The Hong Kong Polytechnic University

School of Accounting and Finance

Earnings Quality, Analysts, Institutional Investors and Stock Price Synchronicity

ZHOU Jing

A Thesis Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

August 2007

CERTIFICATE OF ORIGINALITY

I hereby declare that this thesis is my own work and that, to the best of my knowledge and belief, it reproduces no material previously published or written, nor material that has been accepted for the award of any other degree or diploma, except where due acknowledgement has been made in the text.

_____ (Signed)

ZHOU Jing (Name of Student)

Dedication

To my parents,

Hongchang Zhou and Jingwei Shen

Abstract

Stock price signals information to the financial market, the informativeness of stock price is always a keen topic in finance and accounting literature. Recently, attention has been directed to stock price synchronicity as a measure of stock price informativeness.

The objective of this study is to examine the relationship between earnings quality (measured by a set of seven attributes: accrual quality, persistence, predictability, smoothness, value relevance, timeliness and conservatism) and stock price synchronicity. In addition, I examine with the presence of financial analysts and institutional investors, whether the relation between earnings quality and stock price synchronicity is stronger or weaker.

Using 7,422 firm-year observations from 1996-2004 in the US market, I conduct the tests using the methods outlined in Fama-MacBeth (1983). The results support the hypothesis that the higher (lower) the earnings quality the lower (higher) the stock price synchronicity. The results are generally consistent with the information perspective of stock price synchronicity. I partition the full sample into analyst following/non-analyst following subsamples and high/low institutional ownership subsamples. The regression results reveal that the relation between stock price synchronicity and earnings quality is stronger for analyst following subsample (AF) and high institutional ownership (HIO) subsample, indicating that financial analysts

and institutional investors reinforce the relation between earnings quality and stock price synchronicity.

Overall, I find evidence that the higher (lower) earnings quality is associated with lower (higher) stock price synchronicity. This evidence suggests that earnings quality matters in the information incorporation process. I further provide evidence that two market participants, financial analysts and institutional investors reinforce the above relation.

Keywords: Earnings Quality, Stock Price Synchronicity, Analysts, Institutional Investors

Acknowledgement

I want to express my sincerest gratitude to my supervisor, Professor Gul for his support and guidance during my Ph.D. study. Professor Gul has provided me with invaluable inspiration and encouragement in spite of his busy schedule. I am greatly influenced by his thoughts.

I am deeply indebted to my co-supervisor, Professor Chen for his never-ending support. Professor Chen has allocated a lot of time for me to discuss my findings. His suggestions and encouragement helped me in all the time of research and writing of this thesis.

I would like to express my gratitude to all those who gave me the possibility to complete this thesis. I wish to offer thanks to Professor Peter Cheng for his unconditional support in every matter in my Ph.D. study. I am also thankful to Roger Lui for his kind help in my data collection process.

I owe many thanks to my friends and classmates at Hong Kong Polytechnic University for their help, support and valuable hints: Shauna Shi, Rachel Hang, Jerry Chen, Byron Song, Kevin Zhu and the rest of the Faculty of School of Accounting and Finance.

Table of Contents

🕮 Chapter One

Introduction

1.1 Objectives and Motivation

In this study, I examine the relationship between earnings quality (measured by a set of seven attributes: accrual quality, persistence, predictability, smoothness, value relevance, timeliness and conservatism) and stock price informativeness (measured by stock price synchronicity). In addition, I investigate the effect of two types of market participants, namely financial analysts and institutional investors, on this relation. Specifically, I examine whether the relation between earnings quality and stock price synchronicity is stronger or weaker for firms with financial analysts and institutional investors.

This study is motivated by the following factors. First, stock price reflects the resources allocation in the capital market. An informative stock price will improve the efficiency of capital allocation. Understanding what factors affect stock price synchronicity is important from this resource allocation perspective. Resource allocation efficiency affects economic development and growth.

Second, there is a debate over the interpretation of stock price synchronicity. In the literature, there are basically two opposite interpretations of stock price synchronicity, the information interpretation vs. the noise interpretation. Morck et al. (2000), Wurgler (2000), Durnev et al. (2004), Piotroski and Roulstone (2004) and other studies support the information interpretation. They use stock price synchronicity to measure the extent to which firm information incorporated into stock price. The noise interpretation is recently supported in studies by Rajgopal and Venkatachalam (2006), Yang and Zhang (2006) and Ashbaugh-Skaife et al. (2006), who find evidence that synchronicity is more a measure of noise rather than a measure of information. These opposite evidence basically raise the question that if greater firm-specific return volatility (lower synchronicity) is associated with poorer quality information then how higher firm-specific return volatility (lower synchronicity) can also be associated with more firm-specific information being reflected in returns. This study takes the position that it is an empirical issue and tests this issue by linking accounting informativeness and stock price informativeness in order to provide a direct answer to this question. Informed accounting figures (high quality earnings) should lead to informed stock price; by

testing stock price synchronicity in this setting, this study can provide some evidence surrounding the debate.

Third, financial analysts and institutional investors are important market participants in the financial market. Financial analysts influence the mass investors through their earnings forecasts and stock recommendations. Institutional investors are a sophisticated group with information advantage and superior analytical ability; they also exert influence on the firm they invest. Understand their role in the financial market and their influence on the stock price behavior is important. This is the motivation for this study to look at these two market participants. Moreover, there is limited study on the effect of market participants on stock price synchronicity. To my knowledge, there are only two related studies. Piotroski and Roulstone (2004) examine the role of three market participants, insiders, analysts and institutional investors on synchronicity. Chan and Hameed (2006) focus on analysts in emerging markets. Neither of these studies considers the effect of the interaction of market participants and accounting information on synchronicity. The interaction is important because it explains how and to what extent accounting information is used by market participants.

1.2 Overview of Research Methods and Major Findings

Three hypotheses are tested in this study. The first hypothesis is to test whether earnings quality is related to stock price synchronicity. I hypothesize that stock price synchronicity, as an inverse measure of stock price informativeness, is negatively associated with earnings quality. Following Francis et al. (2004), I use seven commonly used measures to measure earnings quality: accrual quality, persistence, predictability, value relevance, timeliness and conservatism.

Using 7,422 firm-year observations from 1996-2004 in the US market, I conduct the tests using the methods outlined in Fama-MacBeth (1983). The results of the Fama-MacBeth regression of the decile rank of earnings quality attributes support the hypothesis that the higher (lower) the earnings quality the lower (higher) the stock price synchronicity (except for the relation between Conservatism and stock price synchronicity which is not statistically significant). The results are generally consistent with the information perspective of stock price synchronicity. Using two factors derived from the factor analysis of seven earnings quality attributes, the relationship still holds, which further supports the hypothesis.

The next two hypotheses test the effects of two market participants, financial analysts and institutional investors, on the relation between earnings quality and stock price synchronicity. The second hypothesis considers financial analysts and the third hypothesis takes institutional investors into account.

Lang and Lundholm (1996) identify two roles analysts play in the capital market. These two roles are sometimes called 'substitutes' or 'complements' in later researches. One stream of research finds results indicating that timely (often interpreted as high quality) accounting disclosure and analyst following are complements (Lang and Lundholm 1996; Frankel et al. 2006; Francis et al. 2002). Others find that investors are expected to place lower weight on accounting information with high analyst following (the substitution role) (Holthausen and Verrecchia 1988; Demski and Feltham 1994; Frankel and Li 2004; Botosan 1997). If earnings quality and analyst following are substitutes, then with the presence of financial analysts, the relation between earnings quality and synchronicity will be weaker. If earnings quality and analyst following are complements, then with the presence of financial analysts, the relation between earnings quality and

synchronicity will be stronger. Similarly, if institutional investors make better use of accounting information, I expect the relation between synchronicity and earnings quality will be stronger (weaker) in high (low) institutional ownership subsample.

To test Hypothesis 2, I partition the full sample into analyst following/non-analyst following subsamples. The number of analysts following the firm is defined as the number of analysts making annual earnings forecast for that firm during the year. The regression results reveal that the relation between stock price synchronicity and earnings quality is stronger for analyst following subsample (AF), indicating that financial analysts reinforce the accounting information incorporated in to stock price.

To test Hypothesis 3, I partition the full sample into high/low institutional ownership subsamples. Institutional ownership is the percentage of common shares hold by institutions over the total number of common shares outstanding. The regression results reveal that the relation between stock price synchronicity and earnings quality is stronger for high institutional ownership (HIO) subsample, indicating that institutional investors reinforce the relation between earnings quality and stock price synchronicity.

1.3 Contribution

This paper contributes to the literature in the following ways. First, to the best of my knowledge, this paper is the first study that directly links the quality of accounting information to stock price synchronicity. Specifically, I use Francis et al. (2004)'s seven earnings quality variables in my empirical tests on stock price synchronicity. Although Rajgopal and Venkatachalam (2006) also look at the effects of accrual quality on stock price informativeness, my tests are different from theirs in the following aspects. For one thing, they focus on time-series trends; more importantly, their tests focus on return volatility measured as the average monthly variance of raw or market adjusted returns, while my tests directly use stock price synchronicity. This study tests the relation between seven earnings quality variables and stock price synchronicity and links accounting informativeness to stock price informativeness. These results add support the information perspective of the debate over the interpretation of stock price synchronicity.

Second, this study contributes to the literature on the role of financial analysts and institutional investors in the financial market. Specifically, this study shows the

interplay of accounting information and financial analysts and the interplay of accounting information and institutional investors. The empirical results of this study reveal that financial analysts and institutional investors make better use of earnings information in their decision making which is reflected in stock price informativeness, indicating that these two market participants reinforce the relation between earnings quality and stock price synchronicity.

1.4 The Structure of the Thesis

The rest of the thesis is structured as follows. Chapter 2 reviews the related literature. Chapter 3 examines the effect of earnings quality on stock price synchronicity. Based on the results of Chapter 3, Chapter 4 further examines the effect of two market participants, financial analysts and institutional investors, on the relation between earnings quality and stock price synchronicity. I conclude this study and put forward some future research opportunities in Chapter 5.

🕮 Chapter Two

Literature Review

In this chapter, I review the relevant literature on stock price synchronicity, earnings quality, financial analysts and institutional investors. Section 2.1 reviews the literature on stock price synchronicity. Section 2.2 reviews the literature on the seven earnings quality attributes used in this paper. Section 2.3 and section 2.4 review the literature on the role of analysts and institutional investors in the financial market respectively.

2.1 Stock Price Synchronicity

2.1.1 Stock Price Synchronicity as a Measure of Firm-Specific Information

The extant literature on stock price synchronicity suggests that it is a measure of firm-specific information that is incorporated into stock prices. Morck et al. (2000) observe a phenomenon that stock prices move together more in poor economies than in rich economies. Across 40 countries, the five highest synchronicities are for Poland, China, Malaysia, Taiwan, and Turkey while the lowest synchronicities are for developed high-income countries: the United States, Ireland, Canada, the United

Kingdom, and Australia. They find that this phenomenon is not due to market size and is only partially explained by higher fundamentals correlation in low-income economies. They further consider another plausible explanation that poor and uncertain protection of private property rights causes market-wide stock price swings. They construct a 'good government index' to measure how well a country protects private property rights as the sum of three indexes from La Porta et al. (1998), each ranging from zero to ten. These indexes measure government corruption, the risk of expropriation of private property by the government, and the risk of the government repudiating contracts. They find that government disrespect of private property rights and lack of shareholder protection laws actually explains the low level of firm-specific return variation in those economies.

Wurgler (2000) examines whether and how financial markets improve the allocation of capital. Using data from 65 countries, 28 industries across 33 years from 1963 to 1995, he finds evidence that developed financial markets, as measured by the size of the domestic stock and credit markets relative to GDP, are associated with better allocation of capital. He further finds that capital allocation is improved through at least three mechanisms. First, the efficiency of capital allocation is positively

correlated with the amount of firm-specific information (less stock price synchronicity) in domestic stock returns, which indicates that countries with stock markets that impound more firm-specific information into stock prices exhibit a better allocation of capital. Second, the efficiency of capital allocation is negatively correlated with the extent of state ownership in the economy, indicating that capital allocation improves as state ownership declines. Third, the efficiency of capital allocation is positively correlated with the legal protection of minority investors.

Bushman et al. (2004) find greater firm-specific return variation (less stock price synchronicity) in countries with more developed financial analysis industries and with a freer press. They measure the amount of private information acquisition by financial analysts with the average number of analysts following large firms as reported in Chang et al. (2000) and the firm specific information dissemination by the penetration of the media channels in the economy by the average rank of countries' per capita number of newspaper and televisions during 1993 and 1995 as reported by World Development Indicators. These studies link the country level stock price synchronicity to better functioning stock market and in these country level studies, the stock price synchronicity is calculated for each country which is

contrary to the following studies on firm level stock price synchronicity in which the stock price synchronicity is calculated for each individual firm.

The following studies have applied the firm level stock price synchronicity to measure firm level stock price informativeness. Durnev et al. (2003) investigate whether firm-specific price movements reflect the capitalization of private information into price or noise trading. Using the US data from 1983 to 1995, they find the firm specific stock price variability is positively correlated with both of their measures of stock price informativeness: (1) the aggregated coefficients on the future earnings, and (2) the marginal variation of current stock return explained by future earnings. Their results support the first conjecture of Roll (1988) that firm-specific variation reflects arbitrageurs trading on private information.

Durnev et al. (2004) investigate the link between corporate capital investment and firm's stock price informativeness. They argue that corporate capital investment should be more efficient where stock prices are more informative because stock prices convey meaningful signals. Using a sample of 4,066 firms spanning 205 three-digit SIC industries from 1990 to 1992, they document a positive association

between a measure of the economic efficiency of corporate investment (deviation in Tobin's marginal q from its optimal level, the smaller the deviation, the greater the investment efficiency) and the magnitude of firm-specific variation in stock returns. Their results further support the view that firm-specific variation (or stock price synchronicity) gauges the extent to which information about the firm is quickly and accurately incorporated into stock prices.

Chen et al. (2006) assess the hypothesis that managers learn from the private information in stock price when they make corporate investment decisions. Specifically they examine the relation between measures of the amount of private information in stock price and the sensitivity of corporate investment to price. Their sample consists of 68,277 firm-year observations with 7,268 firms in the US market from 1981 to 2001. They use stock price non-synchronicity and PIN[1] as measures of stock price informativeness to test the effect on the sensitivity of corporate investment to stock price and find significant positive relation between these two measures and sensitivity of investment to stock price. Their results show that

[1] The measure was developed in Easley, Kiefer, and O'Hara (1996), Easley, Kiefer, and O'Hara (1997a), and Easley, Kiefer, and O'Hara (1997b)

managers learn from the private information in stock price when they make corporate investment decisions.

Gul et al. (2007) examine the effects of firm level corporate governance on stock price synchronicity in emerging market, China, over period 1996 to 2003. Using a sample of 6,120 firm-year observations, they first find that stock price synchronicity increases, but at a decreasing rate (concave relation), with the shareholding by the largest shareholder. Moreover, the synchronicity is lower when the largest shareholder is not government-related than when he or she is government related which supports the view that government-related, largest shareholders have little incentive to disclose value-relevant, firm-specific information to outsider shareholders than the no-government-related, largest shareholders. Second, stock price synchronicity decreases with the level of foreign shareholding. A comparison between B shares and H shares indicates that foreign shares that are listed in Hong Kong stock market are associated with even higher firm-specific information and lower stock price synchronicity than foreign shares that are listed in the domestic Shanghai or Shenzhen B share stock market. Third stock price synchronicity decreases with audit quality. Their results suggest that firm level corporate

governance could improve the informational and functional efficiency of capital market in emerging markets where country level investor protection is weak.

Piotroski and Roulstone (2004) investigate the impact of three market participants, namely, institutional investors, analysts and insiders on the synchronicity of stock price. Using the US data from 1984 to 2000, they find that insider transactions improve the flow of firm-specific information into individual stock prices because insiders possess firm level information advantage. In addition they argue that analysts focus their efforts on obtaining industry-wide and market-wide information and thus the analyst activities will lead to more industry-level and market-level information incorporated into stock price. In line with this argument, they find that a positive association between stock return synchronicity and analyst forecasting activities, suggesting analysts improve intra-industry information transfers. Institutional trading, measured by change of institutional ownership, is negatively related to stock price synchronicity, but the relation is conditional on the level of holdings. Institutional trading reduces synchronicity, but this effect becomes less negative as the combined, pre-trade ownership stake increases.

Chan and Hameed (2006) examine the association between stock price synchronicity and analyst following in 25 emerging markets from 1993 to 1999. In emerging markets, the lack of publicly available firm-specific information and less stringent disclosure requirement may lead to greater investor demand for analysts who produce firm-specific information; or on the contrary, the weak property rights discourage informed risk arbitrage based on firm-specific information (Morck et al. 2000) and the pay off to analysts to produce firm-specific information may be too low. They find that greater analyst coverage increases stock price synchronicity, indicating that stocks covered by more analysts incorporate greater market-wide information and lesser firm-specific information. Their results are consistent with those of Piotroski and Roulstone (2004), suggesting that analysts help the market and industry level information transfer.

2.1.2 Stock Price Synchronicity as a Measure of Noise

Recently there is more and more evidence emerging to challenge the information interpretation of stock price synchronicity. For example, Rajgopal and Venkatachalam (2006) examine the time-series trends of financial reporting quality and idiosyncratic return volatility for the US firms over the last four decades (1962-

2001). In particular, they investigate whether the upward trend in idiosyncratic volatility is related to (1) financial reporting quality, and (2) dispersion in analysts' earnings forecasts. They find that deteriorating financial reporting quality and higher dispersion in analysts' forecasts of earnings are statistically associated with higher idiosyncratic return volatility and this association persists even after control for accounting for new listings, high-technology firms and firm-years with losses, mergers and acquisitions and financial distress. Although they focus on time-series trends in these two constructs, their results question the information interpretation of stock price synchronicity because higher idiosyncratic return volatility is generally associated with lower stock price synchronicity.

Basically, they raise the question that if greater firm-specific return volatility is associated with poorer quality information then how higher firm-specific return volatility can also be associated with more firm-specific information being reflected in returns. However they focus on return volatility which is measured as the average monthly variance of raw or market adjusted returns rather than directly use stock price synchronicity in their empirical tests.

Yang and Zhang (2006) examine stock price synchronicity and four accounting based regularities countering efficient market hypothesis, including accrual anomaly (Sloan 1996), the net operating assets anomaly (Hirshleifer et al. 2004), post earnings announcement drift (Bernard and Thomas 1989, 1990) and the V/P anomaly (V/P is the ratio of I/B/E/S consensus forecasts to estimate firms' fundamental values (V) over stock price (P), Frankel and Lee 1998). Their argument is that better corporation information environment decreases the magnitude of anomalies and if stock price synchronicity is inversely related to the amount of firm-specific information available to investors, they should observe that the anomalous effects are weaker among low synchronicity firms. Using data from the US market covering period from 1964 to 2002, they find low synchronicity firms have strong accounting-based anomalies, which is not consistent with the argument that stock price synchronicity measures the extent to which firm-specific information is incorporated into stock price.

Ashbaugh-Skaife et al. (2006) find little evidence to support using stock price synchronicity as a measure of firm-specific information internationally. Their sample covers firms from Australia, France, Germany, Japan, the United Kingdom,

and the United States from 1990 to 2002. They fail to find consistent relation between the R^2 measure of stock price synchronicity and the pricing of the future earnings information or between R^2 measure and analysts' forecast errors in international markets, indicating stock price synchronicity is not associated with the amount of firm-specific information. In addition, they investigate whether there is a change in stock price synchronicity surrounding firms' cross listings in the United States. Cross listing in the US represents a major information event and cross listed firms need to provide more detailed firm information in financial reports to meet the disclosure requirement in the US stock market. In this case, if stock price synchronicity measures the amount of firm-specific information in stock price, synchronicity is expected to decline after a firm cross list in the US market. However, they find no evidence that Australian, French, German, Japanese or UK firms' synchronicity decline following their cross listing in the United States market, which further question whether the stock price synchronicity measures the amount of firm-specific information incorporated in stock price. They further propose a new measure, zero-return (measured as the percentage of number of zero return days) to measure the informativeness of stock price and find supporting evidence that zero-return is superior to synchronicity to measure stock price informativeness.

These opposite evidence question the information interpretation of stock price synchronicity and indicate that synchronicity is more a measure of noise rather than a measure of firm-specific information reflected in stock price.

2.2 Earnings Quality

The quality of earnings figures is important to the financial market. Investors value the firm and analysts make earnings forecasts and stock recommendations based on earnings figures. In the past few years, the corporate fraud of Enron, Tyco and WorldCom call into question the reliability of reported earnings. Poor quality earnings provide distorted information to the financial market to defraud investors and other stakeholders, therefore understanding the nature of accounting transactions and different attributes of earnings quality is important. This section reviews the literature on the earnings quality attributes used in my empirical analysis. Following Francis et al. (2004), this paper uses accrual quality, persistence, predictability, smoothness, value relevance, conservatism and timeliness to proxy for earnings quality. Using seven measures instead of one single measure can better

capture various dimensions of the quality of earnings and make the empirical results more meaningful and insightful.

2.2.1 Bottom Line Figures as Source of Information

Academic researchers have identified annual reports as the principal communication device available to companies. Botosan (1997) states that although the annual report is only one means of corporate reporting, it should serve as a good proxy for the level of voluntary disclosure provided by a firm across all disclosure avenues because annual report disclosure levels are positively correlated with the amount of disclosure provided via other media (Lang and Lundholm 1993). Among the various items disclosed in annual reports, bottom line earnings number is certainly one of the most important, if not the most important, source of information for investors. Earnings are widely believed to be the premier information item provided in financial statements (Lev 1989). General investors, even skilled analysts use earnings number in their decision making. A survey by Block (1999) asked analysts to rank their key valuation inputs and the respondents ranked earnings first and dividends last. Given the key role earnings play in investors' decision making, it is not surprising to find extensive research in this area.

