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Abstract - This paper compares the value relevance of earnings under two different accounting methods (namely, conservative accounting and mark to market accounting) in a competitive security market. It proves that the reported earnings are value relevant under both types of accounting methods. Furthermore, if the proportion of earnings fixated traders lies in the upper range of the interval [0,1], the reported earnings under conservative accounting are more value relevant than the ones under mark to market. Otherwise, the reported earnings under mark to market are more value relevant than the ones under conservative accounting.

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Value Relevance of Reported Earnings under Conservative Accounting Versus under Mark to Market Accounting

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Abstract - This paper compares the value relevance of earnings under two different accounting methods (namely, conservative accounting and mark to market accounting) in a competitive security market. It proves that the reported earnings are value relevant under both types of accounting methods. Furthermore, if the proportion of earnings fixated traders lies in the upper range of the interval [0,1], the reported earnings under conservative accounting are more value relevant than the ones under mark to market. Otherwise, the reported earnings under mark to market are more value relevant than the ones under conservative accounting.

I. Introduction

The value relevance of earnings is referred to the association between earnings and security market values. This association was explored as early as in 1968 by Ball and Brown (1968), who examine the usefulness of accounting income numbers to investors. In the past two decades, a large number of empirical articles examine this association in different contexts. For example, Alford et al. (1993) find empirical evidence that this association between earnings and stock returns is stronger in countries where capital is traditionally raised in capital markets and there are weaker links between financial and tax reporting. Chan and Seow (1996) examine this association under foreign GAAP versus U.S. GAAP. They find a stronger association using foreign GAAP earnings than using earnings adjusted to U.S. GAAP. Ali and Hwang (1999) examine the relationship between value relevance and country specific factors related to financial reporting. They find that the value relevance of financial reports is lower for countries where the financial systems are bank-oriented rather than market-oriented.

Recently, in the literature, a group of articles focuses on examining the value relevance of accounting information under mark to market accounting. Barlev and Haddad (2003) advocate that historical cost accounting hides the real financial position and the fair value accounting is more value relevant than historical cost accounting. Ahmed and Takeda (1995) supports fair value accounting in their examination of the relation between unrealized or realized gain/losses and bank returns in normal period. Beatty et al. (1996) also find empirical evidence supporting fair value accounting in analyzing the bank share prices around the adoption of SFAS 115. Petroni and Wahlen (1995) argue that property-liability share prices can be explained by fair value of equity investments and U.S. Treasury investments, even after controlling for historical costs. Venkatachalam (1996) shows that the fair value estimates for derivative help explain cross-sectional variation in bank share prices and that the fair values have incremental explanatory power over and above notional amounts of derivatives. Gebhardt et al. (2004) find strong evidence in favor of fair value accounting within the German banking sector, although there are additional problems to overcome when extending fair value measurements to more classes of financial assets and liabilities.

Another group of articles in the literature examines the value relevance of accounting information under conservative accounting. For example, Kousenidis, Ladas and Negakis (2010) examine how conservatism affects value relevance of earnings. They use the data in Greece from the period 1989 to 2003. Their empirical evidence suggests that conservatism helps earnings to exhibit sufficient information content for security prices through alleviating measurement errors in earnings. Brown et al. (2006) find evidence in their international study among 20 countries that conservatism is associated with a higher level of value relevance in countries with high accrual intensity. However, the empirical results of Balachandran and Mohanram (2005) indicate that accounting conservatism is not related with the value relevance of accounting information. In their study on whether conservatism has caused the value relevance of accounting information to decline, the data over a twenty-five year period from 1978-2002 is used. They find that the value relevance of accounting information has declined only for firms with the least conservative accounting and changed insignificantly for firms with the most conservative accounting. Hellman (2008) in his study of how the conservatism principle is applied in Europe under IFRS, reports that the mixing of consistent and temporary conservatism practice can reduce the value relevance of earnings information.

So far, in the literature, the empirical evidence has not suggested a consensus on which accounting

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standard provide more value relevant accounting information. This paper takes an analytical approach to formally investigate whether earnings under conservative accounting is more value relevant than the ones under mark to market accounting.

