0001)	0.4364 (0.0001)				
P_{t+1}	0.3733 (0.0001)	0.4695 (0.0001)				
X_{t-3}					0.3000 (0.0001)	-1.546 (0.0062
X_{t-2}			0.4794 (0.0001)	4.0182 (0.0001)	0.2187 (0.0001)	-1.572 (0.0095
X_{t-1}			0.3297 (0.0001)	6.3047 (0.0001)	0.3446 (0.0001)	4.8923 (0.0001
X_t	1.7755 (0.0001)	3.8006 (0.0001)	5.0422 (0.0001)	11.4385 (0.0001)	0.3857 (0.0001)	15.989 (0.0001
X_{t+1}			0.7915 (0.0001)	2.1834 (0.0001)	4.9850 (0.0001)	6.4610 (0.0001
X_{t+2}			0.7214 (0.0001)	1.2052 (0.0020)	-0.6090 (0.0001)	2.6082 (0.0001
X_{t+3}					0.05586 (0.4345)	-2.332 (0.0001
Adjusted R^2	0.9211	0.8345	0.4737	0.5747	0.4709	0.6154
Significance Level of Dummy Variable Test	0.0235		0.0001		0.0001	
Number of Firm/Year Observations	14,512	6,429	12,078	4,686	9,908	3,007

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.
2. Model 1 is an autoregressive model:
$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$
3. Model 2 is a definite lead/lag model with two lead and two lag variables:
$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$
4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
US sample	P_{t-1}, P_{t+1}, X_t	X_{t-2},X_{t-1},X_t	X_{t-1},X_{t+1},X_t,X_{t+2}
Japanese sample	P_{t+1}, P_{t-1}, X_t	X_t,X_{t-2},X_{t-1}	X_t,X_{t+2},X_{t+3},X_{t-3},X_{t-1},X_{t+1}

Table 8.3

Comparison Between Large and Small Firms: US Sample

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	Small Firms	Large Firms	Small Firms	Large Firms	Small Firms	Large Firms
Constant	5.6521 (0.0001)	-1.7037 (0.0001)	3.0046 (0.0001)	4.2009 (0.0001)	3.2489 (0.0001)	2.7216 (0.0001
P_{t-1}	1.2418 (0.0001)	0.6046 (0.0001)				
P_{t+1}	0.2464 (0.0001)	0.4034 (0.0001)				
X_{t-3}					0.0098 (0.2803)	1.2469 (0.0001
X_{t-2}			0.0828 (0.0416)	1.7243 (0.0001)	1.0608 (0.3856)	1.6159 (0.0001
X_{t-1}			-1.649 (0.0001)	2.2744 (0.0001)	2.2222 (0.0001)	4.0330 (0.0001
X_t	0.0894 (0.0001)	1.3036 (0.0001)	7.8667 (0.0001)	-0.1120 (0.8574)	8.6889 (0.0001)	0.3963 (0.5414
X_{t+1}			-0.8908 (0.0001)	3.6216 (0.0001)	0.8655 (0.0001)	3.3188 (0.0001
X_{t+2}			0.0871 (0.2267)	5.9620 (0.0001)	0.2770 (0.0009)	2.8074 (0.0001
X_{t+3}					0.4183 (0.0001)	2.7061 (0.0001
Adjusted R^2	0.8287	0.9659	0.3662	0.9271	0.5230	0.9428
Significance Level of Dummy Variable Test	0.0001		0.0001		0.0001	
Number of Firm/Year Observations	3,615	3,615	3,019	3,019	2,473	2,473

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t

and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.

2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
Small Firms	P_{t-1}, P_{t+1}, X_t	X_t, X_{t-1}, X_{t+1}	$X_t, X_{t-1}, X_{t+1}, X_{t+2}$
Large FIrms	X_t, P_{t+1}, P_{t-1}	$X_{t+1}, X_{t+2}, X_{t-2}, X_{t-1}$	$X_{t+1}, X_{t+2}, X_t, X_{t-1}, X_{t-2}, X_{t+3}$

Table 8.4

Comparison Between Large and Small Firms: Japanese Sample

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	Small Firms	Large Firms	Small Firms	Large Firms	Small Firms	Large Firms
Constant	177.576	130.688	652.387	717.057	715.820	594.43
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.000
P_{t-1}	0.3056	0.3267				
	(0.0001)	(0.0001)				
P_{t+1}	0.3647	2.3805				
	(0.0001)	(0.0001)				
X_{t-3}					0.1557	0.419
					(0.6336)	(0.847
X_{t-2}			0.7475	-1.6587	0.3978	-5.133
			(0.0001)	(0.2240)	(0.2396)	(0.033
X_{t-1}			0.9494	-7.336	3.2372	2.566
			(0.0044)	(0.0001)	(0.0001)	(0.182
X_t	0.7308	11.9318	2.3120	26.8554	2.0558	27.962
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.000
X_{t+1}			1.5722	7.6748	2.6205	6.840
			(0.0001)	(0.0001)	(0.0001)	(0.000
X_{t+2}			0.6202	-0.1234	0.9802	2.033
			(0.0787)	(0.8779)	(0.0978)	(0.191
X_{t+3}					0.1666	0.453
					(0.7363)	(0.678
Adjusted R^2	0.9670	0.8339	0.1635	0.7330	0.2301	0.795
Significance Level of Dummy Variable Test	0.0001		0.0001		0.0001	
Number of Firm/Year Observations	1,607	1,607	1,171	1,171	751	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t

and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.

