ISCTE Business School
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MOMENTUM AND CONTRARIAN STRATEGIES IN THE PORTUGUESE STOCK MARKET

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Key words

Momentum strategy

Contrarian strategy

Asset Pricing

Market anomalies

JEL Classification System

G11 - Portfolio Choice; Investment Decisions

G14 - Information and Market Efficiency; Event Studies

G12 - Asset Pricing

SUMÁRIO EXECUTIVO

Esta dissertação desenvolve estratégias de obtenção de rendibilidades através da extrapolação de performances passadas, com base em dois estilos principais de investimento: estratégias *momentum* e estratégias *contrarian*.

As estratégias *momentum* consistem no investimento a curto prazo (sobretudo de três a doze meses) nas acções que tenham obtido as melhores rendibilidades num passado recente (de três a doze meses). O primeiro estudo académico neste âmbito foi o de Jegadeesh e Titman (1993). A racionalidade destas estratégias assenta na sub-reacção (*under-reaction*)

As estratégias *contrarian* baseiam-se na compra das acções que tenham obtido as piores rendibilidades nos últimos três a cinco anos, e depois investi-las durante períodos de tempo similares. De Bondt and Thaler (1985, 1987) foi o primeiro estudo a evidenciar a rentabilidade destas estratégias. Estas estratégias assentam na hipótese da sobre-reacção (*over-reaction*).

Estudos realizados em diversos países têm evidenciado que as estratégias *momentum* e *contrarian* permitem auferir rendibilidades superiores às do mercado. Todavia, em alguns países existe alguma controvérsia relativamente a este assunto.

Os estudos realizados em Portugal neste âmbito são muito escassos. Os mais relevantes e com um maior grau de profundidade, são apenas dois: Alves e Duque (1996) e Soares e Serra (2005).

Alves e Duque (1996) realiza o estudo das estratégias *contrarian* usando uma pequena amostra de acções para o período de 1989-1994, obtendo resultados inconclusivos.

Soares e Serra (2005) engloba uma amostra de 82 acções (com liquidez considerável) para o período de 1988 até 2003. Os resultados apontam para a rentabilidade das estratégias *contrarian* (que se baseiam na hipótese da sobre-reacção) mesmo após os factores de risco e outros terem sido considerados. Quanto às estratégias *momentum* (baseadas na hipótese da sub-reacção) estas permitem obter rendibilidades consideráveis mas após o risco ser levado em consideração, a evidência neste sentido é fraca.

Esta dissertação procura acrescentar valor à actual literatura financeira, nacional e internacional.

Neste sentido, debruça-se essencialmente em saber se é possível obter rendibilidades superiores às do mercado usando as célebres e tradicionais estratégias *momentum* e *contrarian*, no sentido de reforçar ou contradizer os resultados evidenciados sobretudo por Soares e Serra (2005) sobre o mercado português de acções. Ainda neste âmbito procura identificar se as estratégias mais rentáveis são as *momentum* ou *contrarian* e quais especificamente são mais lucrativas. Outro aspecto relevante prende-se em saber se os resultados são economicamente e estatisticamente significativos. Por fim, esta dissertação procura descobrir outras formas de obter rendibilidades mais elevadas, usando tendências de performance passadas.

Procurando dar resposta a esta última questão foram desenvolvidas estratégias de investimento "inovadoras" que consistem na compra de acções sempre que se verifiquem dois requisitos: a rendibilidade no mês precedente ao investimento tem de ser maior que *Js* (5% ou 10%) e nos meses anteriores a este mês a rendibilidade média terá de ser superior a *Jm* (30% ou 40%). Caso estas duas condições não se verifiquem, o modelo desenvolvido considera que o melhor é investir a uma taxa de juro "sem risco" (por exemplo dum depósito a prazo) e, por conseguinte, assume essa rendibilidade para esse período. As estratégias inovadoras podem também ser divididas em duas sub-estratégias: "seguir os vencedores" (comprar acções que escrupulosamente preenchem os dois requisitos) e "seguir os vencedores ou iniciantes" (comprar acções que cumprem o requisito *Js*, mas que por terem entrado na bolsa muito recentemente não existe informação disponível para comparação com o *Jm*).

A amostra usada neste estudo é constituída por todas as acções da bolsa portuguesa (PSI) para o período de Janeiro de 1997 até Dezembro de 2008. As estratégias usam períodos de investimento de um a sessenta meses, e períodos de formação/passados entre um a trinta e seis meses. No caso específico do estudo das estratégias *contrarian* para a amostra de 1999-2008, o período de formação foi estendido até sessenta meses.

As estratégias *momentum*, *contrarian* e inovadoras foram calculadas por dois métodos distintos: o CAR ou AAR (períodos sobrepostos) e o BHAR (períodos não sobrepostos).

