Accounting Fundamentals and Variations of Stock Price: Investment Scalability Inducement[#]

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Abstract
This study develops a new return model in relationship with accounting fundamentals. The new return model is based on Chen and Zhang (2007). This study induces investment scalability information. Specifically, this study splits scale of firm's operation into short-run and long-run investment scalabilities. This study documents that five accounting fundamentals could explain variations of annual stock return. The factors, consist of book value, earnings yield, short-run and long-run investment scalabilities, and growth opportunities vary positively with stock price movements. The remaining factor, pure of interest rate relates to annual stock return negatively. This study finds that inducing short-run and long-run investment scalabilities into the model could improve association degree, in other words they have value relevance. Finally, this study suggests that basic trading strategies would be better if investors revert to accounting fundamentals.

Keywords*: earnings yield, book value, short-run and long-run investment scalabilities, growth opportunities, accounting fundamentals, value relevance, trading strategy.*

JEL Classification: M41 (*accounting*); G12 (*assets pricing; interest rate);* G14 (*information and market efficiency*); G15 (*international financial markets*)

1. Introduction

Chen and Zhang (2007) present the latest return model that relates fundamental firm value and variations of stock price. It also provides theory and empirical evidences that stock return is a function of accounting variables, namely earnings yield, equity capital, changes of profitability, growth opportunities, and discount rates. Chen and Zhang (2007) argued that firm's value contains the potential future assets and growth opportunities. This argument is supported by Miller and Modigliani (1961). In simple explanation, both studies infer that stock price is a function of future assets or capital scalability.[1] Earnings could be determined by adaptation concept when the firm's invested resources are modifiable to generate future earnings (Wright, 1967).

The association between stock return and fundamental firm value has been examined by Burgstahler and Dichev (1997), and Collins, Pincus, and Xie (1999). They suggest that earnings yield has concave-nonlinear association, not purely linear. Other studies show otherwise, inverse relationship of earnings and book value of equity with stock price or return (Jan and Ou, 1995, and Collins, Pincus, and Xie, 1999). The inconsistent relationship between stock price and accounting fundamentals has been overviewed by Lev (1989), Lo and Lys (2000), and Kothari (2001). Those three researches argue that this inconsistency due to (1) weak relationship between earnings and stock price variability, marked by R^2 less than 10% (Chen and Zhang, 2007), and (2) linear correlation between accounting information and future related cash flow, with equity value as a function of scalability and profitability (Ohlson, 1995, Feltham and Ohlson, 1995, 1996, Zhang, 2003, and Chen and Zhang, 2007).

This study mainly focused on designing new return model including its examination. Previous studies clearly show positive association between accounting data and return based on four related-cash flow, namely earnings yield, equity capital, profitability, and growth opportunities, and negative relationship with cost of debts and equity capital (Zhang, 2003, and Chen and Zhang, 2007). Since previous models could not

[1] Scalability is actually a firm's scale of operation. This study shortens it into scalability. It refers to measure of increase or decrease firm's scale of operation in a ratio or proportion of. In this study, the ratio denominator is previous year assets.

yet explain comprehensively the role of equity capital, then this recently designed model is aimed to enhance the identification of initial factors causing equity capital scalability to rise, whether it is short-run or long-run investment scalability according to financial management concept (Smith, 1973).

Hatsopoulus (1986) supports investment scalability argument suggesting that the strength of firm productivity associates with earnings and stock price. Drucker (1986) also concludes that production scalability affects not only the earnings power but also firm's market value. Other empirical studies have confirmed the followings (1) positive association between assets productivity and equity value (Kaplan, 1983), (2) efficient productivity showed by low cost assets usage to increase firm's equity (Dogramaci, 1981; Kendrick, 1984), (3) cheap resources input to ensure future firm's growth (Kendrick, 1984), (4) enhancements of firm productivity to improve firm's equity value and stockholders' wealth (Bao and Bao, 1989), (5) the non-earnings numbers as additional predictive value which is called valuation link (Ou, 1990).

This complementary analysis relies on the following reasons. (1) The limitation of Ohlson (1995) model, Feltham and Ohlson (1995; 1996). This weakness lies on its assumptions that (i) future earnings could be determined by using consecutive previous earnings, and (ii) earnings can be pre-determined stochastically. (2) Earnings are noises when measuring economics earnings and equity value (Kolev, Marquadt and McVay, 2008; Collins, Maydew and Weiss, 1997; Givoly and Hayn, 2000; and Bradshaw and Sloan, 2002). (3) High value relevance when eliminating earnings (Bradshaw and Sloan, 2002; and Bhattacharya, et al., 2003). Therefore, this study provides complementary measurement of earnings. Additionally, this study focuses on adaptation theory in which assets in financial position statements is determinants of equity value (Burgstahler and Dichev, 1977).

The main research objective is to design a new return model. It also examines the degree of association of this model. This new return model does not only associate stock return with four related-cash flows factors, namely earnings (Easton and Harris, 1991; Burgstahler and Dichev, 1997; Collins, Pincus, and Xie, 1999), equity capital (Jan and Ou,

1995, and Collins, Pincus, and Xie, 1999), profitability, growth opportunities (Ohlson, 1995, Feltham and Ohlson, 1995, 1996, Zhang, 2003, and Chen and Zhang, 2007), and discount rate (Zhang, 2003, and Chen and Zhang, 2007), but also deepen by inducing short-run and long-run investment scalabilities. This study examines this new theoretical return model using empirical data. Furthermore, this new model reexamines its richness and robustness. Therefore, the consistency between the new model and its predecessor is ensured, including the association between each construct and stock return.

This study is beneficial for investors and managers. From investors' point of view, this study provides more comprehensive, realistic, and accurate parameters to predict potential future cash flow, because the new model extracts more information than currently available models. From managers' point of view, this study provides incentives for managers to disclose more information publicly as mandated by SFAC No. 5, para. 24 (FASB, 1984). Finally, the new return model can lead investors and management to assess comprehensively the information contained within published financial statements.

This study contributes to accounting literature by providing more comprehensive and more realistic return model. This study has advantages in comparisons with models by Easton and Harris (1991), Liu and Thomas (2000), Zhang (2003), Copeland et al. (2004), Chen and Zhang (2007), and Weiss, Naik and Tsai (2008). The advantages are explained as follows. First, this model is more comprehensive due to its broader coverage. The comprehensive refers to the inclusion of assets scalability to generate future cash flow. Second, by inducing scalability, this model is expected to be closer to economic reality. It means that firms should choose reasonably future investment projects which contribute positive net cash inflow. Cash inflow magnifies earnings and its variability. This second advantage is denoted as earnings capitalization model by Ohlson (1995) which explains that earnings and its variability is affected by current projects.

Third, this new return model grants more comprehensive and accurate predictor of future cash flow to estimate potential future earnings by extracting multiple relevance information (Liu, Nissim and Thomas, 2001). Multiple information could improve model accuracy, as long as they are aligned to increase value relevance. Last, this study offers

considerable contribution by improving association degree of return model for it's more comprehensive, realistic, and accurate. This contribution is reflected by higher R^2 or *adj-*R^2 than the previous model.

This study assumes that, *firstly*, the association of accounting fundamentals and stock price variability is linear. Accounting information is positively proportional to earnings yield, invested equity capital, profitability, and growth opportunities, and is negatively proportional to discount rate. *Secondly*, investors consider accounting information comprehensively. It means that investors use accounting fundamentals for business decision makings. *Thirdly*, investors comprehend firm's prospects based not only on equity capital and its growth, but also on assets as stimulus of increasing firm's equity value. This refers to adaptation theory (Wright, 1967). *Fourthly*, efficiency-form of stock markets is comparable. Stock price variability at all stock markets acts in the same market-wide regime behavior and depends solemnly on earnings and book value (Ho and Sequeira, 2007). *Fifthly*, cost of equity capital represents opportunity cost for each firm. It describes that every fund was managed in order to maximize assets usability. This refers to that management always behaves rationally.

2. Literature Review, Model and Hypothesis Development

Earnings Yield and Stock Value

Ohlson (1995) formulates that firm equity comes from book value and future residual value. Firm value can be calculated from current, potential discount rate which is unrelated to current accounting net capital economics assets. If a firm created new wealth value from invested assets, the new wealth value is concluded in firm's net equity capital. Then, this net value is reflected in firm stock price.

Ohlson (1995) model suggests linear information dynamics of book value and expected residual value in association with stock price. This model then followed by many further studies. Lo and Lys (2000), and Myers (1999) implemented linear information dynamics model for the first time or refers to clean surplus theory. This theory summarizes that end-year firm's stock price is the result of beginning-year stock price added by current

earnings and subtracted by current dividend paid. Meanwhile, Lundholm (1995) formulates that firm's market value is sums of invested equity capital and its future residual earnings discounted by cost of invested capital.

Other researches consistently use Ohlson (1995) model without criticizing the stock value and earnings within the model. Feltham and Ohlson (1995; 1996) emphasize that the association between stock value and earnings is asymptotic. It may be affected by other information and accounting conservatism in depreciation. Burgstahler and Dichev (1997) use the same model, introducing book values of assets and debts to explain firm market value better. Liu and Thomas (2000), and Liu, Nissim and Thomas (2001) added clean surplus model by multiple factors, either earnings disaggregating and other measures that related to book value and earnings.

Collins, Maydew, and Weiss (1997), Lev and Zarowin (1999), and Francis and Schipper (1999) point out association validity that value relevance between book value and earnings and stock market value could be maintained. Abarbanell and Bushee (1997) and Penmann (1998) specifically suggest that accounting information signals can improve degree of association. Both studies complement that earnings quality improves return association. Collins, Pincus, and Xie (1999) declare similarly and enhance their association by eliminating firms with negative earnings.

Backward review before Ohlson (1995) model, researches in the past have associated book value and earnings with firms' market value. Rao and Litzenberger (1971), and Litzenberger and Rao (1972) formulate that firm's market value is a function of book value and earnings though it still may be adjusted by function of debts and firm's productivity growth. Bao and Bao (1989) indicate specifically that equity is not only affected by earnings, but also by expected earnings, standard deviation of earnings and earnings growth.

Investment Scalability

The first limitation of Ohlson (1995) model lays on its assumption. Continued by Feltham and Ohlson (1995; 1996), it still assumes that future earnings is determined by consecutive previous earnings. However, investors may have different insight, which is by observing future potential earnings. Burgstahler and Dichev (1977) clearly state that equity value is not determined by previous earnings only, but can be determined by adaptation theory.[2] It was firm's invested capital when its resources are modifiable for other utilizations. Furthermore, the other utilizations may generate future potential earnings. This concept is based on Wright (1967). He argues that adaptation value derives from the role of financial information in balance sheet. The role primarily comes from assets.

The second limitation of Ohlson model (Ohlson, 1995, and Feltham and Ohlson 1995; 1996) lays on earnings assumption. Earnings are assumed to be pre-determined stochastically. This concept is based on Sterling (1968). He assumes that firms are in stationary condition. This formulates that firm continues to operate based on its past strength and performance. Factually, the firm strength and performance may change due to its business technology, for example merger, acquisition, take-over, liquidation, bankruptcy, business restructuring, management change, and new invested capital.

