The Market-Wide Cost of Capital Impacts on the Aggregate Earnings-Returns Relation

-Evidence from Japan-*

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Abstract

Prior studies have observed a significantly positive relation between earnings changes and the contemporaneous stock returns at the firm level. However, when they are cross-sectionally aggregated, even a negative relation can be observed. Through clarifying this puzzling relation, U.S. studies have shown that risk-free rate and expected inflation, which are components of the market-wide cost of capital, cause strong omitted variable bias against the relation. On the other hand, the economic impacts of these components are trivial in Japan due to "zero-interest-rate policy" and stable prices, such that the market-wide cost of capital can be weak. Therefore, we test whether changes in the market-wide cost of capital still have a strong bias against the aggregate earnings-returns relation in Japanese stock market. First, we find that aggregate earnings changes are positively correlated to the contemporaneous changes in the market-wide cost of capital. Second, a significantly positive aggregate earnings-returns relation appears after controlling for changes in the market-wide cost of capital, though this relation cannot be detected running a simple regression. Third, these results are not caused by risk-free rate or expected inflation but caused by market risk premium, the other component of the market-wide cost of capital.

Keywords: aggregate earnings, earnings-returns relation, implied cost of capital

JEL Classification: E44, G12, G14, M41

1. Introduction

The purpose of this paper is to contribute to clarifying the mechanism of the surprising earnings-returns relation observed at the aggregate level. In accounting and finance research, many researchers have studied the relation between accounting earnings and stock returns, beginning with Ball and Brown (1968). In this stream of studies, a robust positive relation between earnings changes and the contemporaneous stock returns is observed at the firm level[1] (cf. Ball and Sadka 2015). Earnings changes are often regarded as earnings surprises[2]. Positive (negative) earnings surprises indicate that reported earnings are higher (lower) than expected and these earnings are financial resources for payout. Thus, investors will increase (decrease) the expected cash flows from stocks of the firm and trade them based on their modified expectations. This results in a positive earnings-returns relation at the firm level[3].

If this explanation holds true and when earnings changes and stock returns of individual firms are cross-sectionally aggregated, what relation should be observed between "aggregate" earnings changes and "aggregate" stock returns? These aggregate variables represent the general trends of the listed firms. When positive (negative) aggregate earnings changes are observed, listed firms will generally experience a rise (drop) in performance. Subsequently, the economic impacts of positive (negative) firm-level earnings surprises should be dominant in the market, hence resulting in higher (lower) stock prices. According to this logic, positive earnings-returns relation should also be observed at the aggregate level. However, recent U.S. studies, such as Kothari et al. (2006) (referenced as KLW henceforth), present evidence contrary to this prediction. By running a simple regression, they report that a significantly

[1] We describe "contemporaneous" variables as variables at the earnings announcement period in this paper.
[2] Assuming that expected earnings at the current period are equal to the realized earnings at the previous period ($E_{t-1}[X_t] = X_{t-1}$), earnings surprises at the current period become equal to the earnings changes at the current period ($UE_{t-1}[\Delta X_t] = \Delta X_t \because UE_{t-1}[\Delta X_t] = X_t - E_{t-1}[X_t], \Delta X_t = X_t - X_{t-1}$).
[3] We use the description, "earnings-returns relation" as the relation between earnings changes and the contemporaneous corresponding stock returns.

positive earnings-returns relation cannot be detected at the aggregate level[4]. Furthermore, some studies indicate that even a significantly negative relation can be observed[5]. In order to clarify this puzzling earnings-returns relation, KLW develop a hypothesis based on the omitted variable bias. KLW suppose that investors increase (decrease) the discount rate generally when aggregate earnings changes are positive (negative). If this is correct, the positive effect of aggregate earnings changes on the contemporaneous aggregate stock returns can be concealed by the negative effect of changes in the discount rate. This hypothesis can explain the puzzling aggregate earnings-returns relation.

Discount rate is the cost of capital (Brealey et al. 2014) and market-wide cost of capital can be decomposed into real risk-free rate, expected inflation, and market risk premium (Patatoukas 2014). Among these components, prior U.S. studies supporting KLW's hypothesis (Kothari et al. 2006; Uysal 2010) mainly have focused on risk-free rate and expected inflation. They show that when controlling for risk-free rate and expected inflation, which are the components of the market-wide cost of capital, a positive aggregate earnings-returns relation appears. Therefore, these two components should cause a strong bias against aggregate earnings-returns relation in the U.S. market. However, turning our eyes to our country, the economic impacts of these components should be trivial due to the "zero-interest-rate policy" and stable prices. These differences can reduce the economic significance of the market-wide cost of capital. Thus, whether the market-wide cost of capital works as an omitted variable that

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[4] Most existing U.S. studies report that a significantly positive aggregate earnings-returns relation cannot be detected in a simple regression or in a pairwise correlation (Kothari et al. 2006; Anilowski et al. 2007; Bali et al. 2008; Hirshleifer et al. 2009; Sadka and Sadka 2009; Uysal 2010; Patatoukas 2014). We also observe an insignificant and negative (-0.638) aggregate earnings-returns relation in Japanese stock market by running a simple regression, as shown in Table 3.

[5] Despite a robust positive earnings-returns relation at the firm level (the micro level), a positive earnings-returns relation cannot be detected at the aggregate level (the macro level) when running a simple regression. Such a puzzling earnings-returns relation is introduced as "Micro-Macro-Puzzle" in Japan (cf. Nakano 2012, 2014).

bias against the aggregate earnings-returns relation in Japanese stock market is not clear[6]. In this paper, we investigate whether changes in the market-wide cost of capital bias the aggregate earnings-returns relation even in Japanese stock market.

This study proceeds as follows. Section 2 introduces two hypotheses to explain the aggregate earnings-returns relation. One is proposed by KLW and the other is proposed by Sadka and Sadka (2009) (referenced as SS henceforth). We state our research design in Section 3, and our sample selection and variable definition are described in Section 4. Section 5 details our empirical results and interpretations. Finally, Section 6 concludes this study and describes our implications for the future research.

2. Prior research and our research questions

There are two primary hypotheses on the aggregate earnings-returns relation. One is proposed by KLW and the other is by SS. In this section, we introduce these two hypotheses and propose our research questions.

Hecht and Vuolteenaho (2006) present a formula that three components explain realized returns, based on Campbell (1991) who decomposes unexpected returns into two components.

$$R_t \approx E_{t-1}[R_t] + (E_t - E_{t-1})\left[\sum_{j=0}^{\infty} \rho^j \Delta d_{t+j}\right] - (E_t - E_{t-1})\left[\sum_{j=0}^{\infty} \rho^{j-1} R_{t+j}\right]$$

$$= E_{t-1}[R_t] + N_{CF,t} - N_{DR,t} \qquad (1)$$

R_t is realized return at period t. E_{t-1} is the expectation operator with expectations conditional on the information available at the end of period t-1 (the beginning of period t). Thus, $E_{t-1}[R_t]$ denotes stock return at period t expected at the end of period t-1.

[6] He and Hu (2014) report that the interest rate and inflation do not produce omitted variable biases against the aggregate earnings-returns relation in the non-U.S. markets, including Japanese stock market. However, He and Hu (2014) use “pooled regression” to check whether these have any effect on the aggregate earnings-returns relation. Therefore, their evidence is for the average non-U.S. market, not for a specific stock market.

