Fundamental factors influencing returns of shares listed on the Johannesburg Stock Exchange in South Africa

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Abstract

This study investigated the relationship between share returns and nine variables that had been proven to influence returns in previous research, using a multiple regression analysis. These variables are size, leverage, book-to-market ratio, earnings yield, dividend payout, earnings growth, return on equity, earnings per share and asset growth. The impact of some of the variables on share returns proved to be insignificant, and some collinearity was identified between some of the variables. However, three significant variables were identified and the final regression model included the book-to-market ratio, dividend payout and leverage as the explanatory variables.

Keywords

Return, company size, leverage, book-to-market ratio, dividend payout

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1. INTRODUCTION AND PRIOR RESEARCH

The capital asset pricing model (CAPM) is still probably the most popular asset pricing theory today, stating that average share returns are explained by beta and expected market returns. However, the results of many studies contradict this model and show that there are other variables such as size, leverage, book-to-market ratio and earnings yield that might have a more significant effect on average share returns.

One of the more prominent contradictions is the size effect found by Banz (1981). He found that, on average, smaller firms earned higher risk-adjusted returns than larger firms. He believed that the 'size effect' that had been in existence for at least 40 years at that stage was evidence that the CAPM was misspecified. Banz measured size in terms of market capitalisation (total market value of listed equity).

A further contradiction of the CAPM was documented by Bhandari in 1988. His tests revealed a positive relation between leverage (debt-equity ratio) and average return, and he concluded that leverage helped to explain the cross-section of average share returns where size and beta were also included in the tests.

A positive relation between the ratio of a firm's book value of equity to its market value (book-to-market ratio) and average share returns for United States of America stocks was found by Stattman (1980), as well as by Rosenberg, Reid and Lanstein (1985). The same results for the book-to-market ratio of Japanese stocks were found by Chan, Hamao and Lakonishok (1991).

Miller and Scholes (1982) found that lower-priced stocks earned higher expected returns. Book-to-market ratios can identify stocks that are mispriced relative to their fundamental value in efficient markets. When this temporary mispricing is corrected, the stocks that are underpriced (with high book-to-market ratios) subsequently deliver higher excess returns than overpriced stocks (Lakonishok, Shleifer & Vishny, 1994).

Pontiff and Schall (1998) used an aggregate measure of the book-to-market ratio and showed that the ratio forecasted market returns. They argue that the ability of book-to-market ratios to predict returns is a result of the relation between book value and future earnings.

Various studies reveal excess returns after public announcements of company earnings. Since these earnings figures are publicly available information and essentially privately costless, they should not have a significant effect on share prices in an efficient market. Ball (1978) argued that this anomaly was a result of omitted variables or other specification errors when implementing the two-parameter model of Sharpe (1964), Lintner (1965), Black (1972) and others. According to Ball (1978), the earnings-price ratio can be used as a proxy for unidentified factors in expected return, with the ratio likely to be higher for high-risk stocks with corresponding higher expected returns.

Basu (1983) showed that earnings yield could contribute to the explanation of the cross-section of average returns. On average, firms with high earnings yield ratios seem to have earned higher risk-adjusted returns than firms with low earnings yield ratios. These results were still significant even when the tests controlled for differences in firm size. Basu's results also indicate that the earnings yield anomaly does not result from earnings information effects. Consequently, it confirms Ball's (1978) hypothesis that the earnings yield anomaly most likely implies a misspecification of the capital asset pricing model.

Fama and French (1992) argued that these variables (size, leverage, book-to-market ratio and earnings yield) were all scaled versions of price and that it could be expected that some of them might be redundant in explaining average returns. The authors investigated the joint roles of these variables as well as market beta in the cross-section of average returns on NYSE, AMEX and NASDAQ shares. They found that the relationship between beta and average return was weak and even disappeared during certain time periods and therefore did not support the basic prediction of the CAPM. However, they found strong univariate relations between average return and size, leverage, book-to-market ratio and earnings yield.

Lam (2002) used the same approach as Fama and French (1992) to test the effect of different variables on average share returns in the Hong Kong stock market. He found that size, book-to-market equity and earnings yield ratios seemed to be able to explain the cross-sectional variation in average monthly share returns. His other variables, book and market leverage, also seemed able to capture the variation in returns but were dominated by the other three variables and therefore were regarded as obsolete.