Tanto as estratégias *momentum* e *contrarian*, como as estratégias inovadoras, foram todas desenvolvidas e calculadas através de programas criados no Visual Basic aplicado ao Excel, sendo criado um *UserForm* que permite calcular automaticamente qualquer estratégia que o investidor/utilizador pretenda, sem o mínimo esforço. Nas estratégias *momentum* e *contrarian* apenas é requerida a inserção do número de portfolios, e do período ou períodos de formação

(*m*) e investimento (*n*) que se pretendem calcular. Nas estratégias inovadoras o utilizador insere o período ou períodos de investimento (*n*) e de formação (*s* e *m*), as rendibilidades para *Js* e *Jm*, e escolhe ainda entre "seguir os vencedores" ou "seguir os vencedores ou iniciantes".

No que concerne aos resultados obtidos, estes evidenciam a rentabilidade das estratégias *momentum* e apoiam a hipótese da sub-reacção.

As três melhores rendibilidades (cerca de 1.5% de rendibilidade média mensal) resultam do investimento no grupo dos maiores vencedores (Portfolio 1), sendo as acções alocadas por sete grupos.

Os resultados são consistentes a alterações no tamanho dos portfolios (três, cinco e sete) e ao uso de períodos sobrepostos e não sobrepostos. Contudo, aquando da divisão do período do período de 1997-2008 em dois, o período de 2003 a 2008 aufere rendibilidades consideravelmente superiores ao período de 1997-2002.

As estratégias inovadoras que permitem obter rendibilidades médias superiores são as estratégias a curto prazo até 12 meses que adoptam "seguir os vencedores ou iniciantes" com *Jm* = 30% ou 40%, e *Js* = 5%.

O modelo criado das estratégias inovadoras é de extrema utilidade, pois que, permite auferir rendibilidades acima dos 2.5% de média mensal se consideramos as três melhores estratégias, o que supera de forma abismal as melhores rendibilidades obtidas com as três melhores estratégias *momentum* ou *contrarian* (cerca de 1.5%).

Adicionalmente, a capitalização também foi usada no cálculo das estratégias inovadoras, mas o seu uso não incrementou as rendibilidades, bem pelo contrário, diminui-as.

Os resultados das estratégias inovadoras apresentam consistência a variações nos períodos de tempo, e ao uso de períodos sobrepostos e não sobrepostos.

Finalmente, acresce referir que a maioria dos resultados das estratégias *momentum*, *contrarian* e inovadoras não são estatisticamente significativos.

DISSERTATION SUMMARY

This thesis studies whether momentum and contrarian strategies are profitable on the Portuguese stock market and whether it is possible to obtain higher returns based on past performance trends. The time period analyzed is 1997-2008.

The momentum strategy is based on the under-reaction hypothesis. This suggests that stocks that have had the best (worst) results in the recent past will continue to have better (worse) results in the near future, and therefore a trading strategy that buys winner stocks and sells the losers would provide significant abnormal returns. On the other hand, the contrarian strategy is based on the overreaction hypothesis which assumes the opposite behaviour from stock returns, and hence recommends buying losers and selling winners.

Short term strategies show momentum profitability, thus supporting the under-reaction hypothesis. For longer periods, contrarian profitability (and overreaction) is also considerable but not so evident.

An “innovative” investment strategy was developed that provides much higher returns than momentum and contrarian strategies. It is based on two upward past trends: if the past returns for the two defined periods preceding the holding period were equal or higher than the percentages defined, this stock is bought; otherwise, a safer investment such as a deposit with a risk-free rate is preferable.

Results are not statistically significant but are economically relevant.

Finally, results are robust to changes in the time-period, number of stocks included in the portfolios and after considering transaction and custody costs.

RESUMO DA DISSERTAÇÃO

Esta dissertação analisa a rendibilidade das estratégias *momentum* e *contrarian* na bolsa portuguesa (PSI) no período de 1997 a 2008. Estuda também a possibilidade de obter rendibilidades superiores extrapolando rendibilidades passadas.

A estratégia *momentum* é baseada na hipótese da sub-reacção. Isto sugere que as acções que tenham tido melhores (piores) resultados num passado recente continuarão a ter melhores (piores) resultados num futuro próximo e, portanto, uma estratégia de investimento que compra acções vencedoras e vende as perdedoras, permitirão alcançar rendibilidades superiores. Por outro lado, a estratégia *contrarian* baseia-se na hipótese de sobre-reacção que assume o comportamento oposto da rendibilidade das acções e, consequentemente, recomenda a compra das perdedoras e a venda das vencedoras.

