Stuck with Fundamentals? Testing Investment Strategies

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Abstract

This dissertation was written as part of the MSc in Banking & Finance at the International Hellenic University.

During the last decades market participants and academics have wondered if Markets are Efficient and if indeed they are how Efficient are they? Can an investor profit from a market inefficiency or an anomaly? Does it persist over time? These questions rose the interest of the investors to create and develop miscellaneous investment strategies based upon different assumptions.

This particular dissertation deals with three investment strategies, each one based on a single ratio the Price-to-Earnings, the Price-to-Book Value and the Price-to-Sales. The portfolios under every strategy are sorted with the aid of regression equations with dependent variable the ratios and independent variables their determinants. After forming the portfolios that consist of the most undervalued to the most overvalued we test the strategies.

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Introduction

Conducting a Dissertation dealing with the efficiency and efficacy of particular investment strategies it is unavoidable to discuss the issue of Market Efficiency. Over the past years, market participants and mainly academics have questioned whether markets are efficient and what the implications of an efficient market are. The Efficient Market Hypothesis suggests that all available information is reflected on the price of each security. Of course, as Eugene Fama stated in *Efficient Capital Markets: A Review of Theory and Empirical work (1970),* there are three forms of efficiency depending on the information subset of interest: weak, semi-strong and strong. The first is the less restrictive form, which implies that all available information is included in the historical prices, the second includes all publicly available information and the last is the most restrictive suggesting whether investors, both individual and in groups, hold monopolistic information relative to the price formation. Under the weak form, technical analysis and the use of historical price charts should not provide any advantage in identifying underpriced stocks. Following the same rationale, neither fundamental analysis would help, by using the publicly available information (financial statements, earnings announcements, interest rates, P/E, Book to Value ratios), nor investors exploiting both public and private information would be capable of identifying undervalued stocks in semi-strong and strong form of efficiency, respectively.

The necessity to know if Markets are Efficient lies to the fact that, if indeed they are, there is no room for equity research and valuation. That is because the pricing errors are random, implying that there is a 50 per cent chance of distinguishing an undervalued stock. None would be able to constantly beat the market in the long term because of his/her investment strategy but due to luck. Investors having a certain investment strategy based on identifying underpriced stocks, under the aforementioned condition, can only degrade the performance of their portfolio, since there are costs incurred by the research, transactions and execution of the strategy. This leads us to conclude that, passive strategies aiming to construct well

diversified portfolios based on an index, such as S&P 500, FTSE 100, DAX will always be superior to any other strategy.

According to Bodie et al (2010) there are three factors that combined they imply that the debate of whether security analysis boosts investment performance and to what extent, will possibly never conclude: the magnitude issue, the selection bias issue and the lucky event issue. The magnitude issue refers to the fact that securities are traded at fair prices with small differences over time and only a portfolio manager with a large amount of assets under management would profit by a minor performance increase. Based on this view, these portfolio managers' actions are the reason why market prices move towards fair prices. Therefore, the proper question is not if Markets are Efficient, but how efficient they are. Furthermore, the selection bias issue reflects the fact that, when a portfolio manager with a certain strategy manages to beat the market, does not wish to widely report it to the public. Hence, a fair valuation of his/her abilities to develop profitable investment strategies is not possible. Lastly, the lucky issue suggests what was mentioned before relative to the randomness of spotting undervalued stocks under efficient markets. Some investors will beat the market and they would call it skill, on the other hand some may call it luck. The difference between skill and luck is the consistency of achieving those results.

Additionally, in order for the markets to be efficient, there must be investors who are eager to beat the market by implementing various investment schemes. According to Damodaran (2012), there are certain prerequisite conditions for a market inefficiency to be exterminated. Firstly, there must be a framework for a trading strategy to beat the market and generate profits, plus the existence of rational investors that are willing to maximize their profit. Thus, efficient market could be considered as a self-correcting mechanism, where inefficiencies exist for short periods, because profit maximizing investors seek for them and causing the markets to be efficient again. Apart from inefficiencies though, there are also market anomalies, which create the opportunity for excess returns to persist even when a successful strategy is publicized.

There are multiple strategies based upon miscellaneous criteria in order to take advantage of these inefficiencies or anomalies. As Damodaran (2010) clearly

states, an investor should try to profit from market inefficiency but not from a market anomaly because the first is an inaccuracy caused by the market while the second is a phenomenon that current formulas or data that may be false and inaccurate, cannot explain.

Despite the efficient market hypothesis, it is observed that over the years, bubbles continue to appear in the stock markets. There are various theories that try to explain this phenomenon. A relative new approach was developed by economists with the aid of psychologists during the mid-1970's, called behavioral finance. There are few investment strategies based on the irrationality of investors' behavior that we will review in section 2.

This study is concentrated on the efficiency of three investment strategies, each one based on a different ratio such as the Price-to-Earnings, the Price-to-Sales and the Price-to-Book Value. Every ratio has distinct determinants which are incorporated into the research in order to construct models that will assist the process of separating undervalued from overvalued stocks within the framework of each strategy.

The rest of the dissertation is organized as below. Section 2 discusses prior research on investment strategies based on fundamentals and behavioral factors. Section 3 includes the data and the methodology that is followed in order to build our investment strategies. Section 4 presents the empirical results for the given period of time. Section 5 summarizes the results comparing them with previous studies

Section 2: Literature Review

Before we go into further depth in our study, it is vital to build a theoretical background on which the analysis will rest in. Over the years quite a large number of economists and not only, dealt with the issue of Market Efficiency and whether investors could exploit anomalies and inefficiencies with the aim of profit maximization. There are miscellaneous Investment Strategies in the literature and across the markets, based upon different rules and behaviours, composed in such way that will satisfy every investor style. In this section few of these strategies will be presented.

Market Efficiency

Market efficiency as stated by Fama (1998), despite the fact that finance literature has supported and evidenced a lot of long-term return anomalies, should not be abandoned. These anomalies are considered random results. An overreaction due to flow of information is as equal to be witnessed as underreaction. Additionally, pre-event abnormal returns endurance for a post event period is as possible as a post-event turnaround. Lastly, he concludes that market anomalies are frail, can be eliminated by adjusting the methodology followed to be measured.

Value versus Growth

An interesting article investigating the value premium is the one conducted by Fama and French (1998). Firms with high book-to-market equity, Earnings to Price or Cash flow to price are considered as value stocks and according to previous studies tend to have greater returns compare to the growth stocks. The authors focused on two basic questions, if there is a value premium realized in markets besides United States and if it is compliable with a similar risk model that explains the U.S. returns. The major counties of EAFE (Europe, Australia and Far East) were selected and the time period was from 1975 to 1995. They concluded that separating value from growth stocks based on a high Book-to-Market ratio exceeded the performance of growth stocks in twelve of the thirteen major markets during the aforementioned period.