Specifically, this paper sets up a one-period model of a competitive security market with one risk-free asset and one risky asset. The payoff of the risky asset is normally distributed. Rational traders have correct prior knowledge about the normal distribution of the risky asset's payoff. Earnings fixated traders; on the other hand, underestimate the mean and variance of the asset's payoff under historical cost accounting. The reason for this is as follows. Due to the nature of U.S. accounting standards being conservative, accounting earnings numbers do not incorporate the expected future profits from the positive net present value projects until they are realized while the expected future losses from the negative net present value projects are incorporated in the current accounting earnings numbers. The failure of the historical cost recognition rules to recognize the expected future profits of positive net present value projects in current accounting earnings implies that accounting earnings numbers underestimate the mean and variance of the asset's payoff (economic earnings). This means that earnings fixated traders who are fixated on accounting earnings would underestimate the mean and variance of the asset's payoff.

Under an alternative accounting of mark to market, earnings fixated traders are indistinguishable from rational traders. Also, with mark to market, the payoff of the assets is the same as the accounting earnings number generated under mark to market accounting.

Before any trade takes place, an informational signal about the risky asset's payoff is released to the market. Based on the informational signal received, rational and earnings fixated traders both rationally update their estimates of the mean and variance of the asset's payoff given their prior knowledge. The utilities of both rational and earnings fixated traders are exponential function of their wealth. In this competitive market, both types of traders behave as price takers. They trade against each other or against noise traders whose demand is completely random. The demand for risky asset of both rational and earnings fixated traders is generated from the maximization of their utilities.

Note that the notion of earnings fixated traders is originated from the Functional Fixation Hypothesis in the financial markets. This hypothesis claims that investors who are unfamiliar with different accounting methods of generating accounting output rely on reported accounting numbers for their investment strategies without paying attention to the procedures used in producing these numbers. There are some empirical evidence showing the existence of such fixated traders. For example, Bradshaw et al. (2001), Khurana et al. (2003) and Hermann et al. (2007) show that analysts do not pay enough attention to the differential persistence of earnings components and they tend to focus on total earnings. Brown et al. (2000) present evidence that neither analysts nor investors make proper use of note disclosure in financial reports.

This paper proves that the reported earnings are value relevant under both conservative accounting and mark to market accounting. Furthermore, if the proportion of earnings fixated traders lies in the upper range of the interval [0, 1], the reported earnings under conservative accounting are more value relevant than the ones under mark to market. Otherwise, the reported earnings under mark to market are more value relevant than the ones under conservative accounting.

The remainder of the paper consists of three sections. The next section presents the model. The results are discussed in Section three. Section four concludes the paper.

II. The Model

This section constructs a one-period model of a competitive asset market. There is one risk-free asset and one risky asset. The payoff for the risk-free asset is one and the payoff for the risky asset (denoted as θ) is normally distributed with the mean of $\overline{\theta}$ and variance of σ_{θ}^{2}. There are three types of traders: earnings fixated traders, rational traders and noise traders.

Earnings fixated traders are functionally fixated on accounting earnings and they view the accounting earnings numbers as the asset's payoff (economic earnings). Since conservatism in accounting requires more verifiability for the recognition of gains than for the recognition of losses, the accounting earnings numbers do not incorporate the expected future profits from the positive net present value projects until they are realized while the expected future losses from the negative net present value projects are incorporated in the current accounting earnings numbers. The failure of the historical cost recognition rules to recognize the expected future profits of positive net present value projects in current accounting earnings implies that accounting earnings numbers underestimate the mean and variance of the asset's payoff (economic earnings). Denote earnings fixated traders' prior belief about the mean and variance of the risky asset's payoff as $\overline{\theta}_c$ and σ_c^2, respectively, where $\overline{\theta}_c < \overline{\theta}$ and $\sigma_c^2 < \sigma_{\theta}^2$. Rational traders have correctly estimated the mean and variance of the asset's payoff.

An informational signal about the risky asset's payoff is released to the market before any trade takes place. The informational signal (denoted as S) is modeled according to $S = \theta + \epsilon$ where ϵ is normally

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distributed with the mean of zero and variance of σ_{ϵ}^{2}. The random variables θ and ϵ are independent.

