"IMPLEMENTATION OF THE MOMENTUM STRATEGY IN THE GREEK MARKET"

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Abstract

This study investigates if the momentum idea can be implemented in the Greek stock exchange and with what results. The analysis conducted is being with two approaches. The first approach is the momentum factor that constructs “winners” and “losers” portfolios, based on the past 12 months returns and calculates the “zero cost” portfolio which is the deduction of the “winners” – “losers”. The momentum factor generates negative returns for the examination period of -0.87% per month. The second approach is the trend factor, a factor that tries to capture the trend signals of the stocks based on the moving averages of 3, 6 and 9 months. The average abnormal return for the trend factor is 4.6% per month for the examination period. Moreover it is found that this average return is statistical significant and it is explained by the risks adjustments.

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Introduction

One of the most controversial topics in the field of economics is the theory of the efficient market hypothesis that first developed by the Nobelist Eugene Fama, (Fama, 1965). The theory in its three forms (weak, semi strong and strong form) was widely accepted by the economic community. The doubts about the efficient market hypothesis started in early 1990s when behavioral finance economists started becoming popular. This study deals with the idea of momentum. Momentum is an investment strategy that belongs and based on the field of the behavioral finance. Recently, it is become quite popular, mainly in United States. The idea behind this strategy is that some stocks, due to some reasons, create an abnormal return, for some specific time points and that is why the strategy is called momentum. If someone manages to capture this time points, having done the appropriate analysis, he can benefit with a quite profitable investment. Some of the reasons which cause momentum investing are the underreaction and overreaction among the investors, the different amount and accessibility of the information or some tax constraints, liquidity issues and regulatory difficulties. The paper which first developed the idea and the implementation of such strategy and is considered a major paper in the field of behavioral finance is the one of Jegadeesh and Titman back in 1993 (JEGADEESH NARASIMHAN, 1993). This paper constitutes our major inspiration for the creation of this research. The vast majority of papers and studies that have been done in this field concern the stock markets of United States. Few papers deal with European and International markets and none has been done about the Greek market. The aim and objective of this study is to implement the momentum strategy, and an improved style of the initial idea, in the Greek stock market. It will be attempted to discover if there is room for such type of investment in the Greek market and if yes, what benefit, in terms of returns, it can be succeeded. From my perspective, it is very challenging and motivating to work in new areas and try to conclude in something genuine. It is believed that this kind of study would be very interesting because engages a new style of investing, but very promising, in a total undiscovered market. The Athens Stock Exchange is very small market, in terms of capitalization and number of stocks, being compared with the New York Stock Exchange or other main stock exchanges, but the momentum idea does not have to do so much with the quantity or the number of stocks because it involves the investor’s psychology and ability to adjust in new information. The other reason that makes this study interesting and promising is because this strategy is not well established investment theory, every new study or research about this topic adds something new on the international literature that may lead to a new practice or hypothesis.

1 Explained in more detail in the literature review
This study can contribute in many fields, discovered or not, and can be found interesting to a lot of people. First of all it would be additional evidence to the literature concerning the momentum idea, by explaining if another study managed to implement this strategy having succeeded abnormal returns. Moreover this implementation is being in a total unknown market in behavioral finance, the Greek stock market. Each and every person who deals with behavioral economics and momentum theory can refer to this study as additional evidence. Another target group that might be interested in this study is the Greek financial community that can discover new aspects about how the Greek market works and potential opportunities that may arise. I would also add, concerning that as I mentioned before the momentum theory in Greece is an unknown field, that some can learn about this type of investment.

The hypothesis in this thesis is that through two similar procedures we can succeed abnormal returns in the Greek market. The research period is almost 14 years, from January 2000 to October 2013 for all listed companies in the Athens Stock Exchange. One part of the research is to implement the momentum strategy in the Greek stock exchange by using the method of “12-1” months. This method calculates the return of a stock based on its past 11 months and places it in the 12th month. That means that we try to perform abnormal returns by creating portfolios consisting of stocks based on their past performance. These portfolios are ranked based in their returns and finally we have the “winners” and the “losers”. The “winners” are the top 20% of all the portfolios and the “losers” are the worst 20% of all the portfolios. The portfolio “winners” minus “losers” or “zero cost” portfolio is the one that gives the abnormal returns, if they are exist. The second part of the research is the trend factor. This part is inspired by the very recent work of Yufeng and Guofu (Yufeng Han, 2013), who implement an improved momentum strategy with the use of moving averages and other variables. In this part of research is done the same procedure as the first part but instead of using the “12-1” method I rank my stocks based on their moving averages of 3, 6 and 9 months. The hypothesis suggests that the second part of research will come up with a higher, in terms of return, “zero cost” portfolio than the momentum factor. The procedure is explained in detail in the part of methodology.

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2 The analytical procedure in methodology
Literature review