2.2.2 Earnings Quality Definition

Although academic research on earnings quality is considerable, there is no consensus either on the definition of earnings quality or on the measures. Dechow and Schrand (2004) define high quality earnings as that should (1) accurately reflect the company's current operating performance, (2) be a good indicator of future operating performance and (3) be a useful summary measure for assessing firm value. Schipper and Vincent (2003)'s definition focuses on decision usefulness and define earnings quality as 'the extent to which reported earnings faithfully represent Hicksian income' (Schipper and Vincent 2003, p.98), where Hicksian income corresponds to 'the amount that can be consumed (that is, paid out as dividends) during a period, while leaving the firm equally well off from the beginning to the end of the period' (Hicks 1939, p.176).

2.2.3 Earnings Quality Measurement

Researchers also use various measures to measure earnings quality. As summarized by Francis et al. (2004), the most commonly used measures are: persistence,

predictability, accrual quality, smoothness, value relevance, timeliness and conservatism.

2.2.3.1 Persistence and Predictability

An earnings number that represents the annuity of expected future cash flows is likely to be both persistent and predictable (Dechow and Schrand 2004). Earnings that are more persistent and more predictable are viewed as higher quality. Revsine et al. (1999) state that earnings are considered to be of high quality when they are sustainable. Penman and Zhang (2002), and Richardson (2003) define higher quality earnings are earnings that are more persistent. Lipe (1990) use both predictability and persistence as indicators of quality of earnings. Predictability, according to Lipe (1990), is the ability of past earnings to predict future earnings. The difference between predictability and persistence is that the predictability of earnings is a function of the average absolute magnitude of annual earnings shocks, whereas the time-series persistence of earnings reflects the autocorrelation in earnings (Lipe 1990). As such, following Francis et al. (2004) and Richardson (2003), I measure earning persistence as the slope coefficient from a regression of current earnings per share on lagged earnings per share, while predictability of earnings series is

captured by the variance of the earnings shocks (Lipe 1990), as measured by the variance of estimation residuals of the persistence regression.

2.2.3.2 Accrual Quality

Persistent and predictability alone are not sufficient to indicate that earnings are of high quality. When management intentionally manages earnings, the earnings number will mislead investors. Earnings management occurs:

> when managers use judgment in financial reporting and in structuring transactions to alter financial reports to either mislead some stakeholders about the underlying economic performance of the company or to influence contractual outcomes that depend on reported accounting numbers. (Healy and Wahlen 1999, p.368)

By adopting this definition, I view earnings management as a device management uses to mislead investors. Clearly earnings management decreases earnings quality. In the spirit of high quality financial reporting, the right choice is the one that best reflects the economics of the underlying transaction. Financial reports are prepared

on accrual basis, which creates the opportunity for earnings management because managers need to make forecasts, estimates and judgment in deciding the amount of accruals to be recorded in financial statements. Earnings quality can be improved when accruals smooth out value irrelevant changes in cash flows but earnings quality is reduced when accruals are used to hide value relevant changes in cash flows. Large accruals, especially discretionary accruals, are a signal of earnings management. Discretionary accruals can be disentangled from total accruals by empirical models such as the Jones (1991) model, the modified Jones model (Dechow et al. 1995) and performance-matched model (Ashbaugh et al. 2003, Kothari et al. 2005). Acknowledging this, one stream of research uses the amount of accruals, and sometimes discretionary accruals, as a measure of earnings management (Dechow et al. 1995; Leuz et al. 2003). Their findings indicate that management uses accruals especially discretionary accruals, to opportunistically manipulate earnings.

Dechow and Dichev (2002) develop another model to assess the accrual quality by estimating the standard deviation of residuals from firm-specific regressions of working capital accruals on last-year, current-year, and one-year-ahead cash flow

from operations. As mentioned previously, using accruals involves management's estimates and judgment, and such estimates and judgment will induce estimation error intentionally as well as unintentionally. Estimation error will reduce the beneficial role of accruals and lower the earnings quality. In this sense, Dechow and Dichev (2002)'s approach is better than magnitude of accruals as a measure of earnings quality because one feature of their approach is that the notion of estimation errors includes both intentional and unintentional errors. This paper follows Dechow and Dichev (2002)'s accrual quality model.

2.2.3.3 Smoothness

Early in 1953, Hepworth put forward some motivation for firms to smooth periodic income. Firms smooth income because of tax advantages to do so, in addition, a relative stable level of periodic income will ensure a good relation with investors and workers (Hepworth 1953). Hepworth (1953) also writes

> Certainly the owners and creditors of an enterprise will feel more confident toward a corporate management which is able to report stable

earnings than if considerable fluctuations of reported earnings exist.

(Hepworth 1953, p.33)

Lambert (1984) shows that managers smooth income to smooth managerial compensation. Trueman and Titman (1989) show firms smooth income because they want investors to perceive that their firms are less risky. They argue that by smoothing income the managers may be able to reduce the estimate of various claimant of the firm about the volatility of its underlying earnings process, which in turn, lowers their assessment of the probability of bankruptcy. No matter what the motivations behind income smoothing, the concern here is to assess the impact of income smoothing on earnings quality, namely is smoothness a good attribute or a bad attribute. Chaney and Lewis (1994) put forward a theoretical model to examine whether this smoothing process result in more informative earnings and their results show that by smoothing reported earnings around the expected earnings reports, high type managers (managers of high value firms) can reduce the noise in their reports, thereby allowing investors to increase the accuracy of their assessment of firm value. Consistent with Chaney and Lewis (1994)'s framework, Hunt et al. (2000)'s empirical results indicate a signaling effect of income smoothing.

Smoother income may aid the reader in assessing the future prospects of the firm by enhancing the usefulness of the information conveyed for predictive purpose (Hunt et al. 2000). Therefore, following Francis et al. (2004), this paper views smoother earnings as high quality earnings.

The above four attributes are all derived using accounting numbers only, so following Francis et al. (2004), I classify them as accounting based earnings quality attributes. Next three attributes, namely relevance, timeliness and conservatism are derived using both accounting numbers and market returns, as such, I classify them as market based earnings quality attributes.

2.2.3.4 Value Relevance

Starting from Ball and Brown (1968), researchers began to look at the contemporaneous relationship between stock return and accounting earnings. The return-based approach is to assess the ability of earnings to explain returns and that serves as a measure of the relevance of accounting information. If the information contribution of earnings to investors is significant, then earnings should exhibit a considerable explanatory power with respect to market return, which points to a

consideration of the returns/earnings correlation, or the R^2 of the regression of stock returns on earnings, as a measure of the information contribution of earnings to investors (Lev 1989). Many researches have used this contemporaneous relationship to assess the usefulness of financial information. Early within-country studies generally compare the value relevance of earnings components (Ball and Brown 1968, Bowen et al. 1987, Dechow 1994). Dechow (1994) find that the value relevance of accruals increases with (1) the decrease in the performance measurement interval, (2) the increase in the volatility of the firm's working capital requirements and investment and financing activities, and (3) the increase in the firm's operating cycle. Other studies consider the time-series trend, for example, to investigate the changes in the value relevance of earnings over the past forty years, Collins et al. (1997) use R^2 as the primary metric to measure value relevance. They find that the combined value-relevance of earnings and book values has not declined over the past forty years and, in fact, appears to have increased slightly. In addition, while the incremental value-relevance of 'bottom line' earnings has declined, it has been replaced by increasing value-relevance of book values. Lev and Zarowin (1999) and Francis and Schipper (1999) use value relevance as measured by R^2 of the return/earnings regression to examine the usefulness of financial reporting.

Following Lev (1989) and Francis et al. (2004), my measure of value relevance is the explanatory power of earnings level and change for returns.

2.2.3.5 Conservatism and Timeliness

Conservatism is defined as the differential verifiability required for recognition of profits versus losses (Watts 2003). The accountants usually are prudent and have tendency to require a higher degree of verification to recognize good news as gains than to recognize bad news as losses (Basu 1997). By timeliness, I mean the timely incorporation of economic losses in accounting income. Basu (1997) documents the presence of reporting conservatism in the US from 1963 to 1990 and the contemporaneous sensitivity of earnings to negative returns is two to six times that of earnings to positive returns. Givoly and Hayn (2000) find that the reported profitability for the US firms over the last four decades (1950-1998) has generally declined. More revealing is that this decline is not accompanied by a corresponding decline in cash flows. They demonstrate that the degree of conservatism for the US reporting has been increasing over time. Pope and Walker (1999) and Ball et al. (2000, 2003) examine the international differences in accounting timeliness and conservatism. Pope and Walker (1999) analyze the difference in timeliness and

conservatism between the US GAAP and the UK GAAP regimes. They find that the US firms are related to higher degree of conservatism measured by using earnings before extraordinary items than the UK firms. However, when conservatism is measured by using earnings after extraordinary items, the UK firms are related higher degree of conservatism. Using data in eleven years from seven countries[2], Ball et al. (2000) find that common law countries' earnings are more conservative than those of code law countries. Ball et al. (2003) find that earnings conservatism for four Asian countries Hong Kong, Malaysia, Singapore and Thailand is more similar to that of code law countries than to common law countries although their standards derive from common law sources (UK, US, and IAS) that are widely viewed as higher quality than code law standards. They attribute this phenomenon to the reason that East Asian financial reporting generally takes place within an incentive structure that can be characterized as a variant of the code law model. Incentives dominant standards in the way companies prepare financial reports in these four countries.

[2] The seven countries in Ball et al. (2000) study are Australia, Canada, UK and USA (Common law countries) and France, Germany and Japan (Code law countries).

In the literature, several arguments have been presented in favor of the view that conservatism and timeliness of earnings are favorable attributes of earnings. For example, Watts (2003) argues that conservatism can serve as a constraint to managerial opportunistic behavior and offsets managerial biases with its asymmetrical verifiability requirement and in this sense, conservatism increases earnings quality. Ball et al. (2003) also state that conservative accounting facilitates monitoring of managers and of debt and other contracts, and is an important feature of corporate governance. Timeliness and conservatism together, sometimes called transparency (Ball et al. 2000), are thus desirable attributes of earnings. Following Basu (1997) and Ball et al. (2000), I define timeliness as the explanatory power of a reverse regression of earnings on return and conservatism as the ratio of the slope coefficients on negative returns to the slope coefficients on positive returns in a reverse regression of earnings on returns.

2.3 Role of Financial Analysts

2.3.1 Analysts Influence on Information Efficiency of Capital Markets

Analysts are prominent information intermediaries in the capital market. They engage in private information search, perform prospective analysis aimed at

forecasting a firm's future earnings and cash flows, and conduct retrospective analysis that interprets past events (Beaver 1998). Justice William O. Douglas is an early believer of analysts' activities improving the efficiency of capital markets. Douglas (1933) observes, 'even though an investor has neither the time, money, or intelligence to assimilate the mass of information in the registration statement, there will be those who can and who will do so, whenever there is a broad market. The judgment of those experts will be reflected in the market price.'

Using data from the US market covering period 1976-1996, Hong et al. (2000) find that momentum strategies work better among stocks with low analyst coverage and the momentum profits are roughly 60 percent greater among the one-third of the stocks with the lowest residual coverage, as compared to the one-third with the highest residual coverage. They control for the influence of size on analyst coverage by sorting stocks into groups according to their residual analyst coverage, where the residual comes from a regression of coverage on firm size. Moreover, they find that the effect of analyst coverage is greater for loser stocks than for winner stocks and the effect of coverage in entirely driven by what happens in the loser stocks subsample. Their results indicate that analysts increase the speed of

diffusion of firm information across market participants and the effect of analyst coverage is much more pronounced for stocks that are past losers than for stocks that are past winners. This is intuitively sound since managers are likely to be less forthcoming for bad news than for good news and in that circumstance, outside analysts have a more crucial role to play.

Gleason and Lee (2003) examine the information content and market price discovery process associated with individual analyst earnings forecast revisions. Using the US data from 1993 to 1998, they document several factors that help explain cross-sectional variations in the post-revision price drift associated with analyst forecast revisions and find that the price drift is lower for firms followed by more analysts, suggesting that coverage by multiple analysts helps to facilitate the price discovery process. They conclude that higher analyst coverage leads to faster and more complete assimilation of the information conveyed by the level of revision innovation.

Other researches (Brennan et al. 1999; Bhattacharya 2001) also find supporting evidence that the level of financial analyst coverage influences the efficiency with

which the market processes information. Brennan et al. (1999) investigates the relation between the number of analysts following and the adverse selection costs based on the Kyle (1985) notion of market depth. Their adverse selection cost is defined as the price impact of a marginal dollar of trade, and, part from a price scale factors, is proportional to the inverse of the Kyle (1985) measure[3] of market depth. Using the intraday US data for year 1988, they find that the estimated adverse selection cost decreases with the number of analysts, controlling for the effects of previously identified determinants of liquidity.

Bhattacharya (2001) investigates the difference in the earnings expectations between two market segments, namely small traders vs. large traders. He hypothesizes that it is the small traders' earnings expectations that are most likely to be significantly associated with predictions from the seasonal random-walk model. Based on quarterly earnings announcements from 1988 to 1992, the empirical results are largely consistent with the hypotheses. Moreover, the association between small traders' abnormal trading response and absolute seasonal random-walk forecast

[3] In the Kyle (1985), depth is given by the reciprocal of the regression coefficient of the price change on the order flow.

errors is strongest for firms with low analyst following, indicating that this group of investors with lower level of analyst coverage would to a greater extent limit themselves to an incomplete information set and anchor more on a naïve expectation model such as the seasonal random-walk. This evidence is consistent with the view that analysts can help investors incorporate into their earnings expectations costly and value-relevant information.

Piotroski and Roulstone (2004) examine the effects of market participants on the process of information incorporation. They measure the intensity of analyst activity as the number of one-year-ahead earnings forecasts issued and revised for the firm during a given fiscal year. They find a positive relation between stock price synchronicity and analyst forecast revision, suggesting analysts' comparative advantage lies in interpreting specific industry or market sector trends and they facilitate industry and market level information transfer. They further use the simultaneous estimation procedures to control for the potential endogeneity problems and the results still hold.

Chan and Hameed (2006) examine the association between stock price synchronicity and analyst following in 25 emerging markets for period from 1993 to 1999. They use number of analyst following to measure the intensity of analyst activities, rather than forecast revision used by Piotroski and Roulstone (2004). In emerging markets, the relation between analyst coverage and informativeness of stock price can be argued in both ways. For one thing, the lack of publicly available firm-specific information and less stringent disclosure requirement may lead to greater investor demand for analysts who produce firm-specific information. On the contrary, the weak property rights discourage informed risk arbitrage based on firm-specific information (Morck et al. 2000) and the pay off to analysts to produce firm-specific information may be too low. They find that a significant and positive association between analyst coverage and stock price synchronicity, indicating that stocks covered by more analysts incorporate greater market-wide information and lesser firm-specific information. Their results are consistent with those of Piotroski and Roulstone (2004), suggesting that analysts help the market and industry level information transfer.

2.3.2 Analysts vs. Financial Report Informativeness

Lang and Lundholm (1996) identify two roles analysts play in the capital market. They state

> If analysts are primarily information intermediaries-the principle flow of information goes from the firm to the analysts, who process the information and transmit it to the capital market-then an increase in firm provided information means the analyst has a more valuable report to sell… If analysts are primarily information providers who compete with firm provided disclosures made directly to investors, then an increase in firm provided information will substitute for the analyst report. In this case, increase disclosure reduces the aggregate demand for analyst services. (Lang and Lundholm 1996, p.470-471)

These two roles are sometimes called 'substitutes' or 'complements' in later researches. Empirical evidence on the relation between analyst activities and financial statement informativeness, namely whether they are substitutes or complements, is mixed.

Using data from the Report of the Financial Analysts Federation Corporate Information Committee (FAF Report 1985-89), Lang and Lundholm (1996) suggest that more informative financial statements are associated with an increase in the net benefits available to information intermediaries and increased resources devoted to information discovery. More specifically, they find that more analysts follow firms and greater consensus among analysts with more informative disclosure practices. Their results show that firm-provided information is not a substitute for analyst services, but rather timely (often interpreted as high quality) accounting disclosure and analyst following are complements.

Consistent with this finding, Frankel et al. (2006) analyze analyst forecasts, stock returns, and firm characteristics for almost 24,000 firm-year observations from 1995 to 2002 for the US market and find that instead of preempting the information content of analyst reports, more timely financial information is associated with more informative analysts' reports. They measure the timeliness of financial information as the contemporaneous association between security prices and financial information and informativeness of analysts' reports as the average absolute stock price reaction to all the analyst forecast revisions for the firm. Their results indicate

that analyst informativeness and the timeliness of financial information are complements.

Francis et al (2002) investigate whether competing information, primarily analyst reports, reduces the usefulness of earnings announcement. Using the US data for the period 1986 to 1995, they find a positive relation between the price reaction to analyst reports and to earnings announcement. This positive relation is robust across both annual and pooled samples, after controlling for over time changes in the distribution of absolute abnormal returns. They further find that the market reaction to earnings announcements and to analyst reports become stronger over the sample period 1985 to 1995. Based on these findings, they conclude that their results 'do not in general support the predicted substitution relation between earnings announcements and competing information sources….' (Francis et al. 2002, p.137)

These empirical results (Lang and Lundholm 1996; Francis et al. 2002; Frankel et al. 2006) are at odds with the predictions of models where investors' reaction to the

analyst reports decreases in the quality of other information available to market participants as discussed in the following.

Some analytical models predict that investors are expected to place lower weight on analyst reports in setting prices when corporate accounting information is timely (Holthausen and Verrecchia 1988; Demski and Feltham 1994). Holthausen and Verrecchia (1988) model the relation between the quality of two sequential public information signals about the payoff of a risky asset and the ex ante expected variance of price changes in response to these information signals. For the case of analyst and financial reporting quality, Holthausen and Verrecchia (1988)'s model implies that as the quality of the first signal (analyst report) increases, the ex ante variability of the price changes to the second signal (earnings announcement) decreases.

Frankel and Li (2004) examine how financial statement informativeness, analyst following and news relate to the information asymmetry between insiders and outsiders. Based on over 200,000 firm-year observations for period from 1975 to 1997, they find that firms with financial statements that are less value relevant tend

to have higher analyst following and more news coverage, which means analyst following and news available each substitutes for financial statement informativeness. Further, they find that the profitability of insider trades declines as the number of analysts following the firm increases. Given that analyst following proxies for resources devoted into private information collection, this finding is consistent with less information asymmetry when more resources are devoted to private information collection. Outsider investors in firms with greater analyst following face less information asymmetry.

Botosan (1997) examines the relation between cost of equity capital and disclosure level and finds better disclosure decreases the cost of equity capital, but this relation only exists in low analyst following firms. She fails to find evidence of an association between disclosure level and cost of equity capital for high analyst following firms and the reason according to Botosan (1997) is that the disclosure measure is limited to the annual report and accordingly may not provide a powerful proxy for overall disclosure level when analysts play a significant role in the communication process. This result is consistent with the Holthausen and Verrecchia (1988)'s model that when analyst following is higher, investors places

less weight on financial reports, which implies that analysts and financial reports are substitutes. However, in her later work, she find that companies benefit from increased disclosure in terms of lower cost of capital when more analysts follow the company (Botosan and Plumlee 2002), which is inconsistent with her earlier results.

2.4 Role of Institutional Investors

2.4.1 Institutional Investors as Sophisticated Investors

In recent time, institutional investors have been playing an increasing important role in capital markets. Shiller and Pound (1989) conduct a survey on institutional and individual investors about the diffusion of interest and information among them. They find most individual investors deny they are systematic in their decision to buy stock, that is they do not do systematic search over a large number of stocks for a stock with certain characteristics. While most institutional investors do. In addition their survey results reveal that less than a quarter of individual investors do any analysis of the company they invest. The above survey results show that institutional investors spend more time performing investment analysis compared to individual investors. Their ability to gather and process information is where the sophistication comes from.

Prior researches use institutional ownership as a proxy for investor sophistication in various settings and find supporting evidence. Some studies investigate the role of institutional investors by examining the market reactions to financial information. Balsam et al. (2002) examine the stock price reaction to the release of accounting information around the 10Q filing date for a sample of 366 firms in the US market for period 1996 to 1998. They find a negative association between the level of unexpected discretionary accruals and cumulative abnormal returns (CAR) over a 17-day window around the 10Q filing date. They further find that this association varies systematically across firms with different level of investor sophistication and is only significant for firms with low institutional holdings. In addition, they find a significant negative association between unexpected discretionary accruals and CAR over a period ending two days prior to the filing date of 10Q for firms with relatively high institutional ownership, but not for firms with low institutional ownership. Together, this evidence suggests that institutional investors have an effect on the timing of the market reaction to accruals management and the reaction of sophisticated investors precedes that of unsophisticated investors.

Bartov et al. (2000) analyze whether the observed patterns in stock returns after quarterly earnings announcements are a manifestation of inefficient processing of quarterly earnings. Specifically, they examine the association between post-earnings-announcement abnormal returns and institutional ownership (as a proxy for investor sophistication). Based on a sample of 19,777 firm-quarter observations from 1989 to 1993 for NYSE/AMEX firms, the OLS results from a regression of post-earnings-announcement returns on two explanatory variables, an earnings-surprise variable and an institutional-holdings variable, show a positive association between post-earnings-announcement abnormal return and earnings surprise and a negative association between post-earnings-announcement abnormal return and institutional ownership level. The latter result suggests that institutional investors interpret information more accurately and thus reduce the post earnings announcement drift.