2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1 P_{t-1} + b_2 P_{t+1} + b_3 X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1 X_{t-2} + b_2 X_{t-1} + b_3 X_t + b_4 X_{t+1} + b_5 X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1 X_{t-3} + b_2 X_{t-2} + b_3 X_{t-1} + b_4 X_t + b_5 X_{t+1} + b_6 X_{t+2} + b_7 X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
Small Firms	P_{t+1}, P_{t-1}, X_t	$X_t, X_{t+1}, X_{t-2}, X_{t-1}$	$X_{t+1}, X_{t-1}, X_t, X_{t+2}$
Large FIrms	X_t, P_{t+1}, P_{t-1}	X_t, X_{t-1}, X_{t+1}	$X_t, X_{t+1}, X_{t-2}, X_{t+2}$

Table 8.5

Comparison Between High and Low Institutional Holding Firms: U.S. Sample

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	Low Holdings	High Holdings	Low Holdings	High Holdings	Low Holdings	High Holding
Constant	0.3418	1.0985	15.733	15.1049	10.9425	9.5544
	(0.0711)	(0.0001)	(0.0004)	(0.0001)	(0.0001)	(0.0001
P_{t-1}	0.5109	0.4976				
	(0.0001)	(0.0001)				
P_{t+1}	0.4750	0.4431				
	(0.0001)	(0.0001)				
X_{t-3}					1.6406	2.0712
					(0.0001)	(0.0001
X_{t-2}			0.7681	0.9688	-0.5457	1.8328
			(0.0001)	(0.0001)	(0.0048)	(0.0001
X_{t-1}			0.1270	0.9955	0.4886	1.9995
			(0.1310)	(0.0001)	(0.0084)	(0.0001
X_t	0.0106	0.1766	1.3291	1.1813	4.8352	1.6636
	(0.5941)	(0.0059)	(0.0001)	(0.0001)	(0.0001)	(0.0001
X_{t+1}			2.1866	1.2163	-1.1894	1.2287
			(0.0001)	(0.0001)	(0.0001)	(0.0001
X_{t+2}			0.1670	1.2574	1.846	0.5312
			(0.0674)	(0.0001)	(0.0001)	(0.0005
X_{t+3}					0.1037	0.5095
					(0.5019)	(0.0001
Adjusted R^2	0.8548	0.8139	0.6638	0.3139	0.7316	0.5141
Significance Level of Dummy Variable Test	0.8066		0.0642		0.0199	
Number of Firm/Year Observations	2,513	2,797	2,196	2,453	1,880	2,111

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t

and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.

2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1 P_{t-1} + b_2 P_{t+1} + b_3 X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1 X_{t-2} + b_2 X_{t-1} + b_3 X_t + b_4 X_{t+1} + b_5 X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1 X_{t-3} + b_2 X_{t-2} + b_3 X_{t-1} + b_4 X_t + b_5 X_{t+1} + b_6 X_{t+2} + b_7 X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
Low Inst. Holding	P_{t-1}, P_{t+1}	$X_{t-2}, X_{t+1}, X_{t+2}, X_{t-1}$	$X_t, X_{t-3}, X_{t+2}, X_{t+1}, X_{t-2}, X_{t-1}$
High Inst. Holding	P_{t-1}, P_{t+1}, X_t	$X_{t+2}, X_{t+1}, X_t, X_{t-1}, X_{t-2}$	$X_{t-1}, X_{t-3}, X_{t+1}, X_t, X_{t-2}, X_{t+3}, X_{t+2}$

Table 8.6

Comparison Between High and Low Institutional Holding Firms: Japanese Sample

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	Low Holdings	High Holdings	Low Holdings	High Holdings	Low Holdings	High Holding
Constant	55.616	54.0511	861.967	627.395	941.862	598.197
	(0.0045)	(0.0008)	(0.0001)	(0.0001)	(0.0001)	(0.0001
P_{t-1}	0.6361	0.3918				
	(0.0001)	(0.0001)				
P_{t+1}	0.2825	1.5011				
	(0.0001)	(0.0001)				
X_{t-3}					0.4279	-1.985
					(0.7709)	(0.1602
X_{t-2}			2.6932	0.3761	0.6784	4.0600
			(0.0496)	(0.7632)	(0.0545)	(0.0034
X_{t-1}			2.9283	0.6318	4.150	5.1328
			(0.0161)	(0.6431)	(0.0545)	(0.0016
X_t	2.3867	4.1342	7.8636	12.5205	9.4487	17.7248
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001
X_{t+1}			3.4528	5.8142	1.5441	6.3134
			(0.0006)	(0.0001)	(0.1998)	(0.0001
X_{t+2}			-0.9741	3.0577	1.0051	3.3796
			(0.1678)	(0.0002)	(0.4451)	(0.0027
X_{t+3}					-1.165	-0.175
					(0.2698)	(0.7931
Adjusted R^2	0.8589	0.8397	0.2271	0.6029	0.6600	0.5826
Significance Level of Dummy Variable Test	0.7809		0.0015		0.0001	
Number of Firm/Year Observations	1,607	1,607	1,171	1,171	751	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.
2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
Low Inst. Holding	P_{t-1}, P_{t+1}, X_t	$X_t, X_{t-1}, X_{t-2}, X_{t+2}$	$X_t, X_{t+3}, X_{t-2}, X_{t+2}, X_{t+1}, X_{t-1}, X_{t-3}$
High Inst. Holding	X_t, P_{t+1}, P_{t-1}	$X_t, X_{t+1}, X_t, X_{t+2}, X_{t-2}$	X_t