Ohlson (1995; 2001) himself showed those limitations, that there is other information, noted as mysterious variable. This variable makes stock market fails to reflect book value, or lessens the information content. Further research has attempted to replace mysterious variable (Beaver, 1999; and Hand, 2001), though both studies are interpretative commentary or evaluative review of the Ohlson model.

Later research has left Ohlson concept and try to complement with other empirical concepts. Francis and Schipper (1999) have abandoned Ohlson's linear information dynamics by adding assets and debts into return model. This addition has begun the measurement of assets scalability in either long or short-run. Abarbanell and Bushee (1997) modify return model by adding fundamental signals and its changes consist of inventories,

[2] Apart of adaptation theory, another approach in determining firm equity value is recursion theory. Using the recursion approach, equity value is a discounted future expected earnings under assumption that firm merely applying current business technology into the future.

account receivables, capital expenditure, gross profit, and taxes. These fundamental signals represent investment scalability from assets in the statement of financial position.

Bradshaw, Richardson and Sloan (2006) modify Ohlson's return model by inducing the magnitude of financing obtained from debts. This change in debts is comparable to the change in assets utilized to generate earnings. Cohen and Lys (2006) improve model by Bradshaw, Richardson and Sloan (2006) by inducing not only the change in debts but also the change in short-run investment scalability that is the change in inventories. Up to the latest research, long-run and short-run investment scalability has been put into consideration. In the meantime, Weiss, Naik and Tsai (2008) emphasize on short-run investment scalability, those are the changes in inventories and account receivables to improve degree of association.

Before Ohlson (1995) model, short-run and long-run investment scalabilities have been associated with equity value. Bao and Bao (1989) construct production capacities measured by economic value added; those are the changes in inventories and direct labor costs to measure short term productivity, and fixed assets depreciation to measure long term capacity.

Accounting earnings numbers as noises when measuring economics earnings and equity is introduced by Kolev, Marquadt and McVay (2008), Collins, Maydew and Weiss (1997), Givoly and Hayn (2000), and Bradshaw and Sloan (2002). Investors adjust their focus not to earnings based on generally accepted accounting principles but to the measurement of core potential earnings. The interesting result from research by Bradshaw and Sloan (2002) and Bhattacharya, et al. (2003) is that they eliminate earnings to improve value relevance of they return model.

Those researches verify: (i) limitations of model by Ohlson (1995), Feltham and Ohlson (1995; 1996), (ii) earnings as disturbance when measuring economics earnings and equity (Kolev, Marquadt and McVay, 2008; Collins, Maydew and Weiss, 1997; Givoly and Hayn, 2000; and Bradshaw and Sloan, 2002), and (iii) high value relevance by eliminating earnings (Bradshaw and Sloan, 2002; and Bhattacharya, et al., 2003). Based on citations above, this study constructs complementary measurement for earnings by inducing short-

run and long-run investment scalabilities. Furthermore, this research focuses on adaptation theory in which assets as determinant of firm value (Burgstahler and Dichev, 1977).

Change in Growth Opportunities

Ohlson (1995) model maintains clean surplus theory that associates accounting information, with following premises: (i) stock market value based on discounted future dividend in which investors has neutral position against risks, (ii) accounting information is sufficient to calculate clean surplus, and (iii) future earnings are stochastic which are pre-determined by consecutive previous earnings. However, investors may respond differently against minimum or maximum profitability. Hence, growth factors may affect earnings, which other research include them.

Rao and Litzenberger (1971), Litzenberger and Rao (1972), and Bao and Bao (1972) conclude that growth and its change increase firm competitiveness. Consequently, the higher efficiency the higher productivity is, and also the higher stockholders' welfare and country welfare are. Rao and Litzenberger (1971) and Litzenberger and Rao (1972) specifically disclose that growth opportunities associates directly with long-run prospects within one industry. These studies are based on Miller and Modigliani (1961) concluding that growing firm is firm who has positive rate of return for each invested capital. It also means that every invested resource have lower cost of capital than within industry.

Liu, Nissim and Thomas (2001), Aboody, Hughes and Liu (2002), and Frankel and Lee (1998) show perspective that firm intrinsic value is determined by growth and future potential growth. Current growth drives the increasing of potential future earnings, while future potential growths reduce model's residual error to improve degree of model association. Lev and Thiagarajan (1993), Abarbanell and Bushee (1997), and Weiss, Naik and Tsai (2008) suggests that growths of inventories, gross profit, sales, account receivables and the others improve future earnings growth. Simultaneously, those researches conclude that stock market value adapts to the all growth factors. Danielson and Dowdell (2001) examine that growing firms have better financial performance than others one. It also shows that PB ratio of growing firms is greater than others one.

Chen and Zhang (2007) conclude that firm's equity value completely depend on growth opportunities. They themselves are function of assets operation scale and affect the potential to grow continuously. The inclusion of growth opportunities is based on that earnings and book values are not sufficient enough to explain stock price movements. Therefore, they could be increased more comprehensively when external environment, industry, and interest rate were induced to current and future earnings.

Change in Discount Rate

Ohlson (1995) model assumes that investors take neutral position against fixed risk and interest rate. This simplification is modified by Feltham and Ohlson (1995; 1996), and Baginski and Wahlen (2000). Their modifications lie on that interest rate can change firm's future earnings power. Related to investors' perception, interest rate movement may change their belief of the firm's earnings power. This ability is based on that future earnings can be referred to a set of discount rate giving better certainty of future earnings.

Rao and Litzenberger (1971), and Litzenberger and Rao (1972) indicate previously that equity value depends on discount rate of future potential earnings. This discount rate depends on pure interest rate and then affects the efficiency of firm's scale of operation, and finally in earnings. Danielson and Dowdell (2001), and Liu, Nissim and Thomas (2001) state that firm equity is highly affected by expected discount rate to grow assets and book value. Interest rate has multiplier effect. If interest rate relative to current assets and capital is higher than pure interest rate, the firm could generate earnings more. An alternative method is that the increase of debts or new invested capital could decrease relatively the cost of capital.

Burgstahler and Dichev (1997) suggest that firms' equity value may be increased by adaptation theory. This value may be increased by adapting cheaper alternative resources. The methods include exploration of alternative resources with lower interest rate that improve firms' productivity. Aboody, Hughes and Liu (2002), Frankel and Lee (1998), Zhang (2003) and Chen and Zhang (2007) argue that earnings growth is determined by interest rate. It serves as adjustment factor for firm's scale of operation. In other words,

external environments may affect earnings growth, one of them is external interest rate selected by management to make its operation efficient.

A Model of Equity Value

A model of equity value, the first time, associates accounting information and prospect of future cash flow. This approach refers to Ohlson (1995), and Feltham and Ohlson (1995; 1996). The model is based on firms' scale of operation (scalability) and profitability. Scalability and profitability is a function of current condition and future potential cash flow. Therefore, earnings play major role because its ability to show firm tendency to expand operation or to abandon operation. Equity value model is a process of measuring equity investment to expand or to cease firms' operation (Burgstahler and Dichev, 1997). Zhang (2003) develops equity value model that simplifying the probability of firm's going concern or firm's abandonment operations.

Zhang (2003) and Chen and Zhang (2007) symbolize the equity value of all equity financed at date t (end period t) with V_t. The next, X_t represents earnings during period t. B_t is book value of firm equity. $E_t(X_{t+1})$ is expected future earnings, k is earnings capitalization factor, P is probability of abandonment option, C is probability of continuation option, $q_t \equiv X_t/B_{t-1}$ is profitability – based on ROE, during period t. While, g_t is earnings growth opportunities. Chen and Zhang (2007) formulate equity value as follows.

$$V_t = kE_t(X_{t+1}) + B_t.P(q_t) + B_t.g_t.C(q_t) \quad \text{..... (1)}$$

This model (1) formulates that equity value (V_t) is associated with expected future earnings from invested assets ($E_t(X_{t+1})$, earnings capitalization factor (k), probability of abandonment option ($P(q_t)$), and probability of continuation option ($C(q_t)$). This model indicates that equity value is equal to continuation of current operation (q_t), added by firm growth opportunities either positive or negative (g_t).

Based on model by Chen and Zhang (2007), this study expands the model by complementing and transforming it into detailed form. This transformation is supported by Ou (1990) who indicates that non-earnings accounting value may be used as current and future earnings predictors. Non-earnings information may give additional predictive value

reflected in stock price. Therefore, this study transforms by adding non-earnings values as predictor.

The transformation is based on reasoning that $q_t \equiv X_t/B_{t-1}$ may be specified by sr_t and lr_t. Short-run investment scalability is $sr_t = (Asr_t - Lsr_t)/(Asr_{t-1}-Lsr_{t-1})$, where *A* is assets and *L* is liabilities; and long-run investment scalability is $lr_t = (Alr_t - Llr_t)/(Alr_{t-1}-Llr_{t-1})$. The transformation result in complete formula is expressed in model (2) as follows.

$$V_t = kE_t(X_{t+1}) + B_t(P(sr_t) + P(lr_t)) + B_t.g_t(C(sr_t) + C(lr_t)) \quad \text{..... (2)}$$

By transforming q_t into sr_t and lr_t, this study develops logical framework as follows. Parameter q_t as earnings is capital inflow for the firm from its operating activity. Thus, model (1) is based on capital cash flow. This study formulates that earnings may be measured based on assets, symbolize as sr_t and lr_t. To synchronize into flow form, this study transforms from stock form into flow form by measuring the change, namely by (Asr_t-Lsr_t) and (Alr_t-Llr_t) then normalizing them based on prior period $(Asr_{t-1}-Lsr_{t-1})$ and $(Alr_{t-1}-Llr_{t-1})$. Second reasoning, Zhang (2003) posits that earnings increase due to firm's expansion. This study formulates that earnings increase is not only caused by firm's expansion, but also by scalability of their productive assets. Assets refer to all resources managed to generate earnings. Therefore, the net difference between assets and liabilities may be used to measure firm's earnings power. Additionally, the transformation q_t into sr_t and lr_t is based on Rao and Litzenberger (1971) suggesting that book value of assets and liabilities could increase or decrease the potential future earnings (Smith, 1973).

