Comprehensive Income and Cost of Equity Capital

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Abstract

This paper examines the usefulness of comprehensive income by investigating its association with implied cost of equity capital. We first document that comprehensive income does not explain future cash flows beyond net income, yet it subsumes net income in explaining variations of returns. We posit comprehensive income affects firm value by its ability to explain implied cost of equity capital. We find comprehensive income subsumes net income in explaining cost of equity capital. When we use stock return volatility to measure risk, we find similar results. Our findings suggest the usefulness of comprehensive income over net income comes from its ability of explaining risks rather than future profitability. Previous studies have not found strong evidence of usefulness of comprehensive income over net income. Different from previous studies, we find strong support that comprehensive income is a better measure than net income in explaining firm risk and firm value.

1. Introduction

Existing accounting literature on the usefulness of comprehensive income suggests that other comprehensive income is priced by the market but cannot predict future cash flows. Finance theory has long suggested that firm value is determined by present value of expected future cash flows. If a factor is associated with value but does not have an association with (expected) future cash flows, its effect on value must come from its relation with cost of capital (i.e. the discount factor). This argument can be especially true for other comprehensive income since other comprehensive income is mainly change in fair value of long-term financial assets and liabilities caused by market fluctuation.[1] Market fluctuation affects risk of owning these long-term assets/liabilities but will not have an immediate cash flow impact. Accordingly, we posit other comprehensive income should affect firm's cost of equity capital. We find comprehensive income subsumes net income in explaining firm's cost of equity capital. We also find similar results when we use volatility of stock return to measure risk. We conclude that the value-relevance of comprehensive income is driven by its relation to risk not to future profitability.

Our research builds upon two streams of literature. First, studies examining the value relevance and predictive value of other comprehensive income (e.g. Kanagarentnam et al. 2005; Biddle and Choi, 2006; Chambers et al., 2006) provide evidence indicating that other comprehensive income is value-relevant especially after the introduction of SFAS 130. However, studies (Dhaliwal et al. 1999; Kanagarentnam et al. 2005; Choi et al. 2007) cannot conclude the ability of other comprehensive income in

[1] OCI typically includes changes in fair value of market securities, foreign currency exchanges, pension liability and investment in derivatives. These assets/liabilities are not expected to be disposed in the near future.

predicting next-period cash flows. Another strand of research focuses on the risk implication of fair value accounting in banking industry. Studies (Barth, 1994; Barth et al. 1996; Hodder et al, 2006) investigate the association between volatilities of different income measures and firm fundamental risk factors and find that fair value accounting has increased firm risk by including more unrealized gains and losses caused by changes in fair values of certain assets and liabilities in income measures. While other comprehensive income is a product of fair value accounting, studies have not linked the risk explanation of other comprehensive income with its value-relevance.

This study investigates whether the value relevance of other comprehensive income documented in previous studies is mainly driven by its relation with cost of equity capital instead of its relation with future cash flows. We measure cost of equity capital by average implied cost of equity capital suggested by Dhaliwal et al. (1999). We also analyze volatility of share return for robustness check.

Using a large US sample, we find that other comprehensive income is highly value relevant, which leads to comprehensive income (sum of net income and other comprehensive income) subsuming net income in explaining variation of share return. However, other comprehensive income is negatively associated with future cash flows, which leads to a negative relation between comprehensive income with future cash flows after controlling for net income. These results confirm findings of previous research that other comprehensive income is value relevant but cannot predict future cash flows. Different from previous studies, we find other comprehensive income explains cost of capital (and return volatility), which leads to comprehensive income subsuming net income in explaining cost of capital (and return volatility). We conclude that the value relevance of other comprehensive income (hence, comprehensive income) comes from its risk perspective. Current accounting standards setting boards are toward adopting fair value accounting and comprehensive income reporting[2], our results provide some support of fair value accounting and comprehensive income reporting.

This paper is organized as follows. Section 2 discusses the background of this study and summarizes prior studies in comprehensive income. Section 3 briefly describes sample selection and main data items for this study. Section 4 outlines research design. Empirical results and robustness tests are reported in section 5. Final section summaries and concludes.

2. Background and Prior Research

2.1 Debate over all-inclusive and current operating concept of income

There has been a long stand debate between all-inclusive and current operating concepts of income in the accounting profession. The former concept requires that all changes in equity be reported as 'earnings' in the income statement, including both recurring and non-recurring income items and unrealized windfall gains and losses from market fluctuation. In contrast, the latter concept requires that only recurring income items be reported as earnings in the income statement.

The supporters of the all-inclusive concept of income argue that the income statement and balance sheet are completely articulated under this concept and that income measured based on this concept can better measure a firm's financial performance. For

[2] Many accounting standards are related to comprehensive income and fair value accounting. They include SFAC 6, SFAS 107, SFAS 115, SFAS 130 etc.

example, SFAC 6 clearly states the importance of reporting comprehensive income and its components for users of accounts as follows;

> '*The sources of comprehensive income are therefore significant to those attempting to use financial statements to help them with investment, credit, and similar decisions about the enterprise, especially since various sources may differ from each other in stability, risk, and predictability. Users' desire for information about those sources underlies the distinctions between revenues, expenses, gains, and losses as well as other components of comprehensive income that result from combining revenues, expenses, gains, and losses in various ways*' (1985, paragraph 216)

The American Accounting Association Financial Accounting Standards Committee also states:

> '[*a]n analyst's forecast can be used to value a stock only if it is a forecast of comprehensive income, and a price/earnings ratio only has a precise interpretation if the earnings are comprehensive....[F]or the reported income to be most useful in equity price valuation, it must be comprehensive*' (1997, p. 122)

The above statements are also echoed by the CFA Institute, who recently maintained that:

> '*To be useful in making the(se) assessments [of a company's economic resources, the claims to those resources and changes in them, including measures of an entity's performance], reported information must be timely, accurate, understandable, and comprehensive. The financial statements must recognize, as they occur, all events or transactions that affect the value of the company's net assets and, hence, common shareowner's wealth'* (2005, p.10).

Supporters of the current operating concept of income, however, argue that comprehensive income cannot be used to predict future cash flows simply because it contains extraordinary items and many non-recurring income items. For example, Black states that:

> '*[I]f we want to maximize the information about value in the earnings figure, and minimize the noise, we can choose accounting rules that make earnings look more*

like value and less like change in value. In other words, we can choose rules that minimize transitory components of earnings, while leaving the permanent components' (1993, p. 5)

Although accounting standard-setters in the US have generally developed their accounting standards using the all-inclusive concept of reporting income prior to the 80's, the Financial Accounting Standards Board (FASB) re-enforced the all-inclusive concept of income by formally defining comprehensive income in its concept statements along with other element of financial statements in the early 80s. Even though the FASB favors the all-inclusive concept of income, it has allowed several items (i.e. other comprehensive income) to be directly taken to the balance sheet, bypassing the income statement. The main reason for this exception is again because these items are generally volatile and unpredictable. It has been concerned that adding these items into the bottom-line net income will reduce its stability and usefulness. Also urged by the Association for Investment Management and Research (AIMR), the FASB started a new project on comprehensive income reporting in 1995, which led to *SFAS* No. 130 released in June 1997.

For a long time, financial statement users have to evaluate changes of paid-in capital items and retained earnings to derive these bypassed items. To improve the transparency of the bypassed items and urged by the Association for Investment Management and Research (AIMR), the FASB started a new project on comprehensive income reporting in 1995, which led to *SFAS* No. 130 released in June 1997. SFAS No. 130 defines comprehensive income as the sum of net income and other comprehensive income which consists of adjustments for foreign currency translation, marketable securities, pension liabilities and unrealized gains and losses from cash flow hedges.[3] Researchers have found the reported[4] (rather than derived prior to SFAS 130) comprehensive income is value relevant.

2.2 Prior Research

From the theory prespective, Ohlson (1995) suggests that firm valuation should be based on comprehensive income. The residual income valuation model suggested by Ohlson illustrates that firm value can be explained by book value and abnormal earnings under the clean surplus accounting, i.e. all changes in equity except owners' transactions are included in earnings and reported in the income statement. While the accounting standards promote the comprehensive income, financial analysts demand the comprehensive income reporting and theory of comprehensive income holds, studies have not been able to find strong empirical evidence of the usefulness of comprehensive income over net income.

Previous studies that examine the usefulness of comprehensive income can be classified into two main streams of research. The first stream of research (Cheng, 1993; O'Halon and Pope 1999; Dhaliwal et al. 1999; Kanagarentnam et al.2005; Biddle and Choi 2006; Choi et al. 2007) uses the value relevance and the predictive ability methodologies to examine whether other comprehensive income is priced by the market and whether comprehensive income can better predict future net income and cash flows than net income. The second stream of research (Barth 1994; Barth et al. 1995; Hirst et al. 2002; Hirst et al. 2004; Hodder et al. 2006) examines how fair value accounting

[3] They are related to SFAS 52, 115, 87, and 133, respectively.
[4] To allow flexibility, other comprehensive income can be reported in the income statement, a separate statement of comprehensive income, and the statement of change in shareholders' equity.

income reflects firm risk of commercial banks, hence affects firm values. Studies in this area mainly investigate commercial banks because they own many different types of financial instruments that are normally valued at fair value (SFAS 107, 115, and 130). The implication of this stream of research to comprehensive income is through the close connection between other compressive income and fair value accounting. Below discusses these two streams of research.