$(E_t - E_{t-1})[X]$ represents the modified expectation for X based on the news released at period t. Δd_t is log dividend growth at period t. ρ is the inverse of 1 plus the dividend yield ($\rho < 1$). Then, $(E_t - E_{t-1})\left[\sum_{j=0}^{\infty} \rho^j \Delta d_{t+j}\right](= N_{CF,t})$ means the modified expectation for subsequent dividend growth, which is caused by "cash-flow news." Further, $(E_t - E_{t-1})\left[\sum_{j=0}^{\infty} \rho^{j-1} R_{t+j}\right]\left(= N_{DR,t}\right)$ is the modified expectation for the subsequent cost of capital, which is caused by "discount-rate news[7]." Next, we split earnings changes into expected earnings changes ($E_{t-1}[\Delta X_t]$) and unexpected earnings changes (earnings surprises: $UE_{t-1}[\Delta X_t]$).

$$\Delta X_t = E_{t-1}[\Delta X_t] + UE_{t-1}[\Delta X_t] \qquad (2)$$

Substituting ΔX_t into $E_{t-1}[\Delta X_t] + UE_{t-1}[\Delta X_t]$ in Equation 1 and deleting the uncorrelated terms in definition[8], we can rewrite the earnings-returns relation ($cov(R_t, \Delta X_t)$) in the following way.

$$cov(R_t, \Delta X_t) \approx cov(E_{t-1}[R_t], E_{t-1}[\Delta X_t]) + cov\left(N_{CF,t}, UE_{t-1}[\Delta X_t]\right) - cov\left(N_{DR,t}, UE_{t-1}[\Delta X_t]\right) \qquad (3)$$

In Equation 3, earnings-returns relation is decomposed into three components: (1) the relation between expected earnings changes and expected returns ($cov(E_{t-1}[R_t], E_{t-1}[\Delta X_t])$); (2) the relation between earnings surprises and the contemporaneous modified expectation for the subsequent dividend growth ($cov\left(N_{CF,t}, UE_{t-1}[\Delta X_t]\right)$); and, (3) the relation between earnings surprises and the contemporaneous modified expectation for the subsequent cost of

[7] Though Hecht and Vuolteenaho (2006) denote $(E_t - E_{t-1})\left[\sum_{j=0}^{\infty} \rho^{j-1} R_{t+j}\right]$ as the "expected-return news," we describe it as the news modifying investors' expectations about the subsequent "cost of capital," because the expected return is normally equal to the cost of capital in the efficient market. If the expected return of a security is higher (lower) than the cost of capital, investors will be eager to buy (sell) the security. Then, the security price will move upward (downward) until the expected return becomes equal to the cost of capital.

[8] We delete the uncorrelated terms in the following way. Earnings changes expected at period t-1 are not related to the news released at period t ($cov\left(N_{CF,t}, E_{t-1}[\Delta X_t]\right) = 0, cov\left(N_{DR,t}, E_{t-1}[\Delta X_t]\right) = 0$). Since earnings surprises occur at period t, they are not correlated to stock returns expected at period t-1 ($cov(E_{t-1}[R_t], UE_{t-1}[\Delta X_t]) = 0$).

capital ($cov\left(N_{DR,t}, UE_{t-1}[\Delta X_t]\right)$). In the following subsections, we introduce two hypotheses on the aggregate earning-returns relation based on these three components.

2.1. KLW's hypothesis

Figure 1 illustrates KLW's hypothesis. In an economic boom (economic recession) when aggregate earnings changes are positive (negative), positive (negative) firm-level earnings surprises should be dominant in the market, hence yielding higher (lower) stock prices. Thus, earnings changes should have a positive effect on the contemporaneous stock returns at the aggregate level, comparable to the firm level ($cov\left(N_{CF,t}, UE_{t-1}[\Delta X_t]\right) > 0$). However, what if aggregate earnings changes are positively related to changes in the market-wide cost of capital ($cov\left(N_{DR,t}, UE_{t-1}[\Delta X_t]\right) > 0$)? Changes in the market-wide cost of capital are generally negatively related to the movement of the stock prices[9]. Additionally, according to KLW, "discount rates should be strongly correlated across stocks, largely driven by business conditions, while cash flows are likely to have a larger idiosyncratic component." Based on the argument that idiosyncratic components will be offset through aggregation, the negative effect of changes in the cost of capital on the contemporaneous stock returns will be stronger than the positive effect of earnings surprises at the aggregate level ($cov\left(N_{CF,t}, UE_{t-1}[\Delta X_t]\right) \leq cov\left(N_{DR,t}, UE_{t-1}[\Delta X_t]\right)$). Therefore, in a simple regression model that does not control for changes in the market-wide cost of capital, an omitted variable bias will make earnings-returns relation insignificant or negative ($cov(R_t, \Delta X_t) \leq 0$)[10].

Patatoukas (2014) observes that aggregate earnings changes are positively related to

9 Based on valuation models such as the Dividend Discount Model, the increase (decrease) of the discount rate (the cost of capital) drives the stock prices downward (upward). Therefore, changes in the market-wide cost of capital have a negative effect on the aggregate stock returns.

10 Additionally, as SS describe, since this hypothesis assumes that aggregate earnings changes are largely unpredictable, the relation between expected earnings changes and expected returns should not affect the aggregate earnings-returns relation ($E_{t-1}[\Delta X_t] \approx 0, \Delta X_t \approx UE_{t-1}[\Delta X_t] \therefore cov(E_{t-1}[R_t], E_{t-1}[\Delta X_t]) \approx 0$).

changes in the market-wide cost of capital. He shows that significantly positive aggregate earnings-returns relation appears after controlling for the changes in the market-wide cost of capital, though this significant relation does not come out in a simple regression. Patatoukas (2014) also decomposes the market-wide cost of capital into three components: real risk-free rate, expected inflation, and market risk premium. Out of these components, existing U.S. studies mainly focus on risk-free rate and expected inflation. KLW show that aggregate earnings changes are positively related to changes in the one-year T-bill rate. They also indicate that a significantly positive aggregate earnings-returns relation can come up after controlling for changes in the T-bill rate, although this relation does not appear by running a simple regression. Uysal (2010) reports that although the aggregate earnings-returns relation is insignificant in a simple regression, a significantly positive aggregate earnings-returns relation occurs after controlling for these two variables. Based on these studies, risk-free rate and expected inflation will have a strong bias against the aggregate earnings-returns relation in the U.S. market[11].

2.2. SS's hypothesis

Figure 2 illustrates the other hypothesis proposed by SS to explain the aggregate earnings-returns relation. In this hypothesis, it is assumed that aggregate earnings changes are almost completely predicted and priced before the earnings announcement period[12] ($UE_{t-1}[\Delta X_t] \approx 0,\ \Delta X_t \approx E_{t-1}[\Delta X_t]$). Thus, this hypothesis assumes that aggregate earnings changes do not modify investors' expectations at the earnings announcement period[13] ($cov\left(N_{CF,t}, UE_{t-1}[\Delta X_t]\right) \approx 0,\ cov\left(N_{DR,t}, UE_{t-1}[\Delta X_t]\right) \approx 0$). SS also suppose that when

[11] To understand KLW's hypothesis more deeply, we propose the possible economic story behind the positive relation between aggregate earnings changes and changes in risk-free rate or expected inflation. In an economic boom (economic recession) when positive (negative) aggregate earnings changes are observed, the demands for money, goods, and services will increase (decrease), hence causing higher (lower) interest rates and inflation.

[12] Strictly speaking, SS's hypothesis assumes that aggregate earnings changes announced at period t are priced in before the beginning of period t.

[13] Existing research supporting SS's hypothesis interprets aggregate earnings changes as cash-flow news priced in before the earnings announcement period, not aggregate earnings surprises at the earnings announcement period.

investors predict an economic boom (economic recession), they will take more (less) risks[14], resulting in a lower (higher) market risk premium. Since the market risk premium is one of the components of the market-wide cost of capital, a lower (higher) market risk premium will lead to a lower (higher) market-wide cost of capital. Then, stock prices will move upward (downward) until the "expected returns from buying stocks on current prices" get equal to the correspondent cost of capital[15]. Assuming that they correspond before the earnings announcement period, "expected returns from buying stocks on current prices" at the beginning of the earnings announcement period will be lower (higher) and will have a negative relation with the predicted aggregate earnings changes ($cov(E_{t-1}[R_t], E_{t-1}[\Delta X_t]) \leq 0$). In conclusion, if positive (negative) aggregate earnings changes are sufficiently predicted, expected returns will decrease (increase), causing realized returns to decrease (increase) ($cov(R_t, \Delta X_t) \leq 0$).