As it is mentioned in the introduction, one of the most controversial issues in the economics, is the theory of the efficient market hypothesis and if it stands, or the contrarian theory of the overreaction in stock markets. The paper of De Bondt and Richard Thaler (WERNER F. M. De BONDT, 1985) aims to explain that the weak form of the efficient market hypothesis along with the Bayes’ rule, are being violated often in the stock markets, and it can be identified the existence of the overreaction. More specifically - and here is generating the idea of momentum - De Bondt and Thaler suggest that if there is excessive price movement of a stock, the price reversal should be easily predicted by past data alone with no use of other tools. Sharp movements will be followed by subsequent opposite direction of the price movements and the more extreme the original price movement the greater will be the subsequent adjustment. They concluded that in the long term (3-5 years), prior “winners” underperformed the prior “losers”. Narasimhan Jegadeesh is considered to be the father of the momentum idea who first wrote the “Evidence of predictable behaviour of security returns” (JEGADEESH, 1990) in which tries to find the correlation among the monthly returns over some periods and also tests the efficient market hypothesis. His findings propose that there is strong evidence of stock return predictability and he also finds that the difference between the abnormal returns on the extreme decile portfolios is 2.49% per month over the analyzed periods. The second and the major paper that actually established the momentum strategy is the “Returns to Buying Winners and Selling Losers: Implications for Stock Market Efficiency” (JEGADEESH NARASIMHAN, 1993) who wrote with Titman 3 years after the previous paper. In this study they wanted to test the relative strength of a stock in its previous short past instead of the contrarian opinion that was very popular at that time. The strategy of the relative strength suggests of buying the winners and selling the losers. They tried also to capture the movement of the stocks after the date of the earnings announcement and how this affects the future behaviour of the stock. The inspiration of our paper and the work that has been done is based on two papers; the first one is that of Jegadeesh and Titman. The strategy of buying the past winners and selling the past losers concluded that can realize significant abnormal returns. More specifically the 6 month returns for a holding period of 6 months generates, on average, 12.01% annually compounded returns for the period of 1965-1989 that was the research period. In my research I developed the method of 12 months past returns and 1 month holding period. Additionally they found evidence that this abnormal return is not due to systematic risk. Finally they concluded that the returns of the “zero-cost” portfolio, (winners minus losers portfolio), realizes positive returns in each of the following 12 months after the formation date excluding January. Josef Lakonishok, Andrei Shleifer and Robert W. Vinshny in the
“Contrarian Investment, Extrapolation and Risk”, (JOSEF LAKONISHOK, 1994), try to find why the value strategies have superior returns and what is the reason for that abnormal returns, if they are fundamental riskier or because they are contrarian to popular strategies. They also examine the implication of the contrarian model, that value stocks outperform glamour stocks. The strategy which involves picking out value stocks outperformed the strategies involving glamour stocks by approximately 10 to 11 percent per year for the examined period. One possible explanation of having this result is that financial indicators like p/e, earnings, growth of glamour stocks turned out to be much lower than there was in the past and the investors overestimated them. Finally the value strategies appeared not to be riskier than the glamour ones, and the theory that stocks that earn more return have to bear more risk does not supported in this analysis. Jegadeesh collaborated with Chan and Lakonishok and went momentum idea one step forward through their paper of “Momentum strategies”, (LOUIS K. C. CHAN, 1996). The objective of this article is to draw the sources of the predictability of future stock returns based on past returns. The way to analyze this is to look to the earnings of each company in order to explain the movements of the stock. In particular, this article relates the evidence on momentum in stock prices to the evidence on the market's underreaction to earnings-related information. They also try to find an answer in a very interesting question, “Why two pieces of publicly available information - a stock's prior six-month return and the most recent earnings surprise- help to predict future returns.” Some of the most important results of this research are that the price momentum effect tends to be stronger and longer-lived than the earnings momentum effect. Another result which gives important insights about the momentum strategy is that in the first 12 months after the portfolio formation, the stocks that were ranked highest based on past return, exhibited abnormal returns. But in the second or third year the returns did not differ so much from the average, and that was the reason that in our analysis we used the “12-1” method⁴. Furthermore, they suggested that if the market is surprised by good or bad earnings news, then on average the market continues to be surprised in the same direction at least over the next two subsequent announcements. Finally for intermediate horizons a stock with low past returns will on average experience low subsequent returns. Another paper that deals with the under and overreaction is that of Hong and Stein, called “A Unified Theory of Underreaction, Momentum Trading, and Overreaction in Asset Markets”, (Harrison Hong, 1999), at which the research suggests that any theory of asset pricing should be judged according 3 criteria: “1) It should rest on assumptions about investors’ behaviour that are either a priori plausible or consistent with casual observation; 2) It should explain the existing evidence in a parsimonious and unified way; and 3) It should make a number of

³ (LOUIS K. C. CHAN, 1996)
⁴ Fully explained in the methodology
further predictions which can be tested and ultimately validated. In the paper researchers try to depict the way of the movement of the prices under two groups of traders. The first group is the “newswatchers” and the second one the “momentum traders”. Given that both of them are bounded rational, the first group absorbs the private information about a stock, which is gradually diffuses across population, and is created an underreaction. The second one is using this underreaction to gain profits of the momentum strategies. The momentum strategy can be explained as a cycle that in the early start makes profits for the traders, and then the later traders (in the same cycle) benefit from the increased price due to the first participants. According to the first criteria they found out that indeed traders use a subset of available information and that is the reason why there is room for arbitrageurs (momentum traders) in the real world. Given that, they showed that if there is ever any short-run underreaction to this kind of news on the part of one set of traders, then there must eventually be overreaction in the longer run as well. The vast majority of the papers and researches about momentum are relating to US markets and how it works in this country. One paper that does not apply these methods in US markets but it does it in Europe is the “Do countries or industries explain momentum in Europe” of Theo Nijmana, Laurens Swinkels, and Marno Verbeek, (Nijman Theo, 2004). This paper investigates the question whether individual stock momentum in Europe is subsumed by country or industry momentum. It also analyses the medium term return continuation in Europe. The results suggest that the positive expected excess returns of momentum strategies in European stock markets are mainly driven by individual stock effects, while industry momentum plays a less important role and country momentum is even weaker. The empirical results indicate that over the period 1990–2000, the individual component of the momentum effect is stronger than the industry component. Their analysis suggests that a momentum strategy which is diversified with respect to countries and industries yields an expected excess return of about 0.55% per month. Incorporating value and size effects in the model confirms that individual momentum dominates country and industry momentum effects. The results indicate that a European momentum strategy is more profitable for small growth stocks, while large value stocks show least return continuation. There is also another paper which investigates the momentum idea in international level and tries to find links between value and growth stocks and momentum strategy. This paper is called “Momentum and contrarian strategies in international stock markets: Further evidence” and is written by Qian Shen, Andrew C. Szakmary, Subhash C. Sharma, (Shen Qian, 2005). Researchers believed that if growth stocks (instead of value stocks) are more sensitive to earnings surprises, then momentum strategy will better work with growth stocks. They found that if market participants underestimate the short run earnings growth and if value stocks are less sensitive to growth stocks then momentum strategy is working better with growth