2.2.1 Value Relevance and Predictive Value of Comprehensive Income

Cheng et al. (1993) investigate the usefulness of three summary income measures, i.e. operating income, net income, and comprehensive income using the relative explanatory power of these income measures for share return. They find that operating and net income dominates comprehensive income and that income items reported between net income and comprehensive income, i.e. other comprehensive income, do not provide significant price relevant information.

Using 1994 and 1995 data, Dhaliwal et al. (1999) investigate whether comprehensive income is more associated with share return/firm value and better predict future net income and cash flows than net income. They find the explanatory power (i.e. R-squared) of comprehensive income for share return is statistically higher than the explanatory power of net income for share return. After comparing the relative explanatory power of the individual components of other comprehensive income and net income for share return, Dhaliwal et al. (1999) finds that only the explanatory power of marketable security adjustment for share return is statistically higher than the explanatory power of net income for share return. They conclude that their results are driven by financial companies. They also find the explanatory powers of net income for future net income and cash flows are significantly higher than the explanatory powers of comprehensive income for future net income and cash flows, suggesting that comprehensive income is not as useful as net income for investors.

Cheng (1998) investigates the usefulness of other comprehensive income for investors using a US sample. She argues that other comprehensive income is recognized much earlier than its potential realization in future periods,[5]and therefore examines the statistical association between share returns and other comprehensive income over a range of return intervals. Cheng (1998) finds the association is only significant when using longer intervals (e.g. 10, 12, and 15 years), confirming that there is a timing difference between accounting recognition of other comprehensive income and its impact on share prices.. However, since timeliness is an important principle for accounting earnings, studies continue investigating the usefulness of other comprehensive income over a short one-year interval (e.g. Choi et al, 2007).

Using a large set of US data for the period 1994-1998, Biddle and Choi (2006) examines whether sixteen different definitions of income, using combinations between net income and the components of other comprehensive income, differ in value relevance. Contrary to the findings of Dhaliwal et al. (1999), they find that comprehensive income has significantly greater explanatory power for share return than net income and that the adjustments for foreign currency translation and marketable securities provide significant incremental price relevance information beyond net income.

[5] In theory, gains or losses from foreign currency translation and marketable securities will not be realized until overseas subsidiaries and marketable securities are disposed. Minimum pension liability can only be eliminated when a company can contribute more than the amount of pension expense. They all have implication for future cash flow.

Chambers et al. (2006) argue that since prior to SFAS No. 130 companies did not explicitly disclose other comprehensive income in their financial statements, other comprehensive income could only be measured by estimation and therefore might contain significant measurement errors. They argue that the weak result of the usefulness of other comprehensive income documented by Dhaliwal et al. (1999) might be driven by the measurement errors contained in as-if estimates of other comprehensive income numbers. Chambers et al. divided their sample period (1994-2003) into the pre (1994-1997) and post SFAS 130 (1998-2003) periods. They then constructed as-if measures of other comprehensive income following the method used by Dhaliwal et al. (1999) for both sub-periods and manually collected other comprehensive income data from the 10-K reports for S&P's 500 index firms in the post SFAS 130 period. They find that the as-if other comprehensive income numbers are not value relevant during both sub periods but that the as-reported other comprehensive income numbers are positively priced, dollar-for-dollars, in the post-SFAS 130 period. Their findings confirm their prediction that measurement errors have weakened the value relevance of other comprehensive income when the as-if other comprehensive income numbers are used in prior research and that SFAS 130 has improved transparency of other comprehensive income disclosure. Their finding is, however, different from Biddle and Choi (2006) and Kanagarentnam et al. (2005), who have provided evidence on the value relevance of other comprehensive income even in the pre SFAS 130 period.

Some studies have investigated similar issues using non-U.S. data. Using UK data, O'Hanlon and Pope (1999) examines the usefulness of other comprehensive income for investors. They find that all the components of other comprehensive income are never associated with future share returns measured in both short and long intervals (up to 20 years) except extraordinary items[6]. Using cross-listed Canadian firms in the US for the period of 1998-2003 and all the US firms for the period of 1994-2003, Kanagarentnam et al. (2005) find that each of the components of other comprehensive income, including adjustments for foreign currency translation, pension liability, and marketable securities, are associated with share return, although the results appear to be stronger in the post SFAS130 period than the pre SFAS 130 period. Their result holds for firms in either financial or non-financial industries. Consistent with previous studies, they also find that net income can better predict future net income, comprehensive income, and cash flows from operations than comprehensive income.

In summary, previous studies focus on investigating the usefulness of comprehensive income by examining the value relevance of other comprehensive income and whether comprehensive income can better predict future net income and cash flows than net income. Empirical results generally indicate that other comprehensive income is value relevant especially in the post SFAS 130 period but it has no associations to future cash flows.

We believe that other comprehensive income should not have a strong association with next-period cash flows, however, more other comprehensive income should imply higher chances for companies to realize more cash flows in a distant future. These higher chances should then reduce market perceived risk, hence, lower the cost of equity capital and increase firm value. To our knowledge, no study has investigated the reason for the

[6] In the UK, many items are taken to the balance sheet, bypassing the income statement during the test period of this study (1972-1992). The authors define dirty surplus items as asset revaluations, goodwill write-off, foreign currency translation, extraordinary items, and others.

value-relevance of other comprehensive income from the risk perspective. Below, we discuss a potentially relevant literature that investigates fair value accounting for banking since other comprehensive income is closely related with fair value accounting in this industry.

2.2.2 Fair Value Accounting Income and Firm Risk

Other comprehensive income is mainly caused by changes in fair values of certain assets and liabilities. Since the assets and liabilities have not been disposed and their fair values are affected by market fluctuations not by operational results, the other comprehensive income is considered as unrealized.[7] This unrealized income will not have immediate effect on cash flows but it may contain information about the change in a firm's fundamental risk.

Using a large US sample from 1971-1990, Barth et al. (1995) examines whether the market prices incremental volatility is from unrealized fair value gains and losses for commercial banks. They find partial-fair-value income, i.e. income including unrealized fair value gains and losses on investment securities disclosed by commercial banks, has higher volatility than reported net income. However, incremental volatility due to fair value gains and losses is not priced by the market as risk. They argue that this unexpected result could be caused by incomplete measurement of fair value in income because banks do not fully disclose unrealized fair value gains and losses from all financial instruments.

[7] Unrealized or realized does not depend on if cash flow is realized. For example, accrued interest income is considered as realized even though the cash has not been collected since it is already earned based on matching principle. Moreover, gains or losses from trading securities caused by market fluctuation are considered as realized because the trading securities are considered as monetory assets that are needed for daily operations. On the other hand, gains or losses from market fluctuation for held-for-sale marketable securities are considered unrealized since the need for selling these securities is remote.

Similar to Barth et al.(1995), Hodder et al. (2006) argue that comprehensive income under the current accounting system does not represent a full-fair-value financial performance because many assets and liabilities are not valued at fair values. They also suggest that full-fair value income should be more related to banks' underlying risks in comparison with net income and comprehensive income. Beyond Barth et al.(1995), Hodder et al. (2006) provide evidence that full-fair-value income[8] volatility is greater than net and comprehensive income volatility for 90 and 77 percent of their sample banks respectively. They also find volatility of full-fair-value income is positively associated with different risk factors beyond volatility of net income and comprehensive income.

Moreover, using the residual income valuation model, Hodder et al. (2006) find a negative (positive) and significant association between share price (cost of equity capital) and the interaction between abnormal earnings and the differences between the volatilities of full-fair-value and comprehensive income. They do not find any statistical association between cost of equity capital and other comprehensive income. They conclude that the market is able to reflect the incremental risk information contained in full-fair-value income in share prices and cost of equity capital.

To sum, studies find other comprehensive income is value relevant but has no predictability of near future cash flows; on the other hand, the banking literature suggest that other comprehensive income should be useful in assessing firm risk. These findings imply that the value-relevance of other comprehensive income comes from the relation between other comprehensive income and cost of equity capital, not from the relation

[8] Following SFAS 107 and 133, they compute full fair-value accounting income by adjusting comprehensive income for unrealized gains and losses for held-to-maturity investment securities, loans, term deposits, long term financial liabilities, and derivatives.

between other comprehensive income and future cash flows. Different from previous studies, this study aims to document the latter relation. .

3. Sample and data

3.1 Sample Selection

Our data is derived from 2006 Compustat, CRSP and IBES databases. Our sample consists of all firm-year observations during the period 1994-2005 [9]that have data available for constructing four different measures of implied cost of equity capital (see the discussion below), volatility of share returns, other comprehensive income, net income and other firm risk factors such as beta, market value, and book value of equity to market value. We start our test period from 1994 to be consistent with previous studies (Dhaliwal et al. 1999; Biddle and Choi, 2006; Chambers et al., 2006; Choi et al., 2007). To avoid problem with outliers, firm-year observations for which the absolute value of the test variables falls in the top percentile of the distribution is eliminated from the sample. The final sample comprises of 32,479 firm-year observations.