Institutional investors also help market more correctly price earnings components. Collins et al. (2003) provide insight on this factor that may contribute to the accrual mispricing phenomenon by examining whether the accrual mispricing phenomenon varies with firms with different level of investor sophistication. Their classification

of sophisticated investors is based on the classification of Bushee (1998) who classifies institutions into three groups based on factors such as portfolio turnover, diversification, and momentum trading. They use both the non-linear regression-based tests[4] (Mishkin, 1983) and hedge portfolio tests to address the research question. Results from Mishkin (1983) test indicate that the degree of accruals mispricing is substantially less for firms with high institutional ownership relative to firms with low institutional ownership, indicating that firms with a high level of institutional ownership have stock prices that more accurately reflect the persistence of accruals. The hedge portfolio tests show that the one-year-ahead hedge returns are significantly smaller for firms with high institutional ownership relative to firms with low institutional ownership, which further confirm the previous results. Together, the evidence is consistent with the belief that understanding accruals' future earnings implications requires that investors possess a reasonably high level of sophistication.

[4] The regression-based test uses a non-linear system of equations that provides a statistical comparison between: (1) the market's assessment of accruals persistence imbedded in share prices (i.e., the market's valuation coefficient on accruals) and (2) the accruals persistence with respect to future earnings (i.e., the forecasting coefficient of accruals with respect to future earnings).

Asdemir (2005) provide insights into whether the future excess returns for high R&D intensive firms and for firms with changes in R&D expenditures are due to market inefficiency and the role of institutional investors in this mispricing phenomenon. Specifically, he examine the relationship between future excess returns of R&D intensive firms and investor sophistication, and the relationship between future excess returns of firms with changes in R&D expenditures and investor sophistication. He finds evidence that the two and three year ahead risk-adjusted excess returns are almost completely mitigated by the institutional investors. In addition, the one, two and three years ahead future risk-adjusted-excess returns for R&D intensive firms that do not have institutional investor ownership are 7.87%, 8.63% and 9.19% which is almost twice the excess returns for the whole sample. His results indicate that the future excess returns of R&D intensive firms are a manifestation of unsophisticated investors' inability to incorporate future operating performance of R&D information into stock prices, and sophisticated investors, using their superior ability can reduce R&D mispricing.

Jimbalvo et al. (2002) test two competing views of institutional owners. One view is that institutional investors are overly focused on current financial performance. If

this is the case, then institutional investors are less likely to consider factors that affect future period earnings in pricing securities. The other view is that institutional investors are sophisticated with better information processing capabilities. In this case, stock prices of firms with higher institutional ownership will tend to reflect a relatively larger proportion of the information in future period earnings. Based on 38,211 firm-years from the period of 1989 to 1995, they regress returns on earnings and interaction of earnings and beginning institutional ownership. They find that for firms with higher levels of institutional ownership, relatively more future earnings information is impounded into stock prices in comparison to firms with lower institutional ownership. Their evidence supports the view that institutional investors are sophisticated investors rather than overly focused on current performance.

Piotroski and Roulstone (2004) use the net change in institutional holdings to measure the intensity of institutional investor activity because institutions can communicate their private information through their trading behavior. They find that stock price synchronicity has a significant and negative relation with the change of institutional holdings, indicating that the trading of institutional investors convey

firm-specific information to the market. However this relation is sensitive (coefficient is still negative but insignificant) to the inclusion of share turnover as an additional control variable. Moreover, the relation becomes significantly positive if they scale the change in institutional holding by total shares outstanding. Due to these inconsistencies, they conclude that the information conveyed by changes in institutional holdings is not clear. They further consider the level of institutional holding and find a significant positive relation between stock price synchronicity and the level of institutional holding. The relation is similar to that between synchronicity and analyst following, suggesting that significant institutional ownership relatively facilitates industry and market level information transfer. The relation between the synchronicity and the change in institutional ownership remains significant and negative after controlling for the level of institutional holding. The interaction of level and change of institutional holding is significantly positive, indicating that the relationship between stock price synchronicity and the change in institutional holding is on condition of the pre-trade ownership stake. Institutional trading (change in institutional holding) reduces synchronicity, but this effect becomes less negative as the combined, pre-trade ownership stake increases.

2.4.2 Institutional Investors as Myopic Investors

Similar to Jimbalvo et al. (2002)'s first view of institutional investors, institutional investors are sometimes criticized for their myopic investment behaviors. Graves and Waddock (1990) quote former chairman of Chevron, George Keller, who describes institutional investors as 'traders, not investors-eager to dump a stock for a quick profit without regard for the consequences'. They state

> Institutional owners are seen to have even shorter time horizons than individual U.S. investors because they are under tremendous pressure to show results to their constituents on a quarterly basis. They cannot afford to hold a stock through a down period when long-term expenditures such as R&D or capital spending may be depressing the stock price. (Graves and Waddock 1990, p.76)

Porter (1992) also states

> Perhaps the most basis weakness in the American system is transient ownership in which institutional agents are drawn to current earnings,

unwilling to invest in understanding the fundamental prospects of companies, and unable and unwilling to work with companies to build long-term earning power.

2.5 Chapter Summary

This chapter reviews the related literature on stock price synchronicity, earnings quality, the role of financial analysts and institutional investors in the financial markets. These past literature suggests the interpretation of stock price synchronicity, recognizes the different earnings quality attributes and identifies the role of financial analysts and institutional investors playing in the financial markets.

🕮 Chapter Three

The Effect of Earnings Quality on Stock Price Synchronicity

In this chapter, I examine the association between earnings quality and stock price synchronicity. Section 3.1 develops the hypothesis. Section 3.2 presents the methodology and the empirical results are reported in Section 3.3. I check the robustness of my results in Section 3.4. I summarize this chapter in Section 3.5.

3.1 Hypothesis 1

Prior researches have linked greater firm-specific return variation (less stock price synchronicity) to better functioning stock markets by using stock price synchronicity as a measure of incorporation of information into stock price at country level (Morck et al. 2000; Wurgler 2000; Bushman et al. 2004). Higher stock price synchronicity in poorer economies is explained by the poor investor protection in those economies (Morck et al. 2000). Wurgler (2000) finds evidence that across 65 countries, the efficiency of capital allocation is positively correlated with the amount of firm-specific information (less synchronicity) in domestic stock returns. Bushman

et al. (2004) find less stock price synchronicity in countries with more developed financial analysis industries and with a freer press.

Other researches have applied the stock price synchronicity to measure firm level stock price informativeness (Durnev et al. 2003; Piotroski and Roulstone 2004; Chan and Hameed 2006; Chan et al. 2006, etc. details see the literature review in Section 2.1.1). Their results indicate the lower the stock price synchronicity, the more informative the stock price, suggesting stock price synchronicity as an inverse measure of stock price informativeness. Synchronicity, according to these studies, mostly likely reflects the extent of capitalization of information about firm fundamentals into stock prices.

I believe these empirical results justify the use of stock price synchronicity as an inverse measure of timely and accurate incorporation of firm specific information into stock prices. The lower the stock price synchronicity, the more firm-specific information is reflected in stock price. However I also realize that this view is based on empirical evidence and recent emerging evidence shows the opposite. Rajgopal and Venkatachalam (2006), Yang and Zhang et al. (2006) and Ashbaugh-Skaife et al.

(2006)'s results suggest an opposite view that stock price synchronicity is a noise measure rather than the information interpretation (details see Section 2.1.2). I believe the evidence supporting information interpretation is better established and the opposite evidence is more likely only conditional on the methodology employed. Therefore this paper adopts the information interpretation. Ultimately I believe that the data will suggest an interpretation for stock price synchronicity. If greater firm lower stock price synchronicity is associated with better quality information then synchronicity as a measure of firm specific information reflected in stock price is reasonably supported and vice versa.

The following researches provide some guidelines to link earnings quality to stock price synchronicity. Stock price synchronicity reflects risk arbitragers' trading on private information (Morck et al. 2000). However, earnings figure which is publicly available information will affect the private information environment. The first view in the literature sees that an increase in the quantity and quality of public information may lower the profitability of acquiring private information, and thus discourages informed traders to collect and trade on private information, as more and better information becomes publicly available (Kim and Verrecchia 2001). The

second opposite view recognizes that high earnings quality will encourage informed traders or information processors with superior information analysis ability to process publicly available information into value-relevant private information, and to trade on private information for arbitrage gains (Kim and Verrecchia 1991). Private information in this case can be thought of as informed judgments or opinions of firm's performance extracted from public information. In other words, high quality public information will lower the cost of private information and result in a more informed trading. Stock prices therefore will impound such private information. Grossman and Stiglitz (1980) predict that a lower cost of private information leads to a higher intensity of informed trading, and hence to what they call 'more informative pricing'.

Durnev et al. (2004) extend the second view that higher firm specific variation (lower stock price synchronicity) stems from more intensive informed trading due to a lower cost of information, and hence indicates a more informative price. Durnev et al. (2004) states

> In a market with many risky stocks, during any given time interval, information about the fundamental values of some firms might be cheap, while information about the fundamental values of others might be dear. Traders, ceteris paribus, obtain more private information about the former and less about the latter. Consequently, the stock prices of the former, moving in response to informed trading, are both more active and more informative than the stock prices of the latter. (Durnev et al. 2004, p.67)

Similarly, Veldkamp (2005) develops a model in which high fixed costs of producing information on individual firms cause investors to focus on signals that are common to many firms. When information is costly, rational investors will not buy information about all assets; instead they will learn about a subset and thus a shock to one signal is passed on as a common shock to many asset prices, which induces stock price co-movement (non-synchronicity). This argument is consistent with the view that greater co-movement (less synchronicity) reflect less private information on each firm's fundamentals.

Morck et al. (2000) conjecture that more firm-specific price variation (less stock price synchronicity) will occur in countries with better accounting standards. If accounting data are more useful, more firm-specific public information is available to all investors, which allows risk arbitrageurs make more precise predictions regarding firm-specific stock price movements. Although they could not find significant results supporting their conjectures, the reasoning behind this argument remains valid.

The linkage of quality of accounting information and stock price synchronicity can also be found in Jin and Myers (2006). They put forward a theoretical model to show that lack of transparency increases R^2. Their model is based on the assumption insiders can capture more cash than they would receive under perfect investor protection. Jin and Myers (2006) state that the lack of transparency will require insiders to absorb firm-specific variance (risk); and therefore the variance (risk) absorbed by investors will be correspondingly lower. Given that the macroeconomic information is presumably common knowledge, the ratio of market to total risk is thus increased by opaqueness (lack of transparency), which means the explanatory power of market return to firm specific return increases by opaqueness.

Consistent with the previous information cost argument (Grossman and Stiglitz 1980; Kim and Verrecchia 1991; Durnev 2004; Veldkamp 2005), this paper suggests that better quality accounting information provided by the company, namely higher quality of earnings figure, will indicate a lower information risk and lower information cost (Francis et al. 2004) and hence will lead to more informative price (proxy by low stock price synchronicity in this paper). High quality accounting information also indicates high transparency, e.g. timeliness and conservatism together, sometimes called transparency (Ball et al., 2000). In accordance with Jin and Myers (2006) argument, high quality accounting information will also induce lower R^2 and lower stock price synchronicity.

For the above reasons, I state the first hypothesis as follows (stated in alternative form):

Hypothesis 1: Ceteris paribus, stock price synchronicity is negatively associated with earnings quality.

3.2 Methodology

3.2.1 Sample

The initial sample consists of all the US listed firms with available data on Compustat from 1996-2004.[5] I delete firms with: (1) insufficient data to estimate earnings quality measures as defined below; (2) insufficient data to estimate synchronicity measure as defined below; and (3) insufficient data to calculate control variables as defined below. Following the tradition, firms from the financial service industry (SIC code 6000-6999) and utility industry (SIC code 4900-4949) are excluded from the analysis because disclosure requirements and accounting rules are significantly different from these industries. After the above adjustments, the final sample consists of 7,422 firm year observations. Table 1 shows the sample description, which reports the number of firms used for my empirical test from 1996 to 2004 in my sample.

[Insert Table 1 Here]

[5] I use total 20 year time period (1985-2004) in this paper, but since my earnings quality measures need rolling ten years to estimate, a firm is included in the year t sample if data are available in years t-9 to t, thus the sample period is reduced to 9 years as a result.

Financial statement data are collected from the Compustat Annual Industrial and Research files. Returns and stock prices data are collected from CRSP daily and monthly stock return files.

3.2.2 Variable Measurements

3.2.2.1 Dependent Variable: Synchronicity

Each year, I estimate firm-specific measures of return synchronicity using the methodology outlined in Piotroski and Roulstone (2004). For each firm-specific observation, I regress firm j's daily return on the current and last day's value-weighted market return and the current and last day's value-weighted industry return:

Eq (1):

$$R_{j,t} = \varphi_0 + \varphi_1 R\_MARKET_{j,t-1} + \varphi_2 R\_MARKET_{j,t} + \varphi_3 R\_IND_{j,t-1} + \varphi_4 R\_IND_{j,t} + \nu_{j,t}$$

where the market return ($R\_MARKET_{j,t}$) is the value-weighted average of all the firms in the market. The industry return ($R\_IND_{j,t}$) for a specific day is created using all firms within the same industry, with firm j's daily return omitted, the industry return is the value-weighted average of these firms' daily return. The industry is

classified based on Fama-French 48 industry specifications (Fama and French, 1997). I exclude the firm in question to eliminate the spurious correlations between firm and industry returns with only few firms. In addition I include lag period industry and market returns to control for potential autocorrelations problems. Following Durnev et al. (2004), I estimate this regression for each firm-year with a minimum of 200 daily observations.

Following the definition of Morck et al. (2000) stock price synchronicity (SYNC) is defined as:

Eq (2):

$$SYNC_{j,t} = Ln[R^2_{j,t(eq1)}/(1-R^2_{j,t(eq1)}]$$

where R^2 is the adjusted R-square value from regression (1) for firm j in year t. The log transformation of R^2 creates an unbounded continuous variable out of a variable originally bounded by 0 and 1, yielding a dependent variable with a more normal distribution (Piotroski and Roulstone 2004).

3.2.2.2 Earnings Quality Measures

3.2.2.2.1 Accrual Quality

Following Dechow and Dichev (2002) and Francis et al. (2004), I estimate accrual quality using the following model:

Eq (3):

$$TCA_{j,t}/ATA_{j,t} = \alpha_{0,j} + \alpha_{1,j}CFO_{j,t-1}/ATA_{j,t} + \alpha_{2,j}CFO_{j,t}/ATA_{j,t} + \alpha_{3,j}CFO_{j,t+1}/ATA_{j,t} + \varepsilon_{j,t}$$

where:

$TCA_{j,t}$ =firm j's total current accruals in year t,

$=\Delta CA_{j,t}-\Delta CL_{j,t}-\Delta Cash_{j,t}+\Delta STDebt_{j,t}$, where:

$\Delta CA_{j,t}$ =firm j's change in current assets (Compustat #4) between year t-1 and t;

$\Delta CL_{j,t}$ =firm j's change in current liabilities (Compustat #5) between year t-1 and t;

$\Delta Cash_{j,t}$ =firm j's change in cash (Compustat #1) between year t-1 and t; and

$\Delta STDebt_{j,t}$ =firm j's change in debt in current liabilities (Compustat #34) between year t-1 and t;

$ATA_{j,t}$ =firm j's average total assets (Compustat #6) in year t and t-1; and

$CFO_{j,t}$ =cash flow from operations in year t,

=net income before extraordinary items (NIBE, Compustat #18)-total accruals (TA), where:

$TA_{j,t} = \Delta CA_{j,t} - \Delta CL_{j,t} - \Delta Cash_{j,t} + \Delta STDebt_{j,t} - DEPN_{j,t}$; and

$DEPN_{j,t}$=firm j's depreciation and amortization expense (Compustat #14) in year t.

The majority of accounting studies in the literature use an indirect balance sheet approach to calculate total accruals, such as Dechow et al. (1995), Subramanyam (1998), Sloan (1996) and Xie (2001), etc. Following these researches, this paper also adopts the indirect balance sheet approach to calculate total accruals rather than the cash flow approach proposed by Hribar and Collins (2002). Although the balance sheet estimation approach, as proposed by Hribar and Collins (2002), contains estimation error which contaminates computations of so-called

discretionary or abnormal accruals, it allows me to calculate accruals for a larger sample, especially for my 10 year window time-series regression. Cash flow approach requires data which is not available prior to 1988; in addition, the missing values for items disclosed in cash flow statement are much more than that in balance sheet.

For each firm year, I estimate the above equation using rolling ten years. This will yield ten firm and year specific residuals. Accrual quality (AccrualQuality) of firm j equals to the standard deviation of firm j's estimated residuals. Large (small) values of AccrualQuality correspond to poor (good) accrual quality.

3.2.2.2.2 Persistence and Predictability

Following Lipe (1990)'s definition of persistence and predictability and Francis et al. (2004), I estimate persistence and predictability using the following regression:

Eq (4):

$$EPS_{j,t} = \beta_{0,j} + \beta_{1,j} EPS_{j,t-1} + \xi_{j,t}$$

where:

$EPS_{j,t}$ =earnings per share,

=income before extraordinary items (NIBE, Compustat #18) in year t divided by the weighted average number of outstanding shares during year t.

For each firm year, I estimate the above equation using rolling ten years. This yield firm and year specific estimates of $\beta_{1,j}$, which capture the persistence of earnings. Persistence = $-\beta_{1,j}$[6], so that large (small) values of Persistence correspond to less (more) persistent earnings. Predictability is also derived from this equation, and is measured by the square root of the error variance. Predictablity = σ ($\xi\hat{}_{j,t}$). Large (small) values of Predictability imply less (more) predictable earnings.

3.2.2.2.3 Smoothness

Following Francis et al. (2004), I define smoothness as the ratio of firm j's standard deviation of net income before extraordinary items divided by beginning total assets,

[6] In order to conform this variable to our ordering of attributes, I use the negative of the slope coefficient of equation (2) as a measure of persistence. Such adjustment is also done for the measure of relevance, timeliness and conservatism.

to its standard deviation of cash flows from operations divided by beginning total assets:

Eq (5):

$$Smoothness_{j,t} = \sigma(NIBE_{j,t}/LTA_{j,t})/\sigma(CFO_{j,t}/LTA_{j,t})$$

where:

$LTA_{j,t}$ =firm j's total asset at the beginning of year t.

All other variables are previously defined.

Standard deviation is calculated over ten year rolling windows. Large (small) values of Smoothness indicate less (more) earnings smoothness. This measure is also similar to that of Hunt et al. (2000), whose measure is the ratio of the standard deviation of nondiscretionary net income (equal to operating cash flows plus nondiscretionary accruals) to the standard deviation of cash flows from operations.

3.2.2.2.4 Value Relevance

Following Francis and Schipper (1999), Lev and Zarowin (1999), and Francis et al. (2004), I estimate value relevance from the following regression:

Eq (6):

$RET_{j,t} = \gamma_{0,j} + \gamma_{1,j} EARN_{j,t} + \gamma_{2,j} \Delta EARN_{j,t} + \upsilon_{j,t}$

where:

$RET_{j,t}$ =firm j's 15 month return ending three months after the end of fiscal year t;

$EARN_{j,t}$ =firm j's income before extraordinary items (NIBE, Compustat #18) in year t, scaled by market value at the beginning of year t; and

$\Delta EARN_{j,t}$ =change in firm j's NIBE in year t, scaled by market value at the beginning of year t.

For each firm year, I estimate the above equation using rolling ten years. The $R^2_{j,t,(eq6)}$ measures the value relevance of earnings. Relevance = $-R^2_{j,t,(eq6)}$, so that large (small) values of Relevance correspond to less (more) relevant earnings.

3.2.2.2.5 Timeliness and Conservatism

Following Basu (1997), Ball et al. (2000) and Francis et al. (2004), I estimate timeliness and conservatism using the following model:

Eq (7):

$$EARN_{j,t} = \theta_{0,j} + \theta_{1,j}NEG_{j,t} + \theta_{2,j}RET_{j,t} + \theta_{3,j}NEG_{j,t} * RET_{j,t} + \omega_{j,t}$$

where:

$NEG_{j,t}$ =1 if $RET_{j,t}$ <0 and 0 otherwise.

All other variables are previously defined.

This equation is also estimated on a firm and year specific basis, using rolling ten-year windows. The Adjusted R^2 of this equation measures the timeliness. Timeliness = $-R^2_{j,t(eq7)}$. Following Basu (1997), Pope and Walker (1999), and Givoly and Hayn (2000), conservatism is measured as the negative of the ratio of the coefficient on bad news to the coefficient on good news, Conservatism = $-(\theta_{2,j}+\theta_{3,j})/\theta_{2,j}$. Large (small) values of Timeliness and Conservatism imply less (more) timely and less (more) conservative earnings, respectively.

3.2.3 Model Specification

I test the relationship between synchronicity (SYNC) and earning quality by estimating the following equation:

Eq (8):

$$SYNC_{j,t}=\lambda_0+ \lambda_1 Earning\ Attributes^{k}_{j,t}+ \lambda_2 SyncROA_{j,t} + \lambda_3 Ln(Herf_{j,t})+ \lambda_4 Ln(MV_{j,t})+ \lambda_5 StdROA_{j,t}+ \lambda_6\ Ln(Numind)_{j,t}+ \lambda_7\ Ind\_dummy + \mu_{j,t}$$

where:

$Earning\ Attributes^{k}_{j,t}$ = the decile rank of firm j's value of the k^{th} earnings attribute in year t, where:

K{Accrual Quality, persistence, Predictability, Smoothness, Relevance, Timeliness, Conservatism};

$SyncROA_{j,t} = Ln[R^2_{j,t(eq9)}/(1-R^2_{j,t(eq9)})]$, where:

Eq (9):

$$ROA_{j,t} = \rho_0 + \rho_1 ROA\_MARKET_{j,t-1} + \rho_2 ROA\_MARKET_{j,t} + \rho_3 ROA\_IND_{j,t-1} + \rho_4 ROA\_IND_{j,t} + \zeta_{j,t}$$

$Ln(Herf_{j,t})$ = natural log of Herfindahl index [7] (measure of industry-level concentration) for firm j in year t;

$Ln(MV_{j,t})$ =natural log of market value of firm j at the beginning of year t;

$StdROA_{j,t}$ = the standard deviation of ROA for firm j from 1996 to 2004; and

$Ln(Numind)_{j,t}$ = natural log of the number of firms in the industry.