The next step is model (2) simplification. Earnings growth usually follows random walk. It means that earnings growth depends on last year observed earnings. With $q_{t+1} = q_t + e_{t+1}$, which e_{t+1} as mean-error closes to zero, then $E_t(X_{t+1}) = E_t(B_tq_{t+1}) = B_tq_t$, and with $k = 1/r_t$. Assets growth used to generate earnings follows the same pattern as earnings growth. Transformation of q_t into sr_t and lr_t results in the following equation (3).

$$E_t(X_{t+1}) = E_t(B_tq_{t+1}) = B_tq_t = B_t((sr_t) + (lr_t)) \quad \text{..... (3)}$$

Substituting equation (3) into the model (2) results in the equation (4) as follows.

$$V_t = B_t\left[\left(\frac{(sr_t)+(lr_t)}{r_t}\right)+P(sr_t)+P(lr_t)+g_t\big(C(sr_t)+C(lr_t)\big)\right] \quad \text{.....(4)}$$

According to equation (4), addition of one unit assets or one unit invested capital into firm's equity (v) could increase with a certain magnitude value into current firm's equity value included into V_t. Its formulation in equation (6) is as follows.

$$V_t = B_t v\left[\left(\frac{(sr_t)+(lr_t)}{r_t}\right)+P(sr_t)+P(lr_t)+g_t\big(C(sr_t)+C(lr_t)\big)\right] \quad \text{.....(6)}$$

A Model of Stock Return

To develop a return model, this study considers equity value model. This model assumes that change in equity value starts from date *t-1* until *t*, notated as ΔV_t. Interpreting equation (6), that change in firm market value equals to the change in book equity value as a function of four-cash flow-related factors ($\Delta B_t v(sr_{t-1},\ lr_{t-1},\ g_{t-1},\ r_{t-1})$) and book value multiplied by the change in all four factors (Δsr_t, Δlr_t, Δg_t, and Δr_t). Then, return formulation is in the following equation.

$$\begin{aligned}\Delta V_t \approx{}& \Delta B_t\ v(sr_{t-1}, lr_{t-1}, g_{t-1}, r_{t-1}) + \\ & B_t\left[v_1\Delta(sr_t)+v_2\Delta(lr_t)+C((sr_t)+C(lr_t))\Delta g_t+v_3\Delta r_t\right]\end{aligned} \quad \text{.....(7)}$$

To show the change in each related factor, the differential equation is developed as follows,

$v_1 \equiv \frac{dv}{d(sr_{t-1})}$, $v_2 \equiv \frac{dv}{d(lr_{t-1})}$, and $v_3 \equiv \frac{dv}{dr_{t-1}}$, with $\frac{dv}{dg_{t-1}} = C\big((sr_{t-1})+(lr_{t-1})\big)$.

If the firm paid dividend D_t during period t, the net contribution for current return (R_t) is as follows.

$$R_t \equiv \frac{\Delta V_t + D_t}{V_{t-1}} \quad \text{.....(8)}$$

By substituting equation (8) into equation (7), an equation to calculate stock return during current period (R_t) is as follows.

$$R_t = v\left[\frac{\Delta B_t}{V_{t-1}}\right] + v_1\left[\frac{B_{t-1}}{V_{t-1}}\Delta sr_t\right] + v_2\left[\frac{B_{t-1}}{V_{t-1}}\Delta lr_t\right] + \left(C(sr_t) + C(lr_t)\right)\left[\frac{B_{t-1}}{V_{t-1}}\Delta g_t\right] + v_3\left[\frac{B_{t-1}}{V_{t-1}}\Delta r_t\right] + \frac{D_t}{V_{t-1}} \quad \text{.....(9)}$$

Because of $v\left[\frac{\Delta B_t}{V_{t-1}}\right] = \frac{\Delta B_t}{B_{t-1}}$, substituting it into equation (9) can obtain equation (10) as follows.

$$R_t = \frac{\Delta B_t}{B_{t-1}} + v_1\left[\frac{B_{t-1}}{V_{t-1}}\Delta sr_t\right] + v_2\left[\frac{B_{t-1}}{V_{t-1}}\Delta lr_t\right] + \left(C(sr_t) + C(lr_t)\right)\left[\frac{B_{t-1}}{V_{t-1}}\Delta g_t\right] + v_3\left[\frac{B_{t-1}}{V_{t-1}}\Delta r_t\right] + \frac{D_t}{V_{t-1}} \quad \text{.....(10)}$$

Assuming that book value growth equals to earnings during current period subtracted by dividend during current period or refers to clean surplus relation, so that $\Delta B_t = X_t - D_t$. This equation is reversed into $D_t = X_t - \Delta B_t$. If this equation was substituted into equation (10), it results in the following equation (11).

$$R_t = \left[\frac{X_t}{V_{t-1}}\right] + v_1\left[\frac{B_{t-1}}{V_{t-1}}\Delta sr_t\right] + v_2\left[\frac{B_{t-1}}{V_{t-1}}\Delta lr_t\right] + \left[\left(1 - \frac{B_t}{V_{t-1}}\right)\frac{\Delta B_t}{B_{t-1}}\right] + \left(C(sr_t) + C(lr_t)\right)\left[\frac{B_{t-1}}{V_{t-1}}\Delta g_t\right] + v_3\left[\frac{B_{t-1}}{V_{t-1}}\Delta r_t\right] \quad \text{.....(11)}$$

This equation (11) shows that stock return is a function of the following factors: (1) earnings yields (X_t/V_{t-1}), (2) change in earnings from short-run invested assets (Δsr_t), (3) change in earnings from long-run invested assets (Δlr_t), (4) change in book equity value ($\Delta B_t/B_{t-1}$), (5) change in growth opportunities (Δg_t), and (5) change in discount rate (Δr_t).

Hypothesis Development

Earnings Yield Earnings yields (X_t) shows additional values generated from beginning of invested capital which it, herein after, refers to current earnings. Earnings yield is deflated by beginning year firm's equity value used to generate current earnings. Based on model (11), if earnings yield increased, stock return increases and vice versa (Rao and Litzenberger, 1971; Litzenberger and Rao, 1972; Bao and Bao, 1989; Burgstahler and Dichev, 1997; Collins, Pincus and Xie, 1999; Collins, Kothari and Rayburn, 1987; Cohen and Lys, 2006; Liu and Thomas, 2000; Liu, Nissim and Thomas, 2001; Weiss, Naik and Tsai, 2008; Chen and Zhang, 2007; Ohlson, 1995; Feltham and Ohlson, 1995; Feltham and Ohlson, 1996; Bradshaw, Richardson and Sloan, 2006; Abarbanell and Bushee, 1997; Lev and Thiagarajan, 1993; Penman, 1998; Francis and Schipper, 1999; Danielson and Dowdell, 2001; Aboody, Hughes and Liu, 2001; Easton and Harris, 1991; and Warfield and Wild, 1992).

Association between earnings yield (X_t/V_{t-1}) and stock return (R_t) is always positive. Because $\frac{dR_t}{dX_t} = \frac{1}{V_{t-1}}$, and $1/V_{t-1}$ always greater than zero, then dR_t/dX_t is always positive. Therefore, alternative hypothesis is stated as follows.

H_{A1}: Earnings yield associates positively with stock return

Short-run and Long-run Investment Short-run investment (Δsr_t) and long-run investment (Δlr_t) is assets invested by firm to generate future earnings. According to model, short-run and long-run investment could generate future earnings when short-run and long-run assets value was greater than their cost of capital. It refers that the increase of short-run and long-run assets will improve the firm ability to generate future earnings. It means that they increase firm's book value (Bao and Bao, 1989; Cohen and Lys, 2006; Weiss, Naik and Tsai, 2008; Bradshaw, Richardson and Sloan, 2006; Abarbanell and Bushee, 1997; Abarbanell and Bushee, 1997; Francis and Schipper, 1999). On the other hand, the increase of short-run and long-run assets will decrease cost of equity capital, because it decreases

ability to pay dividend. Because (B_{t-1}/V_{t-1}) is expected to be greater than one, short-run assets associates positively with stock return.

The differential equation is $\frac{dR_t}{d(\Delta)sr_t} = v_1\left[\frac{B_{t-1}}{V_{t-1}}\right] + C\left[\frac{B_{t-1}}{V_{t-1}}\Delta g_t\right]$. Because of at the beginning B_{t-1}/V_{t-1} is always greater than zero, v_1 is always positive one unit, and when positive B_{t-1}/V_{t-1} caused positive Δg_t, then dR_t/dsr_t must be greater than zero. Using similar method, long-run assets also associate positively with dR_t/dlr_t. Accordingly, this study hypothesizes as follows.

H_{A2}: The change in short-run invested assets associates positively with stock return
H_{A3}: The change in long-run invested assets associates positively with stock return

Change in Book Value Change in book value is the central point of firms' equity value measurement. It is measured by $\Delta B_t/B_{t-1}$ which is a measurement of current earnings divided by beginning book value. In other words, $\Delta B_t/B_{t-1}=v[\Delta B_t/V_{t-1}]$ means that the increase of earnings is proportional with the growth of market value, and also with the change in stock return. Consequently, the change in stock return is proportional after considering the beginning market value (V_{t-1}). Therefore, v is expected to be positive and greater than zero (Rao and Litzenberger, 1971; Litzenberger and Rao, 1972; Bao and Bao, 1989; Burgstahler and Dichev, 1997; Collins, Pincus and Xie, 1999; Collins, Kothari and Rayburn, 1987; Cohen and Lys, 2006; Liu and Thomas, 2000; Liu, Nissim and Thomas, 2001; Weiss, Naik and Tsai, 2008; Chen and Zhang, 2007; Ohlson, 1995; Feltham and Ohlson, 1995; Feltham and Ohlson, 1996; Bradshaw, Richardson and Sloan, 2006; Abarbanell and Bushee, 1997; Lev and Thiagarajan, 1993; Penman, 1998; Francis and Schipper, 1999; Danielson and Dowdell, 2001; Aboody, Hughes and Liu, 2001; Easton and Harris, 1991; and Warfield and Wild, 1992).

With $\frac{dR_t}{d\Delta B_t} = \left(1-\frac{B_{t-1}}{V_{t-1}}\right)\frac{1}{B_{t-1}} = \frac{B_{t-1}}{B_{t-1}} - \frac{1}{V_{t-1}B_{t-1}}$, and B_{t-1}/B_{t-1} was greater than $1/(V_{t-1}B_{t-1})$, then dR_t/dB_t always positive and greater than zero. This association is stated in an alternative hypothesis as follows.

H_{A4}: Change in book value associates positively with stock return

Change in Growth Opportunities Firm's book value depends on the change in growth opportunities (Δg_t). In other words, stock return depends on whether the firm grows or not. A firm is called by option to grow if it can increase its book value and, in turn, increase its stock price. Similarly, a firm is called by option to expand that could generate future earnings from its assets. The growth concept is also inspired by firm's ability to generate future earnings from short-run and long-run assets multiplied ($C((sr_t)+(lr_t))$. It infers that assets growth may different from growth of book value. Therefore, growth opportunities (Δg_t), after being adjusted by B_{t-1}/V_{t-1} and considering multiplier effect of $C((sr_t)+(lr_t)$ associates positively with stock price variations (Rao and Litzenberger, 1971; Litzenberger and Rao, 1972; Bao and Bao, 1989; Weiss, Naik and Tsai, 2008; Ohlson, 1995; Abarbanell and Bushee, 1997; Lev and Thiagarajan, 1993; Danielson and Dowdell, 2001; and Aboody, Hughes and Liu, 2001).

The change in book value which increases proportionally with the growth of beginning short-run and long-run invested assets supports this positive association. With $\frac{dR_t}{dg_t} = C(sr_t) + C(lr_t)\left[\frac{B_{t-1}}{V_{t-1}}\right]$, when $B_{t-1}/V/_{t-1}$ was greater than zero and $C(sr_t)$ and $C(lr_t)$ were greater than zero, then $\frac{dR_t}{dg_t}$ is greater than zero. The alternative hypothesis is stated as follows.