Table 8.7

Comparison Between High and Low Individual Holding Firms: Japanese Sample

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	Low Holdings	High Holdings	Low Holdings	High Holdings	Low Holdings	High Holdings
Constant	104.506	45.0502	557.936	644.859	711.505	733.889
	(0.0001)	(0.0033)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
P_{t-1}	0.3670	0.4526				
	(0.0001)	(0.0001)				
P_{t+1}	1.4445	0.4652				
	(0.0001)	(0.0001)				
X_{t-3}					-1.425	0.9477
					(0.3111)	(0.6219)
X_{t-2}			0.2215	5.0524	-3.528	3.7025
			(0.8398)	(0.0001)	(0.0150)	(0.0095)
X_{t-1}			6.3153	3.6558	1.1738	3.5116
			(0.0001)	(0.0001)	(0.4375)	(0.0001)
X_t	7.4022	1.8933	15.3457	4.3711	23.4141	6.6269
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
X_{t+1}			6.7294	4.4752	5.2182	4.8455
			(0.0001)	(0.0001)	(0.0001)	(0.0001)
X_{t+2}			4.1230	2.5587	4.1389	2.9624
			(0.0912)	(0.0013)	(0.0005)	(0.4268)
X_{t+3}					4.668	-0.7544
					(0.0001)	(0.4613)
Adjusted R^2	0.8427	0.8344	0.7218	0.3851	0.7875	0.3392
Significance Level of Dummy Variable Test	0.0006		0.0001		0.0004	
Number of Firm/Year Observations	1,607	1,607	1,171	1,171	751	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.
2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
Low Indi. Holding	P_{t-1}, P_{t+1}, X_t	X_t, X_{t-2}, X_{t+1}	X_t, X_{t+3}, X_{t+1}, X_{t-2}
High Indi. Holding	P_{t+1}, X_t, P_{t-1}	X_t, X_{t-2}, X_{t-1}, X_{t+1}, X_{t+2}	X_{t-1}, X_t, X_{t-2}, X_{t+2}

Table 8.8

Comparison Between Small US and Japanese Firms

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	US Sample	Japanese Sample	US Sample	Japanese Sample	US Sample	Japanes Sampl
Constant	5.6521 (0.0001)	177.576 (0.0001)	3.0446 (0.0001)	652.387 (0.0001)	3.2489 (0.0001)	715.82 (0.0001
P_{t-1}	1.2418 (0.0001)	0.3056 (0.0001)				
P_{t+1}	0.2464 (0.0001)	0.3647 (0.0001)				
X_{t-3}					0.0098 (0.2803)	0.1557 (0.6336
X_{t-2}			1.0828 (0.0416)	0.7475 (0.0001)	1.0608 (0.3856)	0.3978 (0.2396
X_{t-1}			-1.649 (0.0001)	0.9494 (0.0044)	2.2222 (0.0001)	3.2372 (0.0001
X_t	0.0894 (0.0001)	0.7308 (0.0001)	7.8667 (0.0001)	2.3120 (0.0001)	8.6889 (0.0001)	2.0558 (0.0001
X_{t+1}			-0.8908 (0.0001)	1.5722 (0.0001)	0.8655 (0.0001)	2.6205 (0.0001
X_{t+2}			0.0871 (0.2267)	0.6202 (0.0787)	0.2770 (0.0009)	0.9802 (0.0978
X_{t+3}					0.4138 (0.0001)	0.1666 (0.7363
Adjusted R^2	0.8287	0.9670	0.3662	0.1635	0.5230	0.2301
Significance Level of Dummy Variable Test	0.0001		0.0001		0.0001	
Number of Firm/Year Observations	3,615	1,607	3,019	1,171	2,473	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.
2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
US sample	P_{t-1}, P_{t+1}, X_t	X_t,X_{t-1},X_{t+1}	X_t,X_{t-1},X_{t+1},X_{t+2}
Japanese sample	P_{t+1}, P_{t-1}, X_t	X_t,X_{t+1},X_{t-2},X_{t-1}	X_{t+1},X_{t-1},X_t,X_{t+2}

Table 8.9

Comparison Between Large US and Japanese Firms

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	US Sample	Japanese Sample	US Sample	Japanese Sample	US Sample	Japanese Sample
Constant	-1.7037	130.688	4.2009	717.057	2.7216	594.439
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
P_{t-1}	0.6046	0.3267				
	(0.0001)	(0.0001)				
P_{t+1}	0.4034	2.3805				
	(0.0001)	(0.0001)				
X_{t-3}					1.2469	0.4194
					(0.0001)	(0.8477)
X_{t-2}			1.7243	-1.659	1.6159	-5.134
			(0.0001)	(0.2240)	(0.0001)	(0.0330)
X_{t-1}			2.2744	-7.336	4.0330	2.5665
			(0.0001)	(0.0001)	(0.0001)	(0.1824)
X_t	1.3036	11.9318	-0.112	26.8554	0.3963	27.9626
	(0.0001)	(0.0001)	(0.8574)	(0.0001)	(0.5414)	(0.0001)
X_{t+1}			3.6216	7.6748	3.3188	6.8405
			(0.0001)	(0.0001)	(0.0001)	(0.0004)
X_{t+2}			5.9620	-0.123	2.8074	2.0339
			(0.0001)	(0.8779)	(0.0001)	(0.1918)
X_{t+3}					2.7061	0.4538
					(0.0001)	(0.6788)
Adjusted R^2	0.9659	0.8339	0.9271	0.7370	0.9428	0.7951
Significance Level of Dummy Variable Test	0.0001		0.0001		0.0001	
Number of Firm/Year Observations	3,615	1,607	3,019	1,171	2,473	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20

years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.