To control for cross-sectional differences, I include the firm-specific fundamental synchronicity, following Morck et al. (2000) and Durnev et al. (2004). I expect that stock price synchronicity is positively related to the correlation between a firm's profitability (ROA) and its underlying industry's profitability. SyncROA is calculated in a manner analogous to SYNC. In lieu of stock returns, we estimate the ability of a value-weighted market ($ROA\_MARKET_{j,t}$) and industry ROA ($ROA\_IND_{j,t}$) to explain firm-level ROA realizations. $ROA\_IND_{j,t}$ is calculated

[7] The Herfindahl index, also known as Herfindahl-Hirschman Index or HHI, is a measure of the size of firms in relationship to the industry and an indicator of the amount of competition among them. It is defined as the sum of the squares of the market shares of each individual firm.

using Fama-French 48 industry specifications (Fama and French, 1997). I expect SyncROA is positively related to SYNC.

Following Piotroski and Roulstone (2004), Ln(Herf) is included to control for industry concentration. The more concentrated an industry is, the more likely firms in it perform inter-dependently and the synchronicity of these firms will be bigger. I calculate industry concentration (Herf) as the Fama-French 48 industry specification (Fama and French, 1997) Herfindahl index for the year. I expect Ln(Herf) to be positively related to SYNC.

I include firm size Ln(MV) to control for omitted firm-specific factors, StdROA to control for volatility of firm's earnings stream and number of firms in the industry (Ln(Numind)) to control for other cross-sectional differences (Piotroski and Roulstone 2004). Industry dummies are included based on Fama-French 48 industry specifications (Fama and French, 1997).

In this model, I use decile rank of each attributes of earnings quality in the regression, rather than the raw value. By doing so, I alleviate the effects of extreme

observations and the coefficient estimates become comparable (Francis et al., 2004). Firms in the top decile (decile 1) have the smallest values of the attributes, while firms in the bottom decile (decile 10) have the largest values of the attribute. As our definition of each attribute in section 3.2.2.2, the smaller the value means the better the earnings quality. Thus firms in the top decile (decile 1) have best earnings quality while firms in the bottom decile (decile 10) have the worst earnings quality. According to Hypothesis 1, I predict that the higher (lower) the earnings quality, the lower (higher) the stock price synchronicity (more firm-specific information). Since here the larger the decile rank of earnings quality means the lower the earnings quality, I expect λ_1 to be positive and significant.

I also estimate the following regression model:

Eq (10):

$$SYNC_{j,t}=\lambda_0+\lambda_1 Factor^{p}_{j,t} +\lambda_2 SyncROA_{j,t} + \lambda_3 Ln(Herf_{j,t})+ \lambda_4 Ln(MV_{j,t})+ \lambda_5 StdROA_{j,t}+ \lambda_6 Ln(Numind)_{j,t}+ \lambda_7 Ind\_dummy +\mu_{j,t}$$

I use $Factor^{p}_{j,t}$ to summarize common effects of the total seven earnings quality attributes. $Factor^{p}_{j,t}$ are derived from factor analysis. I expect the coefficient on Factors to be of the same sign as that on earnings quality attributes.

3.3 Results

3.3.1 Descriptive Statistics

The final sample for the first hypothesis consists of 7,422 firm-year observations. Table 2 presents the descriptive statistics for variables. Among these variables, SYNC is dependent variables, AccrualQuality, Persistence, Predictability, Smoothness, Relevance Timeliness and Conservatism are testing variables; and Ln(Numind), Ln(MV), Ln(Herf), StdROA, and SyncROA are control variables.

[Insert Table 2 Here]

For the purpose of Table 2, the descriptive statistics of earnings quality measures are calculated using the raw figures, while the empirical tests use the ranks of the variables to avoid outlier concerns. The AccrualQuality measure has a mean (median) value of 0.042 (0.033) with standard deviation of 0.033; as a benchmark

Francis et al. (2004) report a mean (median) value of 0.026 (0.019). Persistence has a mean (median) value of -0.367 (-0.367) with standard deviation of 0.411; as a benchmark Francis et al. (2004) report a mean (median) value of -0.482 (-0.520) for their sample from 1985-2001. Predictability has a mean (median) value of 0.625 (0.368) with standard deviation of 0.918; as a benchmark Francis et al. (2004) report a mean (median) value of 0.876 (0.536). Smoothness has a mean (median) value of 0.805 (0.783) with standard deviation of 0.370; as a benchmark Francis et al. (2004) report a mean (median) value of 0.640 (0.578). Relevance has mean (median) value of -0.218 (-0.188) with standard deviation of 0.314; as a benchmark Francis et al. (2004) report a mean (median) value of -0.423 (-0.416). Timeliness has mean (median) value of -0.175 (-0.158) with standard deviation of 0.364; as a benchmark Francis et al. (2004) report a mean (median) value of -0.466 (-0.465). Conservatism has mean (median) value of -0.780 (-0.548) with standard deviation of 7.113; as a benchmark Francis et al. (2004) report a mean (median) value of -0.547 (-1.00) with standard deviation of 27.457. The large standard deviation of Conservatism indicates a large dispersion of the measure, which according to Francis et al. (2004), is driven by observations with small values of the denominator of this variable. My empirical tests are not affected by extreme values of Conservatism because our tests

use the decile ranks of the variables. All my earnings quality measures are larger than those reported in Francis et al. (2004), that is to say the firms in my sample period (1996-2004) on average have poorer earnings quality than those in Francis et al. (2004) sample (1985-2001), which may suggest that earnings quality is decreasing overtime. Rajgopal and Venkatachalam (2006) document the financial reporting quality (using two accrual based measures and analysts' forecast dispersion measure) is deteriorating over the last four decades.

Table 3 reports the Pearson correlation among the variables. Panel A reports the correlation among the seven earnings quality measures. The correlation among the accounting attributes are generally positive (greater than 0.1) and significant ($p<0.0001$), except the correlation between Smoothness and Persistence. The correlation among market attributes are all positive and significant ($p<0.0001$). The correlation between Relevance and Timeliness is large in magnitude 0.5751, while the correlation between Conservatism and Relevance and between Conservatism and Timeliness is small, 0.1403 and 0.0830 respectively. The correlation between accounting attributes and market attributes are generally small in magnitude (less than 0.1) and less significant (eight out of twelve have $p<0.01$).

Panel B reports the correlation of the seven earnings quality measures with dependent variable and with control variables. For the correlation between earnings quality attributes and dependent variable (SYNC), five out of seven show significant positive correlations and the rest two show significant negative correlations. This inconsistency may be due to the lack of control variables in this univariate correlation test (in Section 3.3.2, the regression results show consistent positive association between earnings quality attributes and SYNC except for Conservatism). The seven earnings quality attributes generally do not show strong correlation with control variables, (40 out of 42 correlations are smaller than |0.3|).

[Insert Table 3 Here]

3.3.2 Regression Results for H1

Table 4 present results of the association between earnings quality attributes and stock price synchronicity. As stated in previous section, the firms in the bottom decile (decile 10) are those firms with the poorest earnings quality, thus we expected a positive relationship between the decile rank of earnings quality and stock price

synchronicity. I estimate Equation (8) for each of the 9 years in my sample and the coefficient estimates presented in Table 4 are calculated using these 9 yearly coefficient estimates, and the statistical significance using the time-series standard errors of these estimates (Fama and MacBeth, 1973). I also estimate pooled regressions as a sensitivity test and yield similar results as the Fama MacBeth regression.

[Insert table 4 Here]

Table 4 Panel A presents the regression results of synchronicity and each of the earnings quality attributes. Industry dummies based on Fama-French 48 industry classifications are included but not reported. Model 1 to Model 7 show the mean coefficient estimates on each of the earnings attributes. The mean coefficient estimate on AccrualQuality (Model 1) has the largest coefficient 0.054, which is significant at 1% level (t-statistic= 4.95). This indicates that when accrual quality declines from one decile to the next decile, stock price synchronicity increases by 0.054. The second largest coefficient is on Smoothness (Model 4) 0.043, which is also significant at 1% level (t-statistics= 9.17). When smoothness of earnings figure

declines from one decile to the next decile, stock price synchronicity increases by 0.043. The remaining two coefficient on accounting based earnings quality attributes are similar in magnitude, 0.011 (significant at 5% level with t-statistics 2.49) and 0.016 (significant at 5% level with t-statistics 2.07) for Persistence (Model 2) and Predictability (Model 3) respectively. When persistence and predictability of earnings figure declines from one decile to the next decile, synchronicity increases by 0.011 and 0.016 respectively. The coefficient on Timeliness (Model 6) is 0.031 at 1% significant level (t-statistics 4.81), which is the third largest coefficient among the seven earnings quality attributes and the largest one among the three market based attributes. When earnings timeliness declines from one decile to the next decile, stock price synchronicity increases by 0.031. The coefficient on value Relevance (Model 5) is 0.020 at 1% significant level (t-statistics 4.56). When the value relevance of earnings figure declines from one decile to the next decile, synchronicity increases by 0.020. The coefficient on Conservatism (Model 7) is the only insignificant coefficient, 0.013 with t-statistics 1.45, but the sign is as expected.

Panel B reports the results of estimating Equation (8) for all the seven earnings attributes. Model 8 reports the results on the set of four accounting based earnings

attributes. In the presence of other accounting attributes, Persistence is insignificantly related to stock price synchronicity and Predictability takes on a negative coefficient, -0.002 with t-statistics -0.20. That is to say, once we control for AccrualQuality and Smoothness, Persistence and Predictability no longer has reliably association with stock price synchronicity. Model 9 reports the results on the set of three market based earnings attributes. In the presence of other market based attributes, neither Conservatism nor Relevance is reliably associated with stock price synchronicity. The only significant coefficient estimate (at 5% significant level) is on Timeliness, 0.030 with t-statistics 4.43.

Model 10 reports the results on the set of total seven earnings quality attributes. The results are similar to those in Model 8 and Model 9. The coefficients on AccuralQuality (0.035 with t-statistics 2.53), Smoothness (0.032 with t-statistics 4.88) and Timeliness (0.027 with t-statistics 4.12) remain significantly positive at 1% level.

I conduct common factor analysis to identify N common factors that explain common variation in the seven earnings quality attributes. The factor analysis is

conducted by year. The factor analysis identifies two factors and Table 5 report the average factor loadings for these two factors. The four accounting based attributes are significantly loaded on Factor 1 (>0.3 as a rule of thumb). The two market based attributes (Relevance and Timeliness) are significantly loaded on Factor 2.

[Insert Table 5 Here]

I re-estimate the relation between synchronicity and earnings quality using the two factors generated from factor analysis instead of the 7 earnings quality attributes. Specifically I estimate the regression Equation (10). Table 6 reports the relationship between stock price synchronicity (SYNC) and two common factors. The results are consistent with those reported in Table 4. Model 11 presents the association between SYNC and Factor 1, the coefficient estimates is positive and significant at 1% level, 0.191 with t-statistics 7.69. Model 12 presents the association between SYNC and Factor 2, the coefficient estimates is positive and significant at 1% level, 0.114 with t-statistics 5.95. Model 13 presents the association between SYNC and the set of Factor 1 and Factor 2, the coefficient estimates is positive and significant at 1%

level for both Factor 1 and Factor 2, 0.171 with t-statistics 6.64 and 0.067 with t-statistics 3.30 respectively.

[Insert Table 6 Here]

In summary, all the earnings quality attributes except Conservatism are significantly and positively related to stock price synchronicity (SYNC) when considered individually. When the set of accounting based attributes are enter into the regression, AccrualQualtiy and Smoothness remain significant and expected sign. When the set of market based attributes are entered into the regression, Timeliness remains significant and expected sign. When I enter two common factors derived from the seven attributes into the regression, both factors show significantly positive relation with stock price synchronicity. Generally speaking, the relation between synchronicity and accounting based attributes is stronger (larger coefficients and larger explanatory power) than the relation between synchronicity and market based attributes.

3.4 Robustness Checks

I do the pooled regression for all the above tests as a robustness check for my results. For brevity, I do not present table here but I summarize the results for test variables as follows.

The pooled regression results for Model 1 to Model 7 of Eq (8) are generally consistent with the Fama-MacBeth (1973) results. The coefficient estimate on AccrualQuality (Model 1) has the largest coefficient 0.060, which is significant at 1% level (t-statistic= 8.27). The second largest coefficient is on Smoothness (Model 4) 0.044, which is also significant at 1% level (t-statistics= 7.78). The remaining two coefficients on accounting based earnings quality attributes are 0.017 (significant at 1% level with t-statistics 3.14) for Persistence (Model 2) and 0.031 (significant at 1% level with t-statistics 5.10) for Predictability (Model 3) respectively. The coefficient on Timeliness (Model 6) is 0.026 at 1% significant level (t-statistics 4.90), which is the largest one among the three market based attributes. The coefficient on value Relevance (Model 5) is 0.019 at 1% significant level (t-statistics 3.62). Different from the Fama-MacBeth regression, the coefficient on Conservatism (Model 7) is significantly (at 5% level) positive (while not significant in Fama-MacBeth regression) 0.011 with t-statistics 2.11.

The pooled regression results for Model 8, Model 9 and Model 10 are qualitatively the same as Fama-MacBeth regression. In the presence of other accounting attributes, Persistence and Predictability no longer has reliably association with stock price synchronicity. The coefficient on AccrualQualtiy and Smoothness remain significantly (at 1% level) positive, 0.037 with t-statistics 4.50 and 0.030 with t-statistics 4.66, respectively. In the presence of other market based attributes, neither Conservatism nor Relevance is reliably associated with stock price synchronicity. The only significant coefficient estimate (at 1% significant level) is on Timeliness, 0.022 with t-statistics 3.44. When all the seven earnings quality attributes are put into the regression (Model 10), the coefficients on AccuralQuality (0.037 with t-statistics 4.43), Smoothness (0.028 with t-statistics 4.45) and Timeliness (0.019 with t-statistics 3.02) remain significantly positive at 1% level.

The pooled regression results for the relation between stock price synchronicity and two common factors (Eq (10)) are also consistent with the Fama-MacBeth regression results. Model 11, the coefficient estimate on Factor 1 is positive and significant at 1% level, 0.198 with t-statistics 8.84. Model 12 presents the

association between SYNC and Factor 2; the coefficient estimate is positive and significant at 1% level, 0.095 with t-statistics 4.80. Model 13 presents the association between SYNC and the set of Factor 1 and Factor 2; the coefficient estimates are positive and significant at 1% level for both Factor 1 and Factor 2, 0.183 with t-statistics 7.82 and 0.051 with t-statistics 2.46 respectively.

3.5 Chapter Summary

This chapter examines the association between stock price synchronicity (SYNC) and earnings quality attributes. Stock price synchronicity, as an inverse measure of stock price informativeness, is expected to be negatively associated with earnings quality. In general, the results of the Fama-Macbech regression of the decile rank of earnings quality attributes (except Conservatism) support the hypothesis that the higher (lower) the earnings quality the lower (higher) the stock price synchronicity which indicating a more informative stock price. Using two factors derived from the factor analysis of seven earnings quality attributes, the results are also consistent with the hypothesis. Generally speaking, the relation between synchronicity and accounting based attributes is stronger than that between synchronicity and market based attributes in terms of larger coefficient and larger explanatory power. The

pooled regression results are generally qualitatively the same (even better in terms of the coefficient on Conservatism) as the Fama-MacBeth regression.

🕮 Chapter Four

Role of Analysts and Institutional Investors on the Relation between Earnings Quality and Stock Price Synchronicity

In this chapter, I examine the role of two market participants, namely analysts and institutional investors, on the relation between earnings quality and stock price synchronicity. Section 4.1 develops the hypothesis. Section 4.2 presents the methodology and the empirical results are reported in Section 4.3. I check the robustness of my results in Section 4.4. I summarize this chapter in Section 4.5.

4.1 Hypothesis

In Chapter 3, I hypothesis that high quality earnings will help firm information impounded into stock price (lower stock price synchronicity) and find supporting evidence showing that quality of accounting information matters in this information dissimilation process. However this paper believes that to different investors, the importance of the quality of accounting information differs. In this section, I argue that the association between earnings quality and stock price synchronicity might

show different patterns with different level of analyst coverage and with different level of institutional ownership.

4.1.1 H2: Earnings Quality, Analyst Following and Stock Price Synchronicity

There are two possibilities concerning the effect of analyst following on the relation between earnings quality and stock price synchronicity. As mentioned in Section 2.3.2, there are two roles analyst playing in financial market. The effect of analysts on the relation between earnings quality and stock price synchronicity differs with the different role analysts play in financial market.

If analysts are mainly intermediaries in the financial market (Lang and Lundholm 1996), they are mainly responsible for spreading firm information out to the mass market. Analysts can increase the speed and efficiency of diffusion of firm information across market participants (Hong et al. 2000; Brennan et al 1999; Walther 1997; Bhattacharya 2001). The accounting information, namely earnings information in this paper, can quickly reach a broader market. By broader, I mean the number of investors using this information in their investment decisions will increase. This will have an effect on stock price synchronicity (proxy for stock price

informativeness) because investors' investment decisions will be reflected in stock price. On one extreme, if no one uses earnings information, then the quality of this information will not matter, and I should not expect any relation between earnings quality and stock price informativeness. When the usage of the information increases, I argue the importance of the quality of such information will also increase, and thus with the presence of financial analysts the relationship between earnings quality and stock price synchronicity will be stronger.

Analysts and financial information may also be substitutes as suggested in Holthausen and Verrecchia (1988)'s model that as the quality of the first signal (analyst report) increases, the ex ante variability of the price changes to the second signal (earnings announcement) decreases. Frankel and Li (2004) and Botosan (1997) also find evidence supporting this argument. If this substitution role is true, then the more analysts following the firm, I expect more firm information other than financial report is available to the market. Given the other information sources provided by analysts, the earnings information is not as important as when financial information is the only source of information investors can get. When the usage of earnings information decreases, the importance of the quality of this information

also decreases, thus with the presence of financial analysts the relationship between earnings quality and stock price synchronicity will be weaker.

Since the direction of the effect of analysts following on the relation between earnings quality and stock price synchronicity is unclear, I test the following non-directional hypothesis (stated in the null form):

Hypothesis 2: Ceteris paribus, number of analyst following is not related to the relation between earnings quality and stock price synchronicity.

4.1.2 H3: Earnings Quality, Institutional Ownership and Stock Price Synchronicity

Analysts exert influence on the market through their influence on mass investors' investment decisions, while institutional investors themselves can invest in the market and such investment decisions will be reflected in stock price. Although the way analysts and institutional investors influence the financial market is different, the rationale behind the hypothesis is similar. That is the more investors use

earnings information in their decision, the more important the quality of this information to explain stock price informativeness.

Individual investors are usually characterized as uninformed and unsophisticated, most of them are not systematic in their decision to buy stock and they seldom do any analysis of the company they invest. According to Shiller and Pound (1989), less than a quarter of individual investors do any analysis for the company they invest. If this is the case, then accounting information is of little relevance to individual investors and therefore, the quality of the information is not relevant in explaining stock price informativeness. Similar to the effects of analyst following, which increases the number of investors use accounting information; institutional investors themselves are the sophisticated group making better use of accounting information in their decision making. Therefore, I should anticipate that the relation between earnings quality and stock price synchronicity is stronger for high institutional ownership subsample.

Institutional investors are sophisticated investors also because they have other information sources, such as greater access to management. Collins et al. (2003)

states that it is not clear whether the more accurate assessment of accruals persistence for high institutional ownership group results from institutional investors' superior ability to interpret information contained in published financial statements or from an informational advantage such as greater access to management. If institutional investors possess other information then their reliance on earnings information will decrease and the stock price will reflect less earnings information. Similar to the substitute role of analysts, when institutional investors rely less on the earnings information, the importance of the quality of this information decreases, suggesting a weaker relation between earnings quality and stock price synchronicity for high institutional ownership subsample.

Another possibility is that if institutional investors are myopic investors, they are unlikely to invest in understanding the fundamental prospects of companies (Graves and Waddock 1990; Porter 1992). In this sense, institutional investors are not superior to individual investors in processing information. If this is the case, I should not expect any difference between the individual investor subsample and institutional investor subsample.

Since the direction of the effect of institutional ownership on the relation between earnings quality and stock price synchronicity is unclear, I test the following non-directional hypothesis (stated in the null form):

Hypothesis 3: Ceteris paribus, institutional ownership is not related to the relation between earnings quality and stock price synchronicity.

4.2 Methodology

4.2.1 Sample

Basing on 7,422 firm-year observation for H1, I refine the samples for H2 and H3. The missing values for number of analyst following is treated as no analyst following the firm (Hong et al. 2000) and the missing value for institution ownership is treated as zero institutional ownership (Piotroski and Roulstone 2004). So there are still 7,422 firm-year observations for H2 and H3.

Analysts' data are collected from I/B/E/S detail tape. Institutional ownership data are collected from Thomson Financial Equity Ownership & Contract database.

4.2.2 Variable Measurements

The number of analysts following (NAF) the firm is defined as the number of analysts making annual earnings forecast for that firm during the year. If there is no analyst reported in I/B/E/S tape, I assume there is no analyst following the firm, namely NAF=0.