Van Rensburg and Robertson (2003) tested the relationship between size, price-to-earnings ratio and beta of stocks listed on the JSE Limited (Johannesburg Stock Exchange) in South Africa. They found that low price-to-earnings stocks (i.e. high earnings yield) earned higher average returns and had lower betas, contradicting the CAPM. They also found that the size and price-to-earnings effects operated independently from one another, thus identifying two factors in a model for the cross-section of JSE returns. A later study by Strugnell, Gilbert and Kruger (2011) confirmed these earlier findings of Van Rensburg and Robertson.

Auret and Sinclaire (2006) used the same data as the Van Rensburg and Robertson (2003) study and added the book-to-market ratio as an independent variable. They found a significant positive relationship between this ratio and share returns. Although the book-to-market ratio has more explanatory power than size and the price-to-earnings ratio, it does not improve the original two-factor model of Van Rensburg and Robertson (2003). This could be attributed to the correlation of the book-to-market ratio with the other variables that have high explanatory power.

Recent research on these variables and their effect on the returns of South African listed companies is limited. This study aimed to update previous research of this nature on JSE-listed companies, as well as to add to that research by testing a number of additional variables.

Lamont (1998) found that the dividend payout ratio could be used to forecast excess returns. His study showed that higher dividends forecasted higher returns. One possible explanation is the fact that dividends contain information about future returns, as most managers typically use a target level for dividends. Erasmus (2013) investigated how share returns were influenced by dividend decisions. He concluded that it was not only the level of the dividend payment but also the stability of dividend payments that influenced share returns.

Cooper, Gulen and Schill (2008) showed that firm-level asset growth was a strong but negative predictor of cross-sectional variation in share returns. Asset growth encompasses various components of a firm's investment as well as financing activities, and as such it is able to capture the common return effects of all these components of a company's growth.

The financial literature abounds with studies of the relationship between earnings and share returns, with the majority confirming that earnings do drive share prices (Basu, 1983; Jegadeesh & Livnat, 2006; Martani, Mulyono & Khairurizka, 2009; Johnson & Zhao, 2011; Menaje, 2012). Three more earnings-related variables were included in this study, namely earnings growth, earnings per

share and return on equity. These were compared to earnings yield to determine which had the most explanatory power with regard to share returns.

The remainder of the paper is organised as follows: Section 2 discusses the data and methodology employed in this study, Section 3 reports the results and Section 4 concludes the paper.

2. DATA AND METHODOLOGY

The financial statement data items were obtained from the INET BFA database of standardised financial accounts. The share price, number of shares and market capitalisation were taken from the market data section of the INET BFA database. The independent variables were calculated at each company's financial year-end (year t). The return was calculated for each company from its financial year-end of year t to the financial year-end of year t + 1. The sample included all companies (from any sector) that were listed from 1 January 1994 to 31 December 2013. A total of 115 companies complied with these parameters and were therefore included in the sample. The methodology used was a multiple regression model as used by Vermeulen and Smit (2011).

2.1 Research method

A multiple regression model was used to test the effect of the different variables on share returns, particularly log returns, indicated as RET. Initially all the variables were included in the model, but it was subsequently refined to only include the significant variables.

2.2 Initial regression model

$$RET = \propto + \beta_1 Size + \beta_2 LEV + \beta_3 BTM + \beta_4 E/P + \beta_5 DP + \beta_6 EG + \beta_7 ROE + \beta_8 EPS + \beta_9 AG \quad \textbf{(1)}$$

where:

RET = Return: calculated as the natural logarithm of annual share return, including dividends declared for the year under review.

Size = Natural logarithm of market capitalisation.

LEV = Leverage: calculated as total long-term loan capital and total current liabilities as a percentage of total ownership interest.

BTM = Book-to-market ratio: calculated as ordinary share capital** divided by market capitalisation.

E/P = Earnings yield: calculated as earnings* divided by market capitalisation.

DP = Dividend payout: calculated as ordinary dividend divided by earnings*.

EG = Earnings growth: a compound annual growth rate in earnings* was calculated for each year.

ROE = Return on equity: calculated as earnings* divided by ordinary share capital**.

EPS = Earnings per share: calculated as earnings* divided by total number of shares.

AG = Asset growth: a compound annual growth rate was calculated for total assets.

* Earnings for each year were calculated as profit after tax less preference dividends.