2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
US sample	X_t, P_{t+1}, P_{t-1}	$X_{t+1}, X_{t+2}, X_{t-2}, X_{t-1}$	$X_{t+1}, X_{t+2}, X_t, X_{t-1}, X_{t-2}, X_{t+3}$
Japanese sample	X_t, P_{t+1}, P_{t-1}	X_t, X_{t-1}, X_{t+1}	$X_t, X_{t+1}, X_{t-2}, X_{t+2}$

Table 8.10

Comparison Between US and Japanese Firms: Low Institutional Holding

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 3	
	US Sample	Japanese Sample	US Sample	Japanese Sample
Constant	0.3418 (0.0711)	55.616 (0.0045)	10.9425 (0.0001)	941.862 (0.0001)
P_{t-1}	0.5109 (0.0001)	0.6361 (0.0001)		
P_{t+1}	0.4750 (0.0001)	0.2825 (0.0001)		
X_{t-3}			1.6406 (0.0001)	0.4279 (0.7709)
X_{t-2}			-0.5457 (0.0048)	0.6784 (0.0545)
X_{t-1}			0.4886 (0.0084)	4.150 (0.0545)
X_t	0.0106 (0.5941)	2.3867 (0.0001)	4.8352 (0.0001)	9.4487 (0.0001)
X_{t+1}			-1.189 (0.0001)	1.5441 (0.1998)
X_{t+2}			1.846 (0.0001)	1.0051 (0.4451)
X_{t+3}			0.1037 (0.5019)	-1.165 (0.2698)
Adjusted R^2	0.8548	0.8589	0.7316	0.6600
Significance Level of Dummy Variable Test	0.0001		0.0001	
Number of Firm/Year Observations	2,513	1,607	1,880	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t

and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.

2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 3
US sample	P_{t-1}, P_{t+1}	$X_t, X_{t-3}, X_{t+2}, X_{t+1}, X_{t-2}, X_{t-1}$
Japanese sample	P_{t-1}, P_{t+1}, X_t	$X_t, X_{t+3}, X_{t-2}, X_{t+2}, X_{t+1}, X_{t-1}, X_{t-3}$

Table 8.11

Comparison Between US and Japanese Firms: High Institutional Holding

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 3	
	US Sample	Japanese Sample	US Sample	Japanese Sample
Constant	1.0985 (0.0001)	54.0511 (0.0008)	9.5544 (0.0001)	598.197 (0.0001)
P_{t-1}	0.4976 (0.0001)	0.3918 (0.0001)		
P_{t+1}	0.4431 (0.0001)	1.5011 (0.0001)		
X_{t-3}			2.0712 (0.0001)	-1.9848 (0.1602)
X_{t-2}			1.8328 (0.0001)	4.0600 (0.0034)
X_{t-1}			1.9995 (0.0001)	5.1328 (0.0016)
X_t	0.1766 (0.0059)	4.1342 (0.0001)	1.6636 (0.0001)	7.7248 (0.0001)
X_{t+1}			1.2287 (0.0001)	6.3134 (0.0001)
X_{t+2}			0.5312 (0.0005)	3.3796 (0.0027)
X_{t+3}			0.5095 (0.0001)	-0.1754 (0.7931)
Adjusted R^2	0.8139	0.8397	0.5141	0.5826
Significance Level of Dummy Variable Test	0.0001		0.0001	
Number of Firm/Year Observations	2,513	1,607	1,880	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t

and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.

2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1 P_{t-1} + b_2 P_{t+1} + b_3 X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1 X_{t-2} + b_2 X_{t-1} + b_3 X_t + b_4 X_{t+1} + b_5 X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1 X_{t-3} + b_2 X_{t-2} + b_3 X_{t-1} + b_4 X_t + b_5 X_{t+1} + b_6 X_{t+2} + b_7 X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 3
US sample	P_{t-1}, P_{t+1}, X_t	$X_{t-1}, X_{t-3}, X_{t+1}, X_t, X_{t-2}, X_{t+3}, X_{t+2}$
Japanese sample	X_t, P_{t+1}, P_{t-1}	X_t

Table 8.12

Comparison Between US and Japanese Firms: High Individual Holding

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 3	
	US Sample	Japanese Sample	US Sample	Japanese Sample
Constant	0.3418 (0.0711)	42.0502 (0.0033)	10.9425 (0.0001)	733.889 (0.0001)
P_{t-1}	0.5109 (0.0001)	0.4526 (0.0001)		
P_{t+1}	0.4750 (0.0001)	0.4652 (0.0001)		
X_{t-3}			1.6406 (0.0001)	0.9477 (0.6219)
X_{t-2}			-0.5457 (0.0048)	3.7025 (0.0095)
X_{t-1}			0.4886 (0.0084)	3.5116 (0.0001)
X_t	0.0106 (0.5941)	1.8933 (0.0001)	4.8352 (0.0001)	6.6269 (0.0001)
X_{t+1}			-1.1894 (0.0001)	4.8455 (0.0001)
X_{t+2}			1.846 (0.0001)	2.9624 (0.4268)
X_{t+3}			0.1037 (0.5019)	-0.7544 (0.4613)
Adjusted R^2	0.8548	0.8344	0.7316	0.3392
Significance Level of Dummy Variable Test	0.0001		0.0001	
Number of Firm/Year Observations	2,513	1,607	1,880	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t

and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.

2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 3
US sample	P_{t-1}, P_{t+1}	$X_t, X_{t-3}, X_{t+2}, X_{t+1}, X_{t-2}, X_{t-1}$
Japanese sample	P_{t+1}, X_t, P_{t-1}	$X_{t-1}, X_t, X_{t-2}, X_{t+2}$

Table 8.13

Comparison Between US and Japanese Firms: Low Individual Holding

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 3	
	US Sample	Japanese Sample	US Sample	Japanese Sample
Constant	1.0985	104.506	9.5544	711.505
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
P_{t-1}	0.4976	0.3670		
	(0.0001)	(0.0001)		
P_{t+1}	0.4431	1.4445		
	(0.0001)	(0.0001)		
X_{t-3}			2.0712	-1.425
			(0.0001)	(0.3111)
X_{t-2}			1.8328	-3.528
			(0.0001)	(0.0150)
X_{t-1}			1.9995	1.1738
			(0.0001)	(0.4375)
X_t	0.1766	7.4022	1.6636	23.4141
	(0.0059)	(0.0001)	(0.0001)	(0.0001)
X_{t+1}			1.2287	5.2182
			(0.0001)	(0.0001)
X_{t+2}			0.5312	4.1389
			(0.0005)	(0.0005)
X_{t+3}			0.5095	4.668
			(0.0001)	(0.0001)
Adjusted R^2	0.8139	0.8427	0.5141	0.7875
Significance Level of Dummy Variable Test	0.0001		0.0001	
Number of Firm/Year Observations	2,797	1,607	1,880	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t

and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.