Institutional ownership (IO) is the percentage of common shares hold by institutions over the total number of common shares outstanding. Thomson Financial Equity Ownership & Contract database contains share holdings at the institutional level. If the database does not report institutional holding, I assume that the fraction of shares held by institutions is zero, namely IO=0.

4.2.3 Model Specification

To test Hypothsis 2, I partition the sample based on number of analyst following and run the following regression (Eq (10) in Chapter 3) for analyst following (AF) subsample and non-analyst following (NonAF) subsample, separately. Since 3,450 out of 7,422 observations (46% of the full sample) in my full sample are not covered

by I/B/E/S and thus are assigned value zero for NAF, my NonAF subsample consists of the firms with no analysts following and the rest are in the AF subsample.

Eq (10):

$$SYNC_{j,t}=\lambda_0+ \lambda_1 Factor^p_{j,t} + \lambda_2 SyncROA_{j,t} + \lambda_3 Ln(Herf_{j,t})+ \lambda_4 Ln(MV_{j,t})+ \lambda_5 StdROA_{j,t}+ \lambda_6 Ln(Numind)_{j,t}+ \lambda_7 Ind\_dummy +\mu_{j,t}$$

$Factor^p$, namely Factor 1 and Factor 2, according to the results in Chapter 3, are two common factors derived from the total seven earnings quality attributes. I use these two factors to summarize the common effects of earnings quality on stock price synchronicity. They serve as two representatives of the total seven earnings quality attributes. All other variables are previously defined.

If analysts are information intermediaries who spread the accounting information out to the mass public, then I expect λ_1 for AF subsample is bigger than that for NonAF subsample. If analysts are providers of other sources of information, who will lower the relevance of earnings information, then I expect λ_1 for AF subsample is smaller than that for NonAF subsample.

To test Hypothesis 3, I partition the sample based on institutional ownership and run the above equation (Eq (10)) for high institutional ownership (HIO) and low institutional ownership (LIO) subsample, separately. HIO subsample consists of firms with institutional ownership above median and LIO consists of firms with institutional ownership below median.

If institutional investors use more earnings information in their decision making than individual investors, then the earnings quality is expected to be more strongly related to stock price synchronicity; that is I expect λ_1 for HIO subsample is bigger than that for LIO subsample. If institutional investors have other information sources and rely more on other information, then the reliance on earnings information will be correspondingly lower. As such, the quality of earnings information will be less important to explain stock price informativeness, thus I expect λ_1 for HIO subsample is smaller than that of LIO subsample.

4.3 Results

4.3.1 Descriptive Statistics

Table 7 Panel A reports the descriptive statistics for number of analyst following (NAF) and institutional investors (IO) for the full sample. 3,450 out of 7,422 observations (46% of the full sample) in my full sample are not covered by I/B/E/S and thus are assigned value zero for NAF. Compared with Hong et al. (2000) who report 36.9% of their sample is not covered by I/B/E/S tape, the I/B/E/S coverage for my sample is 10% lower. The mean and median for NAF is 1.594 and1, respectively.

Institutional ownership has a mean of and median of 0.347 and 0.277, respectively. Piotroski and Roulstone (2004) report a mean and median of 0.235 and 0.150 of institutional ownership, respectively. My results are approximately 10% larger in magnitude than those of Piotroski and Roulstone (2004) but show similar skewness.

Table 7 Panel B reports the descriptive statistics for analyst following subsamples vs. non-analyst following subsample. The mean and median value of stock price synchronicity in NonAF subsample are -2.019 and -1.828 respectively, while those in AF are -3.316 and -2.304 respectively and the differences between these two subsamples are significant (Both the t-test and Wilcoxon z-test are significant at 1%

level). Firms with more analysts following have significantly larger stock price synchronicity, which is consistent with the findings of Piotroski and Roulstone (2004) who find a positive relation between synchronicity and analyst forecast revision, suggesting that analysts help industry and market level information transfer. Firms in AF subsample are of larger size (with Mean(Ln(MV))=5.083 and Median(Ln(MV)) =5.209) than firms in NonAF subsample (with Mean(Ln(MV)) =3.491 and Median(Ln(MV)) =3.480), which is significant at 1% level for both t-test and Wilcoxon z-test. The mean of standard deviation of ROA is of smaller magnitude in AF subsample (0.910) than that in NonAF subsample (1.406) and the pattern of median is qualitatively the same as mean, indicating less volatile firm fundamentals for analyst following firms. The mean value of all seven earnings quality attributes except Conservatism are smaller in AF subsample than that in NonAF subsample (but insignificant for Timeliness), suggesting higher earnings quality for financial analyst following firms.

Table 7 Panel C reports the descriptive statistics for High vs. Low Institutional Ownership subsamples. The mean and median value of stock price synchronicity in LIO subsample are -2.001 and -1.805 respectively, while those in HIO are -3.246

and -3.141 respectively and the differences between these two subsamples are significant (Both the t-test and Wilcoxon z-test are significant at 1% level). Firms with more institutional ownership have larger stock price synchronicity, which is consistent with the findings of Piotroski and Roulstone (2004) who find level of institutional ownership has a similar positive relation as analyst following with synchronicity, indicating they help industry and market level information transfer. Firms in HIO subsample are of larger size (with Mean(Ln(MV)) =5.135 and Median(Ln(MV))=5.245) than firms in LIO subsample (with Mean(Ln(MV)) =3.547 and Median(Ln(MV)) =3.520), which is significant at 1% level for both t-test and Wilcoxon z-test. The mean of the standard deviation of ROA is of smaller magnitude in HIO subsample (0.774) than that in LIO subsample (1.506) and the pattern of median is qualitatively the same as mean, indicating less volatile firm fundamentals for high institutional ownership firms. The mean value of all seven earnings quality attributes are smaller in HIO subsample than that in LIO subsample (but less significant for market based earnings quality attributes), suggesting higher earnings quality for high institutional ownership firms.

[Insert Table 7 Here]

4.3.2 Regression Results for H2 and H3

I estimate Equation (10) for each of the 9 years for analyst following/non-analyst following subsample and high/low institutional ownership subsamples; and the coefficient estimates presented in Table 8 and Table 9 are calculated using these 9 yearly coefficient estimates, and the statistical significance using the time-series standard errors of these estimates (Fama and MacBeth, 1973). I also estimate pooled regressions as a sensitivity test and yield similar results as the Fama MacBeth regression.

Table 8 reports the regression results for analyst following/non-analyst following subsamples. The coefficient on Factor 1 for analyst following subsample (AF) is 0.273 at 1% significance level (t-statistics = 7.57), while that for non-analyst following (NonAF) subsample is 0.090 at 5% significance level (t-statistics = 2.13). I further test whether the coefficient on Factor 1 for AF is significantly bigger than that for NonAF. I report the t-test for 9 yearly estimate coefficient, the result show that coefficient on Factor 1 for AF subsample is on average 0.183 larger than that for NonAF subsample which is significantly at 1% level (t-statistics =3.70). The

coefficient on Factor 2 for analyst following subsample is 0.264 at 1% significance level (t-statistics = 5.25) while that for non-analyst following subsample is 0.109 at 5% significance level (t-statistics = 2.48). I further test whether the coefficient on Factor 2 for AF subsample is significantly bigger than that for NonAF subsample. I report the t-test for 9 yearly estimate coefficient, the result show that coefficient on Factor 2 for AF subsample is on average 0.155 larger than that for NonAF subsample which is significantly at 1% level (t-statistics =3.13). These results show that with the presence of financial analysts, earnings quality is more strongly related to stock price synchronicity for both Factor 1 and Factor 2, indicating an information intermediary role for analysts in the financial market.

[Insert Table 8 Here]

Table 9 reports the regression results for high/low institutional ownership subsamples. The coefficient on Factor 1 for high institutional ownership (HIO) subsample is 0.192 at 1% significance level (t-statistics = 7.47), while that for low institutional ownership (LIO) subsample is 0.080 but insignificant. I further test whether the coefficient on Factor 1 for HIO is significantly bigger than that for LIO.

I report the t-test for 9 yearly estimate coefficient, the result show that coefficient on Factor 1 for HIO subsample is on average 0.112 larger than that for LIO subsample which is significantly at 5% level (t-statistics =2.46). The coefficient on Factor 2 for high institutional ownership subsample is 0.140 at 1% significance level (t-statistics = 6.08) while that for low institutional ownership subsample is 0.010 but not significant. I further test whether the coefficient on Factor 2 for HIO is significantly bigger than that for LIO. I report the t-test for 9 yearly estimate coefficient, the result show that coefficient on Factor 2 for HIO subsample is on average 0.130 larger than that for LIO subsample which is significantly at 5% level (t-statistics =2.27). The earnings quality (Factor 1 and Factor 2) can not significantly explain stock price synchronicity for LIO subsample, indicating that individual investors are generally uninformed and unsophisticated; they do not use earnings information in their decision making. The significant and larger coefficients on Factor 1 and Factor 2 for HIO subsample indicate earnings quality is more strongly related to stock price synchronicity, which suggests that institutional investors make more use of earnings figure than individual investors do.

[Insert Table 9 Here]

4.4 Robustness Checks

I check the robustness of my previous results for Hypothesis 2 and Hypothesis 3 using the dummy variable regression as follows:

Eq (11):

$$SYNC_{j,t}=\lambda_0+ \lambda_1 D\_Naf_{j,t} + \lambda_2 Factor^{p}_{j,t} + \lambda_3 D\_Naf_{j.t}*Factor^{p}_{j,t} + \lambda_4 SyncROA_{j,t} + \lambda_5 Ln(Herf_{j,t})+ \lambda_6 Ln(MV_{j,t})+ \lambda_7 StdROA_{j,t}+ \lambda_8 Ln(Numind)_{j,t}+ \lambda_9 Ind\_dummy +\mu_{j,t}$$

Eq (12):

$$SYNC_{j,t}=\lambda_0+ \lambda_1 D\_Inst_{j,t} + \lambda_2 Factor^{p}_{j,t} + \lambda_3 D\_Inst_{j.t}*Factor^{p}_{j,t} + \lambda_4 SyncROA_{j,t} + \lambda_5 Ln(Herf_{j,t})+ \lambda_6 Ln(MV_{j,t})+ \lambda_7 StdROA_{j,t}+ \lambda_8 Ln(Numind)_{j,t}+ \lambda_9 Ind\_dummy +\mu_{j,t}$$

where D_Naf=1 if the firm is in AF subsample and zero otherwise; and D_Inst=1 if the firm is in HIO subsample and zero otherwise. All other variables are previously defined.

The dummy variable regressions are also estimated yearly and the coefficient estimates presented in Table 10 and Table 11 are calculated using these 9 yearly coefficient estimates, and the statistical significance using the time-series standard errors of these estimates (Fama and MacBeth, 1973). I also estimate pooled regressions as another robustness check and yield similar results as the Fama MacBeth regression.

If the results in the previous section are robust, I expect λ_3 to be significantly positive in Eq (11) and (12).

Table 10 reports the regression results for Eq (11). The coefficient estimates on D_Naf are significantly (at 1% level) positive (0.214 in Model 14 and 0.235 in Model 15), which is consistent with Piotroski and Roulstone (2004), indicating analyst facilitate industry and market level information transfer. In model 14, the coefficient on Factor 1 is significantly (at 1% level) positive 0.129 (t-statistics=3.30); the coefficient on the interaction term is 0.085 significant at 10% level (t-statistics=1.73). This is consistent with my results in the previous section. In model 15, the coefficient on Factor 2 is significantly (at 1% level) positive 0.165 (t-

statistics=3.44); the coefficient on the interaction term is positive 0.056 but insignificant (t-statistics=1.05), which is not consistent with my previous results.

[Insert Table 10 Here]

Table 11 reports the regression results for Eq (12). The coefficient estimates on D_Inst are positive (0.063 in Model 16 and 0.060 in Model 17) but insignificant. In model 16, the coefficient on Factor 1 is insignificantly positive 0.037 (t-statistics=0.71); the coefficient on the interaction term is 0.121 significant at 5% level (t-statistics=2.06). This is consistent with my results in the previous section. In model 17, the coefficient on Factor 2 is insignificantly positive 0.034 (t-statistics=0.71); the coefficient on the interaction term is positive 0.122 and significant at 5% level (t-statistics=2.21), which is also consistent with my previous results that the relation between synchronicity and Factor 1 or Factor 2 is not significant in LIO subsample but significantly positive in HIO subsample.

[Insert Table 11 Here]

I do the pooled regression for all the tests in this chapter to check the robustness of my main test and the above robustness tests. For brevity, I do not report them here but the unreported results are materially the same as the Fama-MacBeth regressions.

4.5 Chapter Summary

This chapter examines the effect of analysts following and institutional ownership on the association between stock price synchronicity (SYNC) and earnings quality attributes. I hypothesis that the relation between stock price synchronicity and earnings quality will show different pattern with different level of analyst following and different level of institutional ownership. I do not predict a sign for the effect of analysts or institutional ownership because the effect can be argued both ways. The regression results all reject the un-directional null hypothesis and the relation between stock price synchronicity and earnings quality is stronger with the presence of financial analysts and for high institutional ownership (HIO) subsample. The results for Hypothesis 2 support the view that analysts mainly play an information intermediaries role in the financial markets. In this sense, analysts and financial reports are what Lang and Lundholm (1996) called 'complements'. The results for Hypothesis 3 support the argument that institutional investors are sophisticated

investors and make more use of earning information in their trading decisions than individual investors do.

🕮 Chapter Five

Conclusions

This chapter concludes the thesis. Section 5.1 summarizes this paper and Section 5.2 points out future research opportunities.

5.1 Summary

First, this study examines the relation between earnings quality and stock price synchronicity. Rather than focus on a single measure of earnings quality, I follow Francis et al. (2004) to use a set of seven earnings quality attributes, namely accrual quality, persistence, predictability, smoothness, value relevance, timeliness and conservatism. I find that the higher (lower) earnings quality is associated with lower (higher) stock price synchronicity. This evidence suggests that earnings quality matters in the information incorporation process; the more informative the accounting information is, the more firm information is reflected in stock price. This evidence also support the use of stock price synchronicity as a measure of the extent to which firm information is incorporated into stock price.

Second, this study looks at the effects of two market participants, financial analysts and institutional investors on the above relation. With the presence of financial analysts and institutional investors, the relation between earnings quality and stock price can be either stronger or weaker. My empirical results reveal that the relation between earnings quality and stock price synchronicity is stronger for analyst following subsample and high institutional ownership subsample, indicating these two market participants reinforce this relation.

5.2 Future Research Opportunities

This study can be extended in the following aspects. First this study can be extended to examine the value consequence of stock price synchronicity. Stock price informativeness is important because it will have stock price valuation consequences, for example it will affect a firm's cost of capital. I have done some preliminary tests on this relation which is presented in the Appendix. Using Easton (2004)'s approach to calculate the measure of cost of equity capital, I find a significant positive relationship between stock price synchronicity and cost of equity capital. The relation holds after I control the effect of the informativeness of accounting

figures. The results indicate that informed stock price can lower cost of equity capital.

Second, the earnings quality measure is not limited in the seven measures used in this study. It is possible to try more earnings quality measures. For example, I follow Francis et al. (2004) to define predictability as the ability of earnings to predict themselves. However, in the literature, there is another stream of research which defines predictability as the extent to which current earnings or their components realized as future cash flow (Dechow et al. 1998, Barth et al. 2001, Srinidhi and Gul 2005). Using alternative measures of earnings quality can provide more evidence on the relation between earnings quality and stock price synchronicity.

Third, institutional ownership in this study is measured by the aggregate level. However, institutional investors differ in their behavior and incentives (Bushee 1998, Bushee 2001). For example Bushee (1998) examines whether certain group of institutional investors influences R&D myopic behaviors and classifies institutional investors into three groups: transient, dedicated and quasi-indexer, based on their

past investment patterns in the area of portfolio turnover, diversification, and momentum trading. For future research, this study can be extended by using different groups of institutional investors rather than the aggregate ownership level. The relation between earnings quality and stock price synchronicity might exhibit different pattern in different institutional investor groups.

Finally, Sarbanes-Oxley Act was passed in 2002 to improve the quality of financial reports. The relation between earnings quality and stock price synchronicity before and after the act might be different. This study does not look at the effect of the act and this may be examined in future studies.

🕮 Appendix

Stock Price Synchronicity and Cost of Equity Capital

In the literature, most studies on synchronicity study the determinant rather than the consequences. So far, the economic consequences are considered in terms of the economic efficiency of corporate investment (deviation in Tobin's marginal q from its optimal level) by Durnev et al. (2004) and in terms of the sensitivity of corporate investment to stock price by Chen et al. (2006). Cost of capital is undoubtedly a very important value consequence in the stock market, which has not yet been studied in the context of stock price synchronicity. This is the motivation to do the following additional tests.

Literature Review

In literature, there are several streams of theoretical research suggesting a link between information and cost of capital.

One stream of research suggests that increase in the amount of information available for developing inferences about the returns parameters of securities will reduce the

estimation risk associated with investors' assessments of such parameters (Barry and Brown 1985; Honda and Linn 1993; Coles et al. 1995). Barry and Brown (1985) show that parameter uncertainty, or estimation risk, can have an effect upon market equilibrium. Securities with less information are shown to have relatively higher systematic risk than those with more information. Honda and Linn (1993) find that factor betas and prices of assets under incomplete information differ from those under complete information; risky assets with high quality information are priced relatively high and their factor betas are relatively lower. These papers attribute the effect of the differential information to produce differences in the degree to which there is estimation risk across securities.

Apart from the estimation risk argument, another stream of theoretical research argues an indirect link between information quality and cost of capital via market liquidity. Amihud and Mendelson (1986)'s model suggests that asset returns are an increasing and concave function of the spread. Their model predicts that higher spread yields higher expected return and investors with longer holding periods prefer to trade assets with higher spreads because they demand compensation for spreads. They show that the cost of equity capital is greater for securities with wider

bid-ask spreads because investors require a high return to compensate for added transaction costs. Botosan and Plumlee (2002) argue that disclosure can help reduce the adverse selection component of the bid-ask spread and thus reduce the cost of capital. Easley and O'Hara (2004) show that the differences in the composition of information, namely public vs. private information, affect the cost of capital. The information risk captured both by the extent of private information and by the precision of both public and private information, will affect the cost of capital. Private information imposes risk on uninformed investors because they are not able to adjust their portfolios weights in the same way as informed investors and thus uninformed investors require price protection against adverse selection, and this price protection is manifested in market liquidity. In both models, the link between information and the firm's cost of capital arises due to information asymmetries between traders in secondary markets (Leuz and Verrecchia 2005).

Leuz and Verrecchia (2005) use another approach to assess the effect of information on cost of capital; their model captures the idea that 'firm reports coordinate the activities of managers and investors with respect to the firm's capital investment' (Leuz and Verrecchia 2005, p.2). When firms have poor quality financial reports,

the coordination between firms and their investors with respect to the firm's capital investment decisions is impaired, which creates information risk. When this happens, investors will demand higher risk premium and therefore a higher cost of capital. The fundamental role of financial reporting in Leuz and Verrecchia (2005) model is in improving the efficiency of firms' investment decisions.

Consistent with these theoretical models, several empirical studies suggest a relation between cost of equity capital and information risk, using different characterizations of information risk.

Botosan and Plumlee (2004) examine the role of information precision (BKLS model) and find an inverse relationship between the cost of equity capital and the precision of public information and the magnitude of the reduction in the cost of equity capital arising from more precise public information is more than offset by the magnitude of the increase in the cost of equity capital arising from more precise private information. A more recent related work by Botosan and Plumlee (2007) examines the relation between cost of equity and information attributes posited by Easley and O'Hara (2004). They find that cost of equity capital is decreasing in the

precision of the information set and dissemination (the percentage of informed traders of the company), and increasing in composition (the percentage of private information in the firm's information set). These results indicate that cost of equity capital is increasing in information asymmetry, which are generally consistent with the implication of the theoretical model of Easley and O'Hara (2004).

Botosan (1997) examines the relation between cost of equity capital and disclosure level and finds better disclosure decreases the cost of equity capital, but this relation only exists in low analyst following firms. She fails to find evidence of an association between disclosure level and cost of equity capital for high analyst following firms and the reason according to Botosan (1997) is that the disclosure measure is limited to the annual report and accordingly may not provide a powerful proxy for overall disclosure level when analysts play a significant role in the communication process. Botosan and Plumlee (2002) re-examine the relation between the disclosure level and cost of capital using a larger sample. They find that the cost of equity capital decreases in the annual report disclosure level but increases in the level of timely disclosure. They further document those firms with a high

analyst following benefit from providing greater annual report disclosure, which is contrary to their earlier findings.

Francis et al. (2004) examine the relation between seven earnings quality attributes (accrual quality, persistence, predictability, smoothness, value relevance, timeliness, and conservatism) and the cost of equity capital. They find that firms with the least favorable value of each attribute experience larger cost of equity than those with the most favorable values. Francis et al. (2005) focus on accrual quality as their proxy for information risk, measured as the standard deviation of residuals from regressions relating current accruals to cash flows. They document that poor accrual quality (both innate accrual quality and discretionary accrual quality) is associated with both higher cost of debt and higher cost of equity. Hribar and Jenkins (2004) examine the indirect link of earnings quality and cost of equity through accounting restatement on earnings. Their hypothesis is based on the argument that accounting restatements lowering the perceived earnings quality of the firm and increase the information uncertainty among investors, which increases investor' required rates of return. They find that the restatement of accounting earnings revision will increase the cost of equity capital by 7% to 20% depending on the estimation model used.

In international settings, Hail and Leuz (2005) investigate the international cost of equity capital differences across 40 countries. They analyze the effects of a country's legal institutional and securities regulation on cost of equity capital and find that country level corporate governance mechanism, namely more extensive disclosure requirements, stronger securities regulation and stricter enforcement mechanisms, can lower cost of capital.

