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Is Sales Growth Associated with Market, Size and Value Factors in Returns? Evidence from Athens Stock Exchange (1998-2003)

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Abstract:*This article investigates whether past sales growth of a firm is associated with market, size and value factors in returns so it can be inferred that this fundamental variable is related to size and book-to-market equity that help capture the cross-section of average stock returns in the Athens stock exchange during the period 1998-2003.The findings of the study provide supportive evidence that past sales growth of a firm is associated with market, size and value factors in returns so it can be inferred that this fundamental variable is related to size and book-to-market equity that help capture the cross-section of average stock returns in Athens Stock Exchange. Several unanswered questions arise from this study such as: (i) what are the underlying economic state variables that produce variation in earnings and returns related to size and BE/ME? (ii) do these unnamed state variables produce variation in consumption and wealth that is not captured by an overall market factor and so can explain the risk premiums in returns associated with size and BE/ME?*

Keywords: *Sales growth, market, value factors in returns*

1. INTRODUCTION

This article investigates whether past sales growth of a firm is associated with market, size and value factors in returns so it can be inferred that this fundamental variable is related to size and book-to-market equity that help capture the cross-section of average stock returns in the Athens stock exchange. Tests are conducted for a period of six years (1998-2003), which is characterized by intense return volatility, covering historically high returns for the Greek Stock market as well as significant decrease in asset returns over the examined period. These market return characteristics make it possible to have an empirical investigation of the pricing model on differing financial conditions thus obtaining conclusions under varying stock return volatility. The rest of the article is structured as follows. Next section provides information regarding sample selection and data. Section 3 provides information regarding size and value factors in earnings and

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returns. Section explains the common risk factors in sales. Section 5 concludes the study.

2. SAMPLE SELECTION AND DATA

The study uses weekly stock returns of one hundred and twenty stocks that are traded on the ASE for the period of January 1998 to December 2003. The data are obtained from MetaStock (Greek) Data Base.The selected stocks are included in the formation of the FTSE/ASE 20, FTSE/ASE Mid 40 and FTSE/ASE Small Cap index that have designed to provide real-time measures of the Athens Stock Exchange.We excluded financial firms because the high leverage that is normal for these firms probably does not have the same meaning as for non financial firms, where high leverage more likely indicates distress [Banz W. 1981: 3-18, Basu S. 1977: 129-56, Bhandari et al 1988: 507-528]. The price data has been adjusted for capitalization changes such as bonus rights and stock splits.

The sample firms have their fiscal year ends on Decembers, so tests did not have to deal with matching the accounting data for all fiscal year ends in every calendar year. We use a firm's market equity at the end of December of each year to compute its book to market, leverage and earnings price ratios and we use its market equity of June of each year to compute its size. Additionally annual profit information measured as Profit before Depreciation and Taxes (PBDT) has been collected for the sample companies. The choice of the profit figure has been guided by the fact that PBDT figures are seldom negative, making them appropriate for growth rate calculations [Chan et al 1991: 1739-1789]. In order to obtain better estimates of the value of the beta coefficient, the study utilizes weekly stock returns. Returns calculated using a longer time period (e.g. monthly) might result in changes of beta over the examined period introducing biases in beta estimates. On the other hand, high frequency data such as daily observations covering a relatively short and stable time span can result in the use of very noisy data and thus yield inefficient estimates ([Jagannathan R. and McGratten E. 1995: 2-17] [Jagannathan R. and Wang Z. 1996: 3-53).

All stock returns used in the study are adjusted for dividends as required by the CAPM [Blume et al 1973: 19-33]. The ASE Composite Share index is used as a proxy for the market portfolio. This index is a market value weighted index, comprised of the 60 most highly capitalized shares of the main market reflecting the general trends of the Greek stock market. The 3-month Greek Treasury Bill is used as the proxy for the risk-free asset. The yields were obtained from the Treasury Bonds and Bill Department of the National Bank of Greece. The yield on the 3-month

Treasury-bill is specifically chosen as the benchmark that better reflects the short-term changes in the Greek financial market.