(Harrison Hong, 1999)
indices than the value ones. The growth indices showed much stronger profits applying the Momentum strategy than value indices, especially for 6 and 9 month formation and holding periods. On the other hand findings didn’t support the argument that growth stocks are more subject to mispricing than value stocks and they conclude that is not so clear if momentum strategies are as profitable in International level as it is in United States. Ding Du also worked in the same field as the previous research in his paper called “The 52-week high and momentum investing in international stock indexes”, (Ding, 2008), trying to find if there is intermediate continuation, momentum and long term reversals and if this momentum existence is due to systematic risk in the International Stock Exchanges. His results showed that after adjusting for risk and transaction costs, the momentum strategy in these markets are still profitable. Moreover he states that long term reversal and momentum strategy are directly combined, for both strategies based on past returns and on the nearness of 52-week high. Finally he disagrees with Hong and Stein (Harrison Hong, 1999) that investors only underreact to information and not overreact. The next paper relates the dividend policy of a company with the momentum strategy. “Dividends and price momentum”, by Ebenezer Asem, (Asem, 2009) analyzes the influence of the dividend policy of a company in the psychology of the investor and consequently in momentum strategy. The literature suggests that there is an asymmetry in the way that investors perceive the same information for a winner company and for a looser company. Also Chordia and Shivakumar, (Chordia Tarun, 2006), report that dividend maintenance by losers and winners conveys different information. The idea behind this argument is that if a “winner” company reports dividend maintenance the investor would thing that the managers are afraid to increase the dividends because the growing earnings would not be persistent in the near future so it is considered bad news. On the other hand “losers” companies which report dividend maintenance means that the decline of earnings would not be lengthy so it is considered as good news. The results of the research showed that the momentum strategy is more profitable to non dividend companies and a strategy that buys winners that increased their dividends and shorts losers that decreased their dividends generates high momentum profits. The overreaction and underreaction to the good news of the dividend maintenance of the losers companies, will result in post announcement returns relative to the “winners” companies which maintain their dividends or they do not distribute at all. Finally they concluded that if someone goes long a portfolio composed of past winners that increased their dividends and go short a portfolio of past losers that decreased their dividends should generate high momentum profits. An additional paper which testes the momentum trading strategies in a different market and not in the US, is the “The profitability of momentum trading strategies: Empirical evidence from Hong Kong” of Joseph W. Cheng and Hiu-fung Wub, (Joseph W. Cheng, 2010), who also intend to compare the findings with US market. They discovered that there are momentum
profits in the Hong Kong stock exchange which are significant, but they become insignificant after adjusting for risk with Chordia and Shivakumar model, (Chordia Tarun, 2006). The next paper is not so relevant to our work but tries to capture the profile and the background of the traders who implement momentum strategies. The title of the paper is “Are Momentum Traders Different? Implications for the Momentum Puzzle”, by Menkhoff (Menkhoff, 2010). It showed that momentum traders differ from other type of investor and the special characteristic is that they combine the short term horizon with the long term fundamentals under a behavioural point of view. The second finding is very interesting, saying that momentum traders are less risk averse than other investors and maybe that is the reason that this type of investment produces abnormal returns. Finally momentum traders seem to be as sophisticated as other type of investors. The next paper of Robert Novy-Marx, called “Is momentum really momentum?” (Novy-Marx, 2012), investigates what is the best time horizon that causes the momentum, short or intermediate horizon. The findings suggest that the real momentum is caused by the intermediate time horizon, 7 to 12 months prior the formation period and not the most recent period of 6 to 1 months. Specifically, the stocks that increased the first half of the year but performed poorly in the second one outperformed those stocks that experienced the opposite. The above conclusion is truer when the stocks are large and more liquid and also holds for international equity indices, currencies, commodities and industry momentum. The next paper of Yaqiong Yao, “Momentum, contrarian, and the January seasonality”, (Yaqiong, 2012), analyzes the implications of the behaviour of the January effect for two papers. The first one is the paper of De Bondt and Thaler (WERNER F. M. De BONDT, 1985) which examines the contrarian theory over the long term (2-5 years). The second paper is that of Novy-Marx, (Novy-Marx, 2012) who examines the reason behind of the short term continuation of momentum profits. Yao found that the January effect is surprisingly strong in the contrarian strategy. More specifically the January contrarian strategy is unusual profitable, whereas outside January the profits are economically and statistically insignificant. In contrast with Novy–Marx, Yao found that the profits of the intermediate-term periods are caused due to the January seasonality profits. Another paper about the profitability of the momentum, but with different point of view, is examined in the paper “The relevance of information and trading costs in explaining momentum profits: Evidence from optioned and non-optioned stocks”, by Sina Badreddine, Emilios C. Galariotis and Phil Holmes, (Badreddine Sina, 2012). Researchers tried to answer the question: “what is the source of the profitability of momentum strategy”. Researchers believe that market constraints, low liquidity, high transaction costs and low accessibility to information (all the above are reasons causing underreaction) are major reasons which create arbitrage opportunities. So they use stock options in order to depict the source of the profitability of such strategy, because options contribute in the reduction or elimination of the
transaction costs, the constraints especially in short sales and increase the information in the market. They created two samples, one with stock options and the other one with non-optioned stocks, expecting that the first one will generate lower returns. Unlike with the expected results, the evidence of this research showed that optioned stocks have higher momentum profits than the non-optioned stocks. This does not agree with Hong and Stein (Harrison Hong, 1999) who suggested that momentum arises due to slow diffusion of information because it is documented that the use of options helps in the flow of information. They also concluded that the market underreacts even to the most publicly information. Thereafter, the paper “Frog in the Pan: Continuous Information and Momentum” by (Zhi Da, 2011), testing the economic argument that investors underreact in small amounts of information that arrive continuously than to large amount of information arrived in discrete time points. The results showed that the continuously small amount of information causes stronger and more persistent return continuation. Over a six-month holding period, momentum decreases from 8.86% for stocks with continuous information to 2.91% for stocks with discrete information. Furthermore the profits generated by continuous information, persists for 8 months, whereas the profits following discrete and not continuous information persists just for two months. Another interesting finding of this research is associated with the media coverage and the analyst coverage of a firm. Great media coverage means discrete information, so insignificant return continuation. On the other hand, after adjusting of media coverage and press releases, great analyst coverage means continuous information in small amounts which leads to stronger momentum profits. The last and most recent paper concerning momentum trading is the “Trend Factor: A New Determinant of Cross-Section Stock Returns” by Yufeng Han and Guofu Zhou, (Yufeng Han, 2013). The trend factor is an improved way of implementing the momentum factor proposed by Jegadeesh and Titman (JEGADEESH NARASIMHAN, 1993). This factor tries to capture the short, intermediate and long term period by using moving averages. This paper is directly connected with our research because we also tried to test the momentum idea in the Greek stock exchange by using moving averages to capture the different time periods. Han and Zhou believed that momentum trading is not caused just by price trends. Prices can change due to short term positive or negative shocks such as mergers or acquisitions without any price trend. The factor they created tries to capture the predictability and the pricing power of authentic price trends in the stock market. The trend factor has negative correlation with the momentum factor, resulting different outcomes. Through this process they succeeded to create an average return of 1.61% per month, which means approximately double than the momentum factor. Additionally during the financial crisis accomplish a positive return approximately 1.65% per month, whereas the momentum factor experienced negative returns during the same period. Finally, trend factor outperform momentum factor even after the controlling
of some variables such as the market size and book to market ratio. The following chapter describes in detail the methodology used for the implementation of the momentum strategy.