Existing literature supporting SS's hypothesis argues that aggregate earnings changes are more predictable than firm-level earnings changes, and that the earnings-returns relation will get weaker (from positive to negative) as the number of firms aggregated increases[16]. SS report

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[14] We tentatively present the economic background behind the negative relation between the predicted aggregate earnings changes and risk appetite of investors to understand SS's hypothesis more deeply. When expected cash flows are modified upward (downward), the possibility of capital loss of buying stocks will decrease (increase) as long as the volatilities of stock prices are stable.

[15] Although expected returns are ordinarily equal to the cost of capital, "expected returns from buying stocks on current prices" can be different from the cost of capital temporally due to cash-flow news or discount-rate news. When "expected returns from buying stocks on current prices" become higher than the cost of capital, it means that the expected cash flows are higher (lower) than required. Since investors are eager to buy (sell) such stocks, stock prices will move upward (downward). As stock prices move upward (downward), "expected returns from buying stocks on current prices" get lower (higher) and finally, "expected returns from buying stocks on current prices" become equal to the cost of capital.

[16] SS name Chen (1991) as a supporter of their hypothesis. However, we suspect that he may not be a proper supporter for their hypothesis. Chen (1991) shows that the recent growth of Gross National Product is negatively correlated to the future market return. If the effects of cash-flow news and discount-rate news stay constant, realized return is equal to the expected return on average. Thus, his results may suggest a negative relation between the economic growth and the market-wide cost of capital (which is equal to the expected return). Since aggregate earnings changes have a positive relation with the contemporaneous economic growth (e.g., Konchitchki and Patatoukas 2014), aggregate earnings changes can be regarded as reflecting the contemporaneous economic growth. Therefore, the result by Chen (1991) may indicate the negative relation between aggregate earnings changes and changes in the market-wide cost of capital. Assuming that the economic growth and changes in the market-wide cost of capital are positively correlated, KLW's hypothesis can explain the results by Chen (1991).

that aggregate earnings changes have more components that can be explained by the correspondent stock returns before the earnings announcement period than the firm-level earnings changes. They also show that the more number of firm-level earnings changes are aggregated, the more information about aggregate earnings changes are priced in before the earnings announcement period. This causes a weaker (from positive to negative) aggregate earnings-returns relation. Ball et al. (2009) report a positive correlation between aggregate earnings and the previous aggregate stock returns. This positive correlation suggests that the information in aggregate earnings is priced in before the earnings announcement period. He and Hu (2014) run a pooling regression of the country/year observations made from the financial data of listed firms in 28 non-U.S. stock markets. They show that the aggregate earnings-returns relation is weaker (from positive to negative) in countries with more transparent financial disclosure because such disclosure helps investors forecast future earnings more precisely.

2.3. Research questions

As described, prior U.S. studies supporting KLW's hypothesis suggest that risk-free rate and expected inflation are important components of the market-wide cost of capital that bias the aggregate earnings-returns relation. However, the economic significance of these components will be trivial in Japan due to the "zero-interest-rate policy" and stable prices. For example, the average absolute value of the quarterly yield changes in 10-year government bond over our sample period (from Q2:2003 to Q1:2015) is 0.153% in Japan, while it is 0.397% in the U.S. In addition, the average absolute value of the year-over-year changes in the quarterly Consumer Price Index for all items less food and energy from Q2:2003 to Q1:2014 is 0.590% in Japan, while it is 1.920% in the U.S.[17]

[17] The yield of 10-year government bond in the U.S. is collected from the website of the U.S. Department of the Treasury and the Consumer Price Index in the U.S. is from website of the U.S. Bureau of Labor Statistics. The

Thus, changes in the market-wide cost of capital may not function as an omitted variable. Therefore, our research question is whether the market-wide cost of capital still biases the aggregate earnings-returns relation in Japanese stock market. To answer this question, we focus on three points. The first is whether aggregate earnings changes are positively related to changes in the market-wide cost of capital. If changes in the market-wide cost of capital cause the omitted variable bias, they must have a positive relation.

Second, we focus on whether changes in the market-wide cost of capital have a significantly negative relation with aggregate stock returns and whether a significantly positive aggregate earnings-returns relation appears after controlling for changes in the market-wide cost of capital in Japanese stock market. If changes in the market-wide cost of capital are an omitted variable, they should have a significantly negative effect on the aggregate stock returns. Additionally, a significantly positive earnings-returns relation should appear at the aggregate level after controlling for them.

Finally, we decompose changes in the market-wide cost of capital into three components following Patatoukas (2014), and investigate which components bias the aggregate earnings-returns relation in Japanese stock market. Due to the slight changes of risk-free rate and expected inflation during our sample periods, their economic impacts will be trivial in Japanese stock market. Therefore, we predict that these two components do not cause an omitted variable bias against the aggregate earnings-returns relation in Japan.

3. Research design

3.1. Model description

We adopt two main tests to investigate whether the market-wide cost of capital biases aggregate earnings-returns relation in Japanese stock market. In the first test, we check the

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Japanese data is collected from "Nikkei NEEDS Financial Quest 2.0."

relation between aggregate earnings variables ($\Delta AggE_q$) and the contemporaneous changes in the market-wide cost of capital (ΔICC_{q+1}). We use two aggregate earnings variables: aggregate earnings changes ($\Delta EARN_q$) and aggregate earnings surprises[18] (SUR_q). Following Patatoukas (2014), we use the regression model as shown in Equations 4 through 6.

$$\Delta AggE_q = \alpha + \beta_1 \Delta ICC_{q+1} + \varepsilon \tag{4}$$

$$\Delta AggE_q = \alpha + \beta_1 \Delta IRP_{q+1} + \beta_2 \Delta RF_{q+1} + \varepsilon \tag{5}$$

$$\Delta AggE_q = \alpha + \beta_1 \Delta IRP_{q+1} + \beta_2 \Delta RRF_{q+1} + \beta_3 \Delta INF_{q+1} + \varepsilon \tag{6}$$

In Equation 4, we investigate the relation between aggregate earnings variables and changes in the market-wide cost of capital. If KLW's hypothesis grasps the reality of Japanese stock market, β_1 in Equation 4 should be significantly positive. In Equations 5 and 6, we investigate which components of changes in the market-wide cost of capital cause an omitted variable bias. In Equation 5, we split changes in the market-wide cost of capital into changes in the market risk premium (ΔIRP_{q+1}) and changes in the nominal risk-free rate (ΔRF_{q+1}). In Equation 6, we divide changes in the nominal risk-free rate into the real risk-free rate (ΔRRF_{q+1}) and those of expected inflation (ΔINF_{q+1}). If these components are omitted variables, their coefficients should be significantly positive.

In the second test, we focus on the bias of changes in the market-wide cost of capital and those in its components against the aggregate earnings-returns relation. We use the regression model described in Equations 7 through 10.