** Ordinary share capital was calculated as total ownership interest less preference share capital.

3. EMPIRICAL RESULTS

3.1 Univariate analysis

An initial review of the correlation of the variables with return showed that size, leverage, the book-to-market ratio and dividend payout were all significant at the 5% level. To evaluate the correlations further, a cross-correlation matrix was set up that showed the Pearson product-moment correlation coefficients among all the variables. The results of the univariate analysis are shown in TABLE 1.

TABLE 1: Cross-correlation matrix

	RET	Size	LEV	BTM	E/P	DP	EG	ROE	EPS	AG
RET	1.000	-0.058*	0.054*	0.090*	0.050	0.055*	0.033	0.003	-0.034	-0.031
Size		1.000	0.043	-0.518*	-0.220*	0.138*	-0.003	0.061*	0.518*	-0.003
LEV			1.000	-0.210*	0.010	-0.005	0.009	0.208*	0.052*	0.076*
BTM				1.000	0.331*	-0.163*	-0.120	-0.193*	-0.152*	-0.070*
E/P					1.000	-0.122*	0.099*	0.411*	0.099*	-0.049
DP						1.000	-0.053*	0.080*	-0.032	-0.106*
EG							1.000	0.064*	0.066*	0.170*
ROE								1.000	0.148*	-0.026
EPS									1.000	-0.053*
AG										1.000

Source: Author's calculations

* Correlation coefficients significant at the 5% level.

As is to be expected, there is a significant negative correlation between size and return. Although not significant, the correlation between asset growth and return is also negative. As companies usually grow larger as they increase their assets, it is expected that the relationship will be the same as for size. The relationship between return and leverage as well as the relationship between return and the book-to-market ratio is significant and positive as expected. There is also a significant positive relationship between return and dividend payout.

Although not significant, the relationship between return and earnings yield is positive, as indicated by prior studies. Interestingly, none of the other earnings-related variables (EG, ROE and EPS) display a significant relationship with return, even though the literature suggests that earnings drive share prices.

3.2 Factor analysis

After identifying size, leverage, the book-to-market ratio and dividend payout as significant variables, a principal component factor analysis with a normalised varimax rotation was performed to determine whether these variables might be correlated with each other. The rotated factor scores are given in TABLE 2.

TABLE 2: Factor loadings (varimax normalised)

	Factor 1	*Factor 2*	*Factor 3*
Size	0.472	0.072	0.740
LEV	0.050	0.675	0.019
BTM	-0.715	-0.357	-0.296
E/P	-0.836	0.106	0.120
DP	0.422	-0.105	0.050
EG	-0.208	0.437	0.012
ROE	-0.070	0.607	0.256
EPS	-0.051	0.056	0.856
AG	0.180	0.505	-0.337

Source: Author's calculations

Size, leverage and the book-to-market ratio were all allocated to different factors, whereas dividend payout was not overwhelmingly present in any one of the factors. Therefore, the conclusion was reached that these four variables were not strongly correlated with each other and there should be no colinearity among them.

An interesting observation was that the earnings-related variables, namely earnings yield, return on equity and earnings per share, all belonged to three different factors. Earnings yield is highly correlated with the book-to-market ratio, return on equity is highly correlated with leverage, and earnings per share is highly correlated with size. These relationships require further investigation and may be a subject for further research.

3.3 Multiple regression analysis

The results of a multiple regression model containing all variables are displayed in TABLE 3. It seems that the model contains too many variables that are not significant and do not contribute to the model. This is also evident from the factor analysis above.

A 'best regression' analysis with four variables was done and indicated the following variables to be significant: book-to-market ratio, dividend payout, leverage and earnings yield (in descending order of significance). According to the factor analysis, earnings yield is in the same factor grouping as the book-to-market ratio and would therefore not contribute much to the regression model.