3.2 Variable measurement

3.2.1 Accounting Variables

Other comprehensive income is defined similar to previous studies (e.g. Dhaliwal et al. 1999, Biddle and Choi, 2006, Choi et al. 2007). Following Dhaliwal et al (1999), all examined accounting variables are scaled by prior-year-end market value of equity. They are outlined as follows.

[9] We delete 2006 due to less number of observations since our measurement period of yearly observation is from the fourth month in a fiscal year till the third month after a fiscal year. For year 2006 financial data, this three months restrictions reduce a lot of firm year observations.

NI: Net Income (Compustat data item 172).

Δ *NI*: Change in *NI*.

OCI: Other comprehensive income (measured as the change in Compustat data item 357 or the sum of the change in the following three components if data item 357 is not available). They are adjustments for unrealized holding gains or losses on marketable securities, measured as the change in Compustat data item 238, foreign currency translation, measured as the change in Compustat data item 230, and pension liabilities, measured as the change in cumulative pension liabilities adjustment which equals the difference of Compustat data items 297 and 298 if the difference is less than zero and equals 0 if the difference is greater than or equals to zero.

Δ *OCI*: Change in *OCI*.

CI: Sum of *NI* and *OCI*.

Δ *CI*: Change in *CI*.

3.2.2 Implied cost of equity capital

Measurement of implied cost of capital stems from the theoretical models developed in Ohlson (1995): the residual income valuation model and Ohlson and Juettner_Nauroth (2005): the abnormal earnings growth model. Information required in these models is not readily available and researchers have to develop imperfect surrogates. Since current literature still debates on the superiority of any particular methodology in obtaining the estimate of implied cost of equity capital (*COC*), Dhaliwal, Heitzman and Li (DHL, 2006) and Hail and Leuz (HL, 2006) use the average of four implied cost of equity estimates in their empirical tests to mitigate possible measurement errors. These four estimates are adopted from Gebhardt, Lee and Swaminathan (2001), Claus and Thomas (2001), Gode and Mohanram (2003), and Easton (2004). Appendix A summarizes their models.

We follow DHL's and HL's approach by using average of the four abomentioned estimates. For each firm, they measure the implied *COC* based on the price and earnings forecasts in June of each year. Different from them, we use means across all 12 months from the fourth month in a fiscal year to the third month after the fiscal year. Below describes our calculation procedure in detail. First, we calculate 4 *COC*'s for each month by using the most recent book value available from Compustat and concurrent price and earnings forecasts provided by IBES. The four *COC* measurement methods require different data requirements. To maintain a large sample of observations, we keep the mean *COC* measure as long as there is at least one measure available. We also windsorize the *COC* measures with a minimum of 0.01 and maximum of 0.50. We then average the 'mean' monthly *COC* across the 12 month period starting the fourth month in a fiscal year. Mathematically, our measurement of *COC* can be expressed as follows:

$$COC_t = \frac{1}{12}\sum_{m=4}^{+15}\frac{1}{4}\sum_{n=1}^{4}COC_n$$

Where n= 1…4, indicating one of the four measures developed by previous studies
m= 4…15 indicating the 12-month period starting in the fourth month of a fiscal year.

Similar to DHL and HL, we believe an averaging process across the four methods of aforementioned estimates reduce the measurement errors. Moreover, since we are interested in finding out how the unexpected other comprehensive income occurred in a year affects firms' cost of equity capital, we focus on the mean of *COC* over a whole year period.[10]

One thing needs to be noted here. Since *COC* is affected by risk free rate of return. We adjust COC_n by substracting risk free rate of return, measured by the interest rate of US ten-year government treasury bond. Our analysis then focuses on the association between standardized change in adjusted *COC* (or risk premium) and relevant accounting variables.

3.2.3 Volatility of share returns

Accounting information is used to generate implied cost of equity capital,[11] the correlation between the variables used in calculating the *COC* and the accounting numbers that are of interest to us (such as net income and other comprehensive income) may create spurious effects. Since *COC* is affected by risk, we choose to analyze another risk variable for a benchmark comparison. Volatility of share returns is widely used as a risk measure (Hodder et al., 2006). In this paper, we use the standard deviation of daily share returns for each sample firm for a 12-month period starting from the fourth month in a fiscal year to measure the volatility of share returns.

3.2.3 Control Variables

In our multivariate regression model, we also control for various risk measures including size, market beta, book-to-market, and Fama-French three factors such as

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[10] In a robustness check, we use the 1st available COC after the third month passing the end of the fiscal year. Our results are weaker but the main conclusions remain.

[11] Two estimates (Gebhardt, Lee and Swaminathan (2001), Claus and Thomas (2001)) use current reported book value as inputs when measuring the COC. All estimates use forecasted earnings as inputs.

market (difference between entire market return and firm-specific risk free rate of return, size (large minus low firm size), and value (high book-to-value minus low book-to-narket), which have been widely used in the literature.

3.3 Data Characteristics

We report the descriptive statistics of the variables examined in this study in Table 1. Average (median) premium risk (i.e. implied cost of equity capital adjusted for risk-free rate) is 6.32% (5.03%), higher than DHL 4.95% (4.30%), indicating that our sample contains higher risk firms. Mean and median standardized changes in risk premium ($\Delta COC_t/COC_{t-1}$) are 11.73% and -0.51%, respectively, reflecting right skewed distribution. The standard deviation of $\Delta COC_t/COC_{t-1}$ appears to be high (77.45%), indicating that $\Delta COC_t/COC_{t-1}$ varies significantly across different firm years. Mean and median volatilities of share return (VOL_t) are 3.07% and 2.72%, respectively, which are much smaller than those (5.1% and 4.8% respectively) for commercial banks reported by Hodder et al. (2006). The mean standardized change in volatility of share return ($\Delta VOL_t/VOL_{t-1}$) is positive (2.19%) but the median is negative (-1.87%), also reflecting right skewed distribution. The standard deviation of $\Delta VOL_t/VOL_{t-1}$ is 27.55%, lower than that of $\Delta COC_t/COC_{t-1}$.

All accounting variables are deflated by prior year-end market capitalization. Both mean and median NI_t is much higher than the mean and median of OCI_t, indicating that OCI_t is relatively small. This is expected and consistent with previous studies. Although mean ΔOCI_t are negative, median ΔOCI_t is zero, reflecting its transitory and uncertain nature in general. ΔNI_t has both positive mean and median (0.75% and 0.85%

respectively). Mean and median market value is 3.481 and 0.464 billions respectively, indicating that our sample firms include some very large firms.

Table 2 reports the correlation coefficients between our key variables: $\Delta COC_t/COC_{t-1}$, $\Delta VOL_t/VOL_{t-1}$, OCI_t, ΔOCI_t, NI_t, and ΔNI_t. $\Delta COC_t/COC_{t-1}$ and $\Delta VOL_t/VOL_{t-1}$ are positively correlated. The Pearson and Spearman correlation coefficients are 0.169 and 0.150 respectively. This is expected and consistent with previous studies. Both Pearson and Spearman correlation coefficients show that $\Delta COC_t/COC_{t-1}$ and $\Delta VOL_t/VOL_{t-1}$ are negatively associated with NI_t, OCI_t and ΔNI_t. However, only $\Delta VOL_t/VOL_{t-1}$ is associated with ΔOCI_t. These statistics imply some differences between risk premium and returns volatility and also show some evidence of association between changes in risk premium and volatility of share return and net income and other comprehensive income.

Levels of accounting numbers (i.e. NI_t and OCI_t) are expected to be correlated with their corresponding changes. All the correlation coefficients are smaller than 70%. As a rule of thumb, this correlation level will not create multicollinearity problem when both level and change variables are included in a regression model. Pearson coefficient shows that NI_t is not correlated with OCI_t at the 5% significance level, similarly, ΔNI_t is not correlated with ΔOCI_t. This is not surprising because net income measures performance of a company's operation but other comprehensive income reflects market fluctuation. Their insignificant correlation fits the rational that other comprehensive income is caused by windfalls and should be separately reported from net income. Spearman correlation coefficients are generally higher but provide rather consistent conclusion.

4. Research Methodology

4.1 Using both Level and Change of Earnings to Capture the Unexpected Earnings

In evaluating relations between unexpected earnings and return, accounting studies (e.g. Ali and Zarowin, 1992; Cheng et. al., 19; Easton and Harris, 1991) suggest both the level and change in earnings should be include in the regression model and the sum of the coefficients represent the value-relevance of unexpected earnings (i.e. *ERC*). The rationale can be summarized in a simple model below:

Assuming unexpected return is a function of unexpected earnings as:

$$UR_t = \rho \Delta UE_t \qquad (1)$$

Where UR_t is the unexpected return, UE_t is the unexpected earnings at time t and ρ is the *ERC*.

Let $UE_t = w_1 E_t + w_2 \Delta E_t$, where $w_1 + w_2 = 1$ (refer to Appendix B which shows various form of ARIMA model derives different weights, however, the sum of weights equals to 1).[12]

Equation (1) becomes

$$UR_t = \rho w_1 E_t + \rho w_2 \Delta E_t = \alpha E_t + \beta \Delta E_t \qquad (2)$$

Where $\alpha = \rho w_1$ and $\beta = \rho w_2$. Since $w_1 + w_2 = 1$, we obtain the following:

$\alpha + \beta = \rho (w_1 + w_2) = \rho$.