3. SIZE AND VALUE FACTORS IN EARNINGS AND RETURNS

Fama and French [1992: 441-465] find that two variables, market equity (ME) and the ratio of book to market equity (BE/ME) capture much of the cross section of average stock returns. If stocks are priced rationally, systematic differences in average returns are due to differences in risk. Thus, with rational pricing, size and BE/ME must proxy for sensitivity to common risk factors in returns. Fama and French [1993: 1975-1999] confirm that portfolios constructed to mimic factors related to size and BE/ME add substantially to the variation in stock returns explained by the market portfolio. The evidence that size and book to market equity proxy for sensitivity to risk factors in returns is consistent with a rational pricing story for the role of size and BE/ME in average returns [Fama and French 1995, 1996]. But return tests cannot tell the complete economic story.

Size and BE/ME remain indicator variables that, for unexplained economic reasons, are related to risk factors in returns [Fama and French 1996, 1997]. The purpose of the study is to examine whether stock prices properly reflect differences in the evolution of profitability when stocks are grouped on size and BE/ME.

We focus on six portfolios, formed yearly from a simple sort of firms into two groups on ME and another simple sort into three groups on BE/ME. In June of each year t from 1998 to 2003, all the sample stocks are ranked on the basis of their size (stock price times shares outstanding). The median sample size is then used to split the sample companies into two groups: small (S) and big (B). Book equity to market equity (BE/ME) for year t is calculated by dividing book equity at the end of financial year t by market equity at the end of financial year t. The sample stocks are broken into three BE/ME groups based on the breakpoints for the bottom 30% (low), middle 40% (medium) and top 30% (high) of the ranked values of BE/ME for the sample stocks. We construct six portfolios (S/L, S/M, S/H, B/L, B/M, and B/H) from the intersection of the two sizes and three BE/ME groups [Chen et al 1986: 383-403]. For example the S/L portfolio contains stocks that are in the small size group and also in the low BE/ME group while B/H consists of big size stocks that also have high BE/ME ratios. The equally weighted returns on the portfolios are calculated.

Our measure of profitability is EI(t)/ BE(t),is the ratio of common equity income for the fiscal year ending in calendar year t to the book value of common equity for the same year. EI(t) is the earnings before extraordinary items but after depreciation and taxes, interest and dividends [Lakonishok et al 1994: 1541-1578, Stattman, 1980: 25-45]. The question is how do earnings behave after firms are classified as small or big on ME and low or high on BE/ME.

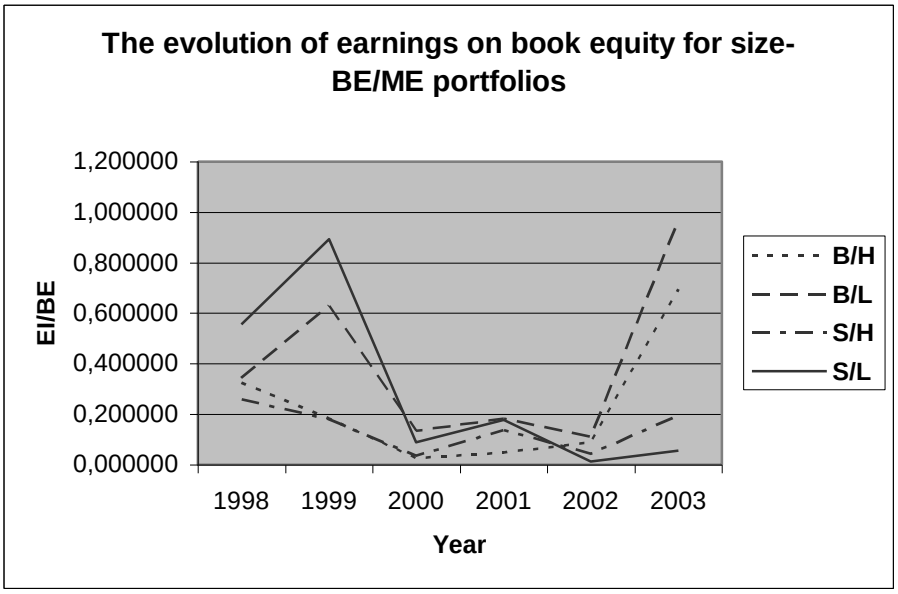

Figure 1: The evolution of earnings on book equity for size – BE/ME portfolios

Figure 1 shows that book-to-market-equity is associated with persistent differences in profitability, measured by EI/BE. Low-BE/ME stocks are on average more profitable than high-BE/ME stocks. Specifically, the B/L and S/L prove to be the most profitable portfolios from their formation date until the year of 2001. This is a very important point of the study because this period is characterised by intense return volatility where the ASE reached its highest level of returns but also suffered from a sharp and sudden decrease in stock returns. Thus, in high volatile times, the typical big low-book-to-market firm is more profitable than the typical big high-BE/ME firm. For small stocks, the S/L portfolio has higher earnings on book equity than the S/H portfolio in every year, so again low-BE/ME is associated with higher profitability.

