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The Role of Accounting Fundamentals in Explaining Stock Returns: Case of Pakistan Stock Exchange (PSX)

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ABSTRACT

This study demonstrates that a firm's accounting variables have a considerable impact on stock price movements. This data is based on the Zhang model (Chen & Zhang 2007), which associates a firm's return with its underlying accounting measurements. Stock returns are estimated by combining four cashflow-based accounting indicators (earnings yield, growth potential, equity capital investment, and profitability) with one non-cashflow-based component (discount rate). The data was acquired from firms on the KSE-100 index. The relationships were analyzed using a fixed effect regression model with a time frame ranging from 2016 to 2023. The empirical findings of this study show that earning yield has a considerable positive impact on stock returns while discount rate has a significant negative impact.

Introduction

Investors can benefit from accounting variables since they provide insight into the firm's financial standing and operational success. If there is a substantial correlation between these characteristics and stock returns, the investor may find this information helpful in building an optimal portfolio. The investor benefits greatly from precise and accurate information to ensure that the stock is priced appropriately. The goal of the study is to find out if accounting variables in Pakistan can account for stock returns. Stock returns in an efficient market should show all the accounting data that is known about that stock. This work primarily adheres to Eugene Fama's efficient market hypothesis (EMH) and the Zhang model (Chen & Zhang 2007).

This model states that the accounting metrics of a company's core business operations relate to the stock returns of that company. According to EMH, a market is efficient when the prices of its stocks accurately reflect all the information that is currently accessible about a company. A theoretical framework has been developed to explain the connection between accounting data and stock returns, according to Zhang, to examine this impact. Furthermore, how do returns compare to the derived function of accounting data? The model's ability to describe the relationship to a remarkable extent will be empirically tested when it has been established.

Four of the five independent variables in the model—growth rate, profitability, equity capital investment, and earning yield—are associated with cash flow, whereas the fifth variable—discount rate—is not. Earnings yield is one of the four primary cash-flow related factors that are chosen to see how accounting information affects stock returns. Profitability demonstrates a company's operational efficiency, which further explains the expected cash flows of the company. It is evident that a company's cash flows are influenced by the scale of its operations; equity capital investment has an impact on the current size of operations, while growth prospects have an impact on the future size of operations. However, when these variables are paired with the discount rate, the entire set of adjustments has an impact on stock returns.

Prior research examines how accounting data affects stock prices since it is important for stock valuation. Returns on equity are significantly impacted by earnings. It is established by empirical findings and prior research that capital investment has the least effect on stock returns, whereas earning yield has the most. For many years, equity valuation has been a concentrated area of study for academics and scholars. Each scholar attempted to approach equity valuation from a different perspective. This research's primary goal is to assist market players by adhering to the EMH, which holds that all securities on the market are fairly valued. Contributing to the existing body of knowledge in appropriate fields is an additional objective.

Many scholars investigated the influence of various modifications on stock prices, but lacked sufficient data and, due to other errors, were unable to make a significant extension in the relevant scenario. There is insufficient research data on the relationship between stock returns and accounting factors, particularly in reference to the KSE-100 index. This article seeks to determine the relationship between stock returns and accounting factors, specifically in the context of the KSE-100 index. If the model proves to be a good research tool, it will be extremely useful for investors in valuing stocks that are trading on the market. It will help investors and businesses identify the variables that have a significant impact in stock return volatility, and statistical research will emphasize the persistence of these variables.

Research Questions

- How do earnings yield and stock returns relate to each other?
- Do stock returns depend on profitability?
- What is the impact of equity capital investment on stock returns?
- Does growth opportunities effect stock returns?
- How do stock returns relate to the discount rate?

Section 1 provides an overview of the study. The literature review is presented in Section 2, data and methods are discussed in Section 3, the discussion and results are presented in Section 4, and a discussion of the study's future is concluded in Section 5.