Methodology

Sample

The sample that was chosen for the analysis of the study, as it is mentioned in the introduction, is the stocks which compose the Athens Stock Exchange. In the study are used all the constituents of the exchange not the representative index that some databases use, or the large capitalization index. The reason of choosing all the constituents is because I believe that the findings will be stronger and statistically more significant with larger sample. The number of the stocks is 280. The original number was 282 but two stocks eliminated from the initial sample because did not have any observation for the examination period which is from the January of 2000 to October of 2013. It is important to be clarified in this moment that all the companies, are shown in the excel files with their tickers and not with their names because the analysis I conduct is focused in how the portfolios of “winners” and “losers” work together and not each company alone. All the initial data extracted from Bloomberg database, and the prices are adjusted for dividends and splits. As Ebenezer Asem states in his paper (Asem, 2009), companies which did not distributed dividends had higher momentum profits. The data are monthly, so there are 166 observations for each company. For all the calculations have been used log returns and not prices, so I lose the first month of data and I have 165 observations (months) for each of 280 listed companies in the Athens Stock Exchange.

There are plenty of papers which deal with momentum in United States, like the one of Jegadeesh and Titman (JEGADEESH NARASIMHAN, 1993) or the paper of Hong and Stein (Harrison Hong, 1999) and the Trend Factor of Han Yefeng and Zhou Guofu (Yufeng Han, 2013), and few in other markets, like the “Do countries or industries explain momentum in Europe?”, (Nijman Theo, 2004) for Europe or the paper of (Ding, 2008) which deal with international data. There is no paper concerning the idea of momentum theory related to Greek market, and that is the reason of picking this sample to analyze. Furthermore is interesting to check how the momentum theory works in a small market, like the Greek one.
Hypotheses/Tests

The tests conducted in this thesis are two. The first test is called momentum factor and the second test Trend factor. The hypothesis for both tests is the same. Through two different methods of constructing portfolios, I will try to realize returns above the market. In order to succeed the goal to beat the market, I will form “winners” and “losers” portfolios based on some trends. The “winners” portfolio consists of the highest ranked returns of the sample, whereas the “losers” portfolio consists of the lowest ranked returns of the sample. The “winners” minus the “losers” portfolio, the so called “zero cost” portfolio, is the one that gives the highest return of the strategy. The above procedure is widely used in cross section studies such as Ang, Hodrick, Zhang (Ang Andrew, 2009) and Easley, Hvidkjaer, O’Hara (Easley David, 2010) which construct “zero cost” portfolios. The literature supports that this kind of strategy yields abnormal returns, more than the average. As I have already mentioned, Jegadeesh and Titman (JEGADEESH NARASIMHAN, 1993) managed to create abnormal returns of approximately 12% per year (approximately 1% per month) and as they endorse, this abnormal return is not due the risk that bears. The trend factor that created by Yufeng and Guofu (Yufeng Han, 2013) almost a year before, yields an average return of 1.61% per month. Moreover this strategy can create positive returns in all the periods, even in times of financial crisis. That happens because the strategy indicates to go long the “winners” portfolio and go short the “losers” portfolio, so the benefit comes from both legs (long and short) at the same time, even if the stock market declines significantly. For the sake of the study, the “zero cost” portfolio replicates the short strategies in the stock markets. Another reason that the “zero cost” portfolio is widely used, is because in some exchanges due to regulatory reasons the shorting is prohibited, so the methodology would not had substance. The difference between these two tests conducted in this study is in the formation of the portfolios. In the next chapter follows the procedure of the portfolios’ formation for each test, step by step.