The Fama-French model involves the use of three factors for explaining common stock returns: the market factor proposed by the CAPM,

and factors relating to size and value. SMB (small minus big) is meant to mimic the risk factor in returns related to size. SMB is the difference between the simple average of the returns of the three small stock portfolios (S/L, S/M and S/H) and the average of the returns on the three big portfolios (B/L, B/M, B/H).

HML (high minus low) is meant to mimic the risk factor in returns related to value (that is book-to-market ratios). HML is the difference between the simple average of the returns on two high BE/ME portfolios (S/H and B/H) and the average returns on two low BE/ME portfolios (S/L and B/L).

The next step is to test for links between the risk factors in returns and earnings. To provide a reference point, time series regressions are run to examine the relation of risk factors in stock returns to size and BE/ME. The dependent variables in the regressions are the returns on the six size BE/ME portfolios. The explanatory variables are the return on the market portfolio and the returns SMB (small minus big) and HML (high minus low) on the created portfolios to mimic the risk factors in returns related to size and BE/ME.

In a standard valuation model, a stock price is the present value of expected future net cash flows to stockholders. Unexpected changes in prices are caused by shocks to expected cash flows and discount rates. Thus, to measure the relation between returns and common factors in net cash flows, we must measure: i) shocks to expected cash flows and ii) the common factors in the shocks [Kothari et al 1995: 185-224]. As a crude proxy for shocks to expected net cash flows, we use changes in earnings yield EI/BE. We use changes in EI/BE, rather than growth rates of EI, because equity income is sometimes negative for the small-stock portfolios. In addition, we use changes in EI/BE, rather than the residuals from a times series model because earnings yields are highly auto correlated and because we would have a very limited number of observations on EI/BE to estimate a richer time series model. The time series regression that is used is the following,

$$\Delta(EI/BE)_t = a + b_i\Delta(EI/BE)_t MKT + s_i\Delta(EI/BE)_t SMB + h_i\Delta(EI/BE)_{''t} HML + e_t$$

Where Δ (EI/BE) MKT is the change of the fundamental variable EI/BE and comes from the value of the quotient of the division with numerator the sum of earnings of all stocks of the current year over the book equity of all stocks of the same year and denominator the sum of earnings of all stocks of the previous year over the book equity of all stocks of the same

previous year. Δ (EI/BE) is the change of the fundamental variable EI/BE from year t for the constructed portfolios.

Table 1: Changes in EI/BE for the six size and value sorted portfolios regressed on market, size and value factors in profitability

Portfolio	**a**	**b**	**s**	**h**	**R^2**
S/L	-0.0877	1.8683	1.0302	-0.2780	0.9989
Std. Error	0.0156	0.1244	0.0648	0.0893	
t-Statistic	-5.6186	15.0134	15.8901	-3.1128	
Probability	0.0302	0.0044	0.0039	0.0896	
S/N	0.0506	0.5767	0.3222	0.0035	0.9783
Std. Error	0.0186	0.1481	0.0771	0.1063	
t-Statistic	2.7263	3.8955	4.1768	0.0330	
Probability	0.1123	0.0600	0.0528	0.9767	
S/H	-0.0035	1.1119	0.5258	0.5058	0.9687
Std. Error	0.0211	0.1679	0.0875	0.1205	
t-Statistic	-0.1654	6.6229	6.0112	4.1980	
Probability	0.8839	0.0220	0.0266	0.0523	
B/L	0.0420	0.7988	-0.0216	-0.4869	0.9996
Std. Error	0.0093	0.0744	0.0388	0.0534	
t-Statistic	4.5044	10.7346	-0.5581	-9.1184	
Probability	0.0459	0.0086	0.6329	0.0118	
B/N	-0.0404	1.2030	-1.5830	-0.0110	0.9997
Std. Error	0.0382	0.3050	0.1589	0.2189	
t-Statistic	-1.0565	3.9444	-9.9629	-0.0502	
Probability	0.4015	0.0587	0.0099	0.9645	
B/H	-0.0422	1.5552	0.4828	0.7292	0.9860
Std. Error	0.0404	0.3222	0.1679	0.2312	
t-Statistic	-1.0436	4.8268	2.8762	3.1538	
Probability	0.4062	0.0403	0.1026	0.0875	