Literature Review

One of the most significant ways that organizations can finance themselves is through equity. Choosing between debt and equity for funding is one of the most crucial choices that businesses must make. Knowing how the capital structure affects the firm's profitability and how much of an impact it has on the firm's profitability will help the management make this decision in an accurate and efficient manner. This mostly stems from the fact that knowledge would enable managers to examine how prosperous companies make financial choices to remain competitive in their marketplaces. Profitability, as defined by the Business Dictionary, is the ability of an organization to consistently and continuously produce net income. It is noted in corporate finance studies that this choice varies from one nation to another and is contingent on the features of each nation.

For the first time, Ball and Brown (1968) verified that stock increases may be largely explained by earnings. Basu (1983) showed that the earning-price ratio can be used to explain stock returns. He investigated this tendency on the US stock exchange using data from 1956 to 1971. Easton and Harris (1991) provided evidence that stock returns are correlated with both current and fluctuating earnings levels. Then, Feltham and Ohlson (1995, 1996) showed that equity value could be explained by book value and earnings as a function of linear regression. They came to the conclusion that the significance of stock prices and earnings yield could not be ignored after Ely and Waymire (1996) and Francis and Schipper (1999) validated their findings.

From an economic and financial perspective, Maio et al. (2021) continue a long-standing capital markets accounting study that examines the relationship between accounting data and expected equity returns (see, for instance, Habtoor & Alharbi, 2020). Like this, Maio et al. (2021) focus more on the quality attribute of the accounting information and the system that generates it than on the actual set of accounting information and disclosures that are part of the capital market anomaly where firm-specific volatility covaries with expected equity returns. Furthermore, the relationship between growth and stock returns has been empirically studied. Market returns are linked by Da et al. (2014) and Barroso et al. (2021) to the macroeconomic growth of market earnings and consumption. Hou et al. (2021) and Li et al. (2021) investigate the microeconomic effects of investment growth on stock returns.

Sharma et al. (2023) discovered that EPS, ROE, capital adequacy ratio, net interest margins, and assets turnover ratio had a positive effect on stock prices in the banking industry, whereas the current ratio and non-performing assets have a negative effect. In their study of the Indonesia company Exchange, Bustani et al. (2021) discovered that while net profit margin had no discernible effect on company prices, earnings per share, price to book value, and dividend payout ratio did. Using the fundamental valuation approach, Arshad's (2021) study on the Shenzhen Stock Exchange (SZSE) in China validates the presence of size, momentum, liquidity, and dividend yield elements. Even when risk proxy variables are taken into account, these factors still account for a considerable portion of stock returns and have the potential to be useful in predicting future stock returns.

Chen and Zhang's (2007) theory and data suggest that accounting variables can account for cross-sectional stock returns. They compute returns using changes in profitability, growth potential, earnings yield, discount rates, and equity capital investment. Empirical evidence supports the predicted involvement of each identified element. About 20% of the variance in cross-sectional returns can be explained by the model, with cash flow-related factors accounting for the majority of the explanatory power rather than changes in discount rates. Accounting data and stock prices

were found to be positively correlated by Fu et al. (2013), with return on equity and earnings yield having a greater influence. According to Borhan et al. (2014), stock prices are significantly impacted by financial parameters, such as the profitability ratio. The relation between accounting factors and stock returns has been the subject of numerous research.

Although there has been work in this area in Pakistan, the accounting variable was chosen at random. This study provides proof of the Zhang model of return in the context of Pakistan. Numerous researchers investigated how various changes affected stock prices, but they were unable to make a significant extension in the pertinent scenario due to a lack of data, other issues with methodology, and poor choice of variables as proxies. Since there are so many factors that were left out of the study that could accurately explain the remaining unexplained movement of stock prices, there is room for more research in this area. Changes in stock return can be greatly influenced by several different accounting considerations.