The variation between the international average returns of value and growth stocks amounts to 7.68 per cent (annually). Comparable results are also present when the discrimination of stocks is based on Earnings/Price, Cash flow /Price and Dividend/Price. Lastly, they claimed that the traditional Capital Asset Pricing Model was not capable of explaining the value premium in global markets, instead an Intertemporal Capital Asset Pricing Model or a two- factor Arbitrage Pricing Theory obtain the value premium in both country and international returns.

A relevant study in addition to the former is the one by Arshanapalli et al (1998) who verified that value stocks outperform growth stocks on average for the same period mentioned above and in 17 out of 18 national equity markets. The percentage change in performance between value and growth stocks per year is equal to 12.94, 10.42, 17.26 for North America, Europe and Pacific-Rim, respectively. They also found that a three factor model describes the majority of cross-sectional variation in average returns on industry portfolios and the supremacy of value investing.

Having already presented studies that prove excess returns of value over growth stocks exist, forces us to question why. There are a lot of theories and academics tried to answer that question approaching the issue from different views. There is uncertainty to what a book to market ratio represents. As Lakonishok et al (1994) claimed, a low B/M may imply a significant amount of R&D that is not capitalized and therefore cannot be depicted by the accounting book value of equity, due to the fact that in most cases is expensed. Companies with high growth opportunities will probably have higher market value of equity which would lead to a low B/M ratio, but well established companies, such as oil firms with low growth opportunities albeit high temporary profits might also have a low book value. The main idea is that B/V does not express explicitly the economic factors that influence the performance of a company, but it also incorporates other elements. There is an interesting study by Petkova and Zhang (2005), dealing with the issue of whether value are riskier than growth stocks and if the compensation for that risk is the source of outperforming. According to previous research conducted by Lakonishok (1994), DeBondt and Thaler (1987) and Chopra et al (1992) investors are not exposed to risk attributable to value overreaction-related mispricing must be the primary source of the value premium. There are two core results of this paper, the first is that time-varying

risk is a relatively good explanation of the value premium. The authors, using a non noisy measure such as the expected market risk premium they concluded that value minus growth betas tend to covary positively with the expected market risk premium, due to the fact that value betas have a tendency to covary positively while growth betas negatively. This finding applies for multiple value and growth strategies and for a variety of samples. Secondly, it is proposed that is mandatory to search for other possible drivers of the value anomaly, both APT- or ICAPM-related risk and overreaction-related mispricing .

Another study on book-to-market ratio is the one constructed by Zhang (2013) focusing on the return distributions of glamour and value stocks. It is documented that return distributions of glamour stocks appear a significant excess positive skewness compared to the ones of value stocks. The inherent importance of this finding is that investment strategies, seeking for mispriced securities in the market may recklessly force the investors to incur significant skewness risk. It is also crucial to mention that the aligning with one of the basic principals in accounting, the conservatism, can aid the researchers to assess a company's relative downside.

An intriguing paper made by Abarbanell and Bushee (1998) deals with the issue of gaining abnormal returns under a fundamental analysis based investment strategy. Employing fundamental accounting elements of enterprises such as the accounts receivables, gross margins, selling expenses, capital expenditures, changes in inventories, inventory calculation methods, effective tax rates, audit qualifications and labor force sales productivity, they constructed portfolios that achieves a twelve month cumulative size adjusted abnormal return that amounts to 13.2 per cent. They also find that fundamentals contain information about the future returns that is related to future earnings news. There is a predictive power characterizing the fundamentals relative to the future returns, although it is constrained to one year horizon.

Overreaction

As we already described, value investing is based on identifying the most undervalued securities according to fundamentals. Previous studies investigated that these

strategies can be profitable. But what drives this value premium is controversial. Lakonishok et al (1994) provided evidence on the reason why the value stocks offer higher returns than growth stocks. Having verified that investment strategies exploiting Book to Market value and other multiples such as Cash Flow to Price, the Earnings to Price and also past growth in sales, produce excess returns by sorting value from growth stocks for a period of April 1968 to April 1990, they continue by investigating the reason. Finding no evidence that value stocks are fundamentally riskier than glamour, the attention is drawn to behavioral factors observed by individual investors. Overestimating growth potential of the growth stocks over the value stocks is the main reason that the latter overperform relative to the former. Individual investors are misled by the representativeness effect. They are erroneously convinced that recent growth rates of glamour stocks can be persistent in the future. As a result they invest in growth stocks expecting to continue to perform with a relative manner to the near past, which leads to their disappointment and consecutively to a price drop. As far as institutional investors are concerned, the main reason they shift towards growth stocks is that are considered an attractive investment selection that can easily be justified and understandable by the clients.

Based on the aforementioned notion contrarian investment strategies can be formed and as DeBondt and Thaler (1985) revealed, can offer excess returns. The authors found that excessive optimism or pessimism by investors caused a systematic overreaction of security prices. This particular characteristic signifies that price reversals might be predictable from past data, which contravenes the efficiency of the markets under the weak form. Last but not least, a significant conclusion of this research is that losers of previous years turn out to outperform winners of the same period. According to the researchers having constructed a portfolio by short selling the winning stocks and buying the losing ones (zero investment portfolio) of the previous period, after thirty-six months the returns of the losing portfolio exceeded the winning one by 25 per cent.

On the other hand, holding the portfolio for a medium term period the opposite will occur as Jegadeesh and Titman (2001) point out. DeBondt and Thaler did not take into consideration the momentum effect that characterizes winners and losers for a one year horizon. Securities that performed well over the recent past (3-12

months) will continue to do so from three to twelve months after the formation of the portfolio. This phenomenon according to the conductors of the paper was observed in the U.S. and most of the developed markets apart from Japan. Underaction of the market participants to the flow of information is the concept on which a momentum strategy is based upon. Jegadeesh and Titman (1993) using for their research U.S. stocks from 1965 to 1989 they constructed zero investment portfolios by selling previous losers and buying previous winners and found that the strategy yielded positive returns. Rouwenhorst (1998) concluded to similar results with Jegadeesh and Titman for an international diversified portfolio, constructed with a similar way as described earlier and tested for the period from 1980 to 1995. The excess return of past winners over the past losers reaches the amount of 1% per month. He also states that the return preservation holds true for all countries and that is negatively correlated with company size without being limited to small firms. Lastly, is stated that correlation between returns of European and U.S. portfolios may indicate a universal factor that makes momentum strategies profitable.

Section 3: Research Design

In this chapter the data that are used and the exact steps that we follow in order to perform our analysis are presented. This description is critical for establishing a conceptual framework which will aid us with the interpretation of empirical results.