As estratégias de curto prazo demonstram a rentabilidade das estratégias *momentum,* apoiando a hipótese da sub-reacção. Os resultados obtidos para períodos longos evidenciam uma rentabilidade considerável das estratégias *contrarian* (e da sobre-reacção), mas não tão evidente.

Uma estratégia "inovadora" foi desenvolvida, permitindo auferir lucros consideravelmente superiores aos obtidos com as estratégias *momentum* e *contrarian*. Esta pressupõe duas condições: caso as rendibilidades passadas nos dois períodos definidos precedendo o período de investimento forem iguais ou superiores às percentagens definidas, a acção é comprada, caso contrário, investimentos mais seguros são preferíveis, tais como, os depósitos (taxa de juro sem risco).

Os resultados não são estatisticamente significativos mas são economicamente relevantes.

Finalmente, os resultados são consistentes às alterações nos períodos de tempo, ao número de acções incluídas nos portfolios, e depois de considerados os custos de transacção e de custódia.

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1 – Introduction

All investors need an investment philosophy. Investment strategies should be guided by organized and consistent thoughts about markets (and the way they work) and the types of mistake others make, so that investors can clearly define a strategy to guide their investments. Investors without an investment philosophy tend to switch from strategy to strategy, driven simply by recent success which in turn will increase the transaction costs and probably make them incur losses (Damodaran, 2003).

By constructing an active investment philosophy, it is assumed that markets are inefficient but this raises two different issues: which stocks will be more underpriced and how long will these inefficiencies last. For instance, if an investor buys an underpriced stock, how long should he/she hold the asset before the stock returns to its true value? This is the reasoning behind momentum and contrarian strategies.

Therefore, in order to beat the market and take advantage of market anomalies, an investor should carefully define an investment style. This thesis will focus on the two main investment styles: contrarian and momentum strategies.

Contrarian strategies consist of buying long-term past losers (stocks with the lowest performance during the previous three to five years) and holding them over the subsequent three to five years (holding period). The literature initiated by De Bondt and Thaler (1985, 1987) justified this long-term return reversal by the irrationality of investors who tend to overweight recent information and underweight past data when revising their prospects. Thus, investors are too optimistic about good news and too pessimistic about bad news (market overreaction), which can make the stock prices move away from their fundamental values. As a result, stocks with a long record of bad news tend to become underpriced and have high returns in the subsequent period (and vice-versa).

Conversely, momentum strategies are based on buying short-medium term winners (stocks with the highest returns over the last three to twelve months) and holding them for the same period. The first academic study in this field came from Jegadeesh and Titman (1993). Given that performance persists in medium-term periods (“return continuation”), stocks should be bought when others are most bullish about them and sold when others are most bearish. This view is based on the under-reaction phenomena; this states that stocks under-react to new information over periods from one to twelve months, and tend to gradually incorporate it into

prices, thus showing positive self-correlations over these periods. Good and positive news will have a positive impact on near future returns.

The existence of abnormal returns provided by momentum and contrarian strategies has been documented in some countries, although there is some controversy about the results. Studies are not unanimous about such evidence.

To date, few studies have addressed the Portuguese stock market. A couple studies international markets and consider Portugal as just one of a number of countries included in the sample. For example, "Global Momentum Strategies – A Portfolio Perspective" provided by Griffin, Ji, and Martin (2003) illustrates that Portugal has no price momentum profits at a five percent statistical significance level. Studies that focus more on the Portuguese market include that of Alves and Duque (1995) which analyzed the contrarian strategies applied to a small sample of Portuguese stocks between 1989 and 1994 and showed inconclusive results. The findings of the more recent and broader study by Soares and Serra (2005) support superior returns of contrarian strategies and provide weak evidence in favor of profitability of momentum strategies after risk has been accounted. They give great emphasis to behavioral models to explain the negative correlations in long term (overreaction) and positive correlations in short term (under-reaction) between formation and holding periods. Most results are not statistically significant.

I will extend the current literature focusing on three main issues:

- Are returns in the Portuguese stock market really abnormal? If so, which strategy seems to be more profitable: momentum or contrarian?
- Are they economically/statistically significant?
- Is it possible to get higher returns using return past trends?

I will apply momentum and contrarian strategies in the Portuguese Stock Market to determine whether there are momentum and contrarian profits and to obtain the most profitable strategies.

I will develop an "innovative" investment strategy based on two upward past trends which use percentages to define whether or not investment should be made in given stock: if the past returns for the two defined periods preceding the holding period were equal to or higher than the defined percentages, the investment should be made in that stock; otherwise, a safer investment such as a deposit with a risk-free rate is preferable.