Based on the informational signal received, rational traders update their prior beliefs about the asset's payoff according to

$$E_r(\theta|S) = \overline{\theta} + \eta_r\left(S - \overline{\theta}\right), \quad (1)$$

and

$$Var_r(\theta|S) = \sigma_\theta^2 - \frac{\sigma_\theta^4}{\sigma_\theta^2+\sigma_\epsilon^2} = \eta_r\sigma_\epsilon^2, \quad (2)$$

respectively, where the subscript r indicates rational traders and $\eta_r = \frac{\sigma_\theta^2}{\sigma_\theta^2+\sigma_\epsilon^2}$ The derivations of equation (1) and (2) are presented in the appendix. Similarly, given their prior beliefs about the mean and variance of the asset's payoff, earnings fixated traders rationally update their conditional mean and variance about the asset's payoff according to

$$E_c(\theta|S) = \overline{\theta}_c + \eta_c\left(S - \overline{\theta}_c\right), \quad (3)$$

and

$$Var_c(\theta|S) = \sigma_c^2 - \frac{\sigma_c^4}{\sigma_c^2+\sigma_\epsilon^2} = \eta_c\sigma_\epsilon^2, \quad (4)$$

respectively, where the subscript c indicates earnings fixated traders and $\eta_c = \frac{\sigma_c^2}{\sigma_c^2+\sigma_\epsilon^2}$. Note that $\eta_c < \eta$ (due to $\sigma_c^2 < \sigma_\theta^2$). The derivations of equations (3) and (4) presented in the appendix.

The utility functions of both rational and earnings fixated traders are exponential functions of their wealth. Their initial wealth for both rational and earnings fixated traders are assumed to be w. Since the asset market is assumed to be perfectly competitive, rational and earnings fixated traders both behave as price takers. In other words, they take the risky asset price as given. Denote trader $i's$ demand for the risky asset as X_i, where $i = r, c$. Trader $i's$ wealth at the end of the period is the summation of their initial wealth and profits from trading the risky asset in the period. That is, $w_i = w + X_i(\theta - p)$, where p is the asset price. Trader $i's$ demand for the risky asset is generated from the maximization of $U(w_i) = -e^{-aw_i}$, where $a > 0$ and a is the coefficient of absolute risk aversion. With normality assumption, the demand for the risky asset for trader i $(i = r, c)$ that maximizes his or her exponential utility function is obtained from solving the following optimization problem:

$$\max_{X_i} E_i(w_i|S) - \frac{a}{2}Var_i(w_i|S), \quad (5)$$

$$s.t. \quad w_i = w + X_i(\theta - p).$$

Substituting equations (1) through (4) into the optimization problem (5), the demand for the risky asset for trader i (where $i = r, c$) is solved as,

$$X_i = \frac{\overline{\theta}_i + \eta_i\left(S - \overline{\theta}_i\right) - p}{a\eta_i\sigma_\epsilon^2}, \quad (6)$$

Where $\overline{\theta}_r = \overline{\theta}$.

Noise traders' demand for the risky asset is modeled to be normally distributed with the mean of zero and variance of σ_x^2.

The supply of the risky asset is assumed to be zero. The risky asset price in this competitive market is determined by the market clearing condition below:

$$fX_c + (1-f)X_r + x = 0, \quad (7)$$

Where f denotes the proportion of earnings fixated traders in the population of rational and earnings fixated traders.

III. The Result

This section compares the value relevance of the reported earnings under conservative accounting and market to market accounting. It proves that the reported earnings are value relevant under both types of accounting methods. In addition, it also proves that the reported earnings under one of the accounting methods can be more value relevant than the ones under the other accounting method provided that the right model parameter value restrictions are imposed. Substituting equation (6) into (7), the asset price is solved as the following:

$$p = \overline{\theta}(1-\eta_r) - \frac{f\eta_r(\overline{\theta} - \overline{\theta}_c + \overline{\theta}_c\eta_c - \overline{\theta}\eta_r)}{\eta_c - f\eta_c + f\eta_r} + \frac{\eta_c\eta_r(S + ax\sigma_\epsilon^2)}{\eta_c - f\eta_c + f\eta_r} \quad (8)$$

$$= \frac{\theta\eta_c(\eta_r(f-1) - f + 1) + f\theta_c\eta_r(1-\eta_c) + \eta_c\eta_r(S + ax\sigma_\epsilon^2)}{\eta_c - f\eta_c + f\eta_r}. \quad (9)$$

Taking a derivative of equation (8) with respect to $\overline{\theta}_c$ yields the following:

$$\frac{dp}{d\overline{\theta}_c} = \frac{f\eta_r(1-\eta_c)}{\eta_c - f\eta_c + f\eta_r}. \quad (10)$$

Note from equation (10) a positive association between earnings under conservative accounting and the asset price due to $\eta_c < 1$.