We test for common factors in the year-to-year changes in earnings yields. Table 1 shows time-series regressions in which changes in EI/BE for the six size-BE/ME portfolios are regressed on market, size, and book-to-market factors in yield changes.

The regressions identify market, size, and book-to-market factors in earnings. All the regressions produce strong evidence of a market factor in earnings. The t-statistics for the slopes on the market factor are all greater than 3.0. The earnings-yield regressions say that the size factor is important in distinguishing the earnings variation of small stocks and big stocks.

The goal of the study is to provide an economic foundation for the empirical relations between average stock return and size, and average return and book-to-market-equity. This is guided by two hypotheses. If the average-return relations are due to rational pricing, then (i) there must be common risk factors in returns associated with size and BE/ME, and (ii) the size and book-to-market patterns in returns must be explained by the behavior of earnings. In a rational market, short-term variation in profitability should have little effect on stock price and book-to-market-equity; BE/ME should be associated with long-term differences in profitability [Reinganum, 1981: 439-462]. The evidence presented here shows that size and BE/ME are related to profitability.

Our work on stock returns and profitability creates an issue for further examination. A logical question that arises is related to the existence of underlying economic state variables that produce variation in earnings and returns related to size and BE/ME. One of the state variables that might play an important role in the evolution of earnings and returns of the firms' is their sales growth. The study continues by examining the interaction between market, size and value factors in returns with firms' sales growth.

4. COMMON RISK FACTORS IN SALES

There is evidence that market, size and value equity factors are pervasive risk factors in portfolio returns and this is consistent with the rational asset pricing explanation for the role of their factor exposures in the cross-section of returns [Jegadeesh et al 1993: 65-91]. The study examines how sales growth, a fundamental firm's variable, is associated with size and BE/ME that is not identified by the market return. We continue the examination in regard to the Athens stock exchange. The purpose is to try to shed further explanation on how sales growth of a firm is associated with market, size and value factors in returns.

The common factors in sales growth are constructed like those in stock returns. ΔSalesSMB, the size factor in sales growth, is the simple average of the change in sales for the three small stock portfolios (S/L, S/M and S/H) minus the average of the change in sales for the three big stock portfolios (B/L, B/M, and B/H). The value factor in sales growth, ΔSalesHML, is the simple average of the change in sales for the two high BE/ME portfolios (S/H and B/H) minus the average of the two low BE/ME portfolios (S/L and B/L). The market factor in sales growth, ΔSalesMKT, is the average of the change in sales for all firms.

Tests have been conducted from 1998 to 2003 using the same sample of stocks of the previous part of the paper. The time-series regression that has been used for examining the common risk factors that are associated to sales is the following:

$$\Delta PSales_t = a_i + b_i \Delta SalesMKT_t + s_i \Delta SalesSMB_t + h_i \Delta SalesHML_t + e_t$$

This alternative way to examine how other fundamental variables are associated with market, size and value factors in stock returns is based on past sales growth. This measure, of past sales growth, is less volatile than either cash flow or earnings particularly for the portfolios that include high BE/ME stocks.

Table 2: Returns of the six constructed portfolios based on sales growth

	Portfolio BH	**Portfolio BL**	**Portfolio BN**	**Portfolio SH**	**Portfolio SL**	**Portfolio SN**
1998	0.605163	0.199936	0.229623	0.028105	0.168382	0.099329
1999	0.427423	0.243117	0.164014	0.271542	1.314729	0.396542
2000	0.481105	0.528147	0.434735	0.125458	0.235116	0.565849
2001	0.033123	1.150248	0.240940	-0.013625	1.791478	-0.115205
2002	0.973386	0.058699	0.120516	0.067413	0.269925	0.090639
2003	1.342045	0.015739	0.449824	0.067586	0.101941	0.333595
Average	0.643707	0.365981	0.273275	0.091080	0.646928	0.228458
Average	64.37%	36.60%	27.33%	9.11%	64.69%	22.85%
Variance	0.2088	0.1802	0.0191	0.0100	0.5187	0.0614