H_{A5}: Change in growth opportunities associate positively with stock return

The change in Discount Rate Discount rate could generate potential future cash flow priced by cost of book value. Discount rate (Δr_t) affects future cash flow. It also affects book value and, in turn, affects stock return. The greater discount rate, the lower future cash flow is, and vice versa (Rao and Litzenberger, 1971; Litzenberger and Rao, 1972; Burgstahler and Dichev, 1997; Liu, Nissim and Thomas, 2001; Chen and Zhang,

2007; Feltham and Ohlson, 1995; Feltham and Ohlson, 1996; Danielson and Dowdell, 2001; and Easton and Harris, 1991).

With $\frac{dR_t}{d\Delta r_t} = v_3 \frac{B_{t-1}}{V_{t-1}}$, when B_{t-1}/V_{t-1} was greater than zero, and v_3 was one unit investment, because $r_t = \frac{1}{k}$, then $\frac{V_{t-1}}{B_{t-1}}$ become smaller than zero. It can be concluded in alternative hypothesis as follows.

H_{A6}: Change in discount rate associates negatively with stock return

3. Research Method

Data

All related-cash flow factors determining return model in this research (earnings yield, expected earnings yield, short-run assets investment assets and expected short-run assets investment assets, long-run assets investment and expected long-run assets investment, change in capital, and change in growth opportunities and change in expected growth opportunities) are obtained from financial statements. Data of expected value or financial statements' prospectus can be found in the notes of financial statement. All data are obtained from OSIRIS database. The change in discount rate data are obtained from central bank website of each country, even though the financial statement of each firm also contains long term liabilities or obligation interest rate. Pure interest rate is proxies with long term obligation interest rate based on central bank in each country. This study, then, extracts stock price and return for each firm from stock market of every country directly.

This study has observation domain in all Asia-Pacific countries, and US, along with stock market and central bank. This study employs data during 2002-2009, excluding 2003 and 2008 because of crisis event at all stock market. However, these years are still employed as basics to calculate expected value compared to previous years.

This study is expected to overcome the cultural problem and the efficiency of stock market based on market-wide regime shifting behavior approach (David, 1997; Veronesi, 1999; Conrad, Cornel and Landsman, 2002; dan Ho and Sequeira, 2007). This approach indicates that the movement of stock price or return model should be equivalent for all stock markets because it based on accounting information. It also states that within certain classification, the movement of stock prices responds against accounting information should be the same. Therefore, cultural problem and efficiency-form stock market were eliminated when market efficiency-form classification or level is applied within return model.

Sampling Method

This study uses purposive sampling, samples are chosen under criteria suited for research objectives. The criteria are as follow. *Firstly*, sample is manufacturing and trading firms. *Secondly*, it eliminates firms with negative book value at the beginning and the end ($B_{it-1}<0$; $B_{it}<0$). This exclusion is based on logical reasoning that firms with negative book value tend to abandon with their short-run and long-run capacity. Those firms are suspected to have tendency to go bankruptcy. *Thirdly,* sample is firms whose stocks are traded actively. Sleeping stocks are excluded because they can compromise this research validity. This study also selects sample with liquidity (*LQ-n*) according to each stock market.

Variables Measurement and Examination

This study is aimed to improve Chen and Zhang (2007) model. Therefore, this research is carried out in consecutive stages as follows. *Firstly*, this study examines Chen and Zhang (2007) model. *Secondly*, this study examines new model, using equation (11). *Thirdly*, this study compares the results of examination (1) and (2).

The first examination is linear regression as follows.

$$R_{it} = \alpha + \beta x_{it} + \gamma \Delta \hat{q}_{it} + \delta \Delta \hat{b}_{it} + \omega \Delta \hat{g}_{it} + \varphi \Delta \hat{r}_{it} + e_{it} \quad \text{.....(12)}$$

with R_{it} is annual stock return for firm *i* during period *t*, measured by a year, a year and three months, a year and six months, and a year and nine months. It is calculated from the

first day of beginning year until the end of month during period *t*; x_{it} is earnings generated by firm *i* during period *t*, calculated by earnings acquired by common stockholders during period *t* (X_{it}) divided by opening market value of equity of current period (V_{it-1}); $\Delta\hat{q}_{it} = (q_{it} - q_{it-1})B_{it-1}/V_{it-1}$ is change in profitability for firm *i* during period *t*, deflated by opening book value of equity of current period. Profitability calculated using formula $q_{it}=X_{it}/b_{it-1}$; $\Delta\hat{b}_{it} = [(B_{it} - B_{it-1})/B_{it-1}](1 - B_{it-1}/V_{it-1})$ is book equity capital or proportional change in equity book value for firm *i* during period *t*, adjusted by one minus opening book to market equity ratio of current period; $\Delta\hat{g}_{it} = (g_{it} - g_{it-1})B_{it-1}/V_{it-1}$ is change in growth opportunities for firm *i* during period *t*; $\Delta\hat{r}_{it} = (r_{it} - r_{it-1})B_{it-1}/V_{it-1}$ is change in discount rate during *t*; α, β, γ, δ, ω and φ are regression coefficient; and e_{it} is residual.

The model used in examination (2) that is comparable to examination of Chen and Zhang (2007) is equation (11) as follows.

$$R_{it} = \alpha + \beta X_{it} + \gamma\Delta sr_{it} + \delta\Delta lr_{it} + \theta\Delta p_{it} + \omega\Delta\hat{g}_{it} + \varphi\Delta\hat{r}_{it} + e_{it} \quad \text{.....(13)}$$

with additional explanations for model (13) are (1) $sr_{it} = (Asr_{it} - Lsr_{it})$ is current assets minus current liabilities, $\Delta sr_{it} = (sr_{it} - sr_{it-1})/sr_{it-1}(B_{it-1}/V_{it-1})$ is change in sr_{it} adjusted by opening book to market equity ratio of current period; (2) $lr_{it} = (Alr_{it} - Llr_{it})$ is fixed assets subtracted by long term liabilities, $\Delta lr_{it} = (lr_{it} - lr_{it-1})/lr_{it-1}(B_{it-1}/V_{it-1})$ is change in lr_{it} adjusted by opening book to market equity ratio of current period; (3) $\Delta p_{it}=\Delta B_{it}/B_{it-1}(1-B_{it}/V_{it-1})$ is change in profitability measured by the change in book value of equity and adjusted by one minus opening book to market equity ratio of current period; (4) $\Delta\hat{g}_{it} = (C(sr_{it}) + C(lr_{it}))(g_{it} - g_{it-1})B_{it-1}/V_{it-1}$ is change in growth opportunities for firm *i* during period *t* measured by considering multiplier effect of growth opportunities against short-run and long-run invested assets. Then, it is adjusted by opening book to market equity ratio of current period; other variables are identical.

It has to be noted that R_{it} in regression model (13) represents various return periods, namely a year, a year and three months, a year and six months and a year and nine months. This study applied them because by inducing investment scalability, current short-run and

long-run assets are considered to be utilized to generate current and future earnings. Therefore, different return periods refer to current return (R_{it}), and potential future return ($R_{i,t+1}$). Nevertheless, it is still notated as R_{it}.

The First Sensitivity Examination

Chen and Zhang (2007) examined their model sensitivity by categorizing profitability and growth opportunities into three groups, those are low group (L), medium group (M), and high group (H). The proposed consideration is that the coefficients of H group should be greater than M and L groups, and greater than zero ($\gamma_H > \gamma_M > 0$, and $\omega_H > \omega_M > 0$). Model used by Chen and Zhang (2007) is as follows.

$$R_{it} = \alpha + \beta x_{it} + \gamma \Delta \hat{q}_{it} + \gamma_M M\Delta \hat{q}_{it} + \gamma_H H\Delta \hat{q}_{it} + \delta \Delta \hat{b}_{it} + \omega \Delta \hat{g}_{it} + \omega_M M\Delta \hat{g}_{it} + \omega_H H\Delta \hat{g}_{it} + \varphi \Delta \hat{r}_{it} + e_{it} \quad \text{.....(14)}$$

with M and H represent group with profitability and growth opportunities those are greater than the lower group.

This study develops the classification of profitability and growth opportunities using four categories, namely, lower group (L), lower-medium group (LM), medium-high group (MH) and high group (H). This examination expects the result of comparison those are $\lambda_H > \lambda_{MH} > \lambda_{LM} > 0$, $\chi_H > \chi_{MH} > \chi_{LM} > 0$, $\phi_H > \phi_{MH} > \phi_{LM} > 0$, and $\pi_H > \pi_{MH} > \pi_{LM} > 0$. This study also performs model's linearity tests. The reason is that linear regressions models require free of normality, heteroscedasticity, and multicolinearity problems. Gujarati (2003) suggests that linear regression model is free from unbiased errors.

The Second Sensitivity Examination

This study performs sensitivity examination for model (12) and (13) by splitting sample into various partition. The partitioning criteria are the ratio between book value and market value of stock (PB ratio). The sensitivity examination is aimed to show return model consistency under various market levels. Moreover, model sensitivity may be achieved in different market chances. It is performed by splitting sample into quintiles of PB ratios.

4. Analysis, Discussion and Findings

Descriptive Statistics

This study acquires sample as much as 6,132 (25.45%) from available initial sample of 24,095 (100.00%) acquired from all stock market in Asia, Australia and United States of America during 2009. Before 2009 predicted data is unavailable in OSIRIS database. The number of data excluded and the reasons are as follow. First, stock price or return data incomplete, 8,939 (37.10%). Second, earnings data unavailable, 661 (2.74%). Third, no expected earnings and growth opportunities, 8,038 (33.36%). Fourth, firm with negative earnings, 167 (0.69%). Fifth, extreme value of earnings and expected earnings, 120 (0.50%). Last, inability to calculate abnormal return based on Fama and French (1992, 1993, and 1995), 38 (0.16%).

Data exclusion due to all six factors above is 17,963 (74.55%). The most dominant exclusion is because stock price incomplete and earnings data unavailable, as much as 70.46%. The result sample has fulfilled all required criteria. For example, this study is unable to acquire data of firms with negative book value because such firms do not have complete data of stock market price. The complete data is presented in Table 1 as follows.

Insert Table 1 about here

This study performed data analysis to investigate initial data tendency. The descriptive statistics are presented in Table 2. It shows the results as follows. Return for one year period (R_{i1}) is 0.8463 then decreases over time and become 0.0528 for R_{i4}. The decrease occurs in all level within percentile 25 (from 0.1667 to -0.2450) and percentile 75 (from 1.2500 to 0.2186) and indicates that firm market value in longer period is closer to real firm intrinsic value. By this tendency, firm fundamental values calculated from accounting information are expected to be reflected in firm's market value.

Insert Table 2 and its notes about here

Focusing on earnings after taxes (x_{it}), this study uses only profit firm. Earnings minimum value is 0.0000, with mean 0.2092, median 0.0968, and standard deviation 0.9104. The median lays in the left from its mean, it shows that some firms have extremely great earnings, so the mean increases. However, it is not a problem, since the standard deviation is less than one. The aligned movement between return and earnings shows that they probably associate. The change of earnings power (Δq_{it}), change of growth opportunities (Δg_{it}), and long-run assets scalability (Δlr_{it}) show relatively the same as the variations of earnings. Meanwhile, change of discount rate (Δr_{it}), change of short-run assets scalability (Δsr_{it}), and change of profitability (Δp_{it}) show otherwise. Nevertheless, the change of discount rate is expected to be not aligned. Though, change of short-run scalability and change of profitability with such movement may reduce degree of association of return model.