In the country level, Bhattacharya et al. (2003) investigate whether information risk impacts equity markets around the world. They use earnings opacity which is defined as 'the extent to which the distribution of reported earnings of firms in that country fails to provide information about the distribution of the true, but unobservable, economic earnings of firms in that country' (Bhattacharya et al. 2003, p.642) to proxy for the information risk. Simply speaking, earnings opacity measures the average lack of informativeness of reported earnings in that country. They find a significant positive relation between earnings opacity and the cost of equity and a significant negative relation between earnings opacity in a country and the trading in the stock market in that country.

Some other studies examine an indirect link between cost of equity capital and information risk. Welker (1995) examines the relation between disclosure policy and bid-ask spreads, his measure of market liquidity. He documents a negative association between disclosure level and relative bid-ask spreads and increased trading by informed traders both increase spreads and intensify the relation between spreads and disclosure policy. Healy et al. (1999) investigate the benefits of increased disclosure and find that firms that increase their disclosure level experience increases in stock performance, institutional ownership, analyst following and stock liquidity. Lang and Lundholm (2000) examine the effect of disclosure in seasoned equity offering. They document that for firms maintain a consistent level of disclosure; they experience price increase prior to the offering and only minor price decrease at the offering announcement. They conclude that disclosure may have reduced the information asymmetry inherent in the offering.

Hypothesis

Investors inevitably face information risk. In theory, increase in quantity and quality of information provided to investors can reduce estimation risk (Barry and Brown

1985; Honda and Linn 1993; Coles et al. 1995), alleviate information asymmetry to increase market liquidity (Amihud and Mendelson 1986; Easley and O'Hara 2004) and to improve the coordination of activities between managers and investors (Leuz and Verrecchia 2005).

These theoretical studies suggest a link between information risk and cost of equity capital and this link is widely tested empirically. Botosan and Plumlee (2004) and Botosan and Plumlee (2007) test the effect of information precision on cost of equity and find a negative association. Botosan (1997) and Botosan and Plumlee (2002) find a negative association between disclosure level and cost of equity capital. Francis et al. (2004) and Francis et al. (2005) document a negative association between accounting information quality and cost of capital. In international studies, the country level corporate governance mechanism (disclosure requirement, securities regulation and enforcement) can reduce cost of equity (Hail and Leuz 2005). In country level settings, Bhattacharya et al. (2003) find that earnings opacity (lack of informativness) increases the cost of capital. These results support the view that information risk (low information precision, low disclosure level, low earnings

quality, poor corporate governance mechanism, high earnings opacity, etc) increases the cost of equity capital.

In these literature, most of the studies use informativeness of accounting information (disclosure, earnings quality, earnings opacity) as their proxies for information risk, while in this chapter I argue stock price informativeness (inversely measured by stock price synchronicity) as a proxy for information risk.

As the informativeness of earnings measures the extent to which firm information reflected in earnings figure, the informativeness of stock price measures the extent to which firm information incorporated in stock price. I argue a more informative stock price system has similar effects as a more informative accounting figure. Past studies have established some evidence supporting this argument. Durnev et al. (2004) argue that corporate capital investment should be more efficient where stock prices are more informative and they find informativeness of stock prices facilitates efficient investment. They also argue that corporate governance mechanisms work better when the stock price is more informative because informed stock price convey meaningful signals to the capital markets and corporate governance

mechanisms depends on these signals. On one hand, this evidence can be directly link to the context of cost of capital by the argument of Leuz and Verrecchia (2005). Leuz and Verrecchia (2005) argue the role of information as to coordinate the activities of managers and investors with respect to the firm's capital investment; higher information quality (a more informative stock price system in my argument) improves the efficiency of capital investments (Durnev et al. 2004), reduces information risk and lowers the cost of capital. On the other hand, the corporate governance argument also supports the link between stock price informativeness and cost of capital. Stock price informativeness improves the efficiency of corporate governance (Durnev et al. 2004) and better corporate governance can lower cost of capital (Hail and Leuz 2005), as such, stock price informativeness can lower cost of capital. To use stock price informativeness to gauge information risk is somewhat supported by the above evidence.

I validate the use of stock price synchronicity to measure stock price informativeness in Chapter 3 (see Section 3.1). In Chapter 3, I also find that good (poor) earnings quality is associated with low (high) stock price synchronicity, where stock price synchronicity is an inverse measure of stock price informativness

(see Section 3.3.2). This result on one hand indicates quality of accounting information matters in the process of information incorporation into stock price, on the other hand shows supports to the information interpretation of stock price synchronicity. I believe my results together with a wide range of empirical results (Morck et al. 2000; Wurgler 2000; Durnev et al. 2003; Durnev et al. 2004, etc.) validate my use of stock price synchronicity to measure the extent of firm information incorporate into stock price.

This paper argues that the higher the stock price synchronicity, the less informative the stock price is and the higher the cost of capital. For the above reasons, I state the hypothesis as follows (stated in alternative form):

Hypothesis 4: Ceteris paribus, cost of equity capital is positively associated with stock price synchronicity.

Methodology

Sample

Basing on 7,422 firm-year observation for H1, I refine the sample for H4. The calculation of cost of equity needs analyst forecast data from I/B/E/S, so the firms not covered by I/B/E/S are deleted. Specifically, I delete firms with (1) insufficient data to calculate cost of equity (CofC) as defined below; and (2) insufficient data to calculate Beta, Size, BM as defined below. So there are 3,306 firm-year observations for H4.

The analyst earnings forecast data are extracted from I/B/E/S detail tape. Stock price data collected from CRSP daily and monthly stock return files. Other financial accounting information data are collected from Compustat Annual Industrial and Research files.

Variable Measurement

Botosan and Plumlee (2005) compare and evaluate the construct validity of five measures of the expected cost of equity (Target Price Method[8], Industry Method[9],

[8] This method is based on the assumption that analysts' and the market's forecasts of the terminal value are consistent.

$P_0=\sum^{5}_{t=1}(1+r_{DIV})^{-t}(dps_t)+(1+r_{DIV})^{-5}(P_5)$

where:

dps=dividend per share;

Finite Horizon Method[10], Economic-Wide Growth Method[11] and PEG Ratio Method[12]) and conclude that the Target Price Method and PEG Ratio Method outperform the others. I use cost of equity under the PEG Ratio Method as my measure of cost of equity.

P_5=price at time t=5; and

r_{DIV}=estimated cost of equity capital under this method.

[9] This method is based on the assumption that a firm's return on equity (ROE) reverts to the industry-level ROE beyond the forecast horizon.

$P_0=b_0+\sum^{11}_{t=1}(1+r_{GLS})^{-t}((ROE_t- r_{GLS})b_{t-1})+ (r_{GLS}(1+r_{GLS})^{11})^{-1}((ROE_{12}- r_{GLS})b_{11})$

where:

ROE_t=return on equity for period t;

b_t=book value per share, year t; and

r_{GLS}=estimated cost of capital under this method.

[10] This method is based on the assumption that a firm's ROE reverts to its cost of equity capital beyond the forecast horizon.

$P_0=\sum^{4}_{t=1}(1+r_{GOR})^{-t}(dps_t)+ (r_{GOR}(1+ r_{GOR})^{4})^{-1}(eps_5)$

where:

eps_t=forecasted earnings per share, year t; and

r_{GOR}=estimated cost of capital under this method.

[11] This method is based on the assumption that a firm's abnormal earnings growth reverts to an economy-wide level beyond the forecast horizon.

$r_{OJN}=A+\sqrt{[A^2+(eps_1/P_0)*((eps_2-eps_1)/eps_1-(\gamma-1))]}$

where:

$A=1/2((\gamma-1)+dps_1/P_0)$

[12] This method is based on the assumption of zero growth in abnormal earnings beyond the forecast horizon.

$r_{PEG}=\sqrt{[(eps_2-eps_1)/P_0]}$

The PEG Ratio Method, according to Botosan and Plumlee (2005), is calculated using short-forecast window (Easton 2004, Eq (12)) as follows:

Eq (13):

$r_{PEG}=\sqrt{[(eps_2-eps_1)/P_0]}$

where:

r_{PEG}=cost of equity estimated under PEG method ($CofC^{PEG}$);

eps_t=forecasted earnings per share, year t; and

P_0=price at time t=0.

This method is based on the assumption of zero growth in abnormal earnings beyond the forecast horizon. This model also imposes some restrictions on data, i.e. $eps_2>=eps_1$.

Model Specification

To test Hypothesis 4, I estimated the following regression:

Eq (14):

$$CofC^{PEG}_{j,t}=\pi_0+\pi_1 Beta_{j,t}+\pi_2 Size_{j,t}+\pi_3 BM_{j,t}+ \pi_4 Factor^{p}_{j,t} + \pi_5 SYNC_{j,t} +\nu_{j,t}$$

where:

$CofC^{PEG}_{j,t}$= the PEG estimate of cost of equity capital, defined in Eq(13);

$Beta_{j,t}$= firm j's beta in year t, estimated using monthly returns data over rolling ten-year windows;

$Size_{j,t}$= firm size measured as the log of firm j's market value at the beginning of year t; and

$BM_{j,t}$= the book to market ratio= log of firm j's book value of equity (Compustat #60) divided by its market value of equity, both measured at the beginning of year t.

All other variables are previously defined.

Beta, Size and BM is included to control for risk proxies known to influence the cost of capital (Fama and French 1993). I estimate the equation on yearly basis and report the mean of the yearly coefficient estimates, and assess statistical significance using the time series standard errors of these estimates (Fama and MacBeth 1973). According to Hypothesis 4, π_5 is expected to be positive; the higher the stock price

synchronicity, the lower the stock price informativeness and the higher the cost of capital.

Stock price incorporate firms accounting information as well as other information from investors in the market. To assess the incremental effect of stock price synchronicity on cost of equity capital, I also estimate the following regressions. Firstly I estimate Eq (10) in Chapter 3 and generate a new variable $Res^{p}\_SYNC_{j,t}$:

Eq (10):

$$SYNC_{j,t}=\lambda_0+ \lambda_1 Factor^{p}_{j,t} + \lambda_2 SyncROA_{j,t} + \lambda_3 Ln(Herf_{j,t})+ \lambda_4 Ln(MV_{j,t})+ \lambda_5 StdROA_{j,t}+ \lambda_6 Ln(Numind)_{j,t}+ \lambda_7 Ind\_dummy +\mu_{j,t}$$

SYNC measures the amount of firm information incorporated into stock price, part of the information is captured by the accounting information (Factor 1 and Factor 2). $Res^{p}\_SYNC_{j,t}$ (p=1,2) is the residual value $\mu_{j,t}$ to capture information other than earnings information reflected in stock price. I think the part of information which is not captured by accounting information may have similar effect on cost of equity capital as accounting information and to assess the effect of that part of information

on the cost of equity, I re-estimate Eq (15) using $Res^{p}\_SYNC_{j,t}$ instead of $SYNC_{j,t}$. That is, I estimate the following regression:

Eq (15):

$$CofC^{PEG}_{j,t}=\pi_0+\pi_1 Beta_{j,t}+\pi_2 Size_{j,t}+\pi_3 BM_{j,t}+ \pi_4 Factor^{p}_{j,t} + \pi_5 Res^{p}\_SYNC_{j,t} +\nu_{j,t}$$

If the unexplained part of information has incremental effect on cost of capital, then I expect π_5 in Eq (15) to be the same sign as the π_5 in Eq (14).

Results

Descriptive Statistics

Table 10 presents the descriptive statistics for new variables used in H4. The mean value of $CofC^{PEG}$ for my sample is 17.3%, which is statistically indistinguishable from 17.1% reported in Francis et al. (2004). The mean and median value for Beta is 0.998 and 0.814, respectively, which is slightly smaller than those reported in Botosan and Plumlee (2002). The mean and median value for Size which is the natural log of the beginning of the year market value of the company is 4.263 and 4.379, respectively, which is not materially different from those reported in Table 2

for my full sample, which indicates my reduced sample for H4 does not materially biased to either larger or smaller firms from my full sample.

[Insert Table 12 Here]

Regression Results

Table 13 reports the regression results for Eq (14). As my previous empirical tests for H1, H2 and H3, the equation is estimated for each year and the coefficients reported are mean of the yearly coefficients and the significance level is calculated using time-series standard errors of these yearly coefficient estimates(Fama and MacBeth 1973).

Model 14 shows the results when only stock price synchronicity (SYNC) is put into the regression to proxy for information risk. The larger the value of stock price synchronicity, the less informative the stock price and the greater the information risk, thus we expect a positive relation between SYNC and cost of equity ($CofC^{PEG}$). The coefficient estimates on SYNC is 0.008 at 5% significance level (t-statistics=2.43), which is consistent with the hypothesis.

Model 15 and Model 16 show the results when Factor 1 and Factor 2 is put into the regression, respectively. These factors are used to represent the effects of earnings quality. I put them into the regression to control for the information risk captured in accounting information. Model 15 shows the coefficient on SYNC is 0.006 and still significant at 1% level (t-statistics =2.70), indicating the informativeness the stock price (non-synchronicity) will lower cost of capital after control for the effect of accounting information captured by Factor 1. The coefficient on Factor 1 is 0.037 at 1% significant level (t-statistics=7.59), which is consistent with the findings in Francis et al. (2004).

Model 16 shows the coefficient on SYNC is 0.008 and still significant at 1% level (t-statistics =3.31), indicating the informativeness of the stock price (non-synchronicity) will lower cost of capital after control for the effect of accounting information captured by Factor 2. The coefficient on Factor 2 is 0.006 but not significant.

The coefficients on innate control variables for Model 14, Model 15 and Model 16 are generally consistent with those reported in Francis et al. (2004). The coefficients on StdCFO under three models are all significantly (1% level) positive, indicating a more volatile cash flow will increase the cost of capital. The coefficients on OperCycle are all significantly positive (1% level), indicating longer the operation cycle, the higher the cost of capital. The coefficients on Int_dummy are all significantly positive (1% level for Model 14 and 15; 5% level for Model 16), indicating the absence of intangibles will increase the firm's cost of capital.

[Insert Table 13 Here]

Table 14 reports the regression results for Eq (15). For brevity, I do not report the results for Eq (10) for the sample of H4, the unreported results are qualitatively the same as those reported for the full sample in Table 6 in Chapter 3. In model 17, the coefficient on Res^1_SYNC is 0.004 significant at 10% level (t-statistics=1.78), indicating a marginal effect of the residual synchronicity on cost of equity capital. The coefficient on Factor 1 is significantly (1% level) positive, 0.037. In model 18, the coefficient on Res^2_SYNC is 0.004 significant at 10% level (t-statistics=1.73),

indicating a marginal effect of the residual synchronicity on cost of equity capital. The coefficient on Factor 2 is insignificantly (t-statistics=1.02) positive, 0.006.

[Insert Table 14 Here]

Summary

In this chapter, I examine the effect of stock price synchronicity on cost of equity capital. My hypothesis is based on the idea that stock price synchronicity, which measures the extent of firm information incorporate into stock price, can be a measure of information risk. My empirical results generally support Hypothesis 4. Stock price synchronicity is significantly positive related to cost of equity capital, and remains so after controlling for accounting information quality (Factor 1 and Factor 2). The residual synchronicity, which is used to capture the unexplained part of information reflected in stock price, is marginally significantly positively related to cost of equity capital.

🕮 References

Amihun, Y., Mendelson, H., 1986. Asset Pricing and the Bid-ask Spread. Journal of Financial Economics 17, 629-528.

Asdemir, O., 2005. Investor Sophistication and R&D Mispricing. Working Paper. Purdue University.

Ashbaugh-Skaife, H., LaFond, R., Mayhew, B.W., 2003. Do Non-Audit Services Compromise Auditor Independence? Further evidence. The Accounting Review 78 (3), 611-639.

_____, Gassen, J., LaFond, R., 2006. Does Stock Price Synchronicity Represent Firm-Specific Information? The International Evidence. Working Paper. University of Wisconsin – Madison, Humboldt University Berlin, and Massachusetts Institute of Technology.

Ball, R., Brown, P., 1968. An empirical valuation of accounting income numbers. Journal of Accounting Research 6, 159-178.

_____, Kothari, S.P., Robin, A., 2000. The effect of international institutional factors on properties of accounting earnings. Journal of Accounting and Economics 29, 1-51.

_____, Robin, A., Wu, J.S., 2003. Incentives versus standards: properties of accounting income in four East Asian countries. Journal of Accounting and Economics 36, 235-270.

Balsam, S., Bartov, E., Marquardt, C., 2002. Accruals management, investor sophistication, and equity valuation: evidence from 10-Q filings. Journal of Accounting Research 40, 987-1012.

Barry, C., Brown, S., 1985. Differential Information and Security Market Equilibrium. Journal of Financial and Quantitative Analysis 20 (4), 407-422.

Barth, M., Cram, D., Nelsen, K., 2001. Accruals and the Prediction of Future Cash Flows. The Accounting Review 76, 27-58.

Bartov, E., Radhakrishnan, S., Krinsky, I., 2000b. Investor sophistication and patterns in stock returns after earnings announcements. The Accounting Review 75, 43-63.

Basu, S., 1997. The Conservatism Principle and the Asymmetric Timeliness of Earnings. Journal of Accounting and Economics 24, 3-37.

Beaver, W., 1998. Financial Reporting: An Accounting Revolution, third ed. Prentice-Hall, Upper Saddle River, NJ.

Bernard, V., Thomas, J., 1989. Post-Earnings-Announcement Drift: Delayed Price Response or Risk Premium? Journal of Accounting Research 27, 1-36.

_____, _____, 1990. Evidence That Stock Prices Do Not Fully Reflect the Implications of Current Earnings for Future Earnings. Journal of Accounting and Economics 13, 305-340.

Bhattacharya, N., 2001. Investors' Trade Size and Trading Responses around Earnings Announcement: An Empirical Investigation. The Accounting Review 76, 221-244.

_____, Daouk, H., Welker, M., 2003. The World Pricing of Earnings Opacity. The Accounting Review 78, 641-673.

Brav, A., Lehavy, R., Michaely, R., 2003. Expected Return and Asset Pricing. Working Paper. Duke Univeristy.

Block, S., 1999. A Study of Financial Analysts: Practice and Theory. Financial Analysts Journal 55(4), 86-95.

Botosan, C., 1997. Disclosure Level and the Cost of Equity Capital. The Accounting Review 72, 323-349.

_____, Plumlee, M., 2002. A Re-examination of Disclosure Level and the Expected Cost of Equity Capital. Journal of Accounting Research 40 (1), 21-40.

_____, _____, 2005. Assessing Alternative Proxies for the Expected Risk Premium. The Accounting Review 80 (1), 21-53.

_____, _____, 2007. Are Information Attributes Priced? Working Paper. University of Utah.

_____, _____, Xie, Y., 2004. The Role of Information Precision in Determining the Cost of Equity Capital. Review of Accounting Studies 9, 233-259.

Bowen, R., Burgstahler, D., Daley, L., 1987. The Incremental Information Content of Accrual versus Cash Flows. The Accounting Review 61, 723-747.

Brennan, M., Jegadeesh, N., Swaminathan, B., 1993. Investment Analysis and the Adjustment of Sock Prices to Common Information. Review of Financial Studies 6, 799-824.

Bushee, B., 1998. The Influence of Institutional Investors on Myopic R&D Investment Behavior. The Accounting Review 73(3), 305-334.

_____, 2001. Do Intitutional Investors Prefer Near-term Earnings over Long-run Value? Contemporary Accounting Review 18, 207-246.

Bushman, R., Piotroski J., Smith, A., 2002. What Determines Corporate Transparency? Journal of Accounting Research 42, 207-252.

Chan, K., Hameed, A., 2006. Stock Price Synchronicity and Analyst Coverage in Emerging Markets. Journal of Financial Economics 80, 115-147.

Chan, Q., Goldstein, I., Jiang, W., 2006. Price Informativeness and Investment Sensitivity to Stock Price. Working Paper. Duke University.

Chang, J., Khanna, T., Palepu, K., 2000. Analyst Activity around the World. Working Paper. Harvard Business School.

Chaney, P., Lewis, C., 1995. Earnings Management and Firm Valuation under Asymmetric Information. Journal of Corporate Finance: Contracting, Governance and Organization 1, 319-345.

Coles, J., Loewenstein, U., Suay, J., 1995. On Equilibrium Pricing under Parameter Uncertainty. Journal of Financial and Quantitative Analysis 30 (3), 347-364.

Collins, D., Gong, G., Hribar, P., 2003. Investor sophistication and the mispricing of accruals. Review of Accounting Studies 8, 251-276.

_____, Maydew, E., Weiss, I., 1997. Changes in the Value-relevance of Earnings and Book values over the past forty years. Journal of Accounting and Economics 24, 39-67.

Dechow, P, 1994. Accounting Earnings and Cash Flows as Measures of Firm Performance: The Role of Accounting Accruals. Journal of Accounting and Economics 18, 3-42.

_____, Kothari, S., Watts, R., 1998. The Relation between Earnings and Cash Flows. Journal of Accounting and Economics 25, 133-168.

_____, Dichev, I., 2002. The Quality of Accruals and Earnings: The Role of Accrual Estimation Error. The Accounting Review 77(Supplement), 35-39.

_____, Schrand, R., 2004. Earnings Quality, A Monograph. Research Foundation of CFA Institute.

_____, Sloan, R., Sweeney A., 1995. Detecting Earnings management. The Accounting Review 70, 193-225.

Demski, J., Feltham, G., 1994. Market Response to Financial Reports. Journal of Accounting and Economics 17, 3-40.

Douglas, W., 1933. Protecting the Investor. Yale Review 21, 523-524.