Sample Selection

The sample selected for the conduction of the dissertation is all the constituent firms of the S&P 500 from 2004 up to 2014. The S&P 500 consist of approximately the five hundred largest U.S. companies based on market capitalization, capturing roughly the 80 per cent coverage of available market capitalization that are traded in the New York Stock Exchange (NYSE) and NASDAQ. The Index is a capitalization weighted one, which means that every firm's weighting is proportional to its market value. The basic characteristic of an index though, is that constantly changes depending on

whether the companies meet the inclusion criteria. Specific care was taken for this peculiarity as it will be revealed in the next section.

In order to perform the analysis, certain characteristics of the aforementioned companies were necessary. Besides the financial ratios, Price-to-Earnings, Price-to-Sales and Price-to-Book Value, the fundamental factors that determines their value are also vital for the research model that is built and described below. For every ratio there are different determinants and according to Damodaran (2012) these are: the Growth of Earnings per Share, the Dividend Payout ratio, the Beta, the Profit Margin and the Return on Equity (hereafter, ROE).

All data employed in the practical section of the dissertation were collected from the Bloomberg Terminal, if otherwise is clearly stated. Data for the multiples (P/E, P/S and P/BV) as well for their determinants of every firm in the sample are gathered from 2004-2013 while historical prices and returns form 2005-2014.

Research Methodology

The main research question of the dissertation is whether the three investment strategies based on the P/E, the P/S and the P/BV respectively manage to beat the market. In order to test each and every of these strategies, the procedure that is followed is similar for all. The methodology proposed by Damodaran (2010) for portfolios studies is the core of the technique that is implemented and consists of the following steps.

First of all, having established the characteristics on which each strategy is built upon, the first step is to run a regression for all stocks forming the S&P 500 and each year. The dependent variable is the relative valuation measure calculated with market values which is different every time depending on the strategy (P/E, P/S, P/BV). The independent variables are the determinants of the relative valuation metric. Each multiple depends on different fundamentals. According to Damodaran (2012) the crucial determinants of P/E, P/S and P/BV can be depicted by the regression equations below:

$$P/E = constant + a_1 g_{EPS} + b_1 Payout + c_1 Beta$$

$$P/S = constant + a_2 g_{EPS} + b_2 Payout + c_2 Beta + d_2 ProfitMargin$$

$$P/BV = constant + a_3 g_{EPS} + b_3 Payout + c_3 Beta + d_3 ROE$$

Where, g_{EPS} =Growth of earnings per share, $Payout$ =Dividend payout ratio, ROE= Return on Equity

Then, the above regression equations are used to predict for each firm in the sample the relative valuation measure based on the fundamental data of each company. Thus, for each company there should be a P/E, P/S and a P/BV ratio based on market data and another ratio based on fundamental data. The comparison of the market based ratios with the fundamental ratios is necessary in order to find out whether each company is overvalued or undervalued and determine the percentage of either over or under valuation.

The next step is to sort all sample firms based on the percentage of over or under valuation in ascending order. Thus, we should have a list of companies ranking from the mostly undervalued to the mostly overvalued.

All sample stocks of each year and for each strategy separately, should be allocated into 10 separate portfolios. Each portfolio should have the same number of companies. Assuming that the weight of every stock in the portfolio is equal and the sample for every year is five hundred companies (S&P 500) we would have fifty (50) firms consisting one portfolio.

Afterwards, the calculation of the monthly rate of returns of each portfolio is needed for the following twelve months, had the portfolios already been formed. Thus, at the end we would have twelve (12) monthly returns for each portfolio. It is important to mention at this point that the time that the portfolios of under or overvalued stocks are formed is the end of the fiscal year. So, the time period in which the returns are computed is the following year of the portfolio formation.

In order to conclude the three investment strategies, the aforementioned process needs to be repeated for ten years and each ratio. Hence, at the end we would have the returns for both underpriced and overpriced portfolio under each strategy.

The final step is to test the significance of all the investment techniques using the necessary tools presented in section 4

Data description

As was mentioned above all data used for the empirical research were extracted from Bloomberg Terminal. In order to proceed into further depth in the research it is meaningful to provide a clear description of the data and the way Bloomberg reports and computes them. Below the necessary information for the research are presented as reported by Bloomberg:

- *BEst Earnings per Share (Bloomberg Estimate)*: The percentage change in the Earnings per share (EPS) estimate for the specified period from the same period a year earlier. The comparable EPS is used for historical periods. If no comparable value is available, the value will not be calculated. When both periods are in the future estimates are used.
- *Price-to-Sales (P/S)*: Is the ratio of a stock's last price divided by sales per share. The average shares outstanding is used when calculating sales per share. Also, Sales per share is calculated on a trailing 12 month basis where available. Trailing values are calculated by adding the most recent four quarters. Reported as current P/S.
- *Price-to-Earnings (P/E)*: Ratio of the price of a stock and the company's earnings per share. Calculated as Last Price divided by Trailing 12 Month Diluted EPS, if only annual earnings exist.
- *Price-to-Book Value*: Is the ratio of the market value of a share divided by the book value per share. Data from the most recent reporting period (quarterly, semi-annual or annual) used in the calculation. The one used in our research is the current. Calculated as: P/B = Last Price / Book Value Per Share
- *Return on Equity (ROE)*: It is a measure of a corporation's profitability by gauging how much profit a company generates with the money shareholders have invested, in percentage. If either the beginning or ending total common equity is negative, Return on Equity will not be calculated. The one reported is the latest year. Calculated as: (Twelve month Net Income Available for Common Shareholders / Average Total Common Equity) * 100.
- *Dividend Payout Ratio*: Is the fraction of net income a firm pays to its shareholders in dividends, in percentage. Us companies distribute dividends quar-

terly. The value that is used refers to the latest year dividends. Calculated as: Total Common Dividends*100 / Income Before Extraordinary Items Less Minority and Preferred

- *Profit Margin*: A comparison between the revenue realized during the period and the net income. It is expressed in percentage terms. Below the calculation of the ratio for each industry is illustrated:
- Industrials, Financial, Insurance, Utilities, & Real Estate Investment Trusts(REITS): (Net Income/Revenue)*100
- Banks: (Net Income / Net Revenue) *100
- *Raw Beta*: Is the percentage change of a security given an one percentage change of the relative market index, in our case the S&P 500. Therefore is a measure of volatility. The beta value is determined by comparing the price movements of the security and the market index (S&P 500) for the past two years of weekly data. The beta exploited for the study is the year to date.

Section 4: Empirical results

The purpose of this section is to present and analyze the findings of the empirical research conducted. We examine thoroughly the criteria used for determining overvaluation and undervaluation of the securities included in the sample which also form the portfolios of each strategy. It is divided into three subsections: the regressions, the portfolio formation and the performance.

Regressions

For the sake of identifying mispriced securities under the current strategy, attention is drawn to the Ratios that were mentioned in the previous sections. But the focus is not on the particular value of the ratios being high or low and the implications of that. The spotlight of this dissertation is on the comparison of two values. The value of every ratio based on market data as reported on the database and the one predicted by the regressions described in section 3.