2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 3
US sample	P_{t-1}, P_{t+1}, X_t	$X_{t-1}, X_{t-3}, X_{t+1}, X_t, X_{t-2}, X_{t+3}, X_{t+2}$
Japanese sample	P_{t-1}, P_{t+1}, X_t	$X_t, X_{t+3}, X_{t+1}, X_{t-2}$

Table 8.14

Comparison of Sub-Samples of Japanese Firms: The 10 Largest Shareholders

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	Low Holdings	High Holdings	Low Holdings	High Holdings	Low Holdings	High Holdin
Constant	33.7404	-31.378	470.921	792.338	451.964	885.75
	(0.0134)	(0.0758)	(0.0001)	(0.0001)	(0.0001)	(0.0001
P_{t-1}	0.4442	0.4807				
	(0.0001)	(0.0001)				
P_{t+1}	0.4607	0.5267				
	(0.0001)	(0.0001)				
X_{t-3}					3.2397	-0.282
					(0.0224)	(0.842
X_{t-2}			3.7813	1.0430	-1.7367	0.030
			(0.0001)	(0.3389)	(0.2980)	(0.985
X_{t-1}			4.8709	3.6445	4.7431	2.401
			(0.0001)	(0.0033)	(0.0014)	(0.166
X_t	3.8412	2.6235	9.8333	6.6709	13.2304	8.4197
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001
X_{t+1}			9.6408	6.0207	10.0208	5.242
			(0.0001)	(0.0001)	(0.0001)	(0.0011
X_{t+2}			-0.007	0.9967	1.0781	3.4001
			(0.9912)	(0.2982)	(0.4167)	(0.0341
X_{t+3}					-0.096	-2.650
					(0.8990)	(0.0234
Adjusted R^2	0.8467	0.8313	0.6550	0.3139	0.6600	0.2627
Significance Level of Dummy Variable Test	0.0254		0.0001		0.0001	
Number of Firm/Year Observations	1,607	1,607	1,171	1,171	751	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t

and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.

2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
Low Holding	X_t, P_{t-1}, P_{t+1}	$X_t, X_{t-2}, X_{t-1}, X_{t+2}$	$X_t, X_{t+2}, X_{t-2}, X_{t-1}$
High Holding	P_{t-1}, P_{t+1}, X_t	X_t, X_{t-2}, X_{t-1}	$X_t, X_{t+2}, X_{t+3}, X_{t-1}$

Table 8.15

Comparison of Sub-Samples of Japanese Firms: Special Shareholders

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	Low Holdings	High Holdings	Low Holdings	High Holdings	Low Holdings	High Holding
Constant	45.1082	12.6856	505.158	791.433(	568.454	904.037
	(0.0004)	(0.4484)	(0.0001)	0.0001)	(0.0001)	(0.0001
P_{t-1}	0.4747	0.5012				
	(0.0001)	(0.0001)				
P_{t+1}	0.4584	0.4608				
	(0.0001)	(0.0001)				
X_{t-3}					-0.074	1.4028
					(0.9483)	(0.3356
X_{t-2}			2.7072	3.6838	0.8165	2.3261
			(0.0014)	(0.0009)	(0.5301)	(0.1797
X_{t-1}			3.8415	3.4818	3.4832	2.6856
			(0.0003)	(0.0039)	(0.0059)	(0.1348
X_t	1.6792	2.3140	9.0857	3.9567	8.8615	5.3229
	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0037
X_{t+1}			7.4180	5.2858	7.8451	3.9703
			(0.0001)	(0.0001)	(0.0001)	(0.0119
X_{t+2}			3.0134	1.2512	1.7706	1.9426
			(0.0001)	(0.1749)	(0.1208)	(0.2034
X_{t+3}					0.5706	-1.291
					(0.4874)	(0.2604
Adjusted R^2	0.8589	0.8397	0.6427	0.2601	0.5681	0.1941
Significance Level of Dummy Variable Test	0.0254		0.0001		0.0001	
Number of Firm/Year Observations	1,607	1,607	1,171	1,171	751	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.
2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
Low Holding	P_{t+1}, P_{t-1}, X_t	$X_t, X_{t-2}, X_{t-1}, X_{t+2}$	X_t, X_{t+1}, X_{t-1}
High Holding	P_{t-1}, P_{t+1}, X_t	$X_{t-2}, X_{t-1}, X_t, X_{t+1}$	X_t, X_{t-1}, X_{t+1}

Table 8.16

Comparison of Sub-Samples of Japanese Firms:

Individual Holding vs. The 10 Largest Shareholders

Regression Coefficients and Significance Levels (in parentheses)

Variables	Model 1		Model 2		Model 3	
	High Individ.	High 10 Laregst	High Individ.	High 10 Largest	High Individ.	High 10 Largest
Constant	42.0502 (0.0033)	-31.3785 (0.0758)	644.859 (0.0001)	792.338 (0.0001)	733.889 (0.0001)	885.750 (0.0001)
P_{t-1}	0.4526 (0.0001)	0.4807 (0.0001)				
P_{t+1}	0.4652 (0.0001)	0.5267 (0.0001)				
X_{t-3}					0.9477 (0.6219)	-0.282 (0.8423)
X_{t-2}			5.0524 (0.0001)	1.0430 (0.3389)	3.7025 (0.0095)	0.0306 (0.9856)
X_{t-1}			3.6558 (0.0001)	3.6445 (0.0033)	3.5116 (0.0001)	2.4012 (0.1665)
X_t	1.8933 (0.0001)	2.6235 (0.0001)	4.3711 (0.0001)	6.6709 (0.0001)	6.6269 (0.0001)	8.4197 (0.0001)
X_{t+1}			4.4752 (0.0001)	6.0207 (0.0001)	4.8455 (0.0001)	5.2429 (0.0011)
X_{t+2}			2.5587 (0.0013)	0.9967 (0.2982)	2.9624 (0.4268)	3.4001 (0.0341)
X_{t+3}					-0.7544 (0.4613)	-2.650 (0.0234)
Adjusted R^2	0.8344	0.8313	0.3851	0.3139	0.3392	0.2627
Significance Level of Dummy Variable Test	0.0001		0.0001		0.0001	
Number of Firm/Year Observations	1,607	1,607	1,171	1,171	751	751