Theoretical Relationship and Hypothesis

The theoretical relationship between accounting variables and stock returns is modeled in this section. There are two types of variables that can influence stock price movements. One is cashflow-based, and the second is non-cashflow-based. Stock return, as changes in market value, depends on two features of operation, i.e., expected scale and expected profitability. For incorporating expected future profitability of operation, this study includes earning yield (related to value generation) and change in profitability (representing operational efficiency). To cover expected scale, this study takes growth opportunities and equity capital investment. These cash flow-based factors are combined with a non-cash flow-based factor to complete the model. The discount rate is a variable used for non-cashflow-based factors.

a. *Earning yield:* Earning are the value generated by firm in current period and they normalized by market value of equity in beginning of period. A higher earnings yield indicates that a stock may be undervalued and that investors may receive a favourable return in relation to the firm's price. On the other hand, a low earnings yield could indicate overvaluation because the stock price is excessively high in relation to its earnings. Expected sign are positive.
H1: Earning yield has a positive relation with stock returns.

b. *Change in profitability:* Change in profitability is essential for return. This methodology adjusts for changes in profitability by comparing the market value of stock at the start of the period book. This is adjusted because returns are tied to the market value of equity, but profitability affects value through the capital invested at the start of the period (book value of equity). Investors are more interested in investing when the firm makes a greater profit because they are worried about the profits the company makes and how those profits will affect the return on their shares. The relation is expected to be positive.
H2: Change in profitability has a positive relation with stock returns.

c. *Equity capital investment:* Capital investments are basically the funds invested in a firm for the reason of furthering business objectives. It is described as a proportionate change in the invested capital's book value. Since capital is the foundation upon which value is created, it is related to return. It is modified by subtracting the beginning of the period book from the equity market value. Because returns are correlated with the production of net value by invested capital, this is adjusted. The growth of the capital base, which results from incremental capital investment, enhances expectations for future value generation, which in turn raises stock value. However, the dividends for the current period are also reduced by

incremental capital investment. The net effect of these two effects is captured by the equity capital investment coefficient.
H3: Equity capital investment is related to stock returns.

d. *Change in Growth opportunities:* Growth opportunities are related to value generation and, hence, change in these related to return of stock. It is also adjusted by beginning of period book to market value of equity. It is adjusted because returns are derived from market value of equity. Growth stocks may provide investors with a more favorable risk-return profile in exchange for lower average returns. The signs are expected to be negative.
H4: Changes in growth opportunities are negatively related to stock returns.

e. *Change in discount rate:* it is related to pricing of future cashflows. Future cashflows become less valuable as the discount rate rises, which lowers equity value and return. Therefore, the study's expected sign is negative.
H5: Change in discount rate has a negative relation with stock returns.

Methodology

Empirical Model

This study basically focuses on the firm-level estimation of the relationship between realized stock return and accounting variables. This relationship is derived from theoretical relations mentioned above. This study estimates the return model as follows:

$$\boldsymbol{Return_{it} = \alpha + \beta_1 EY_{it} + \beta_2 C\_PROF_{it} + \beta_3 ECI_{it} + \beta_4 C\_GWTH_{it} + \beta_4 C\_DSR_{it} + e_{it}}$$

Whereas,

- **$Return_{it}$** (the dependent variable) is the yearly stock return of company i over time period t, which is computed from two days after year t–1 to one day after year t. The formula for the overall stock return is the price gain plus any dividends received, divided by the original stock price.
- **EY_{it}** (independent variable), proxy is E_{it}/V_{it_1}, is the firm i's earnings yield during time period t, while E represents earnings at the end of period t and V represents the stock market value at the start of the period.
- **C_PROF_{it}** (independent variable), proxy is $(R_{it}-R_{it-1})\ B_{it\_1}/V_{it\_1,}$ is the change in company i's profitability over time t, adjusted by the start of the period book to market value of equity. R is the return on equity.
- **ECI_{it}** (independent variable)**,** proxy is $[(B_{it}\_B_{it\_1})/B_{it\_1}]\ (1–\ B_{it\_1}/V_{it\_1})$, is equity capital investment. It is calculated as the proportionate change in firm i's book value of equity in year t, deducted from the start of the period book value of equity by one.
- **C_GWTH_{it}** (independent variable), proxy is $(g_{it}-g_{it-1})\ B_{it\_1}/V_{it\_1,}$ is the change in firm i's growth prospects over time t, adjusted by the start of the period book to market value of equity.
- **C_DSR_{it}** (independent variable), proxy is $(r_{it}-r_{it-1})\ B_{it\_1}/V_{it\_1,}$ which is the change in the discount rate over the time period t used to compute the firm's return, adjusted by the start of the period book to market value of equity.