All investment strategies that we tested can be categorized as value investing ones since the main idea is to seek for undervalued stocks. Every strategy though is based on a distinct ratio out of the three: Price-to-Earnings, Price-to-Book Value and

Price-to-Sales. Each ratio is determined by different fundamentals that were used in the research for mispriced stocks. This subsection will provide a thorough depiction of the fundamentals that determine every ratio as well as output of all the regressions run for the identification of mispriced stocks.

Price-to-Earnings

Since P/E ratio is an equity multiple to find its determinants we have to use an equity model in order to break it down into its fundamental determinants, as Damodaran (2012) states in his book *Investment Valuation: Tools and Techniques for determining the Value of Any Asset* such a model is the dividend discount model. After conducting few manipulations on the initial equation Value of equity[1] he ends up concluding that the fundamentals that affect the P/E ratio are the Payout ratio, the Beta (expressing the risk of the security) and the Expected growth rate of earnings per share.

Before continuing the research, it is vital to state the basic assumption made in order to proceed with the linear regressions. The first and foremost assumption is that there is a linear relationship between the relative metric and the fundamentals defining it. Having established the factors that affect the P/E ratio, it is of high importance to run the regression with dependent variable the relative measure and independent variables its determinants, for each year from 2004 to 2013.

Due to the fact that P/E ratios have a positive upward tendency we took special care in order to avoid unnecessary skewness and removed the outliers from the sample. This process is accomplished by displaying the values of the variables in a scatter plot in order to visualize the extreme high values for the ratio that would have caused problems in the analysis. The process is repeated every year and not only for the P/E ratio but also for the independent variables. In addition, for few other companies that there was information missing whether it was the Growth of

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[1] $Value\ of\ equity = P_0 = \frac{Dividend\ \ per\ \ Share_1}{k_e - g_n}$,where $Dividend\ per\ Share_1 = Dividend\ expected\ in\ the\ next\ year$, $k_e = cost\ of\ equity$,$g_n = expected\ stable\ growth$

Earnings per share, the Payout ratio or the Beta, were excluded from the sample. Firms with negative earnings were also not included. So, from an initial sample of almost 500 companies we ended with a smaller sample available for the research (depending on the year). The number of companies participating in the regressions for each year is explicitly stated.

Table 1, *Regressions of the relative measure P/E against its determinants (2004-2013*)

Year	**Regression**	**Statistics**
2004	*PE*= 14.88 + 2.152*Geps* - 3.286*Dvd* + 7.563*Beta* (1.686) (0.616) (1.724) (1.394) (0.000) (0.001) (0.059) (0.000)	R^2 =14.41% # Observations 442 Significance F: 0.000
2005	*PE*= 22.19 + 2.397*Geps* - 4.347*Dvd* - 0.491*Beta* (2.133) (1.763) (2.006) (1.806) (0.000) (0.175) (0.031) (0.786)	R^2 = 1.68% # Observations 449 Significance F: 0.055
2006	*PE*= 19.362 + 3.052*Geps* - 0.128*Dvd* + 0.316*Beta* (1.382) (1.619) (1.619) (1.059) (0.000) (0.060) (0.937) (0.766)	R^2= 0.97% # Observations 460 Significance F: 0.217
2007	*PE*= 17.65 + 7.112*Geps* + 0.004*Dvd* + 0.715*Beta* (1.569) (1.431) (1.436) (1.369) (0.000) (0.000) (0.988) (0.602)	R^2=5.18% # Observations 462 Significance F: 0.000

2008	*PE*= 15.635 - 0.651*Geps* + 1.181*Dvd* - 3.999*Beta* (0.939) (0.943) (1.028) (0.776) (0.000) (0.491) (0.252) (0.000)	R^2=6.01% # Observations 452 Significance F: 0.000
2009	*PE*= 17.206 - 4.817*Geps* - 0.274*Dvd* + 2.224*Beta* (1.306) (1.804) (1.454) (1.050) (0.000) (0.008) (0.850) (0.035)	R^2=4.32% # Observations 416 Significance F: 0.000
2010	*PE*= 10.896 - 0.65*Geps* - 4.017*Dvd* + 9.934*Beta* (2.077) (1.187) (1.843) (1.778) (0.000) (0.585) (0.030) (0.000)	R^2=9.24% # Observations 445 Significance F: 0.000
2011	*PE*= 16.202 + 0.372*Geps* + 3.691*Dvd* - 0.882*Beta* (1.56) (1.059) (1.373) (1.263) (0.000) (0.725) (0.007) (0.485)	R^2=2.09% # Observations 457 Significance F: 0.022
2012	*PE*= 15.081 + 2.298*Geps* + 4.537*Dvd* + 1.007*Beta* (1.556) (1.428) (1.557) (1.151) (0.000) (0.108) (0.004) (0.382)	R^2=2.48% # Observations 456 Significance F: 0.010
2013	*PE*= 16.183 + 8.627*Geps* + 2.377*Dvd* + 2.796*Beta* (1.995) (1.521) (1.31) (1.7) (0.000) (0.000) (0.007) (0.101)	R^2=8.62% # Observations 456 Significance F: 0.000

Table 1 summarizes all the regressions conducted using the Data Analysis Toolpak of Microsoft Office Excel. It also illustrates the number of firms used for the analysis each year, the R-squared for each regression and the p-values for every co-

efficient. The numbers in the brackets express the Standard errors of every coefficient estimate. We observe that the value of R-squared is quite low with the highest being 14.41% (2004). This statistical measure represents the goodness of fit of the model, how effectively the regression explains the variations of the data. Paying attention only to R-squared though might lead us to false conclusions. We should also focus on the significance F of the regression and the p values of the estimates.

Significance F

As stated earlier, in order to judge whether the model built is significant or not we concentrate on the F value given by the regression analysis. This value portrays the hypothesis test of whether all the coefficients are equal to zero (H_0: null Hypothesis) against the alternative (H_a) that at least one is not zero. With an F value of lower than 0.05 (α= significance level) we reject the null hypothesis. In the case of P/E regressions, there were only two out of ten not significant, the one of the year 2005 (F=0.055>0.05) and year 2006 (F=0.217>0.05).

Coefficient analysis

As can be clearly depicted by Table 1, the second row of numbers within brackets below each regression reflects the p-value of every coefficient. The p-value of every coefficient conveys the result of testing whether it is zero (H_0: coefficient=0) or not (H_a: coefficient≠0). At a significance level of 0.05, we reject the null hypothesis if only the p-value is smaller (<0.05). Extracting the values from table 1, it is important to mention that besides the constant term which is statistically significant for all the years of the research (p-value=0.000), no coefficient is significant, at least for each year. Over the years there are different statistically insignificant coefficients, but yet are kept in the model. The fact that the coefficients signs changes over the years is worth mentioning. For the period 2004-2007 and 2011-2013 the Growth of Earnings per Share had a positive relationship while from 2008-2010 a negative one. The same applies also for the other two coefficients, for 2004-2006 and 2009-2010 the sign of Payout coefficient is negative while for 2007-2009 and 2011-2013 is positive. Lastly, the coefficient of Beta sign is constantly changing over the years.