[12] These weights are similar to those used in Ohlson (1995) when he suggests that firm value is determined by weighted book value and earnings and the sum of these weights should equal to 1

Accordingly, to capture the effect of unexpected income on return, we will focus our discussion on the sum of the coefficient on the level and changes variables.

4.2 Regression Models

Previous studies generally find that *NI* can better predict future *NI* and cash flows than *CI*. For example, Dhaliwal et al (1999) and Kanagarentnam et al. (2005) find that both current period *NI* and *CI* are associated with one-year ahead net income and cash flows but the explanatory power of current period *NI* over future *NI* and cash flows is higher than that of *CI*. Their finding suggests that *OCI* cannot predict future *NI* and cash flows. Biddle and Choi (2006) and Choi et al. (2007), however, find that current period *OCI* has incremental explanatory power for one-year ahead *NI* beyond current period *NI*.

This study re-examines whether *CI* is more price relevant than *NI* and whether *CI* can better predict future cash flows using a more comprehensive dataset for the period 1994-2005. Instead of using one-year ahead of cash flows as a proxy for future cash flows, we investigate the association between current period *OCI* and cash flows in the next five years. We also use a nested model for this purpose instead of the non-tested model that is widely used by previous studies[13]. We are interested to test if *OCI* has relation to future cash flows and if *NI* and *CI* can predict future cash flows beyond each other.

As discussed above, we will include both level and change in the accounting variables in our regression model to capture the effect of unexpected accounting number. Follow Ali and Zarowin (1992) and Cheng et al. (1996), we use the effect of 'unexpected' *NI*, *CI*, and *OCI* to describe the sum of the coefficients on both level and

[13] We also tried the non-nested method and obtained consistent results with previous studies that the explanatory power of net income for share return is always higher than that the explanatory power of comprehensive income for share return.

change of *NI*, *CI*, and OCI, respectively for simplicity reasons. To test the value relevance of *OCI* and *CI*, we use the following two equivalent models:

$$CR_{it} = \alpha + \beta_1 NI_{it} + \beta_2 \Delta NI_{it} + \gamma_1 OCI_{it} + \gamma_2 \Delta OCI_{it} + \varepsilon_{it} \quad (3)$$

$$CR_{it} = \alpha + \hat{\beta}_1 NI_{it} + \hat{\beta}_2 \Delta NI_{it} + \gamma_1 CI_{it} + \gamma_2 \Delta CI_{it} + \varepsilon_{it} \quad (4)$$

Where: CR_{it} is the equity returns for firm *i* for the period *t*, cumulated for 12 months, starting from 9 months prior through 3 months after the fiscal year end; ΔNI_{it}, ΔCI_{it}, ΔOCI_{it} are changes in NI_{it}, CI_{it}, and OCI_{it}, respectively. Note that since CI=NI+OCI, equation (3) and (4) are exactly the same except the coefficients on unexpected NI (i.e. the β's). Substitute OCI with CI-NI in equation (3), it is easy to see that the coefficient on NI in equation (4) becomes $\beta_1 - \gamma_1$ (i.e. $\hat{\beta}_1$) and $\beta_2 - \gamma_2$ (i.e. $\hat{\beta}_2$). Model (3) is used to examine whether the unexpected OCI is value relevant and Model (4) is used to examine whether unexpected CI and unexpected NI is value-relevant beyond each other. Note that if one is interested in only testing if the OCI is value-relevant and if CI provides additional value-relevance, then the r γ coefficients in model (3) will be sufficient. However, if one is interested in finding if value relevance of NI is subsumed by CI, then we need to test the significance of the $\hat{\beta}\,'s$ coefficients.

Since the sum of the coefficients on level and change reflect the valuation effect of unexpected earnings, we state the below hypotheses.

H$_{01}$: $\gamma_1 + \gamma_2$ should be significantly different from zero if we expect unexpected OCI and unexpected CI is value relevant beyond unexpected net income.

H_{02}: $\hat{\beta}_1 + \hat{\beta}_2 = 0$ if we expected unexpected CI subsumes unexpected NI in explaining variations in return.

If the findings of previous studies (Kanagarentnam et al., 2005; Biddle and Choi, 2005; Chambers et al., 2006) are generalizable that *CI* or *OCI* is value relevant beyond net income, we should observe positive and significant coefficients for unexpected OCI in model (3) and for CI in model (4).

The classic valuation model suggests that firm value is determined by discounted present value of expected future cash flows. The contradictory findings in previous studies that *OCI* is value relevant but cannot predict future cash flows could be caused by two potential reasons. First, as documented by Dhaliwal et al (1999) and Kanagarentnam et al. (2005), *OCI* may not affect future cash flows at all. Alternatively, *OCI* may affect future cash flows in a longer interval. Previous studies cannot provide valid evidence if they only focua on one-year-ahead cash flows as a proxy for expected future cash flows. Second, as documented by Hodder et al. (2006), *CI* is more associated with firm risk factors than *NI*. Accordingly, *OCI* may affect the discount rate of future cash flows, hence firm value.

To test the predictive ability of *OCI* and *CI*, we replaced CR_{it} with CFO_{iT} (all scaled by market value at beginning of period t), which is the operating cash flows for firm *i* for the period *T*. *T = t+1, t+2, t+3, t+4, t+5* years after the fiscal year end of *t*.

In evaluating if unexpected OCI (CI) affects cost of capital, we replace the dependent variable in equation (3) and (4) with the ratio of change in COC (i.e. $\Delta COC_{it}/COC_{it}$,). Similarly, for return volatility, we use the ratio of change in VOL (i.e.

$\Delta VOL_{it}/VOL_{it}$,).[14] If *OCI or CI* is negatively related with cost of capital and return volatility, it will be positively related with return. We predict the positive relation between OCI/CI and return is driven by its negative relation to risk.

5. Regression results

5.1 Value Relevance

Table 3 shows the results for the value relevance of *CI* and *OCI*. CI_t is positively associated with share return but not NI_t. The coefficient of CI_t is 0.833, significant at the 1% level, and is much greater than the insignificant coefficient of NI_t (-0.09). Consistent with Biddle and Choi (2006), this finding indicates that CI_t subsumes NI_t in predicting share return during the period 1994-2005. Following Ali (1992) and Cheng et al. (1996) to consider the sums of the coefficients of level and change of NI_t and CI_t (i.e. unexpected NI_t and CI_t) respectively, we find consistent result that unexpected CI_t (0.822) is positive and significant, and subsumes unexpected NI_t (0.146) in predicting share return. Hence, we find evidence indicating that CI_t dominates NI_t in predicting share return.

Table 3 also shows that current period NI_t (CI_t) is consistently positively (negatively) associated with future cash flows for the next five (four) years. In contrast, change in NI_t (CI_t) is negatively (positively) associated with future cash flows for the next three (four) years. The coefficients of NI_t (between 0.827 and 0.3.267) are consistently greater than those of CI_t (between -0.652 and -2.824). Unexpected NI_t and CI_t (sum of the coefficients on NI_t and ΔNI_t and sum of the coefficients on CI_t and ΔCI_t, respectively) also provide similar results. It appears that the coefficient of unexpected NI_t is increasing in

[14] Using a simple pricing model equating price to the expected cash flow over cost of capital, it is easy to see that stock return is negatively affected by the ratio of changes in cost of equity capital.

the first four years. We find NI_t and unexpected NI_t can predict future cash flows for a period of five years. CI_t and unexpected CI_t, however, appear to have negative predictive ability of future cash flows. The coefficient of unexpected CI_t is rather volatile throughout the five-year period. Untabulated results using OCI_t and change in OCI_t also confirm this finding. Our empirical evidence indicates that CI_t cannot better predict future cash flows than NI_t because OCI_t adds noise to NI_t when predicting future cash flows. As a result, we predict the underlying reason for the value relevance of OCI_t is because OCI_t affects firm value through discount rate of expected future cash flows. We test this prediction as follows.

5.2 Implied Cost of Equity Capital

The multivariate analysis of the association between $\Delta COC_t/COC_{t-1}$, CI_t, and OCI_t and NI_t is reported in Table 4. Models 1-3 report the results using *OCI*; models 1a-3a report the results using *CI*. All the models have controlled for year effects although they are not reported in table 4 for simplicity reasons. Model 1 shows that both NI_t and OCI_t are negatively associated with $\Delta COC_t/COC_{t-1}$ at the conventional levels. The coefficient of OCI_t (-0.898) is actually greater than that of NI_t (-0.739). OCI_t appears to have incremental explanatory power over $\Delta COC_t/COC_{t-1}$ beyond NI_t after controlling for year effects. Model 2 shows that both changes in NI_t and OCI_t are negatively associated with $\Delta COC_t/COC_{t-1}$, although the coefficient of NI_t (-0.494) appears to be larger than that of OCI_t (-0.275).