[18] SS construct the hypothesis that aggregate earnings changes are predicted before the earnings announcement period. Consistent with their hypothesis, Yoshinaga (2015) show that aggregate earnings changes have a significantly positive relation with aggregate stock returns before earnings announcements in Japanese stock market. Additionally, KLW report that aggregate earnings changes have a positive autocorrelation (earnings persistence). According to these studies, aggregate earnings changes may be correctly predictable and may mainly be composed of expected earnings changes ($E_{t-1}[\Delta X_t]$), not of unexpected earnings changes ($UE_{t-1}[\Delta X_t]$). Thus, we extract surprising information in aggregate earnings changes (aggregate earnings surprises) to use in our empirical analysis. If the results are not largely different whichever aggregate earnings variables we use, we can judge that aggregate earnings changes mainly reflect aggregate earnings surprises.

$$R_{q+1} = \alpha + \gamma_1 \Delta AggE_q + \varepsilon \quad (7)$$

$$R_{q+1} = \alpha + \gamma_1 \Delta AggE_q + \gamma_2 \Delta ICC_{q+1} + \varepsilon \quad (8)$$

$$R_{q+1} = \alpha + \gamma_1 \Delta AggE_q + \gamma_2 \Delta IRP_{q+1} + \gamma_3 \Delta RF_{q+1} + \varepsilon \quad (9)$$

$$R_{q+1} = \alpha + \gamma_1 \Delta AggE_q + \gamma_2 \Delta IRP_{q+1} + \gamma_3 \Delta RRF_{q+1} + \gamma_4 \Delta INF_{q+1} + \varepsilon \quad (10)$$

According to prior studies, observed aggregate earnings-returns relation is insignificant or negative with a simple regression model both in the U.S. (e.g., KLW; SS; Patatoukas 2014) and in Japan (Yoshinaga 2015). Therefore, we expect that γ_1 in Equation 7 will not be significantly positive. However, KLW's hypothesis argues that this earnings-returns relation is biased by the negative effect of the contemporaneous changes in the market-wide cost of capital (ΔICC_{q+1}). Then, in Equations 8 through 10, we control for the contemporaneous changes in the market-wide cost of capital or their components, and test whether and how γ_1 changes. If KLW's hypothesis reflects reality, γ_1 should be significantly positive and γ_2 should be significantly negative in Equation 8. In Equations 9 and 10, we decompose changes in the market-wide cost of capital and investigate which components have significantly negative coefficients. If the coefficient of a component is significantly positive in the first test and significantly negative in the second test, the component is suggested to bias the aggregate earnings-returns relation. Based on the unique Japanese economic situation, we predict that at least risk-free rate and expected inflation will not meet both requirements.

3.2. Variable definition

We use quarterly data. As a proxy for aggregate stock returns, we use the equally-weighted averages of the quarterly buy-and-hold returns (R_q). Before calculating the firm-level stock returns, we adjust stock prices for the price movements due to the ex-rights and ex-dividends. Aggregate earnings changes ($\Delta EARN_q$) are the averages of the seasonally differenced quarterly earnings deflated by the book value of equity one year before ($\frac{EARN_{i,q}-EARN_{i,q-4}}{BV_{i,q-4}}$). We define aggregate earnings surprises (SUR_q) as the residuals of the following Equation 11[19].

$$\Delta EARN_q = \alpha + \beta_1 \Delta EARN_{q-1} + \beta_2 R_q + \varepsilon \tag{11}$$

Easton and Sommers (2007) run a cross-sectional regression to determine the implied cost of capital for a portfolio. We estimate that the implied cost of capital for a market portfolio which is composed of the stocks of all sample firms based on their method, and use this as the market-wide cost of capital in our analysis (ICC_q). Their method is derived from the following residual income model (Equation 12).

$$v_{i,t} = bps_{i,t} + \sum_{\tau}^{\infty} \frac{eps_{i,t+\tau} - r_{i,t} \times bps_{i,t+\tau-1}}{(1 + r_{i,t})^{\tau}} \tag{12}$$

$v_{i,t}$ is the intrinsic value per share of firm i at period t. $bps_{i,t}$ is the book value per share of firm i at period t. $eps_{i,t}$ is the earnings per share of firm i at period t. $r_{i,t}$ is the cost of capital of firm i at period t. We transform Equation 12 into Equation 13 by setting the following two assumptions: (1) the perpetual growth rate of the residual earnings starting from period t+1 (g_i) is constant, and (2) the intrinsic value is equal to the contemporaneous stock price ($v_{i,t} = p_{i,t}$).

$$p_{i,t} = bps_{i,t} + \frac{E_t[eps_{i,t+1}] - r_{i,t} \times bps_{i,t}}{(r_{i,t} - g_i)} \tag{13}$$

In Equation 13, $p_{i,t}$ is stock price of the firm i at period t, and $E_t[eps_{i,t+1}]$ is the

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[19] According to KLW, aggregate earnings changes have the first to the third order significantly positive autocorrelation and this autocorrelation is mainly caused by the first order partial autocorrelation. In our untabulated test, we confirm that $\Delta EARN_q$ also has the first order to the second order significantly positive autocorrelation and this autocorrelation is mainly caused by the first order partial autocorrelation. (The relation between $\Delta EARN_q$ and $\Delta EARN_{q-2}$ turns into insignificant after controlling for $\Delta EARN_{q-1}$, although the relation is significantly positive when running a simple regression.) Thus, we adjust aggregate earnings changes for only the first order autocorrelation in calculating SUR_q.

earnings per share of firm i at period t+1 that are expected at period t. Then Equation 13 can be reduced to Equation 14.

$$\frac{E_t[eps_{i,t+1}]}{bps_{i,t}} = r_{i,t} + \left(r_{i,t} - g_i\right) \times \frac{p_{i,t}}{bps_{i,t}} \tag{14}$$

If we assume that the analyst forecast of earnings per share is the proxy for the expected earnings per share ($E_t[eps_{i,t+1}]$), we can substitute all items for the specific values in Equation 14 except $r_{i,t}$ and $\left(r_{i,t} - g_i\right)$. Furthermore, if we replace these two variables by the intercept parameter and the slope parameter respectively ($\alpha = r_{i,t},\ \beta = \left(r_{i,t} - g_i\right)$), and run a cross-sectional regression, we can simultaneously estimate the averages of the cost of capital for the stocks in the portfolio and those of the perpetual growth rate for the listed firms whose stocks are in the portfolio each period.

Nonetheless, it is known that the estimated cost of capital by using the analysts' forecast of future earnings is biased upward since analysts tend to forecast future earnings optimistically (Easton and Sommers 2007). To handle this upward bias, Easton and Sommers (2007) propose a method that estimates the implied cost of capital using realized current earnings instead of forecasted future earnings. Assuming that the perpetual growth rate of residual earnings starting from period t (${g'}_i$) is stable and that the intrinsic value is equal to the contemporaneous stock price ($v_{i,t} = p_{i,t}$), we transform Equation 12 into Equation 15. Further, Equation 15 can be reduced to Equation 16.

$$\begin{aligned} p_{i,t} &= bps_{i,t} + \sum_{\tau}^{\infty} \frac{(eps_{i,t} - r_{i,t} \times bps_{i,t-1})(1 + {g'}_i)^{\tau}}{(1 + r_{i,t})^{\tau}} \\ &= bps_{i,t} + \frac{(eps_{i,t} - r_{i,t} \times bps_{i,t-1})(1 + {g'}_i)}{(r_{i,t} - {g'}_i)} \end{aligned} \tag{15}$$

$$\Leftrightarrow \frac{eps_{i,t}}{bps_{i,t-1}} = r_{i,t} + \frac{r_{i,t} - g'_i}{1 + g'_i} \times \frac{p_{i,t} - bps_{i,t}}{bps_{i,t-1}} \tag{16}$$

By replacing $r_{i,t}$ and $\frac{r_{i,t}-g'_i}{1+g'_i}$ with the intercept parameter and the slope parameter respectively $\left(\alpha = r_{i,t},\ \beta = \frac{r_{i,t}-g'_i}{1+g'_i}\right)$, we can simultaneously estimate the average cost of capital for the stocks in the portfolio and the average perpetual growth rates of the listed firms whose stocks are in the portfolio each period. Although Easton and Sommers (2007) estimate the implied cost of capital each year using annual earnings, we have to estimate it each quarter because our analysis is quarterly based. So we sum up the recent four quarterly earnings of each firm and regard such total earnings as the quasi annual earnings of the firm. Using these quasi annual earnings, we estimate the implied market-wide cost of capital each quarter. Considering the timing of the quarterly earnings announcement[20] and multiplying per share items by the number of outstanding shares, we transform Equations 15 and 16 into Equations 17 and 18, respectively.

$$MV_{i,q} = BV_{i,q-1} + \frac{(SUMEARN_{i,q-1} - ICC_{i,q} \times BV_{i,q-5})(1 + G'_{i,q})}{(ICC_{i,q} - G'_{i,q})} \tag{17}$$

$$\frac{SUMEARN_{i,q-1}}{BV_{i,q-5}} = ICC_{i,q} + \frac{ICC_{i,q} - G'_{i,q}}{1 + G'_{i,q}} \times \frac{MV_{i,q} - BV_{i,q-1}}{BV_{i,q-5}} + \varepsilon \tag{18}$$