Note:

1. P_t is the stock price at the end of period t; X_t is basic earnings per share (EPS) for period t. Both P_t and X_t have been adjusted for stock splits and stock dividends. The U.S. data cover a period of 20 years from 1976 to 1995 whereas Japanese data cover 11 years from 1985 to 1995.
2. Model 1 is an autoregressive model:

$$P_t = b_0 + b_1P_{t-1} + b_2P_{t+1} + b_3X_t + e$$

3. Model 2 is a definite lead/lag model with two lead and two lag variables:

$$P_t = b_0 + b_1X_{t-2} + b_2X_{t-1} + b_3X_t + b_4X_{t+1} + b_5X_{t+2} + e_t$$

4. Model 3 is a definite lead/lag model with three lead and three lag variables:

$$P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1} + b_6X_{t+2} + b_7X_{t+3} + e_t$$

5. The order of variables entering a stepwise regression such that R^2 is maximized are as follows:

	Model 1	Model 2	Model 3
High Individual	P_{t+1}, X_t, P_{t-1}	$X_t, X_{t-2}, X_{t-1}, X_{t+1}, X_{t+2}$	$X_{t-1}, X_t, X_{t-2}, X_{t+2}$
High 10 Largest	P_{t-1}, P_{t+1}, X_t	X_t, X_{t-2}, X_{t-1}	$X_t, X_{t+2}, X_{t+3}, X_{t-1}$

Table 8.17
Summary of Decay Ratios of Regression Coefficients

Model: $P_t = b_0 + b_1X_{t-3} + b_2X_{t-2} + b_3X_{t-1} + b_4X_t + b_5X_{t+1}\ b_6X_{t+2} + b_7X_{t+3} + e_t$

	Decay Ratio for Past Periods			Decay Ratio for Future P	
	b_1/b_2	b_2/b_3	b_3/b_4	b_5/b_4	b_6/b_5
The U.S. sample					
Overall	**1.3717**	0.6346	0.8934	**12.9346**	0.1222
Small firms	0.0092	0.4774	0.2556	0.0996	0.3200
Large firms	0.7716	0.4007	**10.1766**	**8.3745**	0.8459
Low institutional holding	**3.0064**	**1.1169**	0.1011	0.2460	**1.5520**
High institutional holding	**1.1301**	0.9166	**1.2019**	0.7386	0.4323
The Japanese sample					
Overall	0.9832	0.3215	0.3060	0.4040	0.4037
Small firms	0.3914	0.1229	**1.5747**	**1.2747**	0.3741
Large firms	0.0817	**2.0002**	0.0918	0.2446	0.2973
Low institutional holding	0.6307	0.1635	0.4392	0.1634	0.6509
High institutional holding	0.4889	0.7910	0.2896	0.0357	0.5353
Low individual holding	0.4039	**3.0056**	0.0501	0.2229	0.7932
High individual holding	0.2560	**1.0544**	0.5299	0.7312	0.6114
Low 10-largest-shareholdings	**1.8986**	0.3662	0.3585	0.7574	0.1076
High 10-largest-shareholdings	**9.2160**	0.0127	0.2852	0.6227	0.6485
Low special-shareholdings	0.0903	0.2344	0.3931	0.8853	0.2257
High special-shareholdings	0.6031	0.8661	0.5045	0.7459	0.4893
Mean					
The U.S. and Japanese samples	**1.3333**	0.7803	**1.0907**	**1.7801**	0.5256
The U.S. sample only	**1.2578**	0.7092	**2.5257**	**4.4787**	0.6545
The Japanese sample only	**1.3676**	0.8126	0.4384	0.5534	0.4670
Standard Deviation					
The U.S. and Japanese samples	2.2398	0.7743	2.4577	3.5788	0.3498
The U.S. sample only	1.1048	0.3015	4.3007	5.8685	0.5672
The Japanese sample only	2.6520	0.9270	0.4058	0.3732	0.2069

Appendix 9.1

In chapter 5, the following relations are assumed in developing the autoregressive model:

$$\theta_1=\gamma[\beta+\binom{3}{1}\alpha\beta^2+\binom{5}{2}\alpha^2\beta^3+\binom{7}{3}\alpha^3\beta^4+\cdots]$$

$$\theta_2=\gamma[\beta^2+\binom{4}{1}\alpha\beta^3+\binom{6}{2}\alpha^2\beta^4+\binom{8}{3}\alpha^3\beta^5+\cdots]$$

$$\theta_3=\gamma[\beta^3+\binom{5}{1}\alpha\beta^4+\binom{7}{2}\alpha^2\beta^5+\binom{9}{3}\alpha^3\beta^6+\cdots]$$

....

These relations can be expressed as:

$$\theta_1=\gamma\beta[1+\binom{3}{1}\alpha\beta+\binom{5}{2}\alpha^2\beta^2+\binom{7}{3}\alpha^3\beta^3+\cdots]$$

$$\theta_2=\gamma\beta^2[1+\binom{4}{1}\alpha\beta+\binom{6}{2}\alpha^2\beta^2+\binom{8}{3}\alpha^3\beta^3+\cdots]$$

$$\theta_3=\gamma\beta^3[1+\binom{5}{1}\alpha\beta+\binom{7}{2}\alpha^2\beta^2+\binom{9}{3}\alpha^3\beta^3+\cdots]$$

....