Firm's book value (B_{it}), market to book value ratio (PB_{it}), and stock market price (V_{it}) are always positive because, according criteria, this study excludes firms with negative earnings after tax and negative book value. Even after elimination of extreme value, B_{it} and V_{it} still have large maximum value. It occurs especially in developing countries, where stock market values usually move away from their book values. Book value (B_{it}) data pattern with mean, 29.8525 and median, 2.7450 resembles data pattern of stock market values. This pattern doesn't threat the association, and also data pattern of firm intrinsic values (V_{it}) reflected in stock market value at the end of accounting period.

Abnormal return calculation based on model by Fama and French (1992; 1993 and 1995) resulting mean 0.0000 for AR_{i1}, AR_{i2}, AR_{i3}, and AR_{i4}. This number shows that estimation of abnormal return is proven valid mathematically. Standard deviation of abnormal return becomes smaller along periods, from 0.9306 (AR_{i1}) to 0.4939 (AR_{i4}). Therefore, it can be concluded that abnormal return moves proportionally with firm market value which is closely reflects fundamental values derived from accounting information. Abnormal return movement is in accordance with return movement and earnings (x_{it}) movement, earnings power (Δq_{it}), change of growth opportunities (Δg_{it}), long-run assets scalability (Δlr_{it}), and all expected values. It is expected to prove the direction of

association as hypothesized. Additionally, this study could achieve higher degree of association.

Analysis of Chen and Zhang (2003) Model

This study, at the first analysis, examines Chen and Zhang (2003) model, or refers to basic model (model 12). The basic model constructs five related-cash flow factors associated with return. Those are earnings yield (x_{it}), change of firm's book value (Δb_{it}), change of earnings power (Δq_{it}), change of growth opportunities (Δg_{it}), and change of discount rate (Δr_{it}). The results of the first analysis are presented in Table 3.

Insert Table 3 and its notes about here

The analysis of Chen and Zhang (2003) model is not yet examine hypothesis by hypothesis. Instead, it is used as initial investigation of five related-cash flow factors associated with stock return. The results show that three variables, consist of earnings yield (x_{it}), firm's book value (Δb_{it}), and growth opportunities (Δg_{it}) is proven significantly in 1% level for various specification of return (R_{i1} to R_{i4}). This study is unable to prove earnings power (Δq_{it}) to associate with stock return which Chen and Zhang (2003) has proven almost consistently. Meantime, the change of pure interest rate (Δr_{it}) such as Chen and Zhang (2003) model, is also unable to prove. Consequently, this study concluded that basic model is supported adequately except for earnings power. However, basic model analysis shows sufficient degree of association with F-value 35.5187 and significant at level of 1%. The basic model has R^2 of 2.82% for R_{i1}, and lower for other return types. The degree of association with adjusted level is not significantly different, with *adj*-R^2 of 2.74%.

The results of this initial investigation are interesting for subjects with various efficiency strength of stock market. The rejections of earnings power (Δqit) lead the change the basic model. The results of basic model analysis show that the relation between accounting information and stock return is not flexible enough against the efficiency-form of stock market, economic uncertainty conditions, and the reflection of firm fundamental

values related to debts or capital concentration. The results needs to transform the basic model into a new model which is more detail and able to explain the change of earnings power. Furthermore, the transformation does not consider the change of pure interest rate (Δr_{it}) which is actually serves as lifter of the change of earnings power. The change of pure interest rate has proven inconsistently by previous studies. This study suspects that the change of pure interest rate must be more reflected when it was specified into short run or long run earnings powers.

Analysis of Investment Scalability Model

The second analysis transform basic model analysis which uses change of earnings power (Δq_{it}) into a model using the change of short run earnings power (Δsr_{it}) and long run earnings power (Δlr_{it}). This model is also called short-run and long-run investment scalabilities inducing model (model 13). Model specifies the earnings power into more detailed forms to investigate their associations with variations of stock price. Table 4 presents the results analysis.

Insert Table 4 and its notes about here

The results of model 13 analysis show that earnings yield (x_{it}), change of book value (Δb_{it}), change of short-run earnings power (Δsr_{it}), change of long-run earnings power (Δlr_{it}), change of growth opportunities (Δg_{it}), and change of discount rate (Δr_{it}) are associated with stock price movements. Consequently, H_{A1}, H_{A4}, and H_{A5} are supported at 1% level for return type's model $R_{i1} - R_{i4}$. H_{A4} is supported partially at 10% level only for R_{i1} return type with t-value amount to 1.7644. H_{A3} beside supported for R_{i1} return type, is also supported for R_{i2} with t-value amount to 1.7466 and significant at 10% level. The results of model 13 examination show adequate degree of association with F-value amount to 31.3601 and significant at 1% level. The model has R^2 amount to 2.98% for R_{i1} type, and lower for other return types. The model has *adj*-R^2 amount to 2.89%.

The analysis results show that model 13 is able to explain the association between change of earnings power (Δq_{it}) and stock return variations after specifying it into more detailed forms, short-run (Δsr_{it}) and long-run (Δlr_{it}) investment scalability. H_{A2} and H_{A3} are supported for both R_{i1} and R_{i2} return types. H_{A2} is also supported for R_{i2} return type. The results analysis implies that the effect of earnings power in aggregate value is actually weak. Therefore, splitting of earnings power into more detailed forms is necessary. Therefore, its association with variations of stock return becomes more comprehensible. Model 13 is better than basic model in its degree of association with *adj-*R^2 amount to 2.89% which is greater than those of the basic model having *adj-*R^2 amount to 2.74%.

Sensitivity Analysis 1: Categorical Arrangement

This study then analyzes the model based on categorical differentiation. This analysis serves to find more favorable degree of association. Model 14 should has higher goodness of fit when, after differentiation, it has higher degree of association and is still consistent with the main variable. The results of categorical arrangement for the basic model are presented in table 5 as follows.

Insert Table 5 and its notes about here

This analysis is aimed to identify the incremental explanatory power. Moreover, categorical arrangement serves to identify initial sensitivity so that hypothesis examination is supported in accordance with the theory. The categorical arrangement for model 14 based on basic model shows that there is difference which is greater than zero or positive for change of earnings power and growth opportunities. H_{A1}-H_{A5} are supported, the same as model 13 before. In detail, the change of earnings power for high group ($H\Delta q_{it}$) has greater degree of association with t-value amount to 16.2990 which is significant at 1% level compared to medium group ($H\Delta q_{it}$). Similar results go to growth opportunities. Model 14 shows better degree of association with R^2 amount to 12.34%, and *Adj-*R^2 amount to 12.21% for return R_{i1} type. Thus, model 14 has better explaining association power than

basic model. Therefore, the ratio between market value and book value serves well within the next analysis.

Sensitivity Analysis 2: PB Partitioning

This study organizes the sample based on PB ratio arrangement into five partitions (quintiles). This quintile arrangement serves to examine model sensitivity based on market strength which draws investors' attention, or no longer based on firm information strength merely. Such arrangement also serves to examine investors' rationality which does not possible anymore to act within stock mispricing. The results of second sensitivity analysis are presented in table 6 as follows.

Insert Table 6 and its notes about here

Table 6 proves that earnings yield (x_{it}), change of book value (Δb_{it}), and change of growth opportunities (Δg_{it}) associate with variations of stock prices in various return types and for all PB levels. Therefore, hypotheses H_{A1}, H_{A4} and H_{A5} are supported consistently in comparisons with previous examinations. Hypothesis H_{A2} is supported for $R_{i1} - R_{i3}$ return types and high level of PB with degree of association of 1%, and for R_{i4} return type and high and medium-high levels of PB with degree of association of 5%. Hypothesis H_{A3} is supported for R_{i1} return type and medium-high level of PB with degree of association of 10%.

The change of pure interest rate (Δr_{it}) in PB partitioning based associates negatively with stock price movements. The supports are shown at low level of PB and R_{i1} - R_{i4} return types with significance of 1% level, and low to medium-high levels of PB and $R_{i2} - R_{i4}$ return types with significance of 1% level, except for R_{i4} return type and medium-high level of PB with degree of significance of 5%. Therefore, this study concludes that H_{A6} is supported. It means that the change of pure interest rate is able to positively elevate earnings and investment scalability and end up in market equity value.

PB partition based model shows proof of R^2 increase up to 38.60%, and $Adj\text{-}R^2$ up to 38.30% for R_{i1} return type. Therefore, partition model has even better explanatory power than the basic model. Furthermore, the ratio of market value and book value works out well to improve model's degree of association.

Discussion

Overall examinations prove that six related-cash flow factors of accounting information associate with stock price variability with direction as hypothesized. This study interprets accounting information variables one by one and suggests some research findings.

Earnings yields Earnings yields associates positively with firm market value. The result of this study supports the classical concept (Ohlson, 1995), along with derivative studies Lo and Lys (2000), Francis and Schipper (1999), Meyers (1999), Bradshaw, Richardson and Sloan (2006), Cohen and Lys (2006), Bradshaw and Sloan (2002), Bhattacharya, et al. (2003), Collins, Maydew and Weiss (1997), Givoly and Hayn (2000), Kolev, Marquadt and McVay (2008), and Weiss, Naik and Tsai (2008). Even though Ohlson (1995) has flaw that earnings are noisy when measuring market equity value, this study concludes that earnings are primary determinant of firm's market value. Therefore, this study denotes that earnings are measures of value added in accounting. Moreover, its measurability is always reflected in market value.

Concurrence of earnings reflection in stock price variability, this study shows that earnings are fundamental signal (Ohlson, 1995; Feltham and Ohlson, 1995, 1996). This study comprehends that this fundamental signal is digested from its characteristic which serves as a lifter of firm performance. Earnings serve as lifter of firm operation performance and end as a lifter of stock price variability. Earnings are perceived by financial users as a primary determinant of firm's equity value. In other words, this study supports the concept of recursion theory (Sterling, 1968) suggesting that firm value is identified from book value and earnings. Consequently, this study suggests that variation of

stock prices fully reflects book value and earnings. Finally, this study concludes that the association between accounting earnings and stock price is undeniable.

Investment scalability and its change Short-run and long-run investment scalabilities can be used as predictors of market value. The analysis shows that investment scalability is associated with return. Therefore, this study concludes that short and long-run assets act as an earnings power. Consequently, assets increase means firm's equity increase (Bao and Bao, 1989; Cohen and Lys, 2006; Weiss, Naik and Tsai, 2008; Bradshaw, Richardson and Sloan, 2006; Abarbanell and Bushee, 1997; Abarbanell and Bushee, 1997; Francis and Schipper, 1999). This study supports that short-run and long-run investment is earnings power and then return when they have low cost of capital. The reason is, the increase of short-run and long-run investment refers to the increase of future earnings power, meaning the increase of firm's equity value. Moreover, the increase of short-run and long-run assets investment will decrease cost of capital, namely the firm ability to pay dividend will decline. Therefore, investment scalability associates with stock price variability directly through dividend or indirectly through earnings variability.