Portfolio Formation of Momentum Factor

The program I used for doing all the calculations is the Microsoft excel. The majority of the similar papers usually use programming languages, most often the Matrix Laboratory (Matlab). In my case this was not doable due to time constraints and because I am not familiar with this program. The programming languages are more dynamic than excel and user-focused but I created an automated system in excel in order to work with different inputs.

In order to create the momentum indicator it was decided to use a method based in the cumulative past returns. This method, as it used in (JEGADEESH NARASIMHAN, 1993), is based on past returns believed to persist in the future. In
this study I use the “12-1” past returns method. This strategy is estimated as the cumulative return from the month t-1 to month t-12. The result of the calculation of the product of the return of the month t-12 to month t-1 is placed in month t. Through this procedure the stock selection in each time point is based in the returns over a year before. My initial sample is reduced by 11 months because I have to skip the first 11 observations, so the effective sample consists of 155 months. This strategy is preferred because the frequency of the data is monthly. Additionally, evidence has shown that the intermediate horizon is the best time to implement the momentum strategy. With the previous finding argues in his paper Prof. Robert Novy-Marx (Novy-Marx, 2012) who found that the real momentum is caused in the 12th to 7th month prior the formation period. In order to find the product of the returns, unity is added in each observation and then follows the “12-1 strategy”. The next step is to rank the returns of each company in each time point. This procedure helps to find the top 20% of the total returns in each month, and also the lowest 20% of the total returns. In each month the observations are not the same because of some missing data during the, almost, 14 years. I calculate the sum of all the observations in each time point and through this summation I estimate the 20% of the total observations. After having found the rankings, through an “if” function in excel, every cumulative return that belongs to top and low 20% of the total sample is replaced with the unity, otherwise with zero. This step helps me to find the log returns which correspond to the top and low cumulative indicator. Next step is to form the long (“winners”) and short (“losers”) portfolios. The portfolios are equally weighted in the chosen strategy, so the weight is the simple division of the unity over the number which corresponds in the 20% of the total observations. Finally I get the “winners” and “losers” portfolios by adding all the weighted returns in each month. The “zero cost” portfolio is the result of the deduction of the “losers” portfolio from the “winners” one. The holding period of the portfolios is one month, so the realization of the profits if there exist is being in the next time point after the portfolio formation. Having completed the procedure of the portfolio formation, are used some risk adjusted and robustness measures.
Formation of Trend Factor

The idea behind the trend factor created by Guofu and Yufeng, as it mentioned above, (Yufeng Han, 2013), approximately one year before, is to generate a factor based on the cross section stock price trends. The cross section predictability can stem from the simple use of the moving averages. The advantage of this strategy is that gives the possibility to include in the portfolio formation the short, intermediate and long term past returns in each time point, something that does not happen with the momentum factor which is based only in the long or the intermediate horizon. Moreover it is believed that moving averages can predict the movement of the stock and can be used as indicators to portfolio formation. Although this strategy is very fresh and not well tested, it returns high profits and outperforms the results of the initial momentum idea. The trend factor can also be made with other variables like book to market ratio or price to earnings or asset growth. For example Michael Cooper, Huseyin Gulen and Michael Schill in their paper (MICHAEL J. COOPER, 2008) proved that the asset growth can forecast the cross section returns even in large capitalization companies. In this survey I selected the 3, 6 and 9 months moving averages returns to construct my model. By choosing these moving averages I include in my portfolios short term and intermediate term past returns, whereas in my first test I had only 4 quarters past returns. Another advantage of the use of the moving averages is that smooth out the results and does not allow big outliers to affect the sample. This study is limited to these 3 moving averages, but in a further research can be selected longer-lived moving averages, or other variables to test.

To construct the trend factor described above, first I calculate the 3, 6 and 9 month moving averages of the prices this time, not the log returns, for each month and company. Every step is calculated in different excel file. The observations of January, February and March constitute the 3 month moving average of April. As a consequence, I skip the 3 observations for the 3 month moving average, 6 for the 6 month moving average and 9 for the 9 month moving average respectively. The cross section analysis to be tested, tries to discover if the moving averages affect, and how the returns. So it is need an equation of the form: \( y = a + b_1 \cdot x_1 \), \( y = a + b_2 \cdot x_2 \) and \( y = a + b_3 \cdot x_3 \), where \( y \) is the dependent variable, in my case the returns of the stocks. The independent variables are the \( x_1, x_2 \) and \( x_3 \) which represent the 3, 6 and 9 month moving averages respectively. The \( b_1, b_2 \) and \( b_3 \) are the slopes of each independent variable. Normally the procedure to calculate the betas, is a cross sectional regression of the form we described above. In my case, because the analysis is conducted in excel, I calculated the slopes through the corresponding function of excel. Having done that, I have 3 betas, 1 beta for each moving average, for all the companies in each month. The next step is to
multiply each moving average with its corresponding beta. Since in the portfolio construction I want every moving average to have the same weight as the other two, I add the 3 moving averages (multiplied with its betas) and I divided by 3. Given that I have skipped the first 9 months of the calculation of the 9 month moving average, the effective sample begins from October of 2000. From this point, the procedure to discover the top and lowest portfolios is the same as the momentum factor. The portfolios are ranked based on the top 20% and lowest 20% returns of the trend signals. Then through the same process as previously, using 1 and 0 we collect the log returns which correspond to the trend signals. Afterward the returns are multiplied with its weights in each time point and I end up with “winners” and “losers” portfolios. The deduction of the second from the first calculates the “zero cost” portfolio. Again there are calculated some measures to check for risk and robustness.