Correlation coefficients

As Damodaran (2012) claims that the independent variables of these regressions are correlated with each other, we decided to test if this holds true. In order to perform this test we use the Stata and the function pwcorr because it can provide correlation matrices with statistical significance (α=0.05). Plotting the correlation matrices for all years included in the study we witness either positive or negative correlation between the independent variables (see Appendix), confirming the aforementioned statement.

Price-to-Book Value

Another ratio which forms the basis that the second investment strategy is built upon is the P/BV. Unlike other strategies that use firms with low price to book value in order to achieve higher excess returns, in this particular strategy the value based on market data is compared with the one predicted by the regression based on the fundamental determinants of the ratio. So, it is of high importance to look closer at these determinants. Being an equity multiple the discount dividend model was also used to decompose the ratio into the elements that defines it (Damodaran, 2012). These factors are the Growth of Earnings per Share, the Beta, the Dividend Payout ratio and most importantly the Return on Equity (ROE).

Below on Table 2 the regressions concerning the P/BV are illustrated. In this point it is critical to mention few details about the sample that is used. As the case with the P/E ratio we eliminated the companies from the sample that had negative P/BV and/or firms with missing data (Growth of Earnings per Share, Beta, Payout Ratio, ROE). The outliers were also removed to secure the model from skewness, using the same procedure as described previously. Useful information about our analysis such as the Adjusted R- squared, the number of observations and the significance F of each regression are also provided. Paying attention to the adjusted R-squared values we notice that there is quite a difference compared to the ones of the P/E regressions, from the lowest being 14.85% (2004) to the highest 39.07% (2011).

Table 2, Regressions of the relative measure P/BV against its determinants (2004-2013)

Year	Regression	Statistics
2004	*PBV*= 1.663 + 0.122*Geps* + 1.037*Beta* - 0.25*Dvd* + 6.063*ROE* (0.402) (0.173) (0.287) (0.379) (0.668) (0.000) (0.481) (0.000) (0.509) (0.000)	Adj.R^2= 14.85% #Observations: 460 Significance F: 0.000
2005	*PBV*= 3.301 + 0.861*Geps* - 0.744*Beta* - 0.762*Dvd* + 5.826*ROE* (0.388) (0.233) (0.316) (0.354) (0.5) (0.000) (0.000) (0.019) (0.032) (0.000)	Adj. R^2= 23.81% #Observations: 460 Significance F: 0.000
2006	*PBV*= 1.771 + 1.202*Geps* - 0.325*Beta* + 0.014*Dvd* + 10.84*ROE* (0.307) (0.281) (0.225) (0.331) (0.623) (0.000) (0.000) (0.149) (0.966) (0.000)	Adj. R^2= 39.04% #Observations: 468 Significance F: 0.000
2007	*PBV* = 3.636 + 1.875*Geps* - 1.075*Beta* - 0.331*Dvd* + 5.997*ROE* (0.521) (0.445) (0.441) (0.466) (0.859) (0.000) (0.000) (0.015) (0.477) (0.000)	Adj. R^2= 14.81% #Observations: 467 Significance F: 0.000

2008	*PBV*= 2.729 + 0.531*Geps* - 1.167*Beta* + 0.136*Dvd* + 4.465*ROE* (0.3) (0.215) (0.23) (0.308) (0.458) (0.000) (0.014) (0.000) (0.659) (0.000)	Adj. R^2= 26.4% #Observations: 466 Significance F: 0.000
2009	*PBV*= 3.255 + 0.431*Geps* - 0.439*Beta* - 0.275*Dvd* + 3.696*ROE* (0.260) (0.162) (0.181) (0.204) (0.438) (0.000) (0.008) (0.016) (0.178) (0.000)	Adj. R^2= 20.15% #Observations: 469 Significance F: 0.000
2010	*PBV*= 1.412+ 0.358*Geps* + 0.518*Beta* + 0.012*Dvd* + 6.757*ROE* (0.356) (0.160) (0.275) (0.194) (0.504) (0.000) (0.026) (0.060) (0.952) (0.000)	Adj.R^2= 28.12% #Observations: 470 Significance F: 0.000
2011	*PBV*= 2.776 + 0.565*Geps* - 1.166*Beta* - 0.082*Dvd* + 7.701*ROE* (0.368) (0.168) (0.264) (0.286) (0.519) (0.000) (0.001) (0.000) (0.775) (0.000)	Adj. R^2= 39.07% #Observations: 463 Significance F: 0.000
2012	*PBV*= 2.170 + 0.817*Geps* - 0.624*Beta* + 0.119*Dvd* + 8.76*ROE* (0.371) (0.269) (0.251) (0.349) (0.564) (0.000) (0.003) (0.013) (0.733) (0.000)	Adj. R^2= 36.99% #Observations: 458 Significance F: 0.000

2013	*PBV*= 1.014 + 1.244*Geps* + 0.828*Beta* - 0.151*Dvd* + 11.06*ROE* (0.555) (0.361) (0.431) (0.311) (0.819) (0.068) (0.001) (0.055) (0.629) (0.000)	Adj. R^2= 28.97% #Observations: 454 Significance F: 0.000

Significance F

In addition, every regression in the period is statistical significant according to the F value (=0.000). The combination of bigger Adjusted R-squared values (than P/E regressions) and statistically significance suggest that this model may be better and produce more reliable results.

Coefficient Analysis

As portrayed by Table 2, the constant is statistically significant (α=0.05) for all years included in the research except the last one. It is clear that the return on equity has a strong positive effect on the P/BV supported by a low p-value during all the years (p=0.000). The coefficient of Growth (EPS) is significant in every equation excluding the one of 2004. Beta is also significant for the majority of the years examined and if not its p-value is not large as it is for the Dividend Payout ratio. As the case of the P/E regressions, there are statistically insignificant variables. Attempts were made to run the regression without them, but the post estimation did not improve the model and the significance of the remaining variables, so we decided to keep them since they do not have a major impact in our analysis. Changes of the determinants signs are present as well as the previous case. The difference is that are observed only for the Beta and the Payout Ratio.

Correlation coefficients

The independent variables are tested for correlation the exact way as presented before in the case of the P/E regressions. The additional variable Return on Equity also correlates with the other independent variables as can be depicted by the correlation matrices over the years.