This study supports old concept that book value and earnings are closely related to firm's market value. Rao and Litzenberger (1971), and Litzenberger and Rao (1972) formulate that firm market value is a function of book value and earnings but still adjustable to function of debts and change of firm's growth opportunities. Analysis and inferences from previous studies show that this study supports adaptation theory (Wright, 1967). Supporting to all hypotheses indicates that firm assets are modifiable to generate future potential earnings. This study concludes that the role of financial position information, it is not equity capital, may also become a determinant of stock price variability, especially the role of assets and liabilities.

Book value and its change This study confirms the relationship between book value and stock return. This study supports Ohlson (1995) and Lundholm (1995) which conclude that book value determine firm's market value. Moreover, Lo and Lys (2000) propose concept that firm equity value is a function of all discounted future earnings and

dividend. Dechow, Hutton, and Sloan (1999) re-evaluate return model which is still based on earnings. Beaver (1999), Hand (2001), and Myers (1999) verify that book value and earnings serve as evaluator of firm market value without ignoring Ohlsons' concept. Within the same logical and reasoning, this study infers that accounting information of book value improve degree of association of return model.

This study implies that the change of book value is a primary measurement of firm's equity value. The change of book value is identical with current earnings measurement. Therefore, the change of book value is in accordance with the growth of equity capital, which in turn, in accordance with the change of stock return (Rao and Litzenberger, 1971; Litzenberger and Rao, 1972; Bao and Bao, 1989; Burgstahler and Dichev, 1997; Collins, Pincus and Xie, 1999; Collins, Kothari and Rayburn, 1987; Cohen and Lys, 2006; Liu and Thomas, 2000; Liu, Nissim and Thomas, 2001; Weiss, Naik and Tsai, 2008; Chen and Zhang, 2007; Ohlson, 1995; Feltham and Ohlson, 1995; Feltham and Ohlson, 1996; Bradshaw, Richardson and Sloan, 2006; and Abarbanell and Bushee, 1997).

Growth Opportunities This study supports to Rao and Litzenberger (1971), Litzenberger and Rao (1972), and Bao and Bao (1972) that growth opportunities increase firm competitiveness. Consequently, the higher efficiency the higher productivity is. Miller and Modigliani (1961) suggest that growing firms always has positive rate of return for each invested assets. It means that every invested resource have lower cost of capital than firms within an industry.

This study posits that firm value is determined by growth and future potential growth opportunities (Liu, Nissim and Thomas, 2001; Aboody, Hughes and Liu, 2002; and Frankel and Lee, 1998). Current growth drives the increasing of future earnings, while future potential growth reduces model's error to improve association degree of return model. Lev and Thiagarajan (1993), Abarbanell and Bushee (1997), and Weiss, Naik and Tsai (2008) conclude that growth of inventories, gross profit, sales, account receivables and the others improve future earnings growth. Simultaneously, this research concludes that stock market value adapts to the growth of those factors.

Change of Discount Rate This study documents that the change of discount rate is associated negatively with annual stock return. From the beginning, this study implies that firm equity value can be increased by adaptation concept. The equity value may be increased by adapting alternative resources through the lower interest rate. Consequently, the invested resources managed by firm would be more productive (Burgstahler and Dichev, 1997). Aboody, Hughes and Liu (2002), Frankel and Lee (1998), Zhang (2003) and Chen and Zhang (2007) argue that earnings growth is determined by some factors, one of them is interest rate. Later, earnings growth associates positively with stock price variability.

This study has a perspective that interest rate play a role as multiplier effects. When interest rate decreases, the firm may generate more earnings. It means that firms acquire more liabilities or new invested capital that firm's weighted interest rate will decline (Rao and Litzenberger, 1971; and Litzenberger and Rao, 1972). Therefore, this study infers that firm's equity value is highly determined by expected discount rate (Danielson and Dowdell, 2001; and Liu, Nissim and Thomas, 2001).

Model This study conducts five model examinations and re-examines with two sensitivity tests. The results of investment scalability analysis show that model 13 has *adj-*R^2 within range of 2%-3% higher than basic model (12) with *adj-*R^2 within range of 2%. This study shows that newly designed model has better degree of association and could explain return association with 1% increase. Next, this study examines by categorical arrangement based on PB ratio. The analysis results demonstrate that *adj-*R^2 is within a range of 6%-11%. These results indicate that when sample was differentiated categorically into sub sample, the association degree of return model increases. It also can be noted that incremental explanatory power is around 9% compared to basic model. The analysis based on PB ratio partition confirms that this model shows high degree of association with *adj-*R^2 about 5%-38%. It is approximately 10%-20% higher than two analyses before. Until this stage, this study is able to show better association degree of return model. Thus, this model is more comprehensive, more realistic, and better accuracy.

Research Findings

Based on overall analysis, this study confirms to the theory and finds some empirical evidences. *First*, all accounting fundamentals, simply as theory, is confirmed to associate with stock price variability. All related-cash flow variables, they are earnings yield, short-run and long-run investment scalabilities, book value, and growth opportunities associate positively. Meanwhile, change of discount rate or pure interest rate, associates negatively. *Second*, change of earnings power in a single measure is verified to explain stock price variability weakly. Until recently, some empirical evidences measure the earnings power as single unit. This study splits this measure into short-run and long-run investment scalabilities and finds that both measures are associated positively with annual stock return. Examination using PB ratio partition shows consistent results for sub samples with low to medium-high PB ratio.

Third, this study could synergize between adaptation theory (Wright, 1967) and recursion theory (Sterling, 1968). Earnings explain stock price variability for a half century. It means that recursion theory is still valid. On the other sides, the result that short-run and long-run investment scalabilities implies that adaptation theory is also valid. This study combines both theories into one model and finds that both theories are demonstrated valid and even the model has better degree of association. Recursion theory which relies on earnings and book value as Ohlson's model (Ohlson, 1995; Feltham and Ohlson, 1995; 1996) is called orthodox paradigm. This forty years old paradigm can be revised by being complemented with older paradigm, it is adaptation theory. Therefore, this study comprehends that both theories are complementing, not substituting reciprocally.

Invested resources capital could be used to generate either potential current or future earnings. Evidences in linkage with invested assets are agent's liabilities. They should disclose information of their activities or projects that create wealth for investors. Firm is also required to disclose information related to increase or decrease of its liabilities. Rational investors should not only cover information related to earnings and book value,

but also characteristics of firm's investment scalability in the financial statements. The detailed assets show that investors could utilize them to perceive earnings powers.

Fourth, this study fruitfully verifies the association between accounting fundamentals and variations of stock price with higher association degree than previous study (Chen and Zhang, 2003). Previous study records highest score for *adj-*R^2 about 20% which comes from sub sample partition. This study makes higher result in sub sample, within range of 7%-38% for PB ratio partition. *Fifth*, this study finds and confirms that accounting fundamentals is related to stock price variability in cross-sectional stock return. This study reminds about the understanding of strong association between accounting fundamentals and stock price variability. This study suggests that not only earnings, but also invested assets should be disclosed immediately to public. The timeliness and comprehensively of firm's disclosures into capital market could reduce the anomaly of stock price variability. Such policy is expected to repress firm value deviation.

Sixth, confirm to the association between the six related-cash flow factors and stock price variability, this study pinpoints that investors' trading strategy should revert to accounting fundamentals. They should rely on them. This suggestion complies with current tendency of stock trading strategy, due to fluctuation of stock market and economic uncertainty. This study formulates that accounting fundamentals, they are assets, book value, earnings and others, are the main factor to explain firm value or return. This study argues because it is supported by reported accounting data.

5. Conclusions and Limitations

Conclusions

This study deducts analysis results in conclusion as follow. Earnings yields and book value associates positively with firm market value. Short-run and long-run investment scalabilities may serve as prime determinant of stock price variability. It means that short term and long term assets are exploited to generate potential future earnings. Growth opportunities also associates with the variations of stock price. In other words, stock price adjusts to growth opportunities. The change of discount rate associates negatively with

annual stock return. It can be explained with adoption of cheap alternative resources by lower interest rate. All of examination results confirm the direction as hypothesized. Additionally, sensitivity test based on PB ratio show similar results. This study delivers better degree of return association. However, this result is comparable with previous study which shows low association degree. Nevertheless, this study contributes an incremental explanatory power.

The association between accounting fundamentals and variations of stock price is confirmed as theory categorized by PB ratio. Specifically, high and medium-high PB ratios could explain stock price variability better than lower PB ratio. Within theory level, this study finds empirical evidence of the synergy between adaptation theory and recursion theory. Therefore, investors should not only simply cover information related to earnings and book value, but they should reap to characteristics of investment scalability or invested resources.

This study documents higher degree of association when explaining stock price variability with accounting fundamentals than previous study. It is proven better in sub sample partition, especially with PB ratio. All findings are ended in conclusion that this study verifies that accounting information associates with stock price variability. Additionally, this study comprehends that investors' trading strategy should revert to accounting fundamentals.

Limitations

This study has some limitations as follows. *First*, it uses large data sample so that its *Adj-*R^2 is low due to law of large data sample. *Second*, this study has survivorship bias in its sample used to verify all hypotheses. From all 24,095 firm-years, this study only uses 6,132 (25.45%) because the remainders are un-analyzable. *Third*, this study did not find firms with negative book value and negative earnings after tax, because it uses purposive sampling criteria. They should be employed as control group. Because of the unavailability, this study fails to identify the robustness results for these group characteristics. *Fourth*, there is a bias because the blending of all stock markets, from semi-strong to weak forms.

Though this limitation is deniable by market-wide regime concept, this study ignores the characteristics of economics, regulations, trading mechanism and cultures among countries. Factually, those factors may affect return model.

Fifth, this study uses earnings after tax so it disregards earnings quality. Earnings quality may affect return model. Nevertheless, this issue is denied because the sample tends to show low PB ratio. It means that this sample usually has good earnings quality. *Sixth*, this study does not consider conservatism in published financial reports, so that assets may be disclosed lower than they should be. This ex-ante conservatism may affect return model. This study does not consider the conservatism level. *Seventh*, investment scalability measurement is weak because it only consists of current assets, fixed assets, short term liabilities and long term liabilities. This study ignores that there might be some reserved or construction in progress that may be operated immediately.