Finally, model 3 shows consistent result that both NI_t and OCI_t are negatively associated with $\Delta COC_t/COC_{t-1}$. However, the only change in NI_t is negatively associated with $\Delta COC_t/COC_{t-1}$. Change in OCI_t appears to be positive but insignificant. Using the unexpected NI_t and OCI_t model, we find both are negative and significantly associated with $\Delta COC_t/COC_{t-1}$ at the 1% level. Again, the coefficient of unexpected OCI_t is greater than that of NI_t. We find evidence consistent with our prediction that *OCI* provides incremental risk information beyond net income. Moreover, our finding indicates that *OCI* and/or unexpected *OCI* reduces firm risk premium (i.e. discount rate of expected future cash flows).

Models 1a-3a simply replace OCI_t in models 1-3 with CI_t. Again we find CI_t, change in CI_t, and unexpected CI_t consistently subsumes NI_t, change in NI_t, and unexpected NI_t in predicting standardized risk premium, respectively. CI_t and unexpected CI_t have much higher coefficients (-0.898 and -0.883 respectively) compared with NI_t and unexpected NI_t.

Different from previous studies (e.g. Barth et al., 1996; Hodder et al. 2006) that focus on the relationship between income volatility and risk factors for commercial banks, this study is the first study of this nature to examine the direct link between *OCI* and perceived firm risk, measured by standardized change in implied cost of equity capital across different industries. With reference to the results reported in Tables 3 and 4 that *OCI* adds noise to *NI* when predicting future cash flows, we find evidence indicating that *OCI* affects firm value through firm risk premium instead of future cash flows. This has not been clearly documented in the literature.

5.3 Volatility of Share Return

To further confirm the above finding, we replace standardized change in risk premium with standardized change in volatility of share return ($\Delta VOL_t/VOL_{t-1}$), which is widely used as a proxy for change in firm risk in accounting and finance literature. Table 5 reports the association between OCI_t and $\Delta VOL_t/VOL_{t-1}$. Model 1 shows that both NI_t and CI_t are negatively associated with $\Delta VOL_t/VOL_{t-1}$ at the 1% level and that the coefficient of OCI_t (-0.310) is greater than NI_t (-0.246). Model 2 shows that both ΔNI_t and ΔOCI_t have negative and significant association with $\Delta VOL_t/VOL_t$, although the coefficient of ΔNI_t (-0.159) is greater than that of ΔOCI_t (-0.145). Model 3 confirms that both unexpected NI_t and OCI_t are negatively associated with $\Delta VOL_t/VOL_{t-1}$. Again the coefficient of unexpected OCI_t (-0.302) is greater than that of unexpected NI_t (*-0.266*), although both are significant at the 1% level. The above results again support our prediction that OCI_t, ΔOCI_t, and unexpected OCI_t consistently have incremental explanatory power over change in firm risk beyond NI_t, change in NI_t, and unexpected NI_t, respectively. Models 1a-3a further confirm our findings in models 1-3 that CI_t, change in CI_t, and unexpected CI_t subsume NI_t, change in NI_t, and unexpected NI_t and provide significant information about change in firm risks.

Both Tables 4 and 5 provide supporting evidence that CI_t and OCI_t can predict change in firm risk, measured by standardized changes in risk premium and change in volatility of share return, which has not been clearly investigated in previous studies. We argue that OCI_t affects firm risk and the discount rate for expected future cash flows, hence affects firm value. We offer an explanation for the puzzling finding in the literature that OCI_t is generally value relevant but cannot predict future cash flows.

5.4 Robustness tests

To confirm our previous findings, we perform the following two robustness tests. First, we investigate and report whether the results reported in Table 4 are robust in Table 6 after controlling for other risk factors such as size, book-to-market ratio, beta, and Fama and French three risk factors such as market, risk, and value risks. Panel A of Table 6 shows that all after controlling for other risk factors the *R*-squared values of regressing standardized change in risk premium are much higher than those reported in Table 4. OCI_t, ΔOCI_t, and unexpected OCI_t are consistently negatively associated with $\Delta COC_t/COC_{t-1}$ in models 1-3. The coefficients of OCI_t and unexpected OCI_t (-0.999 and -0.885 respectively) are higher than those of NI_t and unexpected NI_t (-0.652 and -0.725 respectively). CI_t, ΔCI_t, and unexpected CI_t are also negatively associated with $\Delta COC_t/COC_{t-1}$ and subsume NI_t, change in NI_t, and unexpected NI_t, respectively. These findings are consistent with those reported in Table 4, indicating that OCI_t contains incremental risk information beyond net income and other risk factors.

Panel B shows that OCI_t, ΔOCI_t, and unexpected OCI_t are consistently negatively associated with change in firm risk, measured by $\Delta VOL_t/VOL_{t-1}$ in models 1-3. Different from Panel A, we find the coefficient of the above three variables are smaller than those of NI_t, ΔNI_t, and unexpected NI_t, respectively after controlling for other risk factors. However, models 1a-3a how consistent results that CI_t, ΔCI_t, and unexpected CI_t are consistently negatively associated with change in firm risk, respectively and they also subsume their related NI_t variables. Again, we find the R-squared values reported in

Panel B of Table 6 are much higher than those reported in Table 5 due to the incremental explanatory power of other risk factors for change in firm risk.

In summary, Table 6 confirms our findings reported in Tables 4 and 5 that OCI_t affects (or reduces) firm risk and cost of equity capital, hence affects (increases) firm value.

To further investigate whether our findings reported in Tables 4 and 5 are robust and stable across different years, we use the time-series cross-sectional regression suggested by Fama and McBeth (1973) and report the results in Table 7. Panel A shows slightly weaker results than those reported in Table 4, although OCI_t and unexpected OCI_t still show incremental risk information beyond NI_t and unexpected NI_t, respectively and CI_t and unexpected CI_t also subsume NI_t and expected NI_t, respectively. Changes in OCI_t and CI_t do not appear to be risk relevant in models 2 and 2a. Panel C, however, shows even stronger findings after controlling for other risk factors. We confirm the previous finding that OCI_t provides incremental risk information beyond NI_t and CI_t subsumes NI_t in predicting change in implied cost of equity capital.

Panels B and D provide weaker results than those reported in Table 5. We find OCI_t and unexpected OCI_t provide marginal incremental information about firm risk beyond net income and unexpected NI_t. Again CI_t and unexpected CI_t appear to marginally subsume NI_t in predicting change in firm risk. After control for other firm risk factors, Panel D shows even weaker results than those reported in panel B that OCI_t and unexpected OCI_t provide very marginal incremental risk information than NI_t; CI_t and unexpected CI_t also marginally subsume NI_t and unexpected NI_t.

In summary, our robustness tests generally suggest that after controlling for other risk factors *OCI* and *CI* still dominate the explanatory power over change in risk premium beyond NI. There is some evidence suggesting that *OCI* and *CI* reduce their explanatory power over changes in risk premium and volatility of share return when using the Fama and McBeth's time series and cross sectional regression, indicating that the incremental risk information provided by *OCI* and *CI* significantly varies between different years. However, this study has provided consistent evidence supporting the usefulness of *CI* and *OCI* in predicting firm risk and value. We find *OCI* is risk relevant, which affects firm value through its impact on discounting rate of expected future cash flows.

6. Summary of main results and conclusion

Previous studies find that other comprehensive income is generally value relevant but that they cannot better predict future cash flows than net income. This study predicts that other comprehensive income is mainly changes in fair value of shareholders' equity, which provide incremental risk information beyond net income across different industrials. We find that change in risk premium and change in volatility of share return are consistently negatively associated with comprehensive income and other comprehensive income after adjusting for net income, year effects, and other risk factors. Overall, our study contributes to the literature by providing consistent evidence supporting the usefulness of other comprehensive income in predicting firm risk and value.

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APPENDIX A
Models Used to Estimate the Cost of Equity Capital
(Dhaliwal, Heitzman and Li, 2006, P. 719 with Modifications)

The following definitions are common to the four models. Specific assumptions and modifications
to these variables are described with the model.
P_t = price per share of common stock in each month of year t as reported by I/B/E/S
B_t = book value per share at the beginning of the year adjusted for earnings made in this year up to current month.
DPS_0 = dividends per share paid during year t-1.
EPS_0 = actual earnings per share reported by I/B/E/S for year t-1.
LTG = consensus long-term growth forecast reported in each month of year t.
$FEPS_{t+i}$ = forecasted earnings per share for year t+i. $FEPS_1$ and $FEPS_2$ are equal to the one-year-ahead and two-year-ahead consensus EPS forecasts reported in I/B/E/S in each month of year t. $FEPS_3$ is equal to the three-year-ahead consensus EPS forecast when available, and $FEPS_2$ (1+LTG) when not available.
k= expected dividend payout ratio, calculated as DPS_0/EPS_0. If $EPS_0 \leq 0$, then k is equal to 6% of the total assets at the beginning of year t.
$r_{\_j}$ = implied cost of equity estimate for each of the four models.
$r_{\_rf}$= risk-free rate equal to the yield on a 10-year Treasury note in each month of year t.