$MV_{i,q}$ is the market value of firm i at the end of quarter q. $BV_{i,q-1}$ is the book value of firm i stated in the earnings briefing at quarter q-1 (released at quarter q). $SUMEARN_{i,q-1}$ is the quasi annual earnings of firm i at quarter q-1. $ICC_{i,q}$ is implied cost of capital of firm i estimated at the end of quarter q. $G'_{i,q}$ is the perpetual growth rate of residual quasi annual earnings starting from quarter q. Using Equation 19 as derived from Equation 18, we run the

[20] In Japan, quarterly earnings are normally released at the next quarter.

cross-sectional regression and estimate the implied cost of capital for the market portfolio each quarter.

$$\frac{SUMEARN_{i,q-1}}{BV_{i,q-5}} = \alpha_q + \beta_q \times \frac{MV_{i,q} - BV_{i,q-1}}{BV_{i,q-5}} + \varepsilon \qquad (19)$$

Changes in the nominal risk-free rate are the differenced yield of the 10-year government bond ($\Delta RF_q = RF_q - RF_{q-1}$). We define the difference between changes in the market-wide cost of capital and changes in the nominal risk-free rate as the market risk premium ($\Delta IRP_q = \Delta ICC_q - \Delta RF_q$), following Patatoukas (2014). Changes in expected inflation are the expected year-on-year growth of the core Consumer Price Index (CPI) ($\Delta INF_q = INF_q - INF_{q-1}$). Following Patatoukas (2014), we use the real risk-free rate as the difference between the nominal risk-free rate and expected inflation ($\Delta RRF_q = \Delta RF_q - \Delta INF_q$). Figure 3 is the timeline of our main variables.

3.3. Statistical issues: heteroskedasticity, serial correlation, and multicollinearity

Many empirical studies in accounting and finance adjust for heteroskedasticity. For example, researchers often calculate standard errors by the method of White (1980) to reduce the statistical problems due to heteroskedasticity. Additionally, considering the Durbin-Watson statistics, some of our main results may be biased by the serial correlation[21]. Therefore, we use the heteroskedasticity- and autocorrelation-consistent standard errors proposed by Newey and West (1987). We set the maximum lag length for calculating the Newey-West adjusted standard errors as two, which is the integer part of the 0.25 power of the sample size, based on related studies (Konchitchki and Patatoukas 2014) and practical convention (Ota 2012). We judge if our empirical results are biased by multicollinearity based on the Variance Inflation Factor

[21] Stanford University releases "Critical Values for the Durbin-Watson Test" based on the method by Savin and White (1977) (http://web.stanford.edu/~clint/bench/dwcrit.htm). We use the critical values presented on this homepage to judge whether and how strong the serial correlation affects our results.

(VIF). Since the VIF of each variable is lower than 10 in all models, we suppose that the statistical problems due to multicollinearity are trivial.

4. Sample selection and Data source

4.1. Sample selection

Our data source is primarily "Nikkei NEEDS Financial Quest 2.0," which contains the financial data of listed firms and macroeconomic data in Japan. We define Q1 as the quarter from January to March, Q2 as that from April to June, Q3 as that from July to September, and Q4 as that from October to December. Using this description, our sample covers 48 quarters from Q2:2003 to Q1:2015. Although the first quarter which Nikkei NEEDS includes financial data from the quarterly Summary of Financial Statements (*Kessan-Tanshin* in Japanese) is Q2:2002, we exclude the periods before Q2:2003, because available firm/quarter observations are only less than 500 for these periods. Additionally, we impose the following six data requirements.

I. Firm/quarter observations that have non-missing data to construct the variables
II. Firm/quarter observations of industrial firms (not financial firms: banks; insurance; brokerage; asset management firms)
III. Firm/quarter observations that have positive market values and positive book values used to construct the variables
IV. Firm/quarter observations whose stock price at the beginning of the quarter is ¥100 and over
V. Firm/quarter observations whose fiscal year-ends are March, June, September, or December
VI. Firm/quarter observations that release a quarterly Summary of Financial Statements

by 60 days after the beginning of the earnings announcement period

Data requirement I is required to remove observations that have missing values. Data requirement II is established because the accounting items of financial firms are different from industrial firms. Data requirement III is set to avoid negative deflators and financially abnormal observations. Data requirement IV is imposed to exclude the outliers of stock returns. If stock prices are near the minimum monetary unit (¥1), the stock returns tend to be highly volatile. Thus, it is supposed that KLW and SS exclude observations with stock prices below $1 to reduce the effects of the outliers of stock returns. We cover the listed firms adopting March as the fiscal year-end because March is the most popular fiscal year-end in Japan. Additionally, data requirement V is required to increase the number of sample firms by covering firms that have fiscal year-ends of June, September, or December. Data requirement VI is set so reported earnings are priced in at the earnings announcement period.

After imposing these data requirements, we regard the top and bottom 1% of the firm/quarter observations as ranked by the $\Delta EARN_{i,q}$, $\frac{SUMEARN_{i,q-1}}{BV_{i,q-5}}$ and $\frac{MV_{i,q}-BV_{i,q-1}}{BV_{i,q-5}}$ each quarter as the outliers, and exclude them from our sample. Our final sample contains 43 quarter observations aggregated by 102,877 firm/quarter observations.

We collect macroeconomic data during our sample periods. The nominal risk-free rate is the yield of the 10-year government bond at the end of each quarter obtained from Nikkei NEEDS. We manually collect the averages of the expected year-on-year growth of the core CPI from the ESP forecast[22] issued at the end of each quarter as expected inflation[23].

[22] The ESP forecast is the survey issued by the Economic Planning Association originally and was taken over by the Japan Center for Economic Research after April 2002. These authorities send approximately 40 private economists a questionnaire about their expectations of important economic indicators, such as stock prices and yen exchange rates, each month. They submit their answers each month to clarify the consensus on the future economic trends and the persistence of the business condition (cf. http://www.jcer.or.jp/esp/index.html).

[23] In April 2014, the consumption tax rate was increased from 5% to 8% in Japan. To exclude the effect of this, we

4.2. Correlation matrix and descriptive statistics

Table 1 shows the correlation matrix and descriptive statistics. The correlation between SUR_q and R_q is almost zero because SUR_q is the residuals estimated using the regression model that contains R_q as an independent variable (Equation 11). The correlation between ΔICC_q and ΔIRP_q is almost one probably because of the trivial movements of risk-free rate and expected inflation in Japan. Consistent with this supposition, the standard deviations of ΔRF_q and ΔINF_q are less than one third of those of ΔIRP_q.

We conduct the unit root tests proposed by Phillips and Perron (1988) for all variables described in Table 1. According to Okimoto (2010), when we regress a dependent variable that has a unit root on an independent variable that also has a unit root, significant relation between them can be observed, even though they have no rational relation (cf. "spurious regression" as Granger and Newbold 1974 state). All results of the Phillips-Perron type unit root tests reject the null hypothesis that variables contain a unit root at the 1% level (untabulated). Therefore, our regressions in Section 5 should not be "spurious regressions."

5. Empirical results

5.1. Main results

Table 2 details the results from the first main test. At first, aggregate earnings changes have a significantly positive relation with the contemporaneous changes in the market-wide cost of capital, as do aggregate earnings surprises. In this table, we can also observe the significantly positive relation between aggregate earnings variables and changes in the market risk premium.

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use the average core CPI after adjusting for the rise in the consumption tax rate (the adjusted average core CPI) starting at Q2:2013. However, at Q2:2013 and at Q3:2013, the ESP forecast has not announced the adjusted average core CPI. "The effects of the two scheduled consumption tax hikes on prices can be mechanically estimated by assuming that the rise in the consumption taxes will be fully passed on for all currently taxable items. On this basis, the CPI will be pushed up by 2.0 percentage points in fiscal 2014" (Bank of Japan 2013). Based on these statements, we subtract 2% from the non- adjusted average year-over-year growth of the core CPI at these quarters to rule out the effect of the consumption tax rate increase.