TABLE 3: Multiple regression model with all variables

Variable	*DF*	*Coefficient*	*Standard error*	*t-value*	*Pr > |t|*	*Significant at:*
Intercept	1	0.015	0.172	0.087	0.9303	
Size	1	0.001	0.008	0.078	0.9377	
LEV	1	0.025	0.008	2.975	0.0030	1% level
BTM	1	0.064	0.021	3.038	0.0024	1% level
E/P	1	0.038	0.052	0.741	0.4586	
DP	1	0.119	0.044	2.724	0.0065	1% level
EG	1	0.010	0.006	1.639	0.1014	
ROE	1	-0.007	0.021	-0.307	0.7588	
EPS	1	-0.003	0.004	-0.843	0.3995	
AG	1	-0.031	0.028	-1.119	0.2634	
Multiple R^2			2.216%			
Adjusted R^2			1.604%			

Source: Author's calculations

The process was repeated with only three variables, and the three most significant was the book-to-market ratio, dividend payout and leverage. This corresponds with the three significant variables from the initial regression model. Although the initial relationship between return and size was significant, it seems that size is not significant in a multifactor regression model.

A multiple regression model was constructed with only the three significant and independent variables that make a significant contribution in explaining return, namely the book-to-market ratio, leverage and dividend payout. The results are shown in TABLE 4.

TABLE 4: Regression model with three significant variables

Variable	*DF*	*Coefficient*	*Standard error*	*t-value*	*Pr > |t|*	*Significant at:*
Intercept	1	0.007	0.026	0.289	0.7730	
LEV	1	0.024	0.007	3.231	0.0013	1% level
BTM	1	0.069	0.015	4.612	< 0.0001	1% level
DP	1	0.127	0.036	3.490	0.0005	1% level
Multiple R^2			1.824%			
Adjusted R^2			1.661%			

Source: Author's calculations

The model shows a slight increase in the adjusted R^2 value. The Schwarz criterion for this model was 1.441 and the Durbin-Watson statistic was 1.666, indicating that the residuals are not completely white noise. A unit root test was done on the residuals and indicated that the residuals are stationary.

To improve the overall efficiency of the model, some changes to the model were considered. The first change was removing the intercept as it was insignificant in the model. Further, in an attempt to get the residuals closer to white noise, AR terms were added to the regression. The results of this model are displayed in TABLE 5.

TABLE 5: Regression model with AR terms

Variable	*DF*	*Coefficient*	*Standard error*	*t-value*	*Pr > |t|*	*Significant at:*
LEV	1	0.028	0.008	3.561	0.0004	1% level
BTM	1	0.147	0.014	10.284	< 0.0001	1% level
DP	1	0.052	0.036	1.450	0.1472	
AR(1)	1	0.161	0.025	6.510	< 0.0001	1% level
AR(2)	1	0.089	0.024	3.728	0.0002	1% level
Multiple R^2			6.004%			
Adjusted R^2			5.772%			

Source: Author's calculations

3.4 Final regression model

$$RET = 0{,}028LEV + 0{,}147BTM + 0{,}052DP + v_t - 0{,}161\, v_t - 0{,}089 v_t \qquad \textbf{(2)}$$

The final model as indicated above has a Schwarz criterion of 1.333, which has decreased from 1.441 for the previous model without the AR terms. The Durbin-Watson statistic is now 1.946, which is much closer to 2 than before. The residuals can now be regarded as white noise, with v_t being the error term.

4. CONCLUSION

In this study a multiple regression analysis was used to determine the effect of nine different variables on the annual return of a sample of JSE-listed shares. Not all variables were significant, and some colinearity was evident among some of the variables.

The final multifactor results support a three-factor model with the book-to-market ratio, dividend payout and leverage as the explanatory variables. All three of these variables have previously been proven in other empirical studies to be effective in explaining variation in share returns.

Interestingly, size, which has been identified in many other studies as one of the factors influencing return, does not seem to be significant in this South African study. This phenomenon will be investigated in further research.

The study did not aim to make any generalisations with regard to all companies, as only companies that survived the entire 20-year period were included in the sample. The companies that did not survive would have probably experienced financial distress at some point during this period, changing their risk profile and influencing variables such as earnings, dividend policy and leverage. These differences might have changed the outcome of the regression model, and to compare only companies with more similar characteristics, these companies were omitted from the sample. Future studies could investigate this phenomenon to determine whether it indeed affects the outcome of the model. New entrants during the period under review were also omitted because their inclusion would bias certain sections of the sample period.

This study then provides scientifically and statistically proven evidence that the modern investment officer and the prudent portfolio manager, in their ceaseless quest for superior investment performance, alpha, should seek for those shares with an exceptional book-to-market ratio and should always be alert and on the lookout for companies that have a track record of above-average dividend payouts and also for those who abundantly employ leverage as a business strategy.

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