In hypothesis 3, I expect that response coefficients will continuously decrease when t is further away from t_0. To make sure that $\theta_{\pm(t+1)} < \theta_{\pm t}$, t = 1, 2, 3 ···, I have to ensure that:

$$\binom{4}{1}\beta<\binom{3}{1} \qquad \binom{6}{2}\beta<\binom{5}{2} \qquad \binom{8}{3}\beta<\binom{7}{3}$$

$$\binom{5}{1}\beta<\binom{4}{1} \qquad \binom{7}{2}\beta<\binom{6}{2} \qquad \binom{9}{3}\beta<\binom{8}{3}$$

....

These relations imply that:

$$\beta<\frac{\binom{3}{1}}{\binom{4}{1}}$$

$$\beta<\frac{\binom{4}{1}}{\binom{5}{1}}$$

....

Stated in a generalized form, I get:

$$\beta<\frac{\binom{2k+m}{k}}{\binom{2k+m+1}{k}}=\frac{k+m+1}{2k+m+1}>\frac{1}{2}$$

where k = 1, 2, 3 ···, and m = 1, 2, 3 ···. This proves that $\theta_{\pm(i+1)} < \theta_{\pm i}$ when $\beta < 1/2$.

Chapter 9 Conclusions, Contributions, and Limitations

§ 9.1 Primary findings of the study

Based on an understanding of both the existing literature and information about institutional environments of the countries involved, a detailed regression analysis of available empirical data using the models developed for this study enables us to reach the following conclusions:

- ☐ Both future and past earnings are reflected in current stock prices, which is supported by significant coefficients on earnings from both lead and lag periods, regardless of whether the definite lead/lag model or the autoregressive model is used. However, future and past earnings are associated with current stock prices for different reasons. Due to a lack of timeliness, some value-relevant events are recognized in accounting reports later than other competing sources of information in the markets, which is reflected in stock prices promptly. As a result, stock prices are associated with future earnings. Past earnings, on the other hand, are used in the market to assess earnings' persistence. As such, the higher the quality of earnings, the less noisy earnings would be, and the more likely earnings would persist. The observed different response coefficients on earnings from past, current and future periods may indicate differences in the quality of earnings, the information environment, and market efficiency.
- ☐ Although future and past earnings are reflected in current stock prices, the length of the reflected period, the pattern of coefficients, as well as the magnitudes and sign of coefficients are very different between past and future periods, between large and small firms, between institutional and individual investors, and between Japan and the U.S. A further analysis of these differences reveals that, in general,

investors in large firms are better informed about firms' future opportunities than those investing in small firms. The same phenomenon is also observed for institutional versus individual investors, and for Japanese versus U.S. investors.

- Due to the wide differences in their information and institutional environments, the regression results for the U.S. and Japanese samples demonstrate statistically significant differences, both for the overall samples and for subsamples controlled for firm size and ownership structure. The most distinct differences are found in the comparison of large firms between the two countries, suggesting an underlying gap in the availability of competing information.
- The U.S. markets are characterised by the availability of abundant non-accounting information from competing sources, especially for large firms, and by the efficiency and capability of investment institutions. On the other hand, Japanese investors seemingly have more confidence in the persistence of the reported earnings than their U.S. counterparts, as evidenced by the magnitudes of the coefficients on both the current and future earnings. The poor quality of Japanese accounting reports is believed to be compensated by widespread networking and a reliable persistence of accounting earnings in the long run.
- The information environment in both the U.S. and Japan is seemingly too complicated to be proxied by any single variable. The two-proxy approach used in this study captures different aspects of the information environment in both countries. In general, firm size is closely related to the availability of competing information in the markets, and the existence of a dominant institutional versus individual share holding is associated with the ability to process information. However, large firms and mainly institutionally held firms seem to overlap in the U.S. markets.

- Although historical earnings information from several past years is used in predicting the persistence of the current earnings, the relative usefulness of earnings from each year is different. A declining trend in the usefulness of past earnings hypothesized in this study is supported by a statistcal test using the auotregressive regression results. However, mixed results are found with respect to the coefficients from the definite lead/lag models. Similar inconclusive results are also reported for future periods. As the hypothesis of a gradual decay in response coefficients is partially supported by only two pairs of Japanese subsamples, future research is required with improved model development and finer data.
- The autoregressive model developed in this study demonstrated a remarkably higher explanatory power than the definite lead/lag models, indicating that earnings from periods beyond $t\pm3$ should not be ignored in discussing the price-earnings association.

§9.2 Limitations of the study

This study may suffer from the following limitations due to either the research design or the data used.

- As a consequence of the research design used, tests in the study are carried out on firm/years rather than firms. Although the chance that a company is classified into different subsamples is relatively small, this does act as a constraint in generalizing the results from this study.
- The use of the autoregressive model and the definite lead/lag model requires data for a consecutive 5- or 7-year period, which is likely to induce a survival bias towards inclusion of only successful companies. Besides, companies listed in both

the NYSE and the TSE are mainly large firms. Therefore, my analysis of the impact of the information environment on the price-earnings association may not be readily generalizable to small, privately-held firms.