Durnev, A., Morck, R., Yeung B., Zarwin, P., 2003. Does Great Firm-Specific Return Variation Mean More or Less Informed Stock Pricing? Journal of Accounting Research 41, 797-836.

_____, _____,_____, 2004. Value-Enhancing Capital Budgeting and Firm-Specific Stock Return Variation. Journal of Finance 59, 65-105.

Easley, D., O'Hara, M., 2004. Information and the Cost of Capital. The Journal of Finance 59 (4), 1553-1583.

_____, Kiefer, N., O'Hara, M., 1996. Cream-Skimming or Profit-Sharing? The Curious Role of Purchased Order Flow. Journal of Finance 51, 811-833.

_____,_____,_____, 1997a. The Information Content of the Trading Process. Journal of Empirical Finance 4,159-186.

_____,_____,_____, 1997b. One Day in the Life of a very Common Stock. Review of Financial Studies 10,805-835.

Easton, P., 2004. PE Ratios, PEG Ratios, and Estimating the Implied Expected Rate of Return on Equity Capital. The Accounting Review 79(1), 73-95.

Fama, E., and French, K., 1993. Common Risk Factors in the Returns on Stocks and Bonds. Journal of Financial Economics 33, 3-56.

_____, and _____, 1997. Industry Costs of Equity. Journal of Financial Economics 43, 153-193.

_____, MacBeth, J., 1973. Risk, Return, and Equilibrium: Empirical Tests. Journal of Political Economy 81, 607-636.

Francis, J., LaFond, R., Olsson, P., Schipper, K., 2004. Costs of Equity and Earnings Attributes. The Accounting Review 79(4), 967-1010.

_____, Schipper, K., 1999. Have Financial Statements Lost Their Relevance. Journal of Accounting Research 37(2), 319-352.

_____, _____, Vincent, L., 2002. Earnings Announcement and Competing Information. Journal of Accounting Economics 33, 313-342.

Frankel, R., Kothari, S., Weber, J., 2006. Determinants of the Informativeness of Analyst Research. Journal of Accounting and Economics 41, 29-54.

_____, Lee, C., 1998. Accounting Valuation, Market Expectation, and Cross-Sectional Stock Returns. Journal of Accounting and Economics 25, 283-319.

_____, Li, X., 2004. Characteristics of a Firm's Information Environment and the Information Asymmetry between Insiders and Outsiders. Journal of Accounting and Economics 37, 229-259.

Givoly, D., Hayn, C., 2000. The Changing Time-series Properties of Earnings, Cash Flows and Accruals: Has Financial Reporting Become More Conservatism? Journal of Accounting and Economics 29, 287-320.

Gleason, C., Lee, C., 2003. Analyst Forecast Revisions and Market Price Discovery. The Accounting Review 78(1), 193-225.

Graves, S., Waddock, S., 1990. Institutional ownership and control: Implications for long-term corporate strategy. Academy of Management Executive 4, 75-83.

Grossman, S., Stiglitz, J., 1980. On the Impossibility of Informationally Efficient Markets. American Economic Review 70, 393-408.

Gul, F., Kim, J., Qiu, A., 2007. Ownership Concentration, Foreign Shareholding, Audit Quality and Firm-Specific Return Variation: Evidence from China. Working Paper. Hong Kong Polytechnic University.

Hail,. L., and Leuz, C., 2005. International Differences in the Cost of Equity Capital: Do Legal Institutions and Securities Regulation Matter? Journal of Accounting Research 44(3), 485-531.

Healy, P., Hutton, A., Palepu, K., 1999. Stock Performance and Intermediation Changes Surrounding Sustained Increases in Disclosure. Contemporary Accounting Research 16 (3), 485-520.

_____, Wahlen, J., 1999. A Review of the Earnings Management Literature and Its Implications for Standard Setting. Accounting Horizons 13(4), 365-383.

Hepworth, S., 1953. Smoothing Periodic Income. Accounting Review 28, 32-39.

Hicks, J., 1939. Value and Capital. Oxford, U.K.: Univeristy Press.

Hirshleifer, D., Hou, K., Teoh, S., Zhang, Y., 2004. Do Investors Overvalue Firms with Bloated Balance Sheets? Journal of Accounting and Economics 38, 297-331.

Holthausen, R., Verrecchia, R., 1988. The Effect of Sequential Information Releases on the Variance of Price Changes in an Intertemporal Multi-asset Market. Journal of Accounting Reseach 26, 82-106.

Honda, P., Linn, S., 1993. Arbitrage Pricing with Estimation Risk. Journal of Financial and Quantitative Analysis 28 (1), 81-100.

Hong, H., Lim, T., Stein, J., 2000. Bad News Travels Slowly: Size, Analyst Coverage, and the Profitabiltiy of Momentum Strategies. The Journal of Finance 55, 265-295.

Hribar, P., Collins, D., 2002. Errors in Estimating Accruals: Implications for Empirical Research. Journal of Accounting Research 40, 105-134.

_____, Jenkins, N., 2004. The Effect of Accounting Restatements on Earnings Revision and the Estimated Cost of Capital. Review of Accounting Studies 9, 337-356.

Hunt, A., Moyer, S., Shevlin, T., 2000. Earnings Volatility, Earnings Management, and Equity Value. Working Paper.

Jiambalvo, J., Rajgopal, S., Venkatachalam, M., 2002. Institutional ownership and the extent to which stock prices reflect future earnings. Contemporary Accounting Research 19, 117-146.

Jin, L., Myers, S., 2006. R^2 around the World: New Theory and New Tests. Journal of Financial Economics 79, 257-292.

Jones, J., 1991. Earnings Management during Import Relief Investigations. Journal of Accounting Research 29, 193-228.

Kim, O., and R. Verrecchia. 1991. Trading Volume and Price Reactions to Public Announcements. Journal of Accounting Research 29(2), 302-321.

_____, _____. 2001. The Relation among Returns, Disclosure and Trading Volume Information. The Accounting Review 25, 633-654.

Kothari, S.P., Leone, A., Wasley, C., 2005. Performance Matched Discretionary Accrual Measures. Journal of Accounting and Economics 39, 163-197.

Kyle, A., 1985.Contineous Auctions and Insider Trading. Econometrica 53, 1315-1335.

La Porta, R., Lopez de-Silanes, F., Shleifer, A., Vishny, R., 1998. The Quality of Government. Working Paper. National Bureau of Economic Research, Cambridge.

Lambert, R., 1984. Income Smoothing as Rational Equilibrium Behavior. The Accounting Review 59, 604-18.

Lang, M., Lundholm, R., 1993. Cross-Sectional Determinants of Analyst Ratings of Corporate Disclosures. Journal of Accounting Research 31, 246-271.

_____, _____, 1996. Corporate Disclosure Policy and Analyst Behavior. The Accounting Review 71(4), 467-492.

_____, _____, 2000. Voluntary Disclosure and Equity Offerings: Reducing Information Asymmetry or Hyping the Stock? Contemporary Accounting Research 17 (4), 623-662.

Lev, B., 1989. On the Usefulness of Earnings and Earnings Research: Lessons and Directions from Two Decades of Empirical Research. Journal of Accounting Research 27(Supplement), 153-192.

_____, Zarowin, P., 1999. The Boundaries of Financial Reporting and How to Extend Them. Journal of Accounting Research 37(2), 353-385.

Leuz, C., Nanda D., Wysocki, P., 2003. Earnings management and Investor Protection: an International Comparison. Journal of Financial Economics 69, 505-527.

_____, Verrecchia, R., 2005. Firms' Capital Allocation Choices, Information Quality and the Cost of Capital. Working Paper. University of Pennsylvania.

Lipe, R., 1990. The Relation between Stock Returns and Accounting Earnings Given Alternative Information. The Accounting Review 65, 49-71.

Mikhail, M., Walther, B., Willis, R., 2004. Earnings Surprises and the Cost of Equity Capital. Journal of Accounting, Auditing and Finance 19 (4), 491-513.

Mishkin, F., 1983. A Rational Expectations Approach to Macroeconomics. Chicago: The University of Chicago Press.

Morck, R., Yeung, B., Yu, W., 2000. The Information Content of Stock Markets: Why Do Emerging Markets Have Synchronous Stock Price Movements? Journal of Financial Economics 58, 215-238.

Penman, S., Zhang, XJ., 2002. Accounting Conservatism, the Quality of Earnings and Stock Returns. The Accounting Review 77, 237-264.

Piotroski, J., Roulstone, T., 2004. The Influence of Analysts Institutional Investors, and Insiders on the Incorporation of Market, Industry, and Firm-Specific Information into Stock Price. Accounting Review 79, 1119-1151.

Pope, P., Walker, M., 1999. International Differences in the Timeliness, Conservatism and Classification of Earnings. Journal of Accounting Research 37 (Supplement), 53-87.

Porter, M. 1992. "Capital Choices: Changing the way America invests in industry." Council on Competitiveness/Harvard Business School, Boston.

Rajgopal, S., Venkatachalam, M., 2006. Financial Reporting Qualtiy and Idiosyncratic Return Volatility over the Last Four Decades. Working Paper. University of Washington.

Revsine, L., Collins, D., Johnson, W., 1999. Financial Reporting and Analysis. Upper Saddle River NJ: Prentice Hall.

Richardson, S., 2003. Earnings Quality and Short Sellers. Accounting Horizons 17 (supplement), 49-61.

Roll, R., 1988. R^2. Journal of Finance 43, 541-566.

Schipper, K., Vincent, L., 2003. Earnings Quality. Accounting Horizon (supplement), 97-110.

Shiller, R., Pound, J., 1989. Survey Evidence on Diffusion of Interest and Information among Investors. Journal of economic Behavior and Organization 4(1), 47-66.

Sloan, R., 1996. Do Stock Prices Fully Reflect Information in Accruals and Cash Flows about Future Earnings? The Accounting Review 71, 289-315.

Srinidhi, B., Gul, F., 2005. Economic Bonding of Auditors' Non-audit and Audit Fees and Accrual Quality. Working Paper, City University of Hong Kong, The Hong Kong Polytechnic University.

Subramanyam, R., 1996. The Pricing of Discretionary Accruals. Journal of Accounting and Economics 22, 249-282.

Trueman, B., Titman, S., 1988. An explanation for Accounting Income Smoothing. Journal of Accounting Research 26(Supplementary), 127-139.

Veldkamp, L., 2005. Information Markets and the Comovement of Asset Prices. Working Paper. New York University.

Walther, B., 1997. Investor Sophistication and Market Earnings Expectations. Journal of Accounting Research 35, 157-179.

Watts, R., 2003. Conservatism in Accounting Part I: Explanations and Implications. Accounting Horizons 17(3), 207-221.

Welker, M., 1995. Disclosure Policy, Information Asymmetry and Liquidity in Equity Markets. Contemporary Accounting Research 11 (2), 801-827.

Wurgler, J., 2000. Financial Markets and the Allocation of Capital, Journal of Financial Economics 58, 187-214

Xie, H., 2001. The Pricing of Abnormal Discretionary Accruals. The Accounting Review 76, 357-374.

Yang, Y., Zhang, Y., 2006. R-Square: Noise or Firm-Specific Information? Working Paper. Chinese University of Hong Kong.

Table 1
Sample Description

Year	No. of Firms
1996	608
1997	908
1998	912
1999	864
2000	812
2001	778
2002	858
2003	870
2004	812
	7,422

Table 2
Descriptive Statistics

Variables	Mean	Std. Dev.	5%	25%	Median	75%	95%
SYNC	-2.624	1.655	-5.492	-3.638	-2.563	-1.450	-0.081
Earning Quality							
AccrualQuality	0.042	0.033	0.009	0.020	0.033	0.054	0.108
Persistence	-0.367	0.411	-1.059	-0.648	-0.367	-0.082	0.317
Predictability	0.625	0.918	0.070	0.189	0.368	0.690	1.880
Smoothness	0.805	0.370	0.279	0.519	0.783	1.028	1.471
Relevance	-0.218	0.314	-0.757	-0.464	-0.188	0.049	0.233
Timeliness	-0.175	0.364	-0.783	-0.475	-0.158	0.140	0.374
Conservatism	-0.780	7.113	-13.078	-2.906	-0.548	1.380	12.417
Control Variables							
Ln(Numind)	6.236	0.811	4.934	5.820	6.337	6.812	7.872
Ln(MV)	4.341	1.420	1.796	3.372	4.459	5.476	6.452
Ln(Herf)	-3.904	0.839	-5.541	-4.456	-4.094	-3.313	-2.531
StdROA	1.140	1.916	0.129	0.303	0.598	1.213	3.662
SyncROA	-0.752	1.426	-3.303	-1.582	-0.509	0.207	1.133

Dependent Variable:
SYNC =the natural logarithmic transformation of R^2 of Equation (1), defined as $Ln(R^2/(1-R^2))$.

Earnings Quality Variables: All EQ variables are measured each year for each firm, using rolling ten-year windows.
AccrualQuality = the standard deviation of firm j's residuals from a regression of current accruals on lagged, current and future cash flows from operations;
Persistence = the negative of firm j's slope coefficient from a regression of current earnings per share on lagged earnings per share;
Predictability = the standard deviation of firm j's residuals from a regression of current earnings per share on lagged earnings per share;

Table 2 (Continued)

Smoothness	= the ratio of firm j's standard deviation of earnings before extraordinary items (scaled by beginning of the year total asset) to the standard deviation of cash flows from operations (scaled by beginning of the year total asset);
Relevance	= the negative of the adjusted R^2 from a regression of 15-month returns on the level and change in annual earnings before extraordinary items;
Timeliness	= the negative of the adjusted R^2 from a reverse regression of annual earnings before extraordinary items on variable s capturing positive and negative 15-month returns; and
Conservatism	= the negative of the ration of the coefficient on bad news (negative returns) to good news (positive returns) in the reverse regression.

Control Variables:

Ln(Numind)	=the natural log of the number of firms in the industry (Fama-French 48 industry specification);
Ln(MV)	=the natural log of the market value of equity at the beginning of the year;
Ln(Herf)	=the natural log of Herfindahl index of industry-level concentration;
StdROA	=the standard deviation of return on assets (ROA) measured over the years 1996-2004; and
SyncROA	=the natural logarithmic transformation of the R^2 from a regression (Equation (9)) of the firm's return on assets on a value-weighted market and industry index of ROA; defined as defined as $Ln(R^2/(1-R^2))$.

Table 3
Correlation Matrix

Panel A Correlation among Earnings Quality Variables

	Accrual Quality	Persistence	Predictability	Smoothness	Relevance	Timeliness	Conservatism
Accrual	1.0000	0.1759	0.3231	0.4893	0.0570	0.0743	0.0111
Quality		*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*0.3393*
Persistence		1.0000	0.3318	0.0011	0.0567	0.0414	-0.0108
			<0.0001	*<0.3302*	*<0.0001*	*0.0004*	*0.3505*
Predictability			1.0000	0.2025	0.0967	0.0817	0.0287
				<0.0001	*<0.0001*	*<0.0001*	*0.0135*
Smoothness				1.0000	0.0852	0.0776	0.0391
					<0.0001	*<0.0001*	*0.0008*
Relevance					1.0000	0.5751	0.1403
						<0.0001	*<0.0001*
Timeliness						1.0000	0.0830
							<0.0001
Conservatism							1.0000

Table 3 (Continued)

Panel B Correlation of Earnings Quality Variables with Dependent Variable and Control Variables

	Accrual Quality	Persistence	Predictability	Smoothness	Relevance	Timeliness	Conservatism
SYNC	-0.0486	-0.0888	0.0237	0.0642	0.0242	0.0385	0.0263
	<0.0001	*<0.0001*	*0.0416*	*<0.0001*	*0.0370*	*0.0009*	*0.0237*
Ln(Numind)	0.1419	-0.0182	-0.0526	0.0972	0.0849	0.0554	0.0354
	<0.0001	*0.1174*	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*0.0023*
Ln(MV)	-0.2883	-0.1969	-0.0444	-0.0758	-0.0286	-0.0238	0.0113
	<0.0001	*<0.0001*	*<0.0001*	*<0.0001*	*0.0137*	*0.0401*	*0.3286*
Ln(Herf)	-0.1265	0.0179	0.0630	-0.0736	-0.0857	-0.0504	-0.0272
	<0.0001	*0.1233*	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*0.0190*
StdROA	0.4128	0.0721	0.1638	0.2403	0.0516	0.0368	-0.0123
	<0.0001	*<0.0001*	*<0.0001*	*<0.0001*	*<0.0001*	*0.0015*	*0.2889*
SyncROA	0.0080	-0.1496	-0.0302	0.0701	-0.0305	-0.0265	0.0210
	0.4917	*<0.0001*	*0.0094*	*<0.0001*	*0.0086*	*0.0226*	*0.0711*

All variables are defined in Table 2.
Pearson correlations are reported. Significance levels are shown in italics.

Table 4
Relation between Stock Price Synchronicity and Earnings Quality Attributes

Panel A Relation between Stock Price Synchronicity and Each Earnings Quality Attributes

This panel presents average coefficients from 9 annual estimates of the following model:

$SYNC_{j,t}=\lambda_0+ \lambda_1 Earning\ Attributes^{k}_{j,t}+ \lambda_2 SyncROA_{j,t} + \lambda_3 Ln(Herf_{j,t})+ \lambda_4 Ln(MV_{j,t})+ \lambda_5 StdROA_{j,t}+ \lambda_6\ Ln(Numind)_{j,t}+ \lambda_7\ Ind\_dummy + +\mu_{j,t}$

	Average Coefficients from Annual Estimations						
	Model 1	**Model 2**	**Model 3**	**Model 4**	**Model 5**	**Model 6**	**Model 7**
Intercept	-14.500***	-15.212***	-15.768***	-16.497***	-15.519***	-16.137***	-15.390***
	(-3.98)	(-4.25)	(-4.32)	(-4.30)	(-4.17)	(-4.36)	(-4.26)
Ln(Numind)	6.155**	6.580**	6.966***	7.550***	6.752**	7.199***	6.682**
	(2.27)	(2.41)	(2.54)	(2.64)	(2.42)	(2.55)	(2.49)
Ln(MV)	0.750***	0.732***	0.730***	0.733***	0.729***	0.729***	0.728***
	(13.90)	(13.27)	(13.05)	(12.92)	(13.24)	(13.11)	(12.99)
Ln(Herf)	7.831**	8.277**	8.745***	9.500***	8.480**	9.038***	8.396**
	(2.31)	(2.41)	(2.55)	(2.66)	(2.44)	(2.55)	(2.50)
StdROA	0.041**	0.063***	0.060***	0.049***	0.063***	0.064***	0.064***
	(1.99)	(3.30)	(2.80)	(2.79)	(3.19)	(3.28)	(3.28)
SyncROA	0.022	0.028	0.027	0.016	0.027	0.027	0.023
	(1.13)	(1.49)	(1.42)	(0.94)	(1.37)	(1.40)	(1.21)

Table 4 (Continued)

Accounting Based Attributes							
AccrualQuality	0.054***						
	(4.95)						
Persistence		0.011**					
		(2.49)					
Predictability			0.016***				
			(3.07)				
Smoothness				0.043***			
				(9.17)			
Market Based Attributes							
Relevance					0.020***		
					(4.56)		
Timeliness						0.031***	
						(4.81)	
Conservatism							0.013
							(1.45)
Adj. R^2	46.06%	45.51%	45.57%	45.87%	45.56%	45.80%	45.20%

Table 4 (Continued)

Panel B: Relation between Stock Price Synchronicity and the Set of Accounting Based Attributes and the Set of Market Based Attributes

This panel presents average coefficients from 9 annual estimates of the following model:

$SYNC_{j,t}=\lambda_0+ \lambda_1 Earning\ Attributes^{k}_{j,t}+ \lambda_2 SyncROA_{j,t} + \lambda_3 Ln(Herf_{j,t})+ \lambda_4 Ln(MV_{j,t})+ \lambda_5 StdROA_{j,t}+ \lambda_6\ Ln(Numind)_{j,t}+ \lambda_7\ Ind\_dummy +\mu_{j,t}$

	Average Coefficients from Annual Estimations		
	Model 8	**Model 9**	**Model 10**
Intercept	-15.682***	-16.107***	-16.289***
	(-4.07)	(-4.45)	(-4.32)
Ln(Numind)	7.049**	7.141***	7.402***
	(2.47)	(2.61)	(2.65)
Ln(MV)	0.750***	0.729***	0.750***
	(14.00)	(13.14)	(14.07)
Ln(Herf)	8.953**	8.968***	9.392***
	(2.51)	(2.62)	(2.68)
StdROA	0.037*	0.064***	0.040**
	(1.84)	(3.26)	(1.93)
SyncROA	0.017	0.025	0.016
	(1.02)	(1.29)	(0.95)
Accounting Based Attributes			
AccuralQuality	0.037***		0.035***
	(2.59)		(2.53)
Persistence	0.006		0.005
	(0.85)		(0.69)
Predictability	-0.002		-0.004
	(-0.20)		(-0.34)
Smoothness	0.032***		0.032***
	(4.75)		(4.88)
Market Based Attributes			
R_Relevance		0.001	-0.002
		(0.26)	(-0.15)
R_Timeliness		0.030***	0.027***
		(4.43)	(4.12)
R_Conservatism		0.009	0.009
		(0.94)	(0.88)

Table 4 (Continued)

Adj. R^2	46.41%	45.94%	46.84%

All variables are previously defined in Table 2.

Each year, t =1996-2004, I estimate the cross-sectional relation between SYNC, the decile rank of earnings quality attributes and control variables separately. I report the mean of the annual coefficient estimates; t-statistics are based on the standard errors of the time-series of 9 estimates.

Panel A Model 1 to Model 7 show results for earnings quality attributes considered individually; and Panel B Model 8 shows results for the set of accounting based attributes; Model 9 shows results for the set of market based attributes; and Model 10 shows results for the set of all attributes.