In Table 2, the returns of the six constructed portfolios are presented, from where it can be inferred that the created portfolios from the intersection of the small size stocks and the stocks with low book equity over market equity (S/L) produces the highest returns. The average SL portfolio return for the examined period from 1998 to 2003 is almost 65% while the lowest portfolio return is produced from the S/H portfolio, the portfolio constructed from small stocks in size and stocks with high book equity over market equity that produces 9%. However, it should be noted the high return portfolio is the most risky of all the constructed portfolios with the highest value of variance.

The results from the regression analysis as presented in Table 3 provide supportive evidence that the variants considered here, the three-factor model provides a suitable description of pervasive risk in these size and value-sorted portfolios. All the calculated intercepts are statistically different from zero with values of t-statistics not greater than 2 and large R-squared values. Only in the S/H portfolio the t-statistics values are greater than 2 but with high R-squared values. In addition, the estimated Durbin-Watson values for the constructed portfolios are not greater than 2 providing with no evidence for autocorrelation in stock returns.

5. CONCLUSION

The findings of the study provide supportive evidence of the Fama and French model applied to Greek equities. There is evidence that past sales growth of a firm is associated with market, size and value factors in returns so it can be inferred that this fundamental variable is related to size and book-to-market equity that help capture the cross-section of average stock returns in regard to the Athens stock exchange.

Finally, our work on stock returns related to sales and profitability leaves important open questions. Several unanswered questions arise from this study such as (i) what are the underlying economic state variables that produce variation in earnings and returns related to size and BE/ME? (ii) do these unnamed state variables produce variation in consumption and wealth that is not captured by an overall market factor and so can explain the risk premiums in returns associated with size and BE/ME? A number of variables, like gross national product, consumption, employment, inflation, level of interest rates and others, can be named that may affect the level of earnings-profitability and stock returns. This point of examining the underlying factors that drive earnings and returns is left for future work.

Table 3: Growth in sales for the six size and value sorted portfolios regressed on market, size and value factors in sales growth.

Portfolio	**a**	**b**	**s**	**h**	**R^2**
S/L	0.7019	-0.1802	0.8828	-0.6749	0.9170
t-Statistic	1.2704	-0.1048	1.2259	-2.1164	
Std. Error	0.5525	1.7200	0.7201	0.3189	
Probability	0.3317	0.9261	0.3450	0.1685	
Durbin-Watson stat	1.8562				
S/N	-0.3227	2.1027	0.3009	0.4798	0.8931
t-Statistic	-1.4964	3.1320	1.0706	3.8545	
Std. Error	0.2156	0.6714	0.2811	0.1245	
Probability	0.2732	0.0886	0.3964	0.0612	
Durbin-Watson stat	1.5096				
S/H	0.0377	0.3905	0.4094	0.1729	0.9956
t-Statistic	2.1296	7.0873	17.7496	16.9305	
Std. Error	0.0177	0.0551	0.0231	0.0102	
Probability	0.1670	0.0193	0.0032	0.0035	
Durbin-Watson stat	1.9018				
B/L	0.0040	0.0183	-0.0280	-0.0802	0.9085
t-Statistic	0.0808	0.1170	-0.4251	-2.0822	
Std. Error	0.0501	0.1561	0.0659	0.0385	
Probability	0.9487	0.9258	0.7441	0.2850	
Durbin-Watson stat	1.2023				
B/N	-0.1484	1.2633	-0.4130	0.0876	0.8772
t-Statistic	-1.1514	3.1481	-2.4582	1.1769	
Std. Error	0.1289	0.4013	0.1680	0.0744	
Probability	0.3686	0.0878	0.1332	0.3603	
Durbin-Watson stat	1.6966				
B/H	0.6148	0.2395	-0.2602	0.5212	0.8564
t-Statistic	1.3337	0.1669	-0.4331	1.9589	
Std. Error	0.4610	1.4351	0.6008	0.2661	
Probability	0.3139	0.8828	0.7072	0.1892	
Durbin-Watson stat	1.7335				

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