Gebhardt, Lee and Swaminathan (2001)

$$P_t = B_t + \frac{FROE_{t+1} - r_{gls}}{(1 + r_{gls})} B_t + \frac{FROE_{t+2} - r_{gls}}{(1 + r_{gls})^2} B_{t+1} + TV$$

$$TV = \sum_{i=3}^{T-1} \frac{FROE_{t+i} - r_{gls}}{(1 + r_{gls})^i} B_{t+i\_1} + \frac{FROE_{t+T} - r_{gls}}{r_{gls}(1 + r_{gls})^{T-1}} B_{t+T-1}$$

where:
$FROE_{t+i}$ = forecasted return on equity (ROE) for period t+i. For years one through three, this variable is equal to $FEPS_{t+i}/B_{t+i-1}$. Beyond year three, $FROE_{t+i}$ is a linear interpolation to the industry median ROE. Industry median ROE is defined as the moving median ROE for the prior 5-10 years for the firms industry (excluding loss firm-years). Industries are defined using the 48 classifications in Fama and French (1997).

$B_{t+i} = B_{t+i-1} + FEPS_{t+i}(1-k)$
T = forecast horizon. T= 12.

Claus and Thomas [2001]

$$P_t = B_t + \frac{ae_1}{(1 + r_{ct})} + \frac{ae_2}{(1 + r_{ct})^2} + \frac{ae_3}{(1 + r_{ct})^3} + \frac{ae_4}{(1 + r_{ct})^4} + \frac{ae_5}{(1 + r_{ct})^5} + \frac{ae_5(1 + g_{ae})}{(r_{ct} - g_{ae})(1 + r_{ct})^5}$$

where:
ae_{t+i} = abnormal earnings calculated as $FEPS_{t+I} - r_{ct}*B_t$. For year +3, +4, and +5, $FEPS_{t+i}$ is equal to the consensus forecast for that year, if available, otherwise
$FEPS_{t+i}$=$FEPS_{t+i-1}$*(1+LTG)
$B_{t+i} = B_{t+i-1} + k*FEPS_{t+i}$. k is assumed to be 0.5 in Claus and Thomas [2001]

g_{ae} = growth in abnormal earnings, calculated as $r_{rf} - 0.03$.

Gode and Mohanram [2003]

$$r_{ojn} = A + \sqrt{A^2 + \left(\frac{FEPS_{t+1}}{P_t}\right)\left(g_2 - \left(r_{rf} - 0.03\right)\right)}$$

where

$$A = 0.5\left(\left(r_f - 0.03\right) + \frac{DPS_{t+1}}{P_t}\right)$$

and

$$g_2 = \frac{\left(FEPS_{t+2} + r_{mpeg} DPS_{t+1} - FEPS_{t+1}\right)}{r^2_{mpeg}}$$

g_2 = short-term growth rate defined as (STG + LTG)/2. STG is equal to ($FEPS_{t+2}/FEPS_{t+1} - 1$).

Note: This model is based on Ohlson and Juettner-Narouth [2005]. It requires $FEPS_{t+1} > 0$ and $FEPS_{t+2} > 0$.

Easton [2004]

$$P_t = \left(\frac{FEPS_{t+2} + r_{mpeg} DPS_{t+1} - FEPS_{t+1}}{r^2_{mpeg}}\right)$$

$DPS_{t+1} = DPS_0$

Note: This model requires $FEPS_{t+2} \geq FEPS_{t+1} > 0$.

Appendix B
ARIMA Models and Weights

1. ARIMA(0,0,1)

→ $X_t = \varepsilon_t - \theta\varepsilon_{t-1}$

→ $\varepsilon_t = X_t + \theta X_{t-1} + \theta^2 X_{t-2} + \theta^3 X_{t-3} + \ldots..$

→ $\varepsilon_t = X_t + \theta X_{t-1}$ (two lags terms suppress)

→ $\varepsilon_t = X_t + \theta (X_t - \Delta X_t)$

$= (1+\theta) X_t - \theta\Delta X_t$

2. ARIMA(0,1,1)

→ $\Delta X_t = \varepsilon_t - \theta\varepsilon_{t-1}$

→ $\varepsilon_t = \Delta X_t + \theta\Delta X_{t-1} + \theta^2 \Delta X t_{-2} + \theta^3 \Delta X_{t-3} + \ldots..$

→ $\varepsilon_t = \Delta X_t + \theta\Delta X_{t-1}$ (two lags terms suppressed)

→ $\varepsilon_t = \Delta X_t + \theta (X_{t-1} - X_{t-2})$ (terms beyond two lags suppressed)

$= \Delta X_t + \theta X_{t-1}$

$= \Delta X_t + \theta (X_t - \Delta X_t)$

$= \theta X_t + (1-\theta)\Delta X_t$

3. ARIMA(1,0,0):

→ $X_t = \varphi X_{t-1} + \varepsilon_t$

→ $\varepsilon_t = X_t - \varphi X_{t-1}$

→ $\varepsilon_t = X_t - \varphi (X_t - \Delta X_t)$

→ $\varepsilon_t = (1-\varphi)X_t + \varphi \Delta X_t$

4. ARIMA(1,1,0):

→ $\Delta X_t = \varphi\Delta X_{t-1} + \varepsilon_t$

→ $\varepsilon_t = \Delta X_t - \varphi\Delta X_{t-1}$

→ $\varepsilon_t = \Delta X_t - \varphi(X_t - \Delta X_{t-1})$

→ $\varepsilon_t = - \varphi X_t + (1+\varphi) \Delta X_t$

*ε_t is unexpected earnings and equals $w_1 X_t + w_2 \Delta X_t$ with $w_1 + w_2 = 1$.

Table 1: Distribution Statistics

Variables	Mean	Std	Median	Percentile 1%	10%	25%	75%	90%	99%
COC_t	0.0632	0.0488	0.0503	-0.0009	0.0203	0.0331	0.0783	0.1216	0.2488
$\Delta COC_t/COC_{t-1}$	0.1173	0.7745	-0.0051	-1.2981	-0.4842	-0.2586	0.3439	0.8577	3.0040
VOL_t	0.0307	0.0156	0.0272	0.0098	0.0145	0.0193	0.0385	0.0514	0.0812
$\Delta VOL_t/VOL_{t-1}$	0.0219	0.2755	-0.0187	-0.4689	-0.2937	-0.1713	0.1753	0.3932	0.8374
NI_t	0.0386	0.1350	0.0546	-0.4695	-0.0396	0.0222	0.0829	0.1195	0.2667
OCI_t	-0.0004	0.0168	0.0000	-0.0586	-0.0103	-0.0016	0.0008	0.0089	0.0574
ΔNI_t	0.0075	0.1756	0.0085	-0.4477	-0.0748	-0.0151	0.0289	0.0765	0.4775
ΔOCI_t	-0.0006	0.0252	0.0000	-0.0841	-0.0149	-0.0023	0.0011	0.0122	0.0857
Market Value (in billions)	3.481	14.859	0.464	0.012	0.054	0.141	1.601	5.811	59.731

Number of observations=32479

Notes:

COC_t denotes average implied cost of equity capital across the 12 months period starting from the fourth month in a fiscal year. It is derived from four implied cost of equity estimates, suggested by Gebhardt, Lee, and Swaminathan (2001), Claus and Thomas (2001), Gode and Mohanram (2003), and Easton (2004).

$\Delta COC_t/COC_{t-1}$ denotes standardized average cost of equity capital. It is derived from change in average implied cost of equity capital divided by prior year average implied cost of equity capital.

VOL_t denotes standard deviation of share returns across the 12 months period starting from the fourth month in a fiscal year.

$\Delta VOL_t/VOL_{t-1}$ denotes standardized volatility of share returns, derived from change in volatility of share returns divided by prior year volatility of share returns.

NI_t denotes net income.

ΔN_{it} denotes change in net income.

OCI_t denotes other comprehensive income. It is measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available

ΔOCI_t denotes change in other comprehensive income.

Market Value denotes market capitalization in billions.

Table 2: Correlation Analysis

	$\Delta COC_t/COC_t$	$\Delta VOL_t/VOL_t$	NI_t	OCI_t	ΔNI_t	ΔOCI
$\Delta COC_t/COC_t$		0.15	-0.14	-0.026	-0.122	0.000#
$\Delta VOL_t/VOL_t$	0.169		-0.131	-0.041	-0.118	-0.023
NI_t	-0.277	-0.121		0.004#	0.566	-0.019
OCI_t	-0.038	-0.052	0.014*		0.016	0.686
ΔNI_t	-0.33	-0.119	0.569	0.054		-0.008#
ΔOCI_t	-0.005#	-0.031	-0.013*	0.623	0.015	

Notes:

COC_t denotes average implied cost of equity capital across the 12 months period starting from the fourth month in a fiscal year. It is derived from four implied cost of equity estimates, suggested by Gebhardt, Lee, and Swaminathan (2001), Claus and Thomas (2001), Gode and Mohanram (2003), and Easton (2004).
$\Delta COC_t/COC_{t-1}$ denotes standardized average cost of equity capital. It is derived from change in average implied cost of equity capital divided by prior year average implied cost of equity capital.
VOL_t denotes standard deviation of share returns across the 12 months period starting from the fourth month in a fiscal year.
$\Delta VOL_t/VOL_{t-1}$ denotes standardized volatility of share returns, derived from change in volatility of share returns divided by prior year volatility of share returns.
NI_t denotes net income.
ΔN_t denotes change in net income.
OCI_t denotes other comprehensive income. It is measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available
ΔOCI_t denotes change in other comprehensive income.
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Table 3: Association Between *NI* and *CI* with future cash flows and current return