Industry dummies are included but not reported.

Table 5
Factor Loadings on Earnings Quality Attributes

	Factor 1	Factor2
AccrualQuality	0.64258	0.06868
Persistence	0.33050	0.07676
Predictability	0.50743	0.12388
Smoothness	0.53335	0.06952
Relevance	0.11151	0.67409
Timeliness	0.13439	0.66561
Conservatism	0.04272	0.15210

The factor loadings reported are the mean value of nine yearly estimated factor loadings.

Table 6
Relation between Stock Price Synchronicity and Two Common Factors

This table presents average coefficients from 9 annual estimates of the following model:

$SYNC_{j,t}=\lambda_0+ \lambda_1 Factor^{p}_{j,t} + \lambda_2 SyncROA_{j,t} + \lambda_3 Ln(Herf_{j,t})+ \lambda_4 Ln(MV_{j,t})+ \lambda_5 StdROA_{j,t}+ \lambda_6 Ln(Numind)_{j,t}+ \lambda_7 Ind\_dummy +\mu_{j,t}$

	Average Coefficients from Annual Estimations		
	Model 11	**Model 12**	**Model 13**
Intercept	-15.438***	-15.766***	-15.573***
	(-4.23)	(-4.18)	(-4.25)
Ln(Numind)	6.918**	7.010**	7.005***
	(2.51)	(2.47)	(2.55)
Ln(MV)	0.748***	0.731***	0.748***
	(13.60)	(13.28)	(13.69)
Ln(Herf)	8.738***	8.802**	8.844***
	(2.53)	(2.49)	(2.56)
StdROA	0.038**	0.062***	0.040**
	(1.98)	(3.18)	(2.01)
SyncROA	0.025	0.027	0.026
	(1.33)	(1.40)	(1.37)
Factor1	0.191***		0.171***
	(7.69)		(6.64)
Factor2		0.114***	0.067***
		(5.95)	(3.30)
Adj. R^2	46.10%	45.76%	46.21%

All variables are previously defined in Table 2.
Each year, t =1996-2004, I estimate the cross-sectional relation between SYNC, the two common factors and control variables separately. I report the mean of the annual coefficient estimates; t-statistics are based on the standard errors of the time-series of 9 estimates.
Model 11 shows results for Factor 1; Model 12 shows results for Factor 2; and Model 13 shows results for both Factor 1 and Factor 2.
Industry dummies are included but not reported.

Table 7
Descriptive Statistics

Panel A Descriptive Statistics for Number of Analyst Following and Institutional Ownership

Variables	Mean	Std. Dev.	5%	25%	Median	75%	95%
NAF	1.594	2.259	0	0	1	2	6
OI	0.347	0.308	0	0.066	0.277	0.569	0.943

Panel B Descriptive Statistics for Analyst Following Subsample (AF) vs. Non-Analyst Following Subsample (NonAF)

	AF			NonAF			DIFF (NonAF-AF)	
Variables	**Mean**	**Std. Dev.**	**Median**	**Mean**	**Std. Dev.**	**Median**	**T-Test**	**Wilcoxon Z Score**
SYNC	-2.019	1.549	-1.828	-3.316	1.494	-3.204	-25.88***	-25.18***
Earnings Quality								
AccrualQuality	0.038	0.031	0.029	0.047	0.034	0.038	8.33***	9.90***
Persistence	-0.424	0.419	-0.420	-0.301	0.392	-0.312	9.24***	8.68***
Predictability	0.552	0.662	0.344	0.709	1.136	0.396	5.23***	2.73***
Smoothness	0.800	0.363	0.776	0.816	0.378	0.792	1.65*	1.38
Relevance	-0.229	0.314	-0.201	-0.205	0.313	-0.174	2.31**	2.29**
Timeliness	-0.179	0.366	-0.152	-0.169	0.362	-0.163	0.89	0.82
Conservatism	-0.673	7.032	-0.643	-0.907	7.193	-0.459	-1.00	0.33
Control Variables								
Ln(Numind)	6.246	0.771	6.337	6.224	0.853	6.337	-0.85	-0.47
Ln(MV)	5.083	1.058	5.209	3.491	1.301	3.480	-41.13***	-34.42***

Table 7 (Continued)								
Ln(Herf)	-3.916	0.803	-4.094	-3.891	0.878	-4.094	0.90	0.76
StdROA	0.910	1.350	0.487	1.406	2.380	0.745	7.93***	10.78***
SyncROA	-0.741	1.483	-0.426	-0.767	1.358	-0.597	-0.55	-1.59

NAF = the number of analysts making annual earnings forecast for that firm during the fiscal year. If there is no analyst reported in I/B/E/S tape, NAF=0.
IO = the percentage of common shares hold by institutions over the total number of common shares outstanding. If IO has missing value, then IO=0.

The full sample is partitioned based on number of analyst following (NAF). NonAF (non-analyst following) subsample contains firms with zero analysts following (NAF = 0), which includes 3,450firms. AF (analyst following) subsample contains firms with at least one analyst following (NAF >0), which includes 3,972 firms.
All other variables are defined in Table 2.

Table 7 (Continued)

Panel C Descriptive Statistics for Descriptive Statistics for High Institutional Ownership Subsample (HIO) vs. Low Institutional Ownership Subsample (LIO)

	HIO			LIO			DIFF	
Variables	**Mean**	**Std. Dev.**	**Median**	**Mean**	**Std. Dev.**	**Median**	**T**	**Z**
SYNC	-2.001	1.599	-1.805	-3.246	1.464	-3.141	-24.76***	-24.20***
Earnings Quality								
AccrualQuality	0.036	0.027	0.029	0.049	0.037	0.040	13.05***	12.90***
Persistence	-0.423	0.421	-0.425	-0.311	0.393	-0.309	8.38***	8.22***
Predictability	0.589	0.705	0.363	0.660	1.089	0.376	2.40**	2.38**
Smoothness	0.773	0.359	0.740	0.837	0.378	0.825	5.24***	5.17***
Relevance	-0.225	0.311	-0.200	-0.211	0.317	-0.175	1.32	1.45
Timeliness	-0.183	0.370	-0.169	-0.166	0.358	-0.143	1.42	1.28
Conservatism	-0.876	7.095	-0.672	-0.684	7.128	-0.471	0.83	1.64*
Control Variables								
Ln(Numind)	6.202	0.787	6.282	6.270	0.833	6.337	2.53***	3.04***
Ln(MV)	5.135	1.016	5.245	3.547	1.319	3.520	-41.15***	-34.63***
Ln(Herf)	-3.865	0.814	-4.094	-3.943	0.861	-4.094	-2.84***	-2.92***
StdROA	0.774	1.122	0.453	1.506	2.411	0.806	11.89***	15.41***
SyncROA	-0.714	1.508	-0.408	-0.791	1.338	-0.624	-1.70*	-3.39***

The full sample is partitioned based on Institutional Ownership (IO). HIO (high institutional ownership) subsample contains firms with institutional ownership above median (Median (IO) = 0.2774705), which includes 3,711firms. LIO (low institutional ownership) subsample contains firms with institutional ownership below median, which includes 3,711 firms.
All other variables are defined in Table 2.

Table 8
Relation between Stock Price Synchronicity and Two Common Factors for AF and NonAF Subsamples

This table presents average coefficients from 9 annual estimates of the following model for AF and NonAF subsamples:

$SYNC_{j,t}=\lambda_0+ \lambda_1 Factor^p_{j,t} + \lambda_2 SyncROA_{j,t} + \lambda_3 Ln(Herf_{j,t})+ \lambda_4 Ln(MV_{j,t})+ \lambda_5 StdROA_{j,t}+ \lambda_6 Ln(Numind)_{j,t}+ \lambda_7 Ind\_dummy + \mu_{j,t}$

	Average Coefficients from Annual Estimations			
	AF	**NonAF**	**AF**	**NonAF**
Intercept	-12.227***	-3.208**	-12.187***	-3.173**
	(-7.16)	(-2.48)	(-7.07)	(-2.43)
Ln(Numind)	2.245***	-0.317	2.378***	-0.306
	(3.67)	(-0.55)	(4.07)	(-0.53)
Ln(MV)	0.912***	0.514***	0.902***	0.515***
	(11.94)	(14.24)	(11.89)	(14.20)
Ln(Herf)	2.447***	0.275	2.660***	0.300
	(3.03)	(0.37)	(3.50)	(0.40)
StdROA	0.065**	0.041**	0.062*	0.040*
	(2.05)	(2.15)	(1.82)	(1.82)
SyncROA	0.065***	-0.005	0.064***	-0.009
	(2.92)	(-0.17)	(2.91)	(-0.30)
Factor1	0.273***	0.090**		
	(7.57)	(2.13)		
Factor2			0.264***	0.109**
			(5.25)	(2.48)
Adj. R^2	48.89%	32.49%	58.57%	32.57%

Table 8 (Continued)

Test of Coefficient Difference	**t-stat.**	**p-value**
Diff(Factor 1)= λ_1(AF)- λ_1(NonAF)=0.183	3.70	0.0060
Diff(Factor 2)= λ_1(AF)- λ_1(NonAF)=0.155	3.13	0.0140

All variables are previously defined in Table 2.

Each year, t =1996-2004, I estimate the cross-sectional relation between SYNC, the two common factors and control variables for AF and NonAF subsamples separately. AF consists of 3,450 firm-year observations, while NonAF consists of 3,972 firm-year observations. I report the mean of the annual coefficient estimates; t-statistics are based on the standard errors of the time-series of 9 estimates.
Industry dummies are included but not reported.

Each year, I test the difference between the coefficients on Factor 1 and Factor2 for AF and NonAF. I report the mean difference across 9 yearly estimates, along with t-statistics of whether that mean difference is reliably different from zero.

Table 9
Relation between Stock Price Synchronicity and Two Common Factors for HIO and LIO Subsamples

This table presents average coefficients from 9 annual estimates of the following model for HIO and LIO subsamples:

$SYNC_{j,t}=\lambda_0+ \lambda_1 Factor^p_{j,t} + \lambda_2 SyncROA_{j,t} + \lambda_3 Ln(Herf_{j,t})+ \lambda_4 Ln(MV_{j,t})+ \lambda_5 StdROA_{j,t}+ \lambda_6 Ln(Numind)_{j,t}+ \lambda_7 Ind\_dummy + \mu_{j,t}$

	Average Coefficients from Annual Estimations			
	HIO	**LIO**	**HIO**	**LIO**
Intercept	-8.342***	-7.306***	-9.099***	-7.431***
	(-4.43)	(-3.13)	(-4.79)	(-3.29)
Ln(Numind)	1.533***	0.472	1.824***	0.489
	(3.66)	(0.82)	(4.08)	(0.87)
Ln(MV)	1.003***	0.502***	0.977***	0.497***
	(13.07)	(12.36)	(12.97)	(12.18)
Ln(Herf)	2.362***	0.522	2.629***	0.515
	(3.86)	(0.63	(4.44)	(0.64)
StdROA	0.130**	0.046	0.182***	0.048*
	(2.51)	(1.53)	(3.53)	(1.93)
SyncROA	0.037*	0.037	0.041**	0.037
	(1.81)	(1.48)	(1.96)	(1.44)
Factor1	0.192***	0.080		
	(7.47)	(1.42)		
Factor2			0.140***	0.010
			(6.08)	(0.22)
Adj. R^2	51.56%	31.39%	51.34%	31.21%

Table 9 (Continued)

Test of Coefficient Difference	**t-stat.**	**p-value**
Diff(Factor 1)= λ_1(HIO)- λ_1(LIO)=0.112	2.46	0.0436
Diff(Factor 2)= λ_1(HIO)- λ_1(LIO)=0.130	2.27	0.0578

All variables are previously defined in Table 2.

Each year, t =1996-2004, I estimate the cross-sectional relation between SYNC, the two common factors and control variables for HIO and LIO subsamples separately. HIO consists of 3,711 firm-year observations, while LIO consists of 3,711 firm-year observations. I report the mean of the annual coefficient estimates; t-statistics are based on the standard errors of the time-series of 9 estimates.
Industry dummies are included but not reported.

Each year, I test the difference between the coefficients on Factor 1 and Factor2 for HIO and LIO. I report the mean difference across 9 yearly estimates, along with t-statistics of whether that mean difference is reliably different from zero.

Table 10
Relation between Stock Price Synchronicity Analyst Following and Two Common Factors

This table presents average coefficients from 9 annual estimates of the following model:

$SYNC_{j,t}=\lambda_0+ \lambda_1 D\_Naf_{j,t} + \lambda_2 Factor^p_{j,t} + \lambda_3 D\_Naf_{j.t}*Factor^p_{j,t} + \lambda_4 SyncROA_{j,t} + \lambda_5 Ln(Herf_{j,t})+ \lambda_6 Ln(MV_{j,t})+ \lambda_7 StdROA_{j,t}+ \lambda_8 Ln(Numind)_{j,t}+ \lambda_9 Ind\_dummy +\mu_{j,t}$

Average Coefficients from Annual Estimations

	Model 14	**Model 15**
Intercept	-7.199***	-7.318***
	(-4.90)	(-5.16)
Ln(Numind)	1.040***	1.113***
	(2.99)	(2.85)
Ln(MV)	0.683***	0.698***
	(15.85)	(15.17)
Ln(Herf)	1.592***	1.664***
	(4.36)	(3.66)
StdROA	0.037*	0.035*
	(1.88)	(1.89)
SyncROA	0.026	0.027
	(1.32)	(1.40)
D_Naf	0.214***	0.235***
	(3.46)	(3.96)
Factor1	0.129***	
	(3.30)	
Factor2		0.165***
		(3.44)
D_Naf*Factor1	0.085*	
	(1.73)	
D_Naf*Factor2		0.056
		(1.05)
Adj. R^2	49.99%	49.28%

D_Naf=1 if the firm is in AF subsample and zero otherwise.
All other variables are previously defined in Table 2.

Each year, t =1996-2004, I estimate the above regression and I report the mean of the annual coefficient estimates; t-statistics are based on the standard errors of the time-series of 9 estimates.
Industry dummies are included but not reported.

Table 11
Relation between Stock Price Synchronicity Institutional Ownership and Two Common Factors

This table presents average coefficients from 9 annual estimates of the following model:

$SYNC_{j,t}=\lambda_0+ \lambda_1 D\_Inst_{j,t} + \lambda_2 Factor^p_{j,t} + \lambda_3 D\_Inst_{j.t}*Factor^p_{j,t} + \lambda_4 SyncROA_{j,t} + \lambda_5 Ln(Herf_{j,t})+ \lambda_6 Ln(MV_{j,t})+ \lambda_7 StdROA_{j,t}+ \lambda_8 Ln(Numind)_{j,t}+ \lambda_9 Ind\_dummy +\mu_{j,t}$

Average Coefficients from Annual Estimations

	Model 16	**Model 17**
Intercept	-8.265***	-8.310***
	(-6.07)	(-6.02)
Ln(Numind)	1.309***	1.326***
	(3.70)	(3.61)
Ln(MV)	0.694***	0.694***
	(13.65)	(13.71)
Ln(Herf)	1.772***	1.788***
	(4.41)	(4.33)
StdROA	0.077***	0.078***
	(3.10)	(3.25)
SyncROA	0.032	0.033
	(1.63)	(1.67)
D_Inst	0.063	0.060
	(0.57)	(0.55)
Factor1	0.037	
	(0.71)	
Factor2		0.034
		(0.71)
D_Inst*Factor1	0.121**	
	(2.06)	
D_Inst*Factor2		0.122**
		(2.21)
Adj. R^2	49.72%	49.74%

D_Inst=1 if the firm is in HIO subsample and zero otherwise.
All other variables are previously defined in Table 2.

Each year, t =1996-2004, I estimate the above regression and I report the mean of the annual coefficient estimates; t-statistics are based on the standard errors of the time-series of 9 estimates.
Industry dummies are included but not reported.

Table 12
Descriptive Statistics

Variables	Mean	Std. Dev.	5%	25%	Median	75%	95%
CofC^{PEG}	0.173	0.130	0.033	0.091	0.145	0.221	0.405
Beta	0.998	0.855	0.004	0.430	0.814	1.411	2.658
Size	4.263	1.380	1.762	3.315	4.379	5.342	6.310
BM	0.769	0.868	0.107	0.371	0.625	0.973	2.087

$CofC^{PEG}_{j,t}$= the PEG estimate of cost of equity capital, defined in Eq(13);

$Beta_{j,t}$= firm j's beta in year t, estimated using monthly returns data over rolling ten-year windows;

$Size_{j,t}$= firm size measured as the log of firm j's market value at the beginning of year t; and

$BM_{j,t}$= the book to market ratio
= log of firm j's book value of equity (Compustat #60) divided by its market value of equity, both measured at the beginning of year t.

All other variables are previously defined.

Table 13
Relation between Stock Price Synchronicity and Cost of Equity Capital

This table presents average coefficients from 9 annual estimates of the following model:

$CofC^{VL}_{j,t}=\pi_0+\pi_1 Beta_{j,t}+\pi_2 Size_{j,t}+\pi_3 BM_{j,t}+ \pi_4 Factor^{p}_{j,t} + \pi_5 SYNC_{j,t} +\nu_{j,t}$

	Average Coefficients from Annual Estimations		
	Model 14	**Model 15**	**Model 16**
Intercept	0.136	0.151*	0.162*
	(1.03)	(1.84)	(1.87)
Beta	0.012**	0.009*	0.015*
	(1.96)	(1.89)	(1.79)
Size	-0.051*	-0.047***	0.054***
	(-1.87)	(-2.67)	(-2.90)
Bm	0.065	0.045	0.047
	(1.35)	(1.39)	(1.35)
SYNC	0.008**	0.006***	0.008***
	(2.43)	(2.70)	(3.31)
Factor1		0.037***	
		(7.59)	
Factor2			0.006
			(1.01)
Innate Control			
Ln(Asset)	0.015	0.018	0.018
	(0.92)	(1.47)	(1.45)
StdCFO	0.333***	0.249***	0.301***
	(9.35)	(5.53)	(7.28)
StdSales	0.085	0.062	0.074
	(1.49)	(1.37)	(1.65)
OperCycle	0.028***	0.017***	0.022***
	(4.66)	(3.73)	(4.51)
NegEarn	0.019	0.004	-0.008
	(0.75)	(0.07)	(-0.96)
Int_Intensity	0.016	0.009	0.010
	(0.88)	(0.64)	(0.64)
Int_Dummy	0.077***	0.067***	0.051**
	(2.51)	(2.91)	(2.13)
Cap_Intensity	-0.006	0.006	0.003
	(-0.48)	(0.65)	(0.30)

Table 13 (Continued)

Adj. R^2	39.94%	40.67%	37.48%

All variables are previously defined in Table 2 and Table 10.
Each year, t =1996-2004, I estimate the cross-sectional relation between $CofC^{PEG}$, the residual stock price synchronicity and control variables separately. I report the mean of the annual coefficient estimates; t-statistics are based on the standard errors of the time-series of 9 estimates.
Model 14 shows results for SYNC; Model 15 shows results for SYNC and Factor 1; and Model 16 shows results for both SYNC and Factor 2.
Industry dummies are included but not reported.

Table 14
Relation between Stock Price Synchronicity Residual and Cost of Equity Capital

This table presents average coefficients from 9 annual estimates of the following model:

$CofC^{PEG}_{j,t}=\pi_0+\pi_1 Beta_{j,t}+\pi_2 Size_{j,t}+\pi_3 BM_{j,t}+ \pi_4 Factor^{p}_{j,t} + \pi_5 Res^{p}\_SYNC_{j,t} +\nu_{j,t}$

where $Res^{p}\_SYNC_{j,t}$ is the residual $\mu_{j,t}$ of the following model:

$SYNC_{j,t}=\lambda_0+ \lambda_1 Factor^{p}_{j,t} + \lambda_2 SyncROA_{j,t} + \lambda_3 Ln(Herf_{j,t})+ \lambda_4 Ln(MV_{j,t})+ \lambda_5 StdROA_{j,t}+ \lambda_6 Ln(Numind)_{j,t}+ \lambda_7 Ind\_dummy +\mu_{j,t}$

	Average Coefficients from Annual Estimations	
	Model 17	**Model 18**
Intercept	0.140*	0.134*
	(1.70)	(1.54)
Beta	0.008*	0.015*
	(1.84)	(1.82)
Size	-0.047***	0.052***
	(-2.65)	(-2.76)
Bm	0.045	0.047
	(1.34)	(1.31)
Res^{p}_SYNC	0.004*	0.004*
	(1.78)	(1.73)
Factor1	0.037***	
	(7.60)	
Factor2		0.006
		(1.02)
Innate Control		
Ln(Asset)	0.018	0.019
	(1.46)	(1.41)
StdCFO	0.258***	0.316***
	(5.38)	(7.12)
StdSales	0.063	0.075*
	(1.41)	(1.69)
OperCycle	0.017***	0.022***
	(3.42)	(4.22)
NegEarn	0.001	-0.008
	(0.16)	(-0.96)
Int_Intensity	0.009	0.011
	(0.70)	(0.68)

Table 14 (Continued)

Int_Dummy	0.068***	0.054**
	(2.81)	(2.13)
Cap_Intensity	0.007	0.001
	(0.70)	(0.20)
Adj. R^2	40.48%	37.27%

All variables are previously defined in Table 2 and Table 10.
Each year, t =1996-2004, I estimate the cross-sectional relation between $CofC^{PEG}$, the stock price synchronicity and control variables separately. I report the mean of the annual coefficient estimates; t-statistics are based on the standard errors of the time-series of 9 estimates.
Model 17 shows results for Res_SYNC and Factor 1; and Model 18 shows results for both Res_SYNC and Factor 2.
Industry dummies are included but not reported.