Under an alternative accounting of mark to market, earnings fixated traders become indistinguishable to rational traders. In other words, $\overline{\theta}_c = \overline{\theta}$, $\eta_c = \eta_r$

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and $f = 0$. Hence, using equation (8), the asset price (denoted as p') is solved as

$$p' = \overline{\theta}(1 - \eta_r) + \eta_r(S + ax\sigma_\epsilon^2). \quad (11)$$

Taking a derivative of equation with respect to earnings under mark to market accounting results in the following:

$$\frac{dp'}{d\overline{\theta}} = 1 - \eta_r, \quad (12)$$

which is positive due to $\eta_r < 1$. This means that an increase in earnings under markto market leads to an increase in the asset price.

Note from equations (10) and (12), $\frac{dp}{d\overline{\theta}_c} > \frac{dp'}{d\overline{\theta}}$ if $1 > f > \frac{\eta_c - \eta_c\eta_r}{\eta_c + \eta_r^2 - 2\eta_c\eta_r}$; and $\frac{dp}{d\overline{\theta}_c} < \frac{dp}{d\overline{\theta}}$ if $f < \frac{\eta_c - \eta_c\eta_r}{\eta_c + \eta_r^2 - 2\eta_c\eta_r}$.

This means that if the proportion of earnings fixated traders lies in the upper range of the interval [0, 1], the reported earnings under conservative accounting are more value relevant than the ones under mark to market. Otherwise, the reported earnings under mark to market are more value relevant than the ones under conservative accounting.

IV. Concluding Remarks

This paper compares the value relevance of earnings under two different accounting methods (namely, conservative accounting and mark to market accounting) in a competitive security market. The earnings information under conservative accounting is transmitted into the market through the trading of earnings fixated traders. The results of the model suggests that under certain model parameter restrictions, the asset price incorporates more information from the earnings number generated from conservative accounting; on the other hand, under other model parameter restric-tions, the asset price incorporate more information from earnings generated from mark to market accounting.

The future research agenda in this direction is to investigate the impact of accounting standards on the value relevance of earnings under other market settings. One example of such market setting is the one that involves traders acting strategically instead of taking price as given.

V. Appendix

Theorem 1: If the random variables X^* and Y^* are jointly normally distributed, then

$$E(X^*|Y^* = Y) = EX^* + \frac{Cov(X^*,Y^*)}{Var(Y^*)}(Y - EY^*) \text{ and } Var(X^*|Y^* = Y) = Var(X^*) - \frac{[Cov(X^*,Y^*)]^2}{Var(Y^*)}$$

(See Hoel, p.200).

Derivation of equation (1) and (2): Notice that $S = \theta + \epsilon$, where θ is normally distributed with mean $\overline{\theta}$ and standard deviation of σ_θ and ϵ is also normally distributed with mean zero and standard deviation of σ_ϵ; furthermore, θ and ϵ are independent. Hence, the following are true, (a) S and θ are jointly normal distributed;

(b) $Var_r(S) = \sigma_\theta^2 + \sigma_\epsilon^2$; (c) $Cov_r(\theta, S) = \sigma_\theta^2$.

Result (c) comes from the following

$$Cov_r(\theta, S) = E_r\left[(\theta - \overline{\theta})(S - \overline{S})\right] = E_r(\theta S) - \overline{\theta}^2 = E_r(\theta(\theta + \epsilon)) - \overline{\theta}^2 = E_r\theta^2 - \overline{\theta}^2 = \sigma_\theta^2.$$

With the results (a), (b) and (c), equations (1) and (2) follows from Theorem 1.

Derivation of equation (3) and (4): Notice that $S = \theta + \epsilon$, where θ is estimated by conservatism traders as normally distributed with mean $\overline{\theta}_c$ and standard deviation of σ_c; and ϵ is also normally distributed with mean zero and standard deviation of σ_ϵ; furthermore, θ and ϵ are independent. Hence, the following are true, (a) S and θ are jointly normal distributed;

(b) $Var_c(S) = \sigma_\theta^2 + \sigma_\epsilon^2$; (c) $Cov_c(\theta, S) = \sigma_\theta^2$.

Result (c) comes from the following:

$$Cov_c(\theta, S) = E_c\left[(\theta - \overline{\theta}_c)(S - \overline{S})\right] = E_c(\theta S) - \overline{\theta}_c^2 = E_c(\theta(\theta + \epsilon)) - \overline{\theta}_c^2 = E_c\theta^2 - \overline{\theta}_c^2 = \sigma_c^2.$$

With the results (a), (b) and (c), equations (1) and (2) follows from Theorem 1.

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