	Dependent Variable											
	CFO_{t+1}		CFO_{t+2}		CFO_{t+3}		CFO_{t+4}		CFO_{t+5}		$Return_t$	
N	27672		23670		20052		16977		14436		32143	
Adj R2	3.14%		2.85%		2.74%		2.37%		2.75%		19.09%	
Intercept	0.092	***	0.210	***	0.353	***	0.520	***	0.709	***	0.044	***
NI_t	0.827	***	1.422	***	1.935	***	3.267	***	1.768	**	-0.090	
CI_t	-0.652	***	-1.125	***	-1.463	***	-2.824	***	-1.022		0.833	***
ΔNI_t	-0.142	**	-0.218	!	-0.692	***	-0.515		0.706		0.236	!
ΔCI_t	0.196	***	0.333	**	0.835	***	0.950	**	-0.026		-0.012	
$\mathbf{NI_t + \Delta NI_t}$	0.685	***	1.204	***	1.242	***	2.752	***	2.474	***	0.146	
$\mathbf{CI_t + \Delta CI_t}$	-0.456	***	-0.791	***	-0.628	**	-1.875	***	-1.048	*	0.822	***

All variables are scaled by beginning market value. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively. !indicates statistical significance at the 10% level when using the one tail test.

Notes:

Year dummies are included in all the regressions but are not reported

CFO_{t+1}, CFO_{t+2}, CFO_{t+3}, CFO_{t+4}, *and* CFO_{t+5} denote cash flows from operating activities for the next five years.

$Return_t$ denotes cumulative share return across the 12 months period starting from the fourth month of a fiscal year.

NI_t denotes net income.

ΔN_t denotes change in net income.

CI_t denotes sum of *NI* and *OCI*. *OCI* is other comprehensive income, measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available

ΔCI_t denotes change in comprehensive income.

$NI + \Delta NI$ denotes sum of the coefficients of *NI* and ΔNI; $CI+\Delta CI$ denotes sum of the coefficients of *CI* and ΔCI.

Table 4: Regression Analysis -- Dependent Variable is $\Delta COC_t/COCt_{-1}$

	Model 1		Model 2		Model 3		Model 1a		Model 2a		Model 3a	
adj R2	7.30%		6.87%		7.52%		7.30%		6.87%		7.52%	
Intercept	-0.111	***	-0.133	***	-0.115	***	-0.111	***	-0.133	***	-0.115	***
Ni_t	-0.739	***			-0.552	***	*0.159*				*0.496*	*!*
OCI_t / Ci_t	-0.898	***			-1.049	***	-0.898	***			-1.049	***
ΔNi_t			-0.494	***	-0.253	***			*-0.220*	*!*	*-0.418*	*
$\Delta OCI_t/\Delta Ci_t$			-0.275	*	0.166				-0.275	*	0.166	
NI+ΔNI					**-0.805**	***					**0.078**	
ΔCI+ΔOCI/ CI+ΔCI					**-0.883**	***					**-0.883**	***

All variables are scaled by beginning market value. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively. ! indicates statistical significance at the 10% level when using the one tail test.

Notes:

Year dummies are included in all the regressions but are not reported

$\Delta COC_t/COC_{t-1}$ denotes standardized average cost of equity capital. It is derived from change in average implied cost of equity capital divided by prior year average implied cost of equity capital.

NI_t denotes net income.

ΔN_t denotes change in net income.

OCI_t denotes other comprehensive income. It is measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available

ΔOCI_t denotes change in other comprehensive income.

ΔN_t denotes change in net income.

CI_t denotes sum of *NI* and *OCI*. *OCI* is other comprehensive income, measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available

ΔCI_t denotes change in comprehensive income.

NI + ΔNI denotes sum of the coefficients of *NI* and *ΔNI*; *CI+ΔCI*: sum of the coefficients of *CI* and *ΔCI*; *OCI+ΔOCI* denotes sum of the coefficients of *OCI* and *ΔOCI*.

Table 5: Regression Analysis -- *Dependent Variable is $\Delta VOL_t/VOL_{t-1}$*

	Model 1		Model 2		Model 3		Model 1a		Model 2a		Model 3a	
adj R2	20.96%		20.52%		21.12%		20.96%		20.52%		21.12%	
Intercept	-0.009	*	-0.016	***	-0.010	**	-0.009	*	-0.016	***	-0.010	**
NI_t	-0.246	***			-0.190	***	*0.064*				*0.074*	
OCI_t / C_tI	-0.310	***			-0.264	**	-0.310	***			-0.264	**
ΔNI_t			-0.159	***	-0.076	***			*-0.014*		*-0.038*	
$\Delta OCI_t/\Delta CI_t$			-0.145	***	-0.038				-0.145	***	-0.038	
$NI_t+\Delta NI_t$					**-0.266**	*******					**0.036**	
$\Delta CI_t+\Delta OCI_t$/ $CI_t+\Delta CI_t$					**-0.302**	*******					**-0.302**	*******

All variables are scaled by beginning market value. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively. ! indicates statistical significance at the 10% level when using the one tail test.

Notes:

Year dummies are included in all the regressions but are not reported

$\Delta VOL_t/VOL_{t-1}$ denotes standardized volatility of share returns, derived from change in volatility of share returns divided by prior year volatility of share returns. VOL_t denotes standard deviation of share returns across the 12 months period starting from the fourth month in a fiscal year.

NI_t denotes net income.

NI_t denotes net income.

ΔN_t denotes change in net income.

OCI_t denotes other comprehensive income. It is measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available

ΔOCI_t denotes change in other comprehensive income.

ΔN_t denotes change in net income.

CI_t denotes sum of *NI* and *OCI*. *OCI* is other comprehensive income, measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available

ΔCI_t denotes change in comprehensive income.

$NI + \Delta NI$ denotes sum of the coefficients of *NI* and ΔNI; $CI+\Delta CI$: sum of the coefficients of *CI* and ΔCI; $OCI+\Delta OCI$ denotes sum of the coefficients of *OCI* and ΔOCI.

Table 6: Regression Analysis with Control Variables

Panel A: Dependent Variable is ΔCOCt/COCt-1

	Model 1		Model 2		Model 3		Model 1a		Model 2a		Model 3a	
adj R2	8.37%		8.30%		8.68%		8.37%		8.30%		8.68%	
Intercept	-0.199	***	-0.249	***	-0.212	***	-0.199	***	-0.249	***	-0.212	***
NI_t	-0.652	***			-0.424	***	*0.346*	*!*			*0.759*	**
OCI_t / CI_t	-0.999	***			-1.183	***	-0.999	***			-1.183	***
ΔNI_t			-0.482	***	-0.301	***			*-0.170*		*-0.498*	**
$\Delta OCI_t/\Delta CI_t$			-0.312	*	0.197				-0.312	*	0.197	
$LogMV_t$	-0.040	***	-0.046	***	-0.042	***	-0.040	***	-0.046	***	-0.042	***
BV/MV_t	-0.101	***	-0.091	***	-0.102	***	-0.101	***	-0.091	***	-0.102	***
$Beta_t$	0.074	***	0.093	***	0.080	***	0.074	***	0.093	***	0.080	***
$MKTRF_t$	0.145	*	0.157	*	0.152	*	0.145	*	0.157	*	0.152	*
SMB_t	-0.302	***	-0.298	***	-0.302	***	-0.302	***	-0.298	***	-0.302	***
HML_t	0.173	**	0.178	**	0.177	**	0.173	**	0.178	**	0.177	**
NI_t+ΔNI_t					**-0.725**	***					**0.260**	
OCI_t+ΔOCI_t/ CI_t+ΔCI_t					**-0.985**	***					**-0.985**	***

Table 6: Regression Analysis with Control Variables (cont.)

Panel B: Dependent Variable is $\Delta VOL_t/VOL_{t-1}$

	Model 1		Model 2		Model 3		Model 1a		Model 2a		Model 3a	
adj R2	23.56%		22.65%		23.64%		0.236		0.227		0.236	
Intercept	0.065	***	0.040	***	0.063	***	0.065	***	0.040	***	0.063	***
NI_t	-0.296	***			-0.254	***	*-0.016*				*-0.020*	
OCI_t / CI_t	-0.280	***			-0.234	**	-0.280	***			-0.234	**
ΔNI_t			-0.164	***	-0.056	***			*-0.033*		*-0.015*	
$\Delta OCI_t/\Delta CI_t$			-0.130	**	-0.041				-0.130	**	-0.041	
$LogMV_t$	0.003	***	-0.001		0.002	***	0.003	***	-0.001		0.002	***
BV/MV_t	-0.042	***	-0.036	***	-0.042	***	-0.042	***	-0.036	***	-0.042	***
$Beta_t$	-0.070	***	-0.060	***	-0.068	***	-0.070	***	-0.060	***	-0.068	***
$MKTRF_t$	-0.106	***	-0.100	***	-0.104	***	-0.106	***	-0.100	***	-0.104	***
SMB_t	-0.289	***	-0.289	***	-0.289	***	-0.289	***	-0.289	***	-0.289	***
HML_t	-0.295	***	-0.293	***	-0.294	***	-0.295	***	-0.293	***	-0.294	***
NI_t+ΔNI_t					**-0.309**	***					**-0.035**	
OCI_t+ΔOCI_t/ CI_t+ΔCI_t					**-0.275**	***					**-0.275**	***

All variables are scaled by beginning market value. ***, **, * indicate statistical significance at the 1%, 5%, and 10% level, respectively. ! indicates statistical significance at the 10% level when using the one tail test.