On the other hand, coefficients of changes in risk-free rates and those of expected inflation are not consistent.

Table 3 illustrates the results of the second main test. When running a simple regression, a significantly positive aggregate earnings-returns relation cannot be observed. On the other hand, when controlling for the contemporaneous changes in the market-wide cost of capital, coefficients of aggregate earnings variables dramatically change. They turn into significantly positive. Additionally, it is indicated that changes in the market-wide cost of capital have significantly negative relation with the aggregate stock returns. These results suggest that the contemporaneous changes in the market-wide cost of capital cause an omitted variable bias against the aggregate earnings-returns relation in Japanese stock market.

Next, we decompose changes in the market-wide cost of capital and investigate which components bias the aggregate earnings-returns relation in Japan. Consistent with our prediction, the coefficients of changes in risk-free rates and expected inflation are all insignificant. On the other hand, the coefficient of the market risk premium is significantly negative. Therefore, it is suggested that the market-wide cost of capital causes a strong bias against the aggregate earnings-returns relation due to the bias from the market risk premium in Japanese stock market[24].

Additionally, in Table 3, there are minimal differences between the results with aggregate earnings changes and those with aggregate earnings surprises in the sign and statistical significance of their coefficients. Thus, although aggregate earnings changes may be predicted before the earnings announcement period, they reflect surprising information at the earnings announcement period.

[24] We confirm that the observed aggregate earnings-returns relation is still insignificant, even when we control for only the contemporaneous changes in the real risk-free rate and those in expected inflation (untabulated).

5.2. Robustness checks

In this section, we check the robustness of our main results by using different standard errors, regression method, aggregating method, and sample periods. We do not tabulate the results of these robustness checks due to space considerations.

5.2.1. Robustness checks on serial correlation and heteroskedasticity

We calculate the heteroskedasticity- and autocorrelation-consistent standard errors proposed by Newey and West (1987) in our main tests. In calculating these standard errors, we set the maximum lag length as two. Despite this treatment, we may not be able to reduce statistical problems due to serial correlation, since this lag length is based only on academic and practical conventions. Therefore, we check the robustness of the main results in the following two ways. First, we vary the maximum lag length from zero to four and check the sensitivity of our results. Second, we adopt the generalized least-squares method presented by Prais and Winsten (1954) and use the heteroskedasticity-consistent standard errors presented by White (1980). All results of these robustness checks are similar to our main results.

5.2.2. Robustness checks on the other aggregating method: value-weighted averages

Existing studies on aggregate earnings-returns relation use not only equally-weighted cross-sectional averages but also value-weighted cross-sectional averages as aggregate variables. Therefore, we employ value-weighted averages based on market values as the aggregation method and run the same regressions as conducted in the main analysis. In this robustness check, we estimate the cost of capital separately for each industry and calculate the value-weighted averages of the cost of capital based on the total market value of each industry as the market-wide cost of capital. Almost all signs and statistical significances of the coefficients are similar to those of the main results, with one differing result. When we check the relation between aggregate earnings surprises and the contemporaneous aggregate stock returns after controlling for the contemporaneous changes in the market-wide cost of capital (Equation 8) or those of its components (Equation 9 and 10) with the standard errors by Newey and West (1987), an insignificant relation is observed. To the contrary, when we adopt the generalized least-squares method by Prais and Winsten (1954) and the heteroskedasticity-consistent standard errors proposed by White (1980), a significantly positive aggregate earnings-returns relation occurs consistent with the main analysis. Therefore, we comprehensively judge that the positive effect of the value-weighted aggregate earnings surprises on the contemporaneous aggregate stock returns exists, but is somewhat weaker[25].

5.2.3. Robustness checks on the sample period

Due to the data restrictions, our sample is limited to roughly 1,000 firm/quarter observations before Q2:2005, although we can collect over 2,000 firm/quarter observations starting from Q2:2005. Before Q2:2005, the aggregated variables may become outliers because aggregating fewer firms can cause an inadequate diversification of firm-specific information. Thus, we limit the sample periods starting from Q2:2005 and run our main regression models. The results are not largely different from the main results in the signs and significances of the coefficients.

The bankruptcy of Lehman Brothers and the subsequent financial crisis occurred during our sample period. Since this financial crisis seriously damaged the Japanese economy, some observations can be outliers due to the crisis. Therefore, we exclude quarter observations from

[25] The positive effect of value-weighted aggregate earnings surprises is weaker, probably because the impacts of large firms will be strong if we use value-weighted averages. Collins et al. (1987) suggest that earnings changes in larger firms are more predictable. Therefore, value-weighted averages of earnings changes will be predicted more easily than equally-weighted averages. By running Equation 11 to calculate SUR_q using equally-weighted averages, the adjusted R-Square is 46.54% (untabulated). On the other hand, when we use value-weighted averages, the adjusted R-Square is 56.01% (untabulated). This difference suggests that the value-weighted aggregate earnings changes are more predictable than the equally-weighted aggregate earnings changes.

Q3:2008 (the period Lehman Brothers declared bankruptcy) to Q1:2010 (the first trough of the business cycle following the bankruptcy of Lehman Brothers according to the Cabinet Office of Japan) to reduce the effect of the financial crisis on our results. In this skipped sample period, we run the same regressions as in our main tests using the generalized least-squares method by Prais and Winsten (1954) and the heteroskedasticity-consistent standard errors by White (1980). In the results of this robustness check, aggregate earnings changes are not significantly related to changes in risk-free rates and expected inflation, unlike the main results. However, this does not impede the interpretation of our main results, and the other results are similar to our main results.

5.2.4. Conclusion of the robustness checks

Three main evidences are confirmed again by these robustness checks. First, aggregate earnings changes are positively related to the contemporaneous changes in the market-wide cost of capital. Second, a significantly positive aggregate earnings-returns relation appears after controlling for the contemporaneous changes in the market-wide cost of capital. Third, the economic impacts of the market-wide cost of capital are mainly based on the market risk premium in Japanese stock market. These results support the robustness of our main results.

6. Conclusion

Contrary to the “common sense” of the research area on accounting and finance, recent studies report that significantly positive earnings-returns relation cannot be observed at the aggregate level. To explain this puzzling relation, KLW propose that changes in the market-wide cost of capital cause an omitted variable bias against this relation. Although U.S. studies suggest that risk-free rate and expected inflation are the important components of the market-wide cost of capital, the economic impacts of these components are minimal in Japan due to its economic situation. Nevertheless, our three results suggest that KLW's hypothesis still explains Japanese stock market. First, aggregate earnings changes are positively correlated to changes in the market-wide cost of capital. Second, after controlling for the contemporaneous changes in the market-wide cost of capital, a significantly positive aggregate earnings-returns relation appears. Third, these two results are mainly caused by changes in the market risk premium, not risk-free rate or expected inflation.

To the best of our knowledge, this paper is the first study to show supportive evidence for KLW's hypothesis not only in Japanese stock market but also in another non-U.S. market. Our results suggest that changes in the market risk premium cause an omitted variable bias against the aggregate earnings-returns relation in Japanese stock market, where risk-free rate and expected inflation do not have significant economic impacts. This has some implications for the aggregate earnings-returns relation in foreign stock markets. First, although prior studies suggest that risk-free rate is one of the important components in the U.S. market, the U.S. government has adopted the "zero-interest-rate policy" in 2008. Therefore, the economic impacts of risk-free rate will be weaker in the recent U.S. market. However, related prior U.S. studies do not cover the sample period after 2008 sufficiently[26]. Though there are many differences between Japanese stock market and the U.S. market, our results will help to understand the recent aggregate earnings-returns relation in the U.S. market. Second, our results suggest the importance of market risk premium in investigating the mechanism of aggregate earnings-returns relation. Though prior international research (He and Hu 2014) proposes evidences that interest rates and inflation do not affect the aggregate earnings-returns relation in the non-U.S. markets, it does not consider the effects of market risk premium. Based on our

[26] KLW studies 1970 to 2000 in their main tests. Uysal (2010) studies 1969 to 2008. Patatou1kas (2014) studies Q1:1981 to Q2:2009.

results, market risk premium will strongly bias the aggregate earnings-returns relation in these markets. Therefore, in the future international research, we should control for the changes in market risk premium.