Price-to-Sales

The last set of regression equations that were estimated are those concerning the P/S based investment strategy. One of the advantages of this ratio is that it cannot be negative unlike the preceding ratios. Hence, it is highly possible to avoid undesirable bias caused by the elimination of companies in the sample. With the use of the dividend discount model the core factors that define the P/S can be extracted. They are similar to the aforementioned determining the other ratios with the only distinction being that instead of the ROE we now introduce the Profit Margin (PM).

The results of the regressions can be depicted on the Table 3. Outliers irrespective of origin and firms with missing data were knocked out from the initial sample, with the same preceding procedure leading to a smaller one indicated on the table. The Adjusted R-squared ranges from 14.13% to 78.45%. The largest values are due to the removal of the constant term.

Table 3, Regressions of the relative measure P/S against its determinants (2004-2013)

Year	Regression	Statistics
2004	P/S= 0.353Geps - 0.552Dvd + 1.153Beta + 13.397PM (0.158) (0.232) (0.096) (0.718) (0.026) (0.018) (0.000) (0.000)	Adj. R^2= 73.63% #Observations: 450 Significance F: 0.000

2005	P/S= 1.119 + 0.822Geps - 0.768Dvd + 11.434PM (0.133) (0.18) (0.277) (0.736) (0.000) (0.000) (0.006) (0.000)	Adj. R^2= 34.74% #Observations: 466 Significance F: 0.000
2006	P/S= 0.763Geps + 0.257Dvd + 0.462Beta+13.514PM (0.183) (0.198) (0.089) (0.665) (0.000) (0.195) (0.000) (0.000)	Adj. R^2= 78.45% #Observations: 465 Significance F: 0.000
2007	P/S= 1.366 + 1.815Geps - 0.364Dvd - 0.137Beta + 8.158PM (0.292) (0.248) (0.271) (0.257) (0.730) (0.000) (0.000) (0.18) (0.594) (0.000)	Adj. R^2= 27.33% #Observations: 472 Significance F: 0.000
2008	P/S= 1.083 + 0.592Geps - 0.008Div - 0.424Beta + 5.911PM (0.131) (0.11) (0.145) (0.106) (0.404) (0.000) (0.000) (0.958) (0.000) (0.000)	Adj. R^2= 37.18% #Observations: 460 Significance F: 0.000
2009	P/S= 1.663 + 0.297Geps - 0.179Dvd + 0.144Beta + 3.975PM (0.193) (0.126) (0.212) (0.137) (0.466) (0.000) (0.018) (0.398) (0.293) (0.000)	Adj. R^2= 14.13% #Observations: 467 Significance F: 0.000
2010	P/S= 0.42 - 0.098Geps - 0.48Dvd + 1.043Beta + 8.787PM (0.278) (0.128) (0.229) (0.214) (0.71) (0.132) (0.445) (0.036) (0.000) (0.000)	Adj. R^2= 25.34% #Observations: 469 Significance F: 0.000

2011	P/S= 0.683 + 0.748Geps + 0.4Dvd - 0.11Beta + 9.986PM (0.250) (0.152) (0.202) (0.184) (0.686) (0.006) (0.000) (0.048) (0.551) (0.000)	Adj. R^2= 32.33% #Observations: 472 Significance F: 0.000
2012	P/S= 0.754 + 0.628Geps + 0.256Dvd - 0.156Beta + 12.256PM (0.244) (0.187) (0.240) (0.168) (0.748) (0.002) (0.001) (0.287) (0.354) (0.000)	Adj. R^2= 37.12% #Observations: 466 Significance F: 0.000
2013	P/S= 0.814Geps + 0.234Dvd + 0.967Beta +13.438PM (0.269) (0.206) (0.118) (0.783) (0.003) (0.258) (0.000) (0.000)	Adj. R^2= 72.49% #Observations: 472 Significance F: 0.000

Significance F

Considering the minimal value of the F-value of every regression equation we conclude that all of them are statistically significant. In addition, the fact that we obtain

Coefficient analysis

In contrast with the other regression equations based on the P/E and P/BV in this particular case, having a constant term that is statistically insignificant in the equations of 2004 and 2013 we considered that is better to run the regression without it in order to get more reliable results. After this intervention, indeed the coefficients of the other variables improved substantially. We follow the same procedure for Beta of the year 2006. The reason why similar actions were not practiced earlier is

that there was not any improvement observed to the other elements of the regression such as the R^2, the p-value of the coefficients or the overall F-value. Examining the coefficients and their p- values reported on the table we conclude that the Profit Margin plays a crucial role to the P/S formation affecting it positively.

Correlation coefficients

As analyzed earlier for the P/BV strategy the new variable Profit Margin seems to also correlate with the existing variable of the first investment strategy.

Portfolio Formation

In this subsection the portfolios that were constructed are presented. Having estimated all the regression equations for each financial ratio which constitute the cornerstone of every investment strategy, we now proceed in forming the portfolios by categorizing undervalued and overvalued securities. The basic function that is practiced in this procedure is the comparison of two values of each ratio, the one based on market data and the other predicted by the regression equations. The feature that characterizes a company over or under valued is the simple equation, *Value of the ratio based on Market Data − Predicted Ratio* and in order to facilitate the portfolio building process is better expressing it in percentage terms:

$$\left(\frac{Value\ \ of\ \ the\ ratio\ \ based\ \ on\ Market\ \ Data - Predicted\ \ \ Ratio}{|Predicted\ \ \ Ratio|}\right) \qquad (4.1)$$

The denominator is in absolute value due to the fact that for few firms the predicted ratio is negative. Omitting the absolute value in that case would have led in a completely opposite valuation. Negative predicted values were produced only by P/S and P/BV equations.

It is obvious from the above equation that undervalued stocks carry a negative sign while overvalued a positive one. Therefore, all stocks in the yearly samples (Tables 1, 2 and 3, number of observations) are classified from the firms with the lowest percentage (calculated with the help of equation 4.1) to the ones with highest. Thus, at the end 10 portfolios were formed for each year of the period 2004 to 2013, composed of the most undervalued securities to the most overvalued. Depending on the final number of firms per year and the investment strategy the secu-

rities that each portfolio contains range from 40 to 47. Lastly, It is of vital importance to mention that each portfolio was formed with the data of the latest year, as of 31st of December, which is crucial for the calculation of returns as we will see.

Testing the Investment Strategies

Having already formed the portfolios consisting of underpriced and overpriced securities for the three strategies based on P/E, P/BV and P/S we carry forward testing them. In order to achieve that we need historical prices both for each constituent firm of the portfolios and the market index, which is the S&P 500(ticker: SPX) for the period of 2005-2014. For the calculation of the stock returns natural logarithms of the historical monthly prices were used[2] .