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Table 1 Sample Data

No	Note	Decrease		Sample	
		Number	%	Number	%
1	Population			24,095	100.00%
2	Stock price data incomplete	8,939	37.10%	15,156	62.90%
3	Earnings data unavailable	661	2.74%	14,495	60.16%
4	Expected data unavailable	8,038	33.36%	6,457	26.80%
5	Lossing company exclusion	167	0.69%	6,290	26.11%
6	Extreme value exclusion	120	0.50%	6,170	25.61%
7	Inability to calculate abnormal return	38	0.16%	6,132	25.45%
	Total	17,963	74.55%		

Table 2 Descriptive Statistics

No.	Variable	Min.	Max.	Mean	Median	Std. Deviation	Perc. - 25	Perc. - 75
1	R_{i1}	-0.9954	9.8966	0.8463	0.5880	0.9999	0.1667	1.2500
2	R_{i2}	-0.9964	8.0000	0.4600	0.2419	0.7506	-0.0151	0.7500
3	R_{i3}	-0.9966	9.0000	0.1627	0.0327	0.5932	-0.1981	0.3689
4	R_{i4}	-0.9939	6.6310	0.0528	-0.0356	0.5175	-0.2450	0.2186
5	X_{it}	0.0000	46.2025	0.2092	0.0968	0.9104	0.0532	0.1959
6	Δq_{it}	-55.1125	58.8148	0.0571	0.0071	1.7100	-0.0313	0.0772
7	Δb_{it}	-54.3503	33.3750	-0.0873	0.0011	1.7231	-0.0608	0.0553
8	Δg_{it}	-10.6073	54.4328	0.1977	0.0683	1.2737	0.0056	0.1976
9	Δr_{it}	-29.9957	28.9790	-0.1362	-0.0737	1.3559	-0.4694	0.0301
10	Δsr_{it}	-506.3845	202.6165	0.0336	0.0907	11.8351	-0.1125	0.4198
11	Δlr_{it}	-250.0161	289.1262	0.2959	0.0609	6.3004	-0.0368	0.2572
12	Δp_{it}	-54.3503	33.3750	-0.0873	0.0011	1.7231	-0.0608	0.0553
13	PB_{it}	0.0026	70.4000	1.0362	0.6831	2.4254	0.3594	1.2095
14	V_{it}	0.0100	6,843.3600	39.3251	3.6300	248.8796	1.1600	16.3400
15	B_{it}	0.0200	4,601.1500	29.8525	2.7450	189.1163	0.5400	10.6200
16	AR_{i1}	-2.6632	8.9513	0.0000	-0.2030	0.9306	-0.5655	0.3361
17	AR_{i2}	-2.3542	7.1236	0.0000	-0.1283	0.6854	-0.4069	0.2438
18	AR_{i3}	-1.8951	8.5445	0.0000	-0.0862	0.5433	-0.3150	0.1953
19	AR_{i4}	-1.3450	6.2174	0.0000	-0.0818	0.4939	-0.2785	0.1558

Notes: R_{it}: stock return firm i during period *1* (a year), 2 (a year and three months), 3 (a year and six months), and 4 (a year and nine months); x_{it}: earnings, firm i during period t; Δq_{it}: change of profitability, firm i during period t; Δb_{it}: change of book value, firm i during period t; Δg_{it}: change of growth opportunities, firm i during period t; Δr_{it}: change of discount rate, firm i during period t; Δsr_{it}: change of short-run assets scalability; Δlr_{it}: change of long-run assets scalability; Δp_{it}: change profitability, firm i during period t; E: abbreviation of expected; PB_{it}: ratio between stock market value and firm book value, firm i during period t; V_{it}: stock market value, firm i during period t; B_{it}: book value, firm i during period t; AR_{it}: abnormal stock return, firm i during period *1* (a year), 2 (a year and three months), 3 (a year and six months), and 4 (a year and nine months). Special note, Δb_{it} is identical with Δp_{it}, the former is used in basic model, while the later is used in this study.

Table 3 The Results of Basic Model Analysis

Var(s)	Pred.	R_{i1}			R_{i2}			R_{i3}			R_{i4}		
		Coef.	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*
α	?	0.8096	61.3526	0.0000 ***	0.4447	44.4938	0.0000 ***	0.1548	19.5395	0.0000 ***	0.0419	6.0803	0.0000 ***
X_{it}	+	0.1452	6.7848	0.0000 ***	0.0518	3.1938	0.0014 ***	0.0203	1.5765	0.1150	0.0397	3.5517	0.0004 ***
Δq_{it}	+	0.0002	0.0228	0.9818	0.0071	1.0400	0.2984	0.0084	1.5582	0.1192	0.0019	0.4119	0.6805
Δb_{it}	+	0.0450	4.7703	0.0000 ***	0.0277	3.8822	0.0001 ***	0.0191	3.3806	0.0007 ***	0.0256	5.2008	0.0000 ***
Δg_{it}	+	0.0770	7.0549	0.0000 ***	0.0438	5.2991	0.0000 ***	0.0246	3.7618	0.0002 ***	0.0248	4.3416	0.0000 ***
Δr_{it}	-	0.0370	3.9584	0.0001	0.0158	2.2393	0.0252	0.0000	-0.0070	0.9944	0.0017	0.3432	0.7315
F-value			35.5187	0.0000 ***		13.5133	0.0000 ***		6.0406	0.0000 ***		10.9147	0.0000 ***
R^2			2.82%			1.09%			0.49%			0.88%	
Adj-R^2			2.74%			1.01%			0.41%			0.80%	

Notes: Number of observation (N): 6,132. R_{it}: stock return, firm *i* during period *1* (a year), 2 (a year and three months), 3 (a year and six months), and 4 (a year and nine months); x_{it}: earnings, firm *i* during period *t*; Δq_{it}: change of profitability, firm *i* during period *t*; Δb_{it}: change of book value, firm *i* during period *t*; Δg_{it}: change of growth opportunities, firm *i* during period *t*; Δr_{it}: change of discount rate, firm *i* during period t; *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Linearity test for this model 12 shows that: (1) With Kolmogorov-Smirnov test shows t-value 9.036 and p-value 0.000, and Jarque and Berra shows t-value 15,202.42 and chi-square 0.000, it means that the residuals are not distributed normally. However, normality test is ignorable for large data sample that is 6,132. It tends to follow a central limit theorem (Gudjarati, 2003). (2) Glejser's test for heteroscedasticity shows that all variables have significance above 0.05, with t-value (sig.) x_{it} amount to 0.013 (0.989); Δq_{it} amount to -0.014 (0.989); Δb_{it} amount to -0.007 (0.994); Δg_{it} amount to -0.073 (0.942); and Δr_{it} amount to 0.010 (0.992). The test shows that the data is free from heteroscedasticity problem. (3) Multicolinearity test shows that all variables have VIF about one which means that there is no colinearity among variables, VIF value for each variable is, x_{it} amount to 2.394; Δq_{it} amount to 1.483; Δb_{it} amount to 1.664; Δg_{it} amount to 1.218; and Δr_{it} amount to 1.010.

Table 4 The Results of Investment Scalability Model Analysis

Var(s)	Pred.	R_{i1}			R_{i2}			R_{i3}			R_{i4}		
		Coef.	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*
α	?	0.8075	61.4695	0.0000 ***	0.4430	44.5037	0.0000 ***	0.1535	19.4414	0.0000 ***	0.0416	6.0579	0.0000 ***
X_{it}	+	0.1447	7.9547	0.0000 ***	0.0601	4.3603	0.0000 ***	0.0305	2.7868	0.0053 ***	0.0418	4.3937	0.0000 ***
Δsr_{it}	+	0.0030	2.6663	0.0077 ***	0.0015	1.7446	0.0811 *	0.0008	1.1375	0.2554	0.0008	1.3158	0.1883
Δlr_{it}	+	0.0035	1.7644	0.0777 *	-0.0006	-0.4149	0.6782	-0.0013	-1.0701	0.2846	-0.0017	-1.6076	0.1080
Δp_{it}	+	0.0461	4.9185	0.0000 ***	0.0286	4.0283	0.0001 ***	0.0200	3.5407	0.0004 ***	0.0257	5.2351	0.0000 ***
Δg_{it}	+	0.0833	7.5241	0.0000 ***	0.0461	5.4937	0.0000 ***	0.0250	3.7516	0.0002 ***	0.0271	4.6801	0.0000 ***
Δr_{it}	-	0.0374	4.0118	0.0001	0.0156	2.2068	0.0274	-0.0004	-0.0790	0.9370	0.0016	0.3181	0.7504
F-value			31.3601	0.0000 ***		11.6169	0.0000 ***		5.0317	0.0000 ***		9.7857	0.0000 ***
R^2			2.98%			1.13%			0.49%			0.95%	
Adj-R^2			2.89%			1.03%			0.39%			0.85%	

Notes: Number of observation (N): 6,132. R_{it}: stock return, firm *i* during period *1* (a year), 2 (a year and three months), 3 (a year and six months), and 4 (a year and nine months); x_{it}: earnings, firm *i* during period *t*; Δsr_{it}: change of short-run assets scalability, firm *i* during period *t*; Δlr_{it}: change of long-run assets scalability, firm *i* during period *t*; Δp_{it}: change of profitability, firm *i* during period *t*; Δg_{it}: change of growth opportunities, firm *i* during period *t*; Δr_{it}: change of discount rate, firm *i* during period t; *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Linearity test for this model 13 shows that: (1) With Kolmogorov-Smirnov test shows t-value 9.035 and p-value 0.000, and Jarque and Berra shows t-value 15,202.42 and chi-square 0.000, it means that the residuals are not distributed normally. However, normality test is ignorable for large data sample that is 6,132. It tends to follow central limit theorem (Gudjarati, 2003). (2) Glejser's test for

heteroscedasticity shows that all variables have significance above 0.05, with t-value (sig.) x_{it} amount to 0.045 (0.964); Δsr_{it} amount to -0.045 (0.964); Δlr_{it} amount to -0.035 (0.972); Δp_{it} amount to 0.000 (0.990); Δg_{it} amount to -0.067 (0.946); and Δr_{it} amount to 0.000 (0.990). The test shows that the data is free from heteroscedasticity problem. (3) Multicolinearity test shows that all variables have VIF about one which means that there is no colinearity among variables, VIF value for each variable is, x_{it} amount to 1.731; Δsr_{it} amount to 1.086; Δlr_{it} amount to 1.014; Δp_{it} amount to 1.650; Δg_{it} amount to 1.257; and Δr_{it} amount to 1.008.