Findings / Data Analysis

Momentum Factor

This section is going to present the results of my study and their interpretation. The major separation in the analysis conducted is among the results of the momentum factor and trend factor. As it is explained in the previous sections, these two trend signals are the main pillars that our study is based on. Firstly a graph shows the returns of the “winners”, “losers” and “zero cost” portfolios for the momentum factor.
It is easy to understand that the lowest decile portfolio is the one with biggest volatility which contains big outliers, with negative returns down to approximately -40% and positive returns up to 40%. The “Zero Cost” portfolio and the top decile are much closer to the zero but with many negative returns. The highest return of the period is observed in the “losers” portfolio with almost 38% in April of 2003, as well as the lowest return is produced from the same portfolio in September of 2001 that is -41.5%. The most productive month in terms of return of the “Zero Cost” portfolio is the December of 2002 which shows 16.6% positive return.

The big difference of the fluctuation can be seen more clearly on the lowest decile, compared with the top decile. The next bar graph depicts the average return of the three aforementioned portfolios for the whole sample and gives a clearer picture about the performance of the portfolios.

Unlike with the hypothesis we raised at the beginning, the results are slightly different. The momentum factor, for the examination period of 2000 to 2013, ends up with a negative percentage return of approximately -0.87%. The main reason contributing to this result is the very bad performance of the top decile portfolio which produces almost -1.73% returns for this period. The method which is based in the trend capturing with the “12-1” strategy did not manage to produce positive monthly returns, for the whole sample. My results do not coincide with the results of Jegadeesh and Titman (JEGADEESH NARASIMHAN, 1993) who managed to generate
1.31% per month in the strategy based in 12 months past returns and holding period of 3 months. This strategy is the most successful of this study when there is no lag between the formation and the holding period. The comparison is being with this specific strategy because is the closest on my strategy which based on 12 months past results with 1 month holding period and without lag between the formation and the holding periods.

**Trend Factor**

The second part of the analysis consists of the trend factor which uses momentum averages of 3, 6 and 9 month to predict the return. The graph which follows presents the price of OPAP Group, one of the largest companies in the Athens Stock Exchange (and part of the sample), in comparison with its 3, 6 and 9 month moving averages.

With blue color is the price of the OPAP Group which depicts the fluctuations of the movement. It is easily noticed that the moving averages follow the price trend but with smoothing out the movement. The 9 month moving average is the most “soft” indicator excluding all the extreme prices. Through the usage of 3 moving averages explained above I constructed my trend indicator for the second part of the analysis, and below are represented the main results.
The results here are much more straightforward than the momentum factor. It is easily noticed that the “losers” portfolio consists of mainly negative returns, whereas the “winners” portfolio produces more positive returns. The highest return is observed in July 2003 which is approximately 34.3% of top decile portfolio, while the most negative return belongs to the lowest decile portfolio in September of 2001 and it is -36.7%. The “zero cost” portfolio produces mostly positive returns during the 14 years, with the highest percentage to be observed in May of 2012, 27.3%.

Above is presented the Average return of each portfolio for the trend factor indicator. Through this bar chart is easier to perceive the total performance for the
examination period of each one portfolio. The top portfolio generates almost 1% in average. The lowest portfolio generates -3.6% negative returns in average. The combination of the two procreates the “Zero Cost” portfolio which yields the surprising 4.6% monthly return, or approximately 55.2% annually, for the period of the 14 years. This return far exceeds the return that Yufeng Han and Guofu Zhou (Yufeng Han, 2013) managed to realize in their similar study. Han and Zhou created an average monthly return of 1.61% per month. It seems that my trend based on 3, 6 and 9 month moving average predict very well the movement of the prices.

Panel Data

In this part of the Data analysis I have divided my initial sample into two more categories. The first category refers the recent financial crisis and the second one to the growth period in Greece. The first table that follows summarizes the results for the whole sample of my study. I have also incorporated in my results the market performance in order to have an integrated view about the performance of the momentum and trend predictors that I have constructed. The market that I used to make my analysis is the Athens Stock Exchange Index as it is created from the Bloomberg Database and is consisted of approximately 60 listed companies. Except for the average return of each portfolio, the comparison of the data found, are being analyzed also with risk adjusted measures like volatility and Sharpe ratio.

<table>
<thead>
<tr>
<th>Whole Period</th>
<th>Average Return</th>
<th>Volatility</th>
<th>Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Momentum Factor</td>
<td>-0.8714%</td>
<td>8.1644%</td>
<td>-0.18</td>
</tr>
<tr>
<td>Trend Factor</td>
<td>4.6025%</td>
<td>5.1498%</td>
<td>0.78</td>
</tr>
<tr>
<td>Market</td>
<td>-0.8010%</td>
<td>8.9473%</td>
<td>-0.16</td>
</tr>
</tbody>
</table>

Table 1 - Findings for the Whole Sample

As it is mentioned above the momentum factor did not manage to capture the trend we constructed, and generated negative results for the whole period of the analysis of -0.87%. The market for the same period has an average return of -0.8%, slightly higher but still negative. The trend factor outperforms by far the market and the momentum factor with 4.6% return per month. Although the market has a minor difference with momentum factor, bears more risk for this period. The volatility of the market is 8.9% whereas the momentum factor has a

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6 The risk free rate used for the calculation of the Sharpe ratio is extracted from the data provided in the site of Bank of Greece, (Bank of Greece). I took the risk free rate of each year of my sample and I transpose it to monthly through the effective interest rate function.
volatility of 8.2%. The Sharpe ratio for the momentum factor and the market are very close unsurprisingly, -0.18 and -0.16 respectively. The volatility of the trend factor is quite low, 5.1% and as consequence has very high Sharpe ratio. The trend factor performed extremely well in the analysis we conducted for this period of 14 years for the Greek listed companies and with low additional risk.

The next subsample I created is in respect of the financial crisis occurred in global range. The crisis began in the second half of 2007 and peaked during the next two years. My subsample begins in January of 2008, because of a time lag until we feel the consequences of the crisis in Greece, until January of 2010.