As was earlier mentioned the portfolios were constructed at the end of every year. Therefore, we used data from 2004 to evaluate the S&P 500 constituent companies and form the portfolio based on under and over valuation that we will later test for the year 2005. The procedure is repeated for every period. The S&P 500 Index is revisited each year and other companies are added others replace and even deleted or moved to another Standard & Poor's Index such as the S&P MidCap 400. In order to cope with this peculiarity, the portfolios are matched each year with the index to identify the status of the securities. With the assistance of Excel (Microsoft Office) we plot the portfolios, constructed as described previously under the criteria of every strategy and the list of the S&P 500 constituent firms. By comparing these two columns the status of each company and whether it should be included in the final portfolios that will be subsequently tested is determined.

There are plenty of reasons to explain the absence of a former S&P constituent firm during the current year. We distinguish the main reasons as resulting from the present research as follows. Companies that were acquired by or merged with another constituent or not is a common phenomenon for the period of study. Besides Mergers and Acquisitions, the deletion of a firm that does not meet the inclu-

[2] Ln (Last Price $_n$ / Last Price$_{n-1}$

sion criteria such as a significant deterioration of the market capitalization or the transfer to a more suitable index according to firm specific characteristics could also be met frequently. Firms that belong to the aforementioned groups are eliminated from the portfolios. It is important though to mention that these companies may still be listed in the New York Stock Exchange or the NASDAQ but they are not part of the S&P 500 Index. The reason why they are knocked out is because the purpose of this study is to focus on the constituent firms.

In the cases where firms are not included in the Index as a result of Delisting, Bankruptcy or a Buyout from private equity firms, are kept in the portfolio. According to Chan et al (2013) statement that "a stock deletion appears to be related to poor industry prospects" and following the rationale of testing investment strategies proposed by Damodaran[3] , these stocks are assigned a return of -100 per cent at the starting month of each year and zero the following months.

Having adjusted the portfolios relative to these changes we proceed by implementing the aforementioned method and calculate the excess returns of each portfolio, for every strategy and year under the assumption that the portfolios are equally weighted. As Risk free rate the thirteen week U.S Treasury Bill[4] as of the beginning of every year was used and the Beta represents the average Beta of every portfolio. Tables 4, 5 and 6 below illustrate the excess returns of the P/E, P/BV and P/S investment strategies from 2005 to 2014.

Table 4, P/E Annual Averages of Monthly Excess returns (2005-2014)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	1.04%	1.03%	0.58%	-2.35%	2.65%	0.02%	-0.50%	-0.42%	0.12%	-3.03%
2	0.74%	0.01%	-1.65%	0.07%	0.37%	-0.55%	-0.11%	-0.48%	0.14%	-0.34%
3	0.28%	0.35%	-0.56%	-0.33%	1.35%	0.56%	-0.50%	-0.24%	0.01%	0.00%
4	0.40%	0.17%	-0.15%	-0.35%	0.89%	0.39%	0.26%	0.00%	0.02%	0.39%
5	-0.13%	-0.24%	-0.25%	0.27%	0.86%	0.23%	0.10%	-0.03%	0.30%	-0.30%

[3] Damodaran, A (2012) Investment Philosophies: Successful Strategies and the Investors Who Made Them Work, Wiley Finance, Hoboken, N.J.

[4] Extracted from www.finance.yahoo.com, ticker: IRX

6	-0.01%	0.17%	-0.47%	-0.17%	0.86%	0.58%	-0.03%	0.07%	0.48%	0.04%
7	0.07%	-0.03%	-1.16%	-0.10%	0.17%	0.51%	0.23%	0.39%	0.53%	0.24%
8	-0.67%	-0.12%	-0.61%	-0.83%	-0.26%	-0.05%	0.48%	0.22%	-0.44%	-0.01%
9	0.62%	-0.46%	-0.14%	-0.42%	0.27%	0.75%	0.24%	-0.23%	0.01%	0.03%
10	0.59%	0.18%	0.87%	-1.11%	0.03%	0.09%	-0.46%	0.34%	-0.58%	0.03%

The ascending order implies the under or overvalued portfolios. Thus, one (1) is the portfolio consisted of the most undervalued securities and ten (10) the one with the most overvalued. It can be clearly depicted by the Table 4 that the results are not clear and certainly not what expected, having referred to past evidence concerning value investing in section 2. The extreme undervalued portfolio managed to beat the overvalued only three years out of ten (2005, 2006 and 2009) and in 2014 yield a return of -3.03 per cent. But, in order to test whether the differences between these averages of extreme portfolios are statistically significant a t-test is needed. However, we must first test if the variances are equal in order to conduct the right t-test in Excel. Performing the F-test we realize that the variances are not equal. Therefore, a t-test for unequal variances on a sample consisting of 120 excess monthly returns (10 years) revealed that the difference between the two averages is not statistically significant (α=0.05).

Table 5 presents the results of the Price to Book Value strategy over the 10 years of the research period. As the case with the Price to Earnings strategy the outcome is not as impressive as previous studies conducted on value investing, might had prepared us. Despite that fact, the portfolio consisting of the most undervalued securities manages to outperform the extreme overvalued one for the majority of the years. Although, it does not always yield positive excess returns. Following the same procedure described earlier the difference of averages of the two extreme portfolios is tested for significance. Once again the t-test for variances that are not the same is used (F>F critical) and the result is similar. We fail to reject the null Hypothesis that the averages are not significantly different.

Table 5, P/Bv Annual Averages of Monthly Excess returns (2005-2014)

P/F	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	0.70%	0.23%	-0.22%	-2.46%	2.01%	0.41%	-0.59%	0.07%	0.21%	-1.06%
2	0.17%	0.14%	-1.77%	-1.49%	0.92%	-0.40%	-0.38%	-0.23%	0.29%	0.46%
3	0.67%	-0.28%	-0.76%	-0.52%	0.52%	0.33%	-0.02%	-0.18%	-0.15%	-0.19%
4	0.48%	0.51%	-0.55%	-0.40%	3.79%	0.09%	-0.18%	-0.12%	0.22%	0.39%
5	0.24%	0.10%	-0.31%	0.22%	0.29%	0.35%	0.11%	-0.08%	-0.13%	0.14%
6	0.99%	0.20%	-0.32%	-0.32%	0.96%	0.07%	-0.19%	-0.05%	-0.02%	0.15%
7	0.16%	-0.17%	-4.24%	-0.38%	0.34%	0.02%	0.26%	0.14%	0.11%	-0.02%
8	-0.44%	0.44%	0.14%	0.17%	0.51%	0.29%	0.22%	-0.40%	-0.26%	-0.25%
9	0.18%	-0.10%	-0.15%	-0.88%	0.61%	0.63%	0.02%	0.42%	0.38%	0.10%
10	0.22%	-0.16%	-0.45%	0.17%	1.75%	0.27%	-0.58%	0.10%	0.01%	-0.16%

Table 6, P/S Annual Averages of Monthly Excess returns (2005-2014)