Data and Data Sources

Data from companies listed in the KSE-100 index between 2016 and 2023 is used in this analysis. All of the companies in our sample had their stock prices taken from the KSE daily report between 2016 and 2023. The firm's return is computed using the stock prices. Data from the financial statements of the companies in our sample are used to compile data on earnings yield, equity capital investment, and change in profitability. A company's earnings growth rate serves as a stand-in for growth opportunities, which are essentially the possible expansion of the operating scale. Its data is also computed from company annual reports. The discount rate is represented by a yield on 10 years Pakistani government bond. Annual reports from the State Bank of Pakistan (SBP) are the source of data on this indicator.

Estimation of Empirical Model

The methodology used for this study is panel data. This allows us to eliminate any potential unobservable heterogeneity between the various businesses in our sample. Unobservable heterogeneity may lead to misleading correlations with the dependent variables, which could bias the computed coefficients. If unobservable heterogeneity is linked to the explanatory factors, this investigation should make a conditional inference on the realizations of these effects in the sample (estimate for fixed effects). If there is no association between the effects and the independent variables, then unconditional inference (method of random effects) ought to be employed (refer to Arellano & Bover, 1990). Correlations between the explanatory factors and the unobservable heterogeneity can be verified using the Hausman test. This is accomplished by comparing the coefficients of the estimates for fixed effects and random effects. The null hypothesis is the notion that the coefficients of the two models are similar. If the coefficients differ, only the within-groups estimation (fixed effects) is consistent. Correlations between the explanatory factors and the unobservable heterogeneity can be verified using the Hausman test.

Empirical Findings

The descriptive statistics for the entire pooled sample are shown in Table 1. The study's dependent variable, the mean (std dev) annual stock return, is 37.3% (0.745). The mean (std dev) values of independent variables are as follows: earnings yield, 13.8% (0.237); change in profitability after adjustment, 1.2% (0.339); equity capital investment (proportional change in equity capital) after adjustment 5.9% (2.84), change in growth opportunities (long-term growth rate) after adjustment, 176.2% (36.884); change in the discount rate after adjustment, -35% (1.842). The standard deviation of changes in growth prospects and the discount rate is at its highest.

Table 1: Descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Return	734	0.373	0.745	-0.829	9.500
EY	734	0.138	0.237	-1.979	2.149
C_PROF	734	0.012	0.339	-3.585	5.716
ECI	734	0.059	2.840	-45.375	59.813
C_GWTH	734	1.762	36.884	-282.2	627.4
C_DSR	734	-0.350	1.842	-7.832	7.381

Return is the annual stock returns, EY is the earning yield, C_PROF is the change in profitability, ECI is the equity capital investment, C_GWTH is the change in growth opportunities and C_DSR is the change in discount rate.

The correlation coefficients between the variables are displayed in Table 2. Earnings yield and profitability change are two explanatory elements that have a positive association with stock return, while growth potential, discount rate, and equity capital investments have a negative correlation. The other three cash flow-based criteria have a negative correlation with equity capital investment. Earning yield is also inversely correlated with changes in growth opportunities. There is a positive correlation between the remaining cash-flow factors. The change in the discount rate has a negative correlation with changes in growth prospects, profitability, and earnings yield, but a positive correlation with equity capital investment.