<table>
<thead>
<tr>
<th>Financial Crisis</th>
<th>Average Return</th>
<th>Volatility</th>
<th>Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Momentum Factor</td>
<td>-1.5933%</td>
<td>7.1142%</td>
<td>-0.31</td>
</tr>
<tr>
<td>Trend Factor</td>
<td>3.6226%</td>
<td>3.3862%</td>
<td>0.89</td>
</tr>
<tr>
<td>Market</td>
<td>-3.7102%</td>
<td>11.4287%</td>
<td>-0.38</td>
</tr>
</tbody>
</table>

Table 2 - Findings for the Financial Crisis

The picture changes a bit in this specific period. The average return of all three factors is reduced, as it is logical. The interesting part is that the trend factor still generates high abnormal returns of 3.6% per month, with lower volatility (3.4%) than the whole period, and higher Sharpe ratio (0.89). That means that the trend factor can yield high positive returns even in recession periods, and without these returns to be explained of extra risk that is buried. The momentum factor generates negative returns of -1.6% but outperforms the market, given that the market created negative returns of -3.7%. The momentum strategy is also better off in terms of risk than the market in the crisis period, with 7.1% volatility instead of 11.4% and a Sharpe of -0.31 with -0.38 respectively.

The second subsample concerns the growth period in Greece which is from the early 2000s until the last months of 2007. This period in Greece, benefited of great consumption and growth. This is the period when Greece entered the Eurozone and also hosted the Olympic Games in 2004. The subsample begins in January 2002 and ending in October 2007.

<table>
<thead>
<tr>
<th>Growth Period</th>
<th>Average Return</th>
<th>Volatility</th>
<th>Sharpe Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Momentum Factor</td>
<td>0.4228%</td>
<td>7.2068%</td>
<td>-0.02</td>
</tr>
<tr>
<td>Trend Factor</td>
<td>5.1785%</td>
<td>4.8728%</td>
<td>0.94</td>
</tr>
<tr>
<td>Market</td>
<td>1.0313%</td>
<td>5.5197%</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Table 3 - Findings for the Growth Period
In this growth period the trend factor generates the highest return (5.2%) of all the samples we have analyzed as far, with a standard deviation of 4.8% and a Sharpe ratio of 0.94. The momentum factor yields a positive return of 0.42% but with high volatility (7.2%) and almost 0 Sharpe ratio. The market outperforms the momentum factor in this subsample with approximately 1% return and a volatility of 5.5% and Sharpe of 0.08.

**Correlation between Momentum and Trend Factor**

As it is shown from the above results the momentum factor acts very differently from the trend factor. That raised the question of how two indicators which try to capture the same trend have so different results. This is why I researched and designed the correlation matrix, between the trend, the momentum and the market indicators (see below).

<table>
<thead>
<tr>
<th>Correlation Matrix</th>
<th>Momentum Factor</th>
<th>Trend Factor</th>
<th>Market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Momentum Factor</td>
<td>1</td>
<td>-0.180</td>
<td>-0.401</td>
</tr>
<tr>
<td>Trend Factor</td>
<td>-0.180</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Market</td>
<td>-0.401</td>
<td>-0.029</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 4 - Correlation Matrix Momentum vs Trend vs Market

The number that is attention-grapping is the correlation between the momentum and the trend factor (-0.18). It is very interesting that the correlation is very close to zero but also it is negative. That means that if the trend factor goes up by 1 the momentum factor goes down by -0.18. The other interesting finding is neither the momentum factor nor the trend factor has positive correlation with the market. The trend indicator is negative but very close to zero, whereas the momentum one is -0.4. Then the “zero cost” portfolio for both strategies is decomposed in its long and short leg.
Comparison between the long and short legs of the portfolios

The first diagram refers to the trend factor and the second one to the momentum. Both short legs are volatile with many positive and negative returns. The short leg of the momentum factor yields a return of -0.86% while the short leg of the trend factor yields -3.6%. The correlation between the two is very high (0.9). The “winners” portfolio of the momentum factor yields -1.7%, whereas the trend factor “winners” portfolio yields approximately 1% and the correlation is 0.84, again quite high. The very low correlation between the two factors is coming from the difference of the long – short. The very negative return of the short leg of the trend factor in combination with the positive long leg gives a very high abnormal total return. On
the other hand the negative long and short leg of the momentum factor helps in the negative overall return.

**Risk Adjustments**

The average return of the “zero cost” portfolio of the momentum factor over the market is statistically significant. On the other hand the average return of the “zero cost” portfolio of the trend factor is insignificant. The long legs of both momentum and trend factor are statistically reliable, despite the small number of monthly observations.

I have also calculated the Jensen’s Alpha with respect to the CAPM just for the trend factor, since the momentum factor yields negative returns. The excess alpha of the “zero cost” portfolio of the trend factor is 3.9%, slightly smaller than the average return of 4.6%. That means that the abnormal returns that I have managed to create through the trend factor strategy is explained by the CAPM. I did the same risk adjustment for the long portfolio of the trend indicator. The result is almost similar to the previous one. The excess alpha of the long portfolio is 1.2% a little higher than the average return of the long portfolio (1%) which means that it is totally explained by the CAPM. The average returns which checked for risk adjustments can be shown against the market in the graphs below.