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
1	0.67%	0.61%	-0.17%	-0.17%	1.89%	-0.25%	-0.19%	-0.18%	0.95%	0.01%
2	0.80%	0.56%	0.70%	0.70%	1.37%	0.15%	0.04%	-0.78%	-0.16%	-0.14%
3	0.23%	0.09%	-0.43%	-0.43%	-0.05%	0.67%	-0.21%	0.23%	0.17%	-0.44%
4	0.33%	-0.26%	-1.71%	-1.71%	0.82%	0.53%	0.44%	0.14%	-0.04%	-0.03%
5	0.21%	0.25%	-0.52%	-0.52%	0.15%	0.29%	0.02%	0.21%	0.30%	0.23%
6	-0.52%	0.43%	-0.09%	-0.09%	0.85%	0.17%	-0.22%	-0.32%	-0.11%	-0.28%
7	-0.41%	0.13%	-1.12%	-1.12%	0.49%	0.14%	-0.09%	-0.17%	0.19%	0.53%
8	0.42%	-0.55%	0.30%	0.30%	0.64%	0.28%	0.17%	0.18%	-0.32%	-0.08%
9	0.22%	-0.11%	-0.19%	-0.19%	0.85%	0.18%	0.22%	0.10%	0.60%	0.09%
10	0.82%	-0.26%	-0.41%	-0.41%	0.61%	-0.28%	-1.04%	1.32%	-0.36%	-0.24%

Lastly, Table 6 depicts the results of the Price to Sales investment strategy. Portfolio 1 which included all the most undervalued securities for half of the years yields positive returns and for the other half negative. Before jumping to any erroneous conclusion, we have to identify if the diversity between the two averages of the portfolios 1 and 10 is statistically significant. Failing to reject the null hypothesis in a t-test we conclude that the averages are not significantly different.

Table 7, 10 year Average of Excess Returns

	2005-2014		
Portfolio	**P/E**	**P/Bv**	**P/S**
1	-0.08%	-0.07%	0.32%
2	-0.18%	-0.23%	0.32%
3	0.09%	-0.06%	-0.02%
4	0.20%	0.42%	-0.15%
5	0.08%	0.09%	0.06%
6	0.15%	0.15%	-0.02%
7	0.08%	-0.38%	-0.14%
8	-0.23%	0.04%	0.13%
9	0.07%	0.12%	0.18%
10	0.00%	0.12%	-0.03%

Section 5: Summary, Criticism and Conclusions

The basic difference of the present study relative to previous studies composed over the years dealing with the exploitation of fundamental ratios in order to distinguish undervalued securities lies to one particular factor, the comparison. While other studies sort their portfolios according to the value of some financial ratios, such as the Book to Market or the Earnings to Price (high), in this particular essay the value of the ratios based on market data were compared with the predicted value of the respective ratio depending on the strategy. This prediction was generated by a regression equation of each ratio, whether it was the Price to Earnings, the Price to book or the Price to Sales against its fundamental determinants.

The existence of regressions arises a major issue that is the predictive power of each and every regression equation. It constitutes the most vital element of the study, because it determines whether a security will be viewed as under or overvalued. As we discussed in the subsection regressions, in section 4 we made few assumptions in order to perform the regression analysis and come up with the predicted values. There is a chance that the assumptions that we based upon may be faulty. As Damodaran (2012) clearly states there are three prime limitations to the use of the regressions. Firstly, the probably invalid assumptions made relative to the linearity between independent and dependent variables. Secondly, the sensitivity to data selection that reflects the errors of the data and finally the biasness of regression coefficients resulting from correlation of the independent variables. All the above in conjunction with the analysis of the regressions features in section 4, make us suspect that the regression equations built for the sake of sorting undervalued stocks from overvalued may be erroneous and unreliable, leading to misjudgement and consequently to poor performance of the investment strategies.

The fact that regression analysis is characterized by the aforementioned drawbacks does not mean that it is not a useful tool for the persistent search of the true value in the equity market (Damodaran, 2010). Furthermore we realize that an investment strategy based on certain criteria, in our case the Price to Earnings, the Price to Book Value, the Price to Sales and their determinants, might be easy to design it on paper, but as expected there are a lot of factors determining the overall

result. Finally, the results of this study might not be pleasant to a proponent of active portfolio management. Although, this is not the case as Morgan Stanley's Wealth Management (2015) claims that the optimal strategy lies between allocating investment resources from active to passive strategies with an opportunistic approach depending on the investment background.

Bibliography

Journals:

Arshanapalli, B., Coggin, T. D. and Doukas, J. (1998) Multifactor Asset Pricing Analysis of International Value Investment Strategies. *The Journal of Portfolio Management*, 24, 757, pp. 10-23

Cronqvist, H., Siegel, S. and Yu, F. (2013) Value versus Growth Investing: Why Do Different Investors Have Different Styles? *SSRN Electronic Journal,* 117, 2, pp. 333-349

De Bondt W. F. M. and Thaler R. (1985) Does the Stock Market Overeact? *The Journal of Finance,* 40, 3, pp. 793-805

Fama, E. (1998) Market efficiency, long-term returns, and behavioral finance. *Journal of Financial Economic,* 49,3, pp. 283-306

Fama, E. and French, K. R. (1998) Value Versus Growth: The International Evidence. *The Journal of Finance*,53, 6, pp. 1975-1999

Lakonishok, J., Shleifer, A. and Vishny, R.W. (1994) Contrarian Investment, Extrapolation, and Risk. *The Journal of Finance*, 49, 5, pp. 1541-1578

Mohanram, P. S. (2004) Separating Winners from Losers among Low Book-to-Market Stocks using Financial Statement Analysis Separating Winners from Losers among Low Book-to-Market Stocks using Financial Statement Analysis. Review of Accounting Studies, 10, pp. 133-170

Petkova, R. and Zhang, L. (2005) Is value riskier than growth? Journal *of Financial Economics*, 78, 1, pp. 187-202

Piotroski, J D (2000) Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers. *Journal of Accounting Research*, 38, May, pp. 1-41

Zhang, X. J. (2013) Book-to-market ratio and skewness of stock returns. *Accounting Review* , 88, 6, pp. 2213-2240

Working papers:

Jegadeesh, N. and Titman, S. (2001) *Momentum*. University of Illinois, Illinois, USA, Working paper, October

Books:

Bodie, Z., Kane, A. and Marcus, A. (2011). *Investments and portfolio management*. McGraw-Hill/Irwin, New York

Damodaran, A. (2012). *Investment philosophies*. Wiley Finance, Hoboken, N.J.

Damodaran, A (2010) Investment Valuation Tools and Techniques for Determining the Value of Any Asset(3rd Edition), Wiley Finance Series, New York, United States

Websites:

Morgan Stanley(2015) www.morganstanley.com

Yahoo Finance (2015) www.finance.yahoo.com

Databases: Bloomberg