Notes:

Year dummies are included in all the regressions but are not reported

$\Delta COC_t/COC_{t-1}$ denotes standardized average cost of equity capital. It is derived from change in average implied cost of equity capital divided by prior year average implied cost of equity capital. COC_t denotes average implied cost of equity capital across the 12 months period starting from the fourth month in a fiscal year. It is derived from four implied cost of equity estimates, suggested by Gebhardt, Lee, and Swaminathan (2001), Claus and Thomas (2001), Gode and Mohanram (2003), and Easton (2004).

$\Delta VOL_t/VOL_{t-1}$ denotes standardized volatility of share returns, derived from change in volatility of share returns divided by prior year volatility of share returns. VOL_t denotes standard deviation of share returns across the 12 months period starting from the fourth month in a fiscal year.NI_t denotes net income.
ΔN_t denotes change in net income.
OCI_t denotes other comprehensive income. It is measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available
ΔOCI_t denotes change in other comprehensive income.
ΔN_t denotes change in net income.
CI_t denotes sum of *NI* and *OCI*. *OCI* is other comprehensive income, measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available
ΔCI_t denotes change in comprehensive income.
LogMV denotes natural log of year end market capitalization.
BV/MV denotes book value of equity-to-market value ratio.
Beta denotes market model beta.
MKTRF denotes market return minus free risk rate of return.
SMB denote small market capitalization minus big market capitalization.
HML denote high book-to-market ratio minus low book-to-market ratio.
$NI + \Delta NI$ denotes sum of the coefficients of *NI* and ΔNI; $CI+\Delta CI$: sum of the coefficients of *CI* and ΔCI; $OCI+\Delta OCI$ denotes sum of the coefficients of *OCI* and ΔOCI.

Table7: Regression Analysis by Year (1994-2005, 12 years)

Panel A: Dependent Variable is $\Delta COC_t/COC_{t-1}$

	Model 1	Model 2	Model 3	Model 1a	Model 2a	Model 3a
adj R2	1.98%	1.70%	2.42%	1.98%	1.70%	2.42%
Intercept	0.152 **	0.128 **	0.147 **	0.152 **	0.128 **	0.147 **
NI_t	-0.767 ***		-0.537 ***	*0.154*		*0.621*
OCI_t / CI_t	-0.921 **		-1.158 *	-0.921 **		-1.158 *
ΔNI_t		-0.562 ***	-0.321 ***		*-0.338*	*-0.594 !*
$\Delta OCI_t / \Delta CI_t$		-0.224	0.272		-0.224	0.272
$NI_t + \Delta NI_t$			**-0.858 *** **			**0.027**
$OCI_t + \Delta OCI_t / CI_t + \Delta CI_t$			**-0.885 ***			**-0.885 ***

Panel B: Dependent Variable is $\Delta VOL_t/VOL_{t-1}$

	Model 1	Model 2	Model 3	Model 1a	Model 2a	Model 3a
adj R2	2.46%	1.76%	2.76%	2.46%	1.76%	2.76%
Intercept	0.020	0.013	0.019	0.020	0.013	0.019
NI_t	-0.222 ***		-0.165 ***	0.017		0.047
OCI_t / CI_t	-0.239 !		-0.213 *	-0.239 !		-0.213 *
ΔNI_t		-0.163 ***	-0.082 ***		-0.078	-0.077
$\Delta OCI_t / \Delta CI_t$		-0.085	-0.005		-0.085	-0.005
$NI_t + \Delta NI_t$			**-0.247 *** **			**-0.029**
$OCI_t + \Delta OCI_t / CI_t + \Delta CI_t$			**-0.218 ***			**-0.218 ***

Table 7: Regression Analysis by Year (1994-2005, 12 years) (cont.)

Panel C: Dependent Variable is $\Delta COC_t / COC_{t-1}$ with Control Variables

	Model 1		Model 2		Model 3		Model 1a		Model 2a		Model 3a	
adj R2	5.14%		5.19%		5.61%		5.14%		5.19%		5.61%	
Intercept	0.161	**	0.111	!	0.146	*	0.161	**	0.111	!	0.146	*
NI_t	-0.677	***			-0.418	***	0.232				0.636	
OCI_t / CI_t	-0.909	**			-1.054	*	-0.909	**			-1.054	*
ΔNI_t			-0.534	***	-0.352	***			-0.214		-0.532	!
$\Delta OCI_t / \Delta CI_t$			-0.321		0.180				-0.321		0.180	
$LogMV_t$	-0.033	**	-0.039	***	-0.034	***	-0.033	**	-0.039	***	-0.034	***
BV/MV_t	-0.092	***	-0.086	***	-0.095	***	-0.092	***	-0.086	***	-0.095	***
$Beta_t$	0.057	*	0.078	**	0.064	**	0.057	*	0.078	**	0.064	**
$MKTRF_t$	0.019		0.028		0.019		0.019		0.028		0.019	
SMB_t	0.258		0.218		0.225		0.258		0.218		0.225	
HML_t	0.044		0.003		0.014		0.044		0.003		0.014	
$NI_t + \Delta NI_t$					**-0.771**	***					**0.104**	
$OCI_t + \Delta OCI_t / CI_t + \Delta CI_t$					**-0.874**	**					**-0.874**	**

Table 7: Regression Analysis by Year (1994-2005, 12 years) (cont.)

Panel D: Dependent Variable is $\Delta VOL_t/VOL_{t-1}$ with Control Variables

	Model 1		Model 2		Model 3		Model 1a		Model 2a		Model 3a	
adj R2	10.85%		9.57%		10.97%		10.85%		9.57%		10.97%	
Intercept	0.170	***	0.147	***	0.168	***	0.170	***	0.147	***	0.168	***
NI_t	-0.288	***			-0.247	***	-0.121				-0.113	
OCI_t / CI_t	-0.167	!			-0.134	!	-0.167	!			-0.134	!
ΔNI_t			-0.164	***	-0.054	***			-0.082		-0.028	
$\Delta OCI_t / \Delta CI_t$			-0.082		-0.026				-0.082		-0.026	
$LogMV_t$	0.001		-0.002		0.001		0.001		-0.002		0.001	
BV/MV_t	-0.040	**	-0.035	**	-0.041	**	-0.040	**	-0.035	**	-0.041	**
$Beta_t$	-0.075	***	-0.067	***	-0.075	***	-0.075	***	-0.067	***	-0.075	***
$MKTRF_t$	-0.186	*	-0.187	*	-0.186	*	-0.186	*	-0.187	*	-0.186	*
SMB_t	-0.203	!	-0.211	!	-0.208	!	-0.203	!	-0.211	!	-0.208	!
HML_t	-0.465	***	-0.478	***	-0.466	***	-0.465	***	-0.478	***	-0.466	***
$\boldsymbol{NI_t + \Delta NI_t}$					**-0.301**	***					**-0.141**	
$\boldsymbol{OCI_t+\Delta OCI_t/CI_t+\Delta CI_t}$					**-0.160**	!					**-0.160**	!

Notes:

Year dummies are included in all the regressions but are not reported.

$\Delta COC_t/COC_{t-1}$ denotes standardized average cost of equity capital. It is derived from change in average implied cost of equity capital divided by prior year average implied cost of equity capital.

$\Delta VOL_t/VOL_{t-1}$ denotes standardized volatility of share returns, derived from change in volatility of share returns divided by prior year volatility of share returns. VOL_t denotes standard deviation of share returns across the 12 months period starting from the fourth month in a fiscal year.NI_t denotes net income.

ΔN_t denotes change in net income.

OCI_t denotes other comprehensive income. It is measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available

ΔOCI_t denotes change in other comprehensive income.

ΔN_t denotes change in net income.

CI_t denotes sum of *NI* and *OCI*. *OCI* is other comprehensive income, measured as the change in Compustat data item 357 or the sum of the changes in adjustments for foreign currency translation, minimum pension liability, and market securities if data item 357 is not available

ΔCI_t denotes change in comprehensive income.

LogMV denotes natural log of year end market capitalization.

BV/MV denotes book value of equity-to-market value ratio.

Beta denotes market model beta.

MKTRF denotes market return minus free risk rate of return.

SMB denote small market capitalization minus big market capitalization.

HML denote high book-to-market ratio minus low book-to-market ratio.

$NI + \Delta NI$ denotes sum of the coefficients of *NI* and ΔNI; $CI+\Delta CI$: sum of the coefficients of *CI* and ΔCI; $OCI+\Delta OCI$ denotes sum of the coefficients of *OCI* and ΔOCI.