![Diagram 6 - Market vs Zero Cost of Trend Factor](image-url)

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7 Capital Asset Pricing Model
January Effect

In the field of finance there is a theory about the month of January, called January effect. This theory supports that the stocks have a general increase in the month of January. That happened mostly in the past because many try to sell some stocks at the end of December for several reasons, and then they buy back on January. The effect is observed mainly in small cap stocks. One reason I decided to check for the January Seasonality is that my sample is composed of many small cap stocks, especially when they are compared with stocks of the major International stock exchanges. The other and most severe reason is that Yaqiong Yao (Yaqiong, 2012) in his paper found that the January effect is extremely strong in the contrarian strategy and the profits are extraordinary, whereas outside January the profits are economically and statistically insignificant. I checked for the January effect by doing both strategies of momentum and trend factor again but this time excluding the prices of all the Januaries of my initial sample. Below are presented the graphs of the momentum factor without the Januaries data.
As we can see from the above graphs the difference between the portfolios without Januaries and the ones including Januaries are almost the same. Particularly the initial “zero cost” portfolio yields -0.87%, whereas in this strategy the yield is -0.65%, slightly better. The long portfolio without the Januaries generates an average return -1.81% and the short -1.16% while in the initial sample the results are -1.73% and -0.86%. Below are presented the same results and graphs for the trend factor part of the analysis without Januaries.
The picture here is pretty much the same as in the momentum case. The results differ with a very small percentage. The “zero cost” portfolio in this strategy produces 4.62% average return whereas in the initial sample produces 4.60%. The long portfolio in both cases is approximately 1% and the short portfolio in this strategy generates -3.57% return while the short on the first sample generates -3.61%. In the examination period of 2000-2014 it was proven that the January seasonality is insignificant for both strategies of momentum and trend factor. The
two different strategies, including the Januaries and not, have in practice the same results.

Recommendations

One hypothesis was set in the beginning of this study for each part of the analysis. The hypothesis was the same for the momentum and for the trend factor; the indicators I constructed will capture the trend of the market and will beat the market by generating abnormal returns. For the momentum factor the hypothesis is refuted since the “zero cost” portfolio based on the “12-1” method yielded negative returns. Some reasons that affected the negative outcome of this part and extra work that can be done are discussed below. The sample of this study is limited to 14 years, whereas the vast majority of similar papers examine periods of more than 30 years. It would be interesting to see how the factor works with additional data. Furthermore the data used was on a monthly basis. Momentum strategy can be also implemented in daily frequency, for a clearer view on how the Athens stock exchange works. In my opinion, an issue that affected a lot of the results was the chosen holding period. Jegadeesh and Titman (JEGADEESH NARASIMHAN, 1993) found that their best return was produced by the portfolio based on 12 months data and 3 months holding period. Moreover, the strategy has shown that the best performance is achieved when there is a lag between the formation period and the holding period. In this analysis there is no lag between the two periods. Another test than can be done is the formation of more portfolios based on different past return data or different holding periods up to 6 months. I believe there is great room for further analysis with great potential in the momentum strategy in Greece.

In the second part of the study the trend factor proved the initial hypothesis with surprising results. The strategy based on the simple use of moving averages generated great positive average results for all the sub-periods analyzed. Furthermore all the results are bearing lesser risk than the other factors. Nevertheless, our results maybe have some bias due to the fact that I used just three moving averages and I replicated the procedure of the cross sectional analysis in the excel. It is of great interest to the financial and Greek community to perform further analysis in this subject with the usage of more moving averages than the three I used, as Yufeng and Zhou (Yufeng Han, 2013) did in their paper. Furthermore it is motivating to employ other indicators than the moving averages, as the book to market ratio, asset growth, or price to earnings ratio to see how the strategy works.
Finally the field that needs extra analysis is the one of risk adjustments of the results, in order to gain more insight on how the results explain the risk they bear.

Conclusion

This study is inspired by two major papers in the field of the behavioral finance. The first is the one of Jegadeesh and Titman (JEGADEESH NARASIMHAN, 1993) and the second one and most recent that of Yufeng Han and Guofu Zhou. (Yufeng Han, 2013). The analysis is separated in two different approaches. The first approach tries to create a momentum factor based on past results. The second approach creates a trend factor based on momentum averages. Both approaches were implemented within the same sample, which is the constituents of the Athens Stock Exchange for a period of 14 years - from 2000 to 2014.

The first approach which creates the momentum factor, tries to capture the trend by formatting “winners” and “losers” portfolios based on the past 4 quarters returns. This method ranks the stocks according to their performance of the past 12 months. The top 20% of the total sample indicates the “winners” or long portfolio and the worst 20% creates the “losers” or short portfolio. The deduction between the two gives the “zero cost” portfolio, in which should benefit from both the long and short portfolios. The results found for this strategy did not confirm the initial hypothesis. The total return after implementing the aforementioned procedure is a negative return of -0.87%. The long leg generates -1.73% and the short leg -0.86%. The part that needs further investigation is the long leg that produces such negative returns. Moreover the above results are combined with great risk.

The second approach is the formation of a factor capturing the trend signals based on the moving averages. This procedure is a cross sectional regression based on the 3, 6 and 9 month moving averages. The stocks are ranked again based on their performance and we form the “winners” and losers” through the top and worst 20% returns. The results of the trend factor confirmed the initial hypothesis and the literature. I found that the “zero cost” portfolio generates 4.6% per month. More specifically, the long portfolio for the 14 years yielded approximately 1% and the long one -3.6%. It is interesting that the trend factor outperforms the momentum factor and the market as well as in the sub-samples I have created. During the recent financial crisis the trend factor yields 3.6% whereas the market loses 3.7%. Even in the “good times” the trend factor continues to outperform the momentum factor.
and the market. After the risk adjustments the findings showed that the abnormal return generated, are explained by the risk indicators. Finally it is found that the correlation between the momentum and the trend factor is negative and close to 0.

The momentum idea belongs to behavioral finance, and the behavioral finance incorporates the investor’s psychology and perception. I believe that one part of the participants in the Greek market is not as financially sophisticated as in other markets like Nasdaq or NYSE in the United States which collect the most high profiled and qualified investors and funds around the globe. This fact raises a question about how the findings of this study can be compared with the majority of others similar studies in big markets all over the world.
List of References