The period under analysis for the holding periods is from January 1997 until December 2008 (144 months) and the period for the formation/past periods is from January 1994 until December 1996. The strategies are based on holdings periods ranging from one to sixty months, and formation periods from one and thirty-six months. The sample is composed of all Portuguese stocks.

Momentum and contrarian strategies were executed using overlapping and non-overlapping periods; stocks were ranked according to their past performance into three portfolios, five portfolios and seven portfolios. All strategies were executed in Visual Basic applied to Excel. The UserForm that was developed executes any strategy and simply requires the insertion of the number of portfolios desired, the holding period(s) and the formation period(s). The UserForm can be seen in figure 1

The "innovative strategies" were executed using the overlapping periods and non-overlapping periods, both with and without capitalization in order to determine its effects on profitability. In "innovative strategies", the investor only buys the stocks that meet the following requirements: the performance during the month preceding the holding period must have been higher than *Js* (5% or 10%) and the performance during the months previous to the month preceding the holding period must be higher than *Jm* (30% or 40%). There are then two sub-strategies: "follow the winners" (buying stocks that rigorously fulfill these assumptions) and "follow the winners or starters" (buying stocks with no available data for the evaluation of *Jm* due to very recent entry in the stock market but that fulfill the *Js* requirement). A UserForm was developed in Visual Basic applied to Excel; this is user friendly and allows the execution of any strategy. The user only needs to fill the following parameters in the textboxes: defining the holding period(s) and the formation periods (*s* and *m*), defining the percentages for *Js* and *Jm*, and choosing between "Follow the Winners" (FW) or "Follow the Winners or Starters" (FWS). The UserForm can be seen in figure 2

The results obtained here provide evidence on momentum profitability (and under-reaction) in the Portuguese stock market for the 144 month period analyzed (1997-2008). The evidence on contrarian profitability is weak and consequently there appears to be no over-reaction (long term strategies generate low returns). However when the period from 1999 to 2008 is analyzed the contrarian profits are considerable, especially for the non extreme loser portfolio (*P4*) which reinforces the evidence provided by Soares and Serra (2005). Interestingly the highest mean return on long term strategies is provided by the intermediate portfolio.

Ranking the stocks into seven portfolios and then choosing the top winner portfolio provides the three most profitable strategies (close to 1.5% monthly average returns).

Results are robust to changes in portfolio sizes (three, five and seven portfolios) and to overlapping and non-overlapping periods. There is a considerable difference in returns in favour of the 2003-2008 only when the sample is divided in two sub-periods.

The "innovative strategies" provide higher mean results by implementing strategies for short-term periods (*K1-K12*) from "follow the winners or starters" with *Jm*=30% or 40% and *Js*=5%.

The most profitable "innovative strategies" (higher than 2.5% monthly average returns) undoubtedly provide much higher returns than the most profitable strategies provided by momentum and contrarian strategies. This provides evidence on the importance of the creation of the "innovative strategies" model.

The use of capitalization in the stock market using innovative strategies provides clearly lower results.

Results from innovative strategies are robust for changes in time periods (1997-2002, 2003-2008, and 1997-2007) and using overlapping and non-overlapping periods.

Most results from momentum, contrarian and innovative strategies are not statistically significant.

The paper is organized as follows. Firstly, section 2 makes a brief review of the literature. Section 3 describes the data used in the sample. Afterwards the thesis is divided in two main parts: section 4 is comprised of momentum and contrarian strategies; and section 5 of the "innovative" investment strategies. Each part includes the respective methodology and empirical findings which are carefully and accurately explained. Afterwards there is section 6 that emphasises the focus on profits and not on the returns as explanatory factors. Finally, section 7 presents the main conclusions of the paper.

Figure 1 – UserForm for Momentum and Contrarian strategies using overlapping periods. Example of *K12-J6* strategy with stocks ranked according to their past performance into seven portfolios.

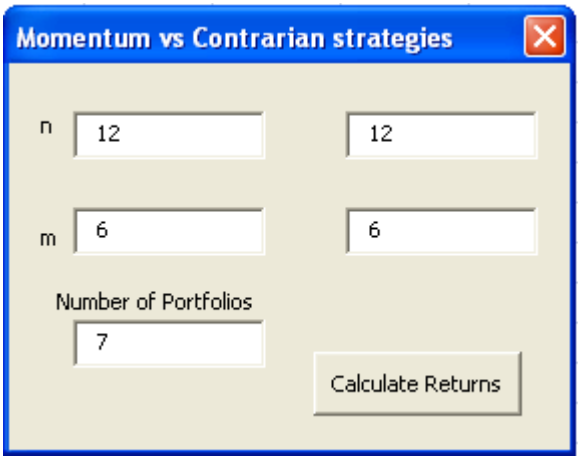