Though aggregate earnings-returns relations have been gradually investigated, there are some unclear points. For example, existing research has not sufficiently clarified why aggregate earnings changes have positive relation with changes in market risk premium. In our next research, we would like to investigate this mechanism.

Appendix

(A) The validity of SUR_q as a proxy for aggregate earnings surprises

We use the residuals of Equation 11 as a proxy for aggregate earnings surprises (SUR_q). We test whether this variable is appropriate as aggregate earnings surprises using Equation 20. If the slope parameters of Equation 20 are significant, SUR_q can have the information priced in before the earnings announcement period and this variable may not be appropriate as aggregate earnings surprises.

$$SUR_q = \alpha + \sum_{\mathrm{k}=0}^{3} \beta_k R_{q-k} + \varepsilon \tag{20}$$

Table 4 indicates the results of the regression using Equation 20. In this table, aggregate earnings surprises are not significantly related to the past aggregate stock returns. From this result, we can interpret that SUR_q is not priced in before the earnings announcement period.

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Table 1 Correlation matrix and descriptive statistics

R_q is aggregate stock returns. $\Delta EARN_q$ is aggregate earnings changes. SUR_q is aggregate earnings surprises. ΔICC_q is changes in the market-wide cost of capital. ΔIRP_q is changes in the market risk premium. ΔRF_q is changes in the nominal risk-free rate. ΔRRF_q is changes in the real risk-free rate. ΔINF_q is changes in expected inflation. In Panel A, Pearson (Spearman) correlations are below (above) diagonal. Significant correlation at 5% level is bold.

Panel A Correlation matrix

	R_q	$\Delta EARN_q$	SUR_q	ΔICC_q	ΔIRP_q	ΔRF_q	ΔRRF_q	ΔINF_q
R_q		0.250	-0.040	**-0.318**	**-0.389**	**0.381**	0.049	0.225
$\Delta EARN_q$	0.245		**0.585**	**0.352**	0.267	0.091	-0.050	0.197
SUR_q	0.000	**0.713**		-0.077	-0.120	0.232	0.101	0.055
ΔICC_q	**-0.341**	**0.474**	-0.006		**0.974**	**-0.344**	**-0.332**	0.129
ΔIRP_q	**-0.361**	**0.424**	-0.049	**0.988**		**-0.512**	**-0.407**	0.072
ΔRF_q	0.292	0.096	0.267	**-0.342**	**-0.481**		**0.572**	0.146
ΔRRF_q	-0.081	**-0.396**	-0.058	**-0.380**	**-0.415**	**0.410**		**-0.594**
ΔINF_q	0.276	**0.487**	0.228	0.186	0.136	0.210	**-0.806**	

Panel B Descriptive statistics

	Mean	S.D.	Min	25%	Median	75%	Max	N
R_q	0.023	0.100	-0.168	-0.049	0.013	0.086	0.265	43
$\Delta EARN_q$	0.002	0.009	-0.026	-0.002	0.002	0.007	0.033	43
SUR_q	0.000	0.007	-0.019	-0.003	0.000	0.003	0.024	42
ΔICC_q	0.000	0.010	-0.023	-0.006	0.000	0.005	0.028	42
ΔIRP_q	0.000	0.011	-0.023	-0.007	0.001	0.007	0.031	42
ΔRF_q	0.000	0.002	-0.003	-0.002	0.000	0.001	0.003	43
ΔRRF_q	-0.001	0.003	-0.008	-0.002	-0.001	0.001	0.009	43
ΔINF_q	0.000	0.003	-0.012	0.000	0.001	0.001	0.005	43

Table 2 The relation between aggregate earnings variables and the changes in the market-wide cost of capital

The table shows the results obtained by $\Delta AggE_q = \alpha + \beta_1 \Delta ICC_{q+1} + \varepsilon$ (Equation 4), $\Delta AggE_q = \alpha + \beta_1 \Delta IRP_{q+1} + \beta_2 \Delta RF_{q+1} + \varepsilon$ (Equation 5), $\Delta AggE_q = \alpha + \beta_1 \Delta IRP_{q+1} + \beta_2 \Delta RRF_{q+1} + \beta_3 \Delta INF_{q+1} + \varepsilon$ (Equation 6). $\Delta AggE_q$ is aggregate earnings variable, which is replaced by $\Delta EARN_q$ or SUR_q. $\Delta EARN_q$ is aggregate earnings changes. SUR_q is aggregate earnings surprises. ΔICC_q is changes in the market-wide cost of capital. ΔIRP_q is changes in the market risk premium. ΔRF_q is changes in the nominal risk-free rate. ΔRRF_q is changes in the real risk-free rate. ΔINF_q is changes in expected inflation. The left three rows indicate the results by the regression whose independent variable is $\Delta EARN_q$. The right three rows indicate the results by the regression whose independent variable is SUR_q. We report t-statistics using heteroskedasticity- and autocorrelation-consistent standard errors proposed by Newey and West (1987) in the brackets. ***, ** and * denote statistical significance at the 1%, 5% and 10% level respectively, using two-tailed tests.

	$\Delta EARN_q$			SUR_q		
$Intercept$	0.002**	0.002**	0.002**	0.000	0.000	0.000
	[2.156]	[2.561]	[2.500]	[0.077]	[-0.065]	[-0.088]
ΔICC_{q+1}	0.857***			0.462***		
	[8.364]			[4.774]		
ΔIRP_{q+1}		0.882***	0.821***		0.435***	0.431***
		[8.389]	[10.900]		[3.784]	[3.554]
ΔRF_{q+1}		1.292***			-0.005	
		[2.931]			[-0.008]	
ΔRRF_{q+1}			0.848**			-0.038
			[2.358]			[-0.055]
ΔINF_{q+1}			1.574***			0.016
			[4.928]			[0.027]
$Adj. R^2$	0.776	0.775	0.810	0.434	0.431	0.416
$F\ stats$	69.953***	35.553***	41.879***	22.787***	17.119***	11.378***
$D.W. stats$	1.648	1.743	1.962	2.173	2.128	2.138
N	42	42	42	41	41	41

Table 3 The bias of the changes in the market-wide cost of capital against the aggregate earnings-returns relation

The table shows the results obtained by $R_{q+1} = \alpha + \gamma_1 \Delta AggE_q + \varepsilon$ (Equation 7), $R_{q+1} = \alpha + \gamma_1 \Delta AggE_q + \gamma_2 \Delta ICC_{q+1} + \varepsilon$ (Equation 8), $R_{q+1} = \alpha + \gamma_1 \Delta AggE_q + \gamma_2 \Delta IRP_{q+1} + \gamma_3 \Delta RF_{q+1} + \varepsilon$ (Equation 9), $R_{q+1} = \alpha + \gamma_1 \Delta AggE_q + \gamma_2 \Delta IRP_{q+1} + \gamma_3 \Delta RRF_{q+1} + \gamma_4 \Delta INF_{q+1} + \varepsilon$ (Equation 10). $\Delta AggE_q$ is aggregate earnings variable, which is replaced by $\Delta EARN_q$ or SUR_q. R_q is aggregate stock returns. $\Delta EARN_q$ is aggregate earnings changes. SUR_q is aggregate earnings surprises. ΔICC_q is changes in the market-wide cost of capital. ΔIRP_q is changes in the market risk premium. ΔRF_q is changes in the nominal risk-free rate. ΔRRF_q is changes in the real risk-free rate. ΔINF_q is changes in expected inflation. We report t-statistics using heteroskedasticity- and autocorrelation-consistent standard errors proposed by Newey and West (1987) in the brackets. ***, ** and * denote statistical significance at the 1%, 5% and 10% level respectively, using two-tailed tests.