Table 2: Correlation matrix

	Return	**EY**	**C_PROF**	**ECI**	**C_GWTH**	**C_DSR**
Return	1.0000					
EY	0.4155	1.0000				
C_PROF	0.2290	0.5505	1.0000			
ECI	-0.0387	-0.0467	-0.0366	1.0000		
C_GWTH	-0.0227	-0.0028	0.0698	0.0144	1.0000	
C_DSR	-0.1750	-0.1011	-0.0703	0.0035	-0.0461	1.0000

Return is the annual stock returns, EY is the earning yield, C_PROF is the change in profitability, ECI is the equity capital investment, C_GWTH is the change in growth opportunities and C_DSR is the change in discount rate.

According to the results of the Breush Pagan LM test, Redundant fixed effects-likelihood ratio test, and Hausman test, the fixed effect regression model is the best approach for model estimation. To test the validity of multivariate regression models, this study has checked the multicollinearity, autocorrelation and heteroscedasticity. Variance inflation factors (VIF) are utilized to detect multicollinearity to perform the residual diagnostic tests. A multicollinearity issue arises when the variables' VIF exceeds 5. The autocorrelation test is then employed to determine whether the residuals exhibit any correlation. The first order autocorrelation in this study is evaluated using the Durbin Watson statistic and the Wooldridge test. There is autocorrelation in the regression model if the Durbin Watson statistic value is distant from 2 or if the Woolridge test is significant at 5%. Finally, to determine if the error term's variance is constant, the Breush Pagan heteroscedasticity test is performed. These tests' results demonstrate that the data is free of autocorrelation and multicollinearity problems [1]. The robust standard errors are used in this study to handle heteroscedasticity.

The impact of accounting variables on stock return is demonstrated by the empirical results of the fixed effects model employed in this investigation. There are two types of variables which can influence the returns i.e. cashflow based and non-cashflow based. Stock return, as changes in market value, depend on two features of operation i.e. expected scale and expected profitability. For incorporating expected future profitability of operation, this study includes earning yield (related to value generation) and change in profitability (represent the operational efficiency). For expected scale, equity capital investment and growth opportunities are used. These cashflow based factors are combined with a non-cashflow based factor to complete the model. Discount rate is variable used for non-cashflow based factor.

The results of the model's estimation using fixed effects are given in Table 3. While coefficient values indicate the strength of the association, the sign of the coefficient indicates the direction of

[1] The appendix contains the results of each of these tests.

the relationship between return accounting variables. The significance of the relationship between the dependent and independent variables is demonstrated by t-values and probability values. The F-test indicates the overall model's significance. The coefficient of determination is known as R2. It will indicate the extent to which the dependent variable was explained by the independent variables in the model.

Table 3: Results of Fixed Effects Model of the Accounting Variables on Stock Returns

	Coef.	**Robust Std. Err.**	**T**	**P>t**	**[95% Confidence Interval]**	
EY	1.6293***	0.5527	2.95	0.0040	0.53235	2.72623
C_PROF	-0.1721	0.2929	-0.59	0.5580	-0.75342	0.40912
ECI	-0.0051	0.0068	-0.75	0.4580	-0.01857	0.00842
C_GWTH	-0.0001	0.0006	-0.23	0.8200	-0.00133	0.00105
C_DSR	-0.0592***	0.0153	-3.86	0.0000	-0.08965	-0.02881
cons	0.1262	0.0765	1.65	0.1020	-0.02565	0.27810
Observations	734					
F-Statistics	8.12					
F-Significance	0.000					
R-squared	0.3081					
Hausman chi-sq	0.000					
Durbin-Watson stat	2.046					

EY is the earning yield, C_PROF is the change in profitability, ECI is the equity capital investment, C_GWTH is the change in growth opportunities, C_DSR is the change in discount rate and cons is the intercept term.
***, ** and * indicate significance at 1%, 5% and 10% respectively.