- ☐ Although differences in ownership play a key role in shaping the Japanese information environment, non-ownership control or influence is no doubt equally important. It is impossible, however, to quantify and test the non-ownership control or influence within the available research framework. Consequently, this study does not capture all the important determinants of the Japanese information environment.
- ☐ Both Cheng *et al.* (1992) and Freeman and Tse (1992) provided evidence that a non-linear approach provides both a significantly higher explanatory power and a richer explanation for the difference between ERCs and price-earnings ratios. However, this study does not use a non-linear model for two reasons. First, it is extremely difficult, if not impossible, to develop a non-linear model which includes lead/lag periods. Such a task is far beyond the scope of this study. Second, the use of a non-linear model may not allow this study to be comparable to previous studies.
- ☐ True expertise in the social-economic environments of both countries being studied is a desirable asset in carrying out comparative studies like the present one. Although a tremendous effort has been made to achieve familiarity with the U.S. and Japanese accounting and financial environments, many complex issues, especially those related to the Japanese security markets, may remain outside the gamut of the available knowledge.

Nevertheless, caution has been exercised in designing this study in order to reduce these limitations to the minimum.

§ 9.3 Contributions of the study

This study is designed and carried out with considerable effort and care. As a result of observing supporting findings for most of its research hypotheses, this study is believed to have made the following contributions:

- ☐ This study takes a new approach to examining the association between accounting measures and stock market prices. Under this approach, several theories/intuitions are tested simultaneously so that the relative significance of accounting information from different periods can be examined. The theories/intuitions tested include: (a) the theoretical association between current earnings and current prices; (b) earnings' lack of timeliness; and (c) the use of past earnings and current earnings to predict future earnings.
- ☐ A new autoregressive model is developed and used to test the association between accounting measures from different periods and market prices simultaneously. The development of this dynamic model is complicated because it includes both lag and lead periods, unlike the existing lag-distributed autoregressive models available from the econometric literature. The model provides a new tool for empirical accounting studies. For this reason, efforts have also been made to clarify methodological issues such as diagnostic procedures and related remedial measures for problems such as autocorrelation resulting from the use of this model.
- ☐ The new model allows this study to extend the time coverage from one future period (in Jacobson and Aaker, 1993) or three future periods (in Kothari and Sloan, 1992; and Collins *et al.*, 1994) to infinity. This provides a more complete

and more practical picture about investors' market decisions. Moreover, the multi-period approach allows me to observe how the use of information is diminished along the time horizon, and makes it possible to compare and test how the speed of decay is different between the U.S. and Japan, which in turn may be a good indicator of differential market behaviour.

- It is widely recognized that there exists a considerable lack of empirical comparative studies on international accounting. This study fills the vacuum by utilizing both market and accounting data for a reasonably large sample of companies from the U.S. and Japan, coupled with an in-depth analysis of the empirical findings.

§ 9.4 Implications for future research

Despite considerable efforts having been made by accounting researchers in modelling and testing the association between stock prices and accounting earnings, the issue remains unresolved to a certain extent. When the time span of reported accounting earnings is extended to include earnings from periods before and after the current year, the issue becomes even more uncertain. By using different models, this study provides an opportunity to observe an important question from a new angle.

The current study may be extended to other cross-sectional comparative studies. The models developed in this study may be applied to other determinants of accounting earnings which are believed to be more closely related to firms' long term performances (e.g., R&D expenses, capital expenditures). Different proxies for the information environment may also be used to extend this study. Items under consideration could include firm age, the number of analysts available, and the timeliness of disclosure.

The current study may also have a practical implication for international accounting standard-setting. Contrary to the optimism of harmonization of international accounting practices, which was stimulated by the recent increase in the worldwide acceptance of International Accounting Standards (IASs), this study shows that the same accounting technique or procedure may be applied and interpreted very differently in different countries.

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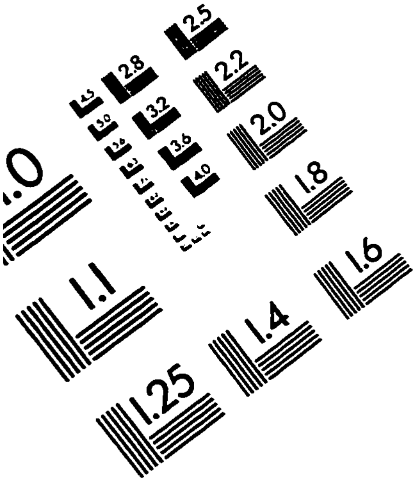
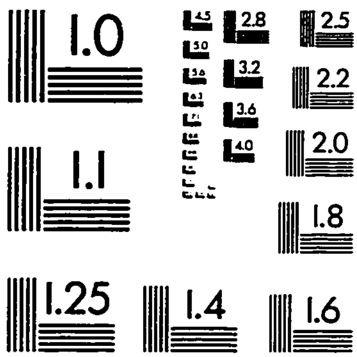
IMAGE EVALUATION TEST TARGET (QA-3)



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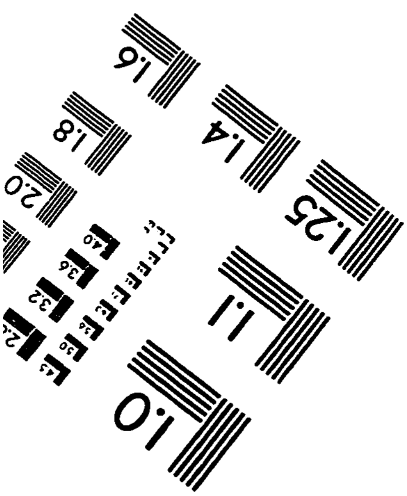
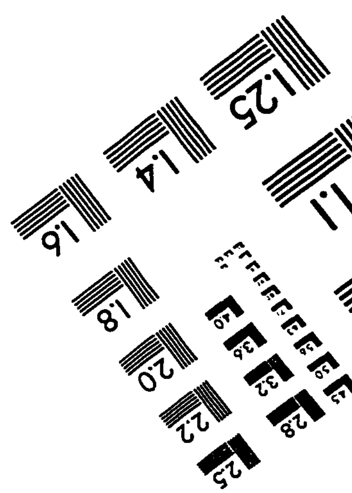

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