$Intercept$	0.026	0.004	0.006	0.007	0.025	0.025	0.028	0.024
	[1.438]	[0.355]	[0.489]	[0.504]	[1.440]	[1.350]	[1.639]	[1.488]
$\Delta EARN_q$	-0.638	11.643***	11.355***	10.068***				
	[-0.417]	[3.947]	[3.684]	[2.779]				
SUR_q					-0.413	5.415**	5.987**	5.812***
					[-0.257]	[2.623]	[2.557]	[3.043]
ΔICC_{q+1}		-13.477***				-5.996***		
		[-4.558]				[-3.372]		
ΔIRP_{q+1}			-12.910***	-12.213***			-5.506***	-6.451***
			[-3.810]	[-3.530]			[-2.774]	[-3.091]
ΔRF_{q+1}			-7.534				7.157	
			[-0.644]				[0.779]	
ΔRRF_{q+1}				-9.089				-0.338
				[-0.733]				[-0.035]
ΔINF_{q+1}				-3.821				11.932
				[-0.331]				[1.632]
$Adj. R^2$	-0.021	0.349	0.339	0.338	-0.025	0.146	0.166	0.250
$F\ stats$	0.174	10.472***	11.494***	12.802***	0.066	5.691***	5.451***	6.895***
$D.W. stats$	1.607	2.262	2.280	2.274	1.618	1.213	1.265	1.371
N	42	42	42	42	41	41	41	41

Table 4 The relation between aggregate earnings surprises and the past aggregate stock returns

The table shows the results obtained by $SUR_q = \alpha + \sum_{k=0}^{3} \beta_k R_{q-k} + \varepsilon$ (Equation 20). R_q is aggregate stock returns. SUR_q is aggregate earnings surprises. We report t-statistics using heteroskedasticity-consistent standard errors proposed by White (1980) in the brackets. ***, ** and * denote statistical significance at the 1%, 5% and 10% level respectively, using two-tailed tests.

$Intercept$	0.000	0.000	0.000	0.000	-0.001
	[0.000]	[-0.069]	[-0.529]	[-0.223]	[-0.584]
R_q	0.000				0.000
	[-0.000]				[-0.014]
R_{q-1}		0.004			0.002
		[0.362]			[0.184]
R_{q-2}			0.023*		0.019
			[1.769]		[1.113]
R_{q-3}				0.018	0.015
				[1.557]	[1.084]
$Adj.R^2$	-0.025	-0.022	0.090	0.050	0.058
$F\ stats$	0.000	0.131	3.129*	2.423	1.625
$D.W.stats$	1.873	1.909	2.046	1.873	1.901
N	42	42	41	40	40

Figure 1 Conceptual diagram of KLW's hypothesis

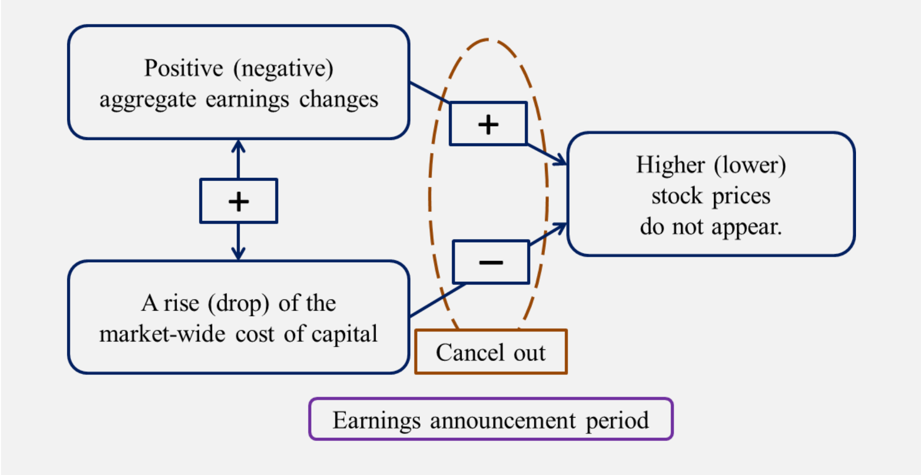


Figure 2 Conceptual diagram of SS's hypothesis

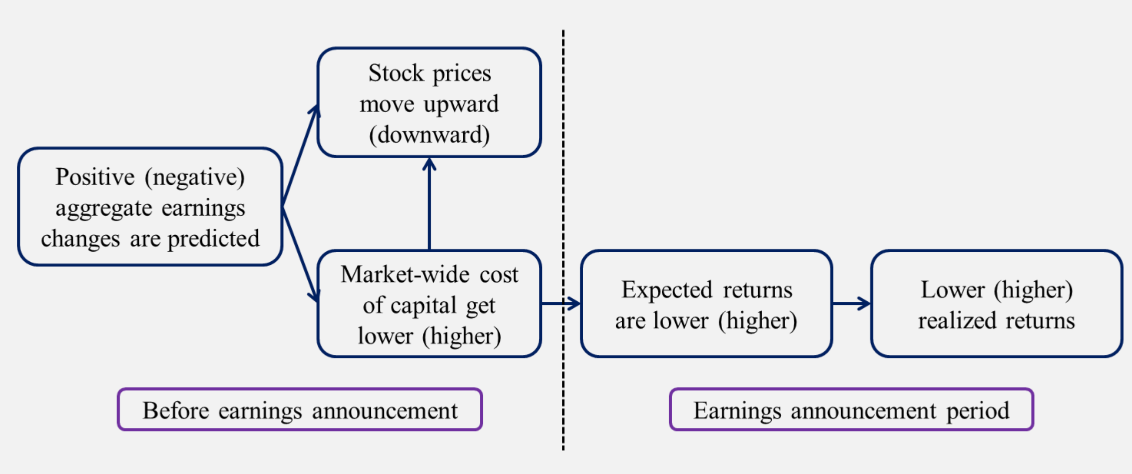
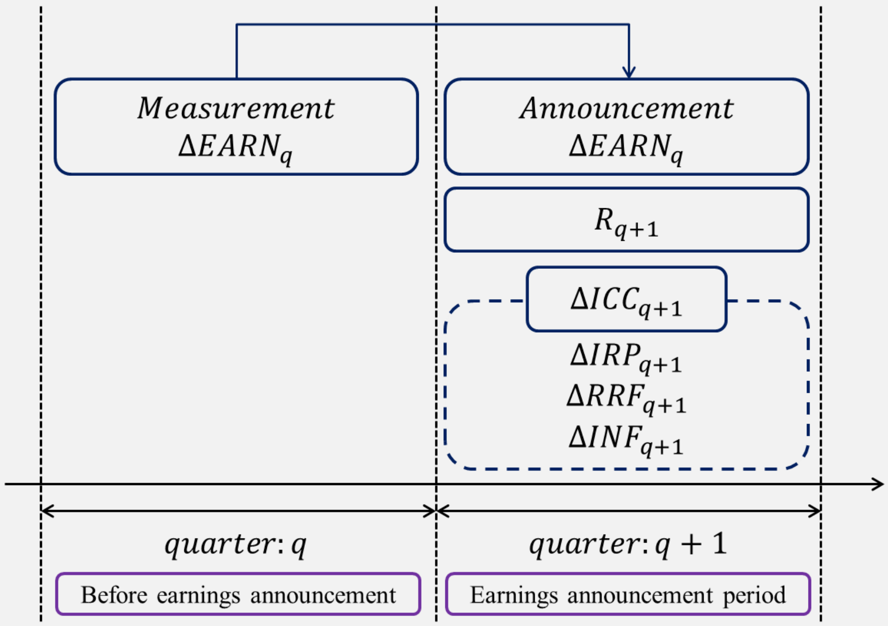


Figure 3 The timeline of our main variables



R_q is aggregate stock returns. $\Delta EARN_q$ is aggregate earnings changes. ΔICC_q is changes in the market-wide cost of capital. ΔIRP_q is changes in the market risk premium. ΔRRF_q is changes in the real risk-free rate. ΔINF_q is changes in expected inflation.