The aforementioned results indicate that two of the five components are highly important, and the signs on the significant slope coefficients match the theoretical model's predictions. Earnings yield is favorable on its own, but stock returns are negatively correlated with changes in profitability, equity capital investment, growth potential, and discount rate. For this regression, the coefficient of determination, or R^2, is 30.81%. The good R^2 score indicates that independent variables account for the variation in stock returns.

Earning yield and stock returns are significantly positively correlated. At the 1% level of significance, the positive relationship is significant. The coefficient value is 1.63 which indicates that one unit increase in earning yield increases the stock return by 1.63 times and vice versa. Investors can assess a stock's overvaluation or undervaluation using earnings yield. An undervalued stock is suggested by a greater earnings yield, which means that investors may receive a favorable return in relation to the price of stock. Conversely, a low earnings yield may be a sign of overvaluation if the stock price is excessively high compared to its earnings. These results are in line with those of Basu (1983), Musallam (2018), and Bali et al. (2008). This link is consistent with the investigation's theoretical prediction.

Stock returns have a slight negative relationship with changes in profitability. The association is not significant even though the negative sign of the coefficient is noticeable. Akbas et al. (2017) discovered that investors' underreaction to profit trends caused a negative relationship between profitability and stock value. Additionally, the shift in growth prospects has a negligible negative correlation with stock returns. Capital investment and unexecuted growth options are two growth option factors that have a negative correlation with stock returns. This suggests that investors

would be willing to accept lower returns in exchange for a more favorable risk-return profile (Trigeorgis and Lambertides, 2014). Equity capital investment has a negative non-significant relation with returns of stock. This sign of relation is according to prediction of this study. Negative signs show the dominance of dividend effect as discussed in sign prediction section. Firms with significant capital investment increases later see negative benchmark-adjusted returns. These findings support the theory that investors typically underreact to the potential for empire-building that comes with higher capital investment (Titman et al., 2004).

Finally, there is a negative correlation between stock returns and the non-cashflow based factor. At the 1% level of significance, the negative connection is significant. The coefficient value is -0.059 which indicates that one unit increase in change in discount rate reduces the stock returns by 0.059 times and vice versa. Although the coefficient's value is not very high, the relationship is significant and consistent with the study's theoretical predictions. As the discount rate increases the value of future cashflows decreases, which leads to a reduction of equity value and return. These findings correspond with Gu et al. (2022); Tauseef (2018) and Chen et al. (1999). The overall result of the above model is significant, according to the result of the F-test.

Conclusion

This study applies the Zhang model of stock return to empirically demonstrate how accounting fundamentals explain variances in stock returns in the KSE-100 index. In accordance with this model, stock returns are correlated with changes in the discount rate (a non-cashflow based factor), earnings yield, profitability, equity capital investment, and growth prospects (cashflow based factors). The empirical findings indicate that one cash flow-based component and one non-cashflow-based factor have predicted signs for their coefficients and are significantly correlated with stock returns. Findings from this study indicate that the earning yield and variations in the discount rate are the primary sources of information content collected by this approach. An insignificant role is played by changes in growth opportunities, equity capital investment, and profitability.

The study's empirical findings advance our knowledge of the relationship between accounting variables and stock returns. This model is more helpful in describing cross-sectional price movements and stock returns than the earlier models used in the experiments. This implies that rather than focusing on market anomalies, investors may find it more beneficial to look at information about the fundamental aspects of firms' operations as stated in the model employed in this study. This return model is far more successful at describing stock returns in Pakistan than existing earnings-based models. Although there may be several additional accounting factors that are related to stock return, we will only concentrate on those that, in accordance with the model we employ, can significantly affect stock return volatility. Future research should undertake a more thorough analysis using moderation and mediation models, as this study concentrates on the factors that directly affect stock returns.

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