Table 5 The Results of Categorical Arrangement for Basic Model Analysis

Var(s)	Pred.	R_{i1}			R_{i2}			R_{i3}			R_{i4}		
		Coef.	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*
α	?	0.6058	18.7617	0.0000 ***	0.1114	4.5000	0.0000 ***	-0.1311	-6.6248	0.0000 ***	-0.1726	-9.8938	0.0000 ***
X_{it}	+	0.1219	5.9680	0.0000 ***	0.0521	3.3264	0.0009 ***	0.0297	2.3692	0.0179 **	0.0454	4.1175	0.0000 ***
Δq_{it}	+	-0.0188	-2.1794	0.0293	-0.0114	-1.7297	0.0837	-0.0071	-1.3465	0.1782	-0.0074	-1.5931	0.1112
$M\Delta q_{it}$	H>M>0	0.0174	0.5442	0.5863	0.2069	8.4532	0.0000 ***	0.2334	11.9242	0.0000 ***	0.1219	7.0670	0.0000 ***
$H\Delta q_{it}$	H>M>0	0.4895	16.2990	0.0000 ***	0.3980	17.2896	0.0000 ***	0.3096	16.8177	0.0000 ***	0.1824	11.2394	0.0000 ***
Δb_{it}	+	0.0363	4.0447	0.0001 ***	0.0217	3.1501	0.0016 ***	0.0161	2.9241	0.0035 ***	0.0230	4.7548	0.0000 ***
Δg_{it}	+	0.0453	4.2684	0.0000 ***	0.0175	2.1477	0.0318 **	0.0105	1.6150	0.1064	0.0119	2.0831	0.0373 **
$M\Delta g_{it}$	H>M>0	-0.1477	-4.1981	0.0000	0.0547	2.0283	0.0426 **	0.0978	4.5328	0.0000 ***	0.1105	5.8089	0.0000 ***
$H\Delta g_{it}$	H>M>0	0.1975	5.5108	0.0000 ***	0.2392	8.7095	0.0000 ***	0.1315	5.9864	0.0000 ***	0.1505	7.7714	0.0000 ***
Δr_{it}	-	0.0493	5.5458	0.0000	0.0248	3.6413	0.0003	0.0050	0.9099	0.3629	0.0055	1.1422	0.2534
F-value			95.7330	0.0000 ***		63.9787	0.0000 ***		46.4409	0.0000 ***		31.9229	0.0000 ***
R^2			12.34%			8.60%			6.39%			4.48%	
Adj-R^2			12.21%			8.46%			6.25%			4.34%	

Notes: Number of observation (N): 6,132. R_{it}: stock return, firm *i* during period *1* (a year), 2 (a year and three months), 3 (a year and six months), and 4 (a year and nine months); x_{it}: earnings, firm *i* during period *t*; Δq_{it}: change of profitability, firm *i* during period *t* (in basic model notated as Δp_{it}); Δb_{it}: change of book value, firm *i* during period *t*; Δg_{it}: change of growth opportunities, firm *i* during period *t*; Δr_{it}: change of discount rate, firm *i* during period t; *** significant at 1% level, ** significant at 5% level, * significant at 10% level. Categorical arrangement of profitability and growth opportunities with conditions, consecutively, $\gamma_H > \gamma_M > 0$, and $\omega_H > \omega_M > 0$ serves to examine the association degree related to profitability and growth opportunities characteristics.

Table 6: The Results of Inducing the Change in Investment Scalability Analysis

	Coef.	Pred.	R_{i1}			R_{i2}			R_{i3}			R_{i4}		
			Coef.	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*
Low PB	α	?	0.9262	26.3673	0.0000 ***	0.8079	25.2705	0.0000 ***	0.4863	18.5310	0.0000 ***	0.2146	9.5104	0.0000 ***
	X_{it}	+	3.6746	15.2294	0.0000 ***	0.8236	3.7505	0.0002 ***	0.5175	2.8714	0.0042 ***	0.6577	4.2440	0.0000 ***
	Δsr_{it}	+	0.0002	0.0892	0.9289	-0.0006	-0.3446	0.7305	0.0008	0.5967	0.5509	0.0008	0.7097	0.4780
	Δlr_{it}	+	-0.0306	-2.0497	0.0406	-0.0198	-1.4573	0.1453	-0.0187	-1.6717	0.0948	-0.0176	-1.8374	0.0664
	Δp_{it}	+	0.0414	2.6972	0.0071 ***	0.0293	2.1012	0.0358 **	0.0175	1.5289	0.1265	0.0136	1.3792	0.1681
	Δg_{it}	+	-0.7296	-9.9661	0.0000	-0.0601	-0.9018	0.3673	-0.0061	-0.1121	0.9107	-0.0756	-1.6071	0.1083
	Δr_{it}	-	-1.9473	-9.4720	0.0000 ***	-1.2520	-6.6911	0.0000 ***	-0.8871	-5.7763	0.0000 ***	-0.5965	-4.5176	0.0000 ***
	F-value			56.8679	0.0000 ***		11.7171	0.0000 ***		9.2309	0.0000 ***		8.2587	0.0000 ***
	R^2			21.86%			5.45%			4.34%			3.90%	
	Adj-R^2			21.47%			4.98%			3.87%			3.43%	
	Coef.	**Pred.**	R_{i1}			R_{i2}			R_{i3}			R_{i4}		
			Coef.	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*
Low-Medium PB	α	?	0.9273	27.1602	0.0000 ***	0.4944	20.1531	0.0000 ***	0.2299	11.6663	0.0000 ***	0.0922	5.1260	0.0000 ***
	X_{it}	+	0.1362	2.2081	0.0274 **	0.1212	2.7338	0.0064 ***	0.1147	3.2218	0.0013 ***	0.1810	5.5703	0.0000 ***
	Δsr_{it}	+	-0.0055	-1.0154	0.3101	-0.0022	-0.5594	0.5760	-0.0035	-1.1290	0.2591	-0.0053	-1.8672	0.0621
	Δlr_{it}	+	0.0041	0.4881	0.6256	-0.0046	-0.7620	0.4462	0.0000	-0.0072	0.9942	0.0010	0.2176	0.8278
	Δp_{it}	+	0.0517	1.0571	0.2907	0.0740	2.1054	0.0355 **	0.0808	2.8596	0.0043 ***	0.1315	5.1021	0.0000 ***
	Δg_{it}	+	0.7051	8.4779	0.0000 ***	0.4950	8.2823	0.0000 ***	0.2773	5.7771	0.0000 ***	0.2252	5.1386	0.0000 ***
	Δr_{it}	-	-0.0479	-0.7671	0.4432	-0.0464	-1.0332	0.3017	-0.0938	-2.6034	0.0093 ***	-0.0638	-1.9401	0.0526 *
	F-value			13.7341	0.0000 ***		13.7660	0.0000 ***		9.3563	0.0000 ***		11.4706	0.0000 ***
	R^2			6.33%			6.35%			4.40%			5.34%	
	Adj-R^2			5.87%			5.88%			3.93%			4.88%	
	Coef.	**Pred.**	R_{i1}			R_{i2}			R_{i3}			R_{i4}		
			Coef.	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*
Medium-Medium PB	α	?	0.5106	17.1578	0.0000 ***	0.1834	8.9008	0.0000 ***	-0.0236	-1.5134	0.1304	-0.0716	-4.9097	0.0000 ***
	X_{it}	+	1.0372	13.2985	0.0000 ***	0.5999	11.1093	0.0000 ***	0.3527	8.6174	0.0000 ***	0.3531	9.2338	0.0000 ***
	Δsr_{it}	+	0.0072	1.1376	0.2555	0.0062	1.4053	0.1602	0.0040	1.1825	0.2372	0.0064	2.0561	0.0400 **
	Δlr_{it}	+	0.0060	0.7466	0.4554	-0.0123	-2.2334	0.0257	-0.0046	-1.0887	0.2765	-0.0077	-1.9811	0.0478
	Δp_{it}	+	-0.0226	-1.0891	0.2763	-0.0227	-1.5800	0.1144	0.0052	0.4738	0.6357	0.0219	2.1477	0.0319 **
	Δg_{it}	+	0.8992	10.0492	0.0000 ***	0.7072	11.4168	0.0000 ***	0.3908	8.3219	0.0000 ***	0.3735	8.5146	0.0000 ***
	Δr_{it}	-	0.0213	0.7259	0.4680	-0.0118	-0.5816	0.5609	-0.0421	-2.7392	0.0062 ***	-0.0364	-2.5338	0.0114 **
	F-value			44.6507	0.0000 ***		40.0357	0.0000 ***		23.7174	0.0000 ***		26.9835	0.0000 ***
	R^2			18.01%			16.45%			10.45%			11.72%	
	Adj-R^2			17.60%			16.04%			10.01%			11.28%	
	Coef.	**Pred.**	R_{i1}			R_{i2}			R_{i3}			R_{i4}		
			Coef.	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*
Medium-High PB	α	?	0.2714	11.2791	0.0000 ***	0.0796	4.6595	0.0000 ***	-0.1066	-8.0359	0.0000 ***	-0.1325	-10.0345	0.0000 ***
	X_{it}	+	1.6294	21.2164	0.0000 ***	0.9001	16.5045	0.0000 ***	0.5053	11.9339	0.0000 ***	0.3746	8.8874	0.0000 ***
	Δsr_{it}	+	0.0010	0.4065	0.6844	-0.0005	-0.2814	0.7784	0.0008	0.5618	0.5744	0.0010	0.7710	0.4409
	Δlr_{it}	+	0.0030	1.7680	0.0773 *	0.0017	1.4319	0.1524	-0.0008	-0.8013	0.4231	-0.0010	-1.1049	0.2694
	Δp_{it}	+	0.0258	1.9758	0.0484 **	0.0126	1.3570	0.1750	-0.0059	-0.8180	0.4135	0.0035	0.4878	0.6258
	Δg_{it}	+	0.2448	4.8097	0.0000 ***	0.0825	2.2821	0.0227 **	-0.0192	-0.6838	0.4942	0.0195	0.6972	0.4858
	Δr_{it}	-	0.0279	1.8392	0.0661	-0.0082	-0.7566	0.4494	-0.0331	-3.9548	0.0001 ***	-0.0208	-2.4959	0.0127 **
	F-value			127.7231	0.0000 ***		70.0659	0.0000 ***		34.7146	0.0000 ***		20.1725	0.0000 ***
	R^2			38.60%			25.64%			14.59%			9.03%	
	Adj-R^2			38.30%			25.28%			14.17%			8.58%	
	Coef.	**Pred.**	R_{i1}			R_{i2}			R_{i3}			R_{i4}		
			Coef.	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*	*Coef.*	*t-value*	*Sig.*
High PB	α	?	0.4335	21.6449	0.0000 ***	0.1444	9.8993	0.0000 ***	-0.1275	-12.4631	0.0000 ***	-0.1729	-17.6318	0.0000 ***
	X_{it}	+	0.0938	4.1453	0.0000 ***	0.0403	2.4450	0.0146 **	0.0259	2.2394	0.0253 **	0.0243	2.1922	0.0286 **
	Δsr_{it}	+	0.0053	4.5853	0.0000 ***	0.0039	4.6269	0.0000 ***	0.0019	3.1430	0.0017 ***	0.0014	2.3871	0.0171 **
	Δlr_{it}	+	0.0047	1.4485	0.1477	-0.0026	-1.1144	0.2653	-0.0007	-0.4333	0.6649	-0.0019	-1.1925	0.2333
	Δp_{it}	+	0.0359	2.2089	0.0274 **	0.0173	1.4596	0.1447	0.0162	1.9544	0.0509 *	0.0186	2.3316	0.0199 **
	Δg_{it}	+	0.0688	6.8601	0.0000 ***	0.0430	5.8899	0.0000 ***	0.0237	4.6342	0.0000 ***	0.0269	5.4863	0.0000 ***
	Δr_{it}	-	0.0247	3.2440	0.0012	0.0110	1.9782	0.0481	-0.0013	-0.3272	0.7435	0.0019	0.5116	0.6090
	F-value			19.6192	0.0000 ***		11.3087	0.0000 ***		5.7043	0.0000 ***		7.1771	0.0000 ***
	R^2			8.81%			5.27%			2.73%			3.41%	
	Adj-R^2			8.36%			4.81%			2.25%			2.94%	

Additional Notes: Number of observation (N) for Low PB: 1,227, Low-Medium PB: 1,226, Medium-Medium PB: 1,227, Medium-High PB: 1,226, High PB: 1,226. The limits of each PB: Low PB < 0.3065; Low-Medium PB < 0.5462; Medium-Medium PB < 0.8505; Medium-High PB < 1.3687, High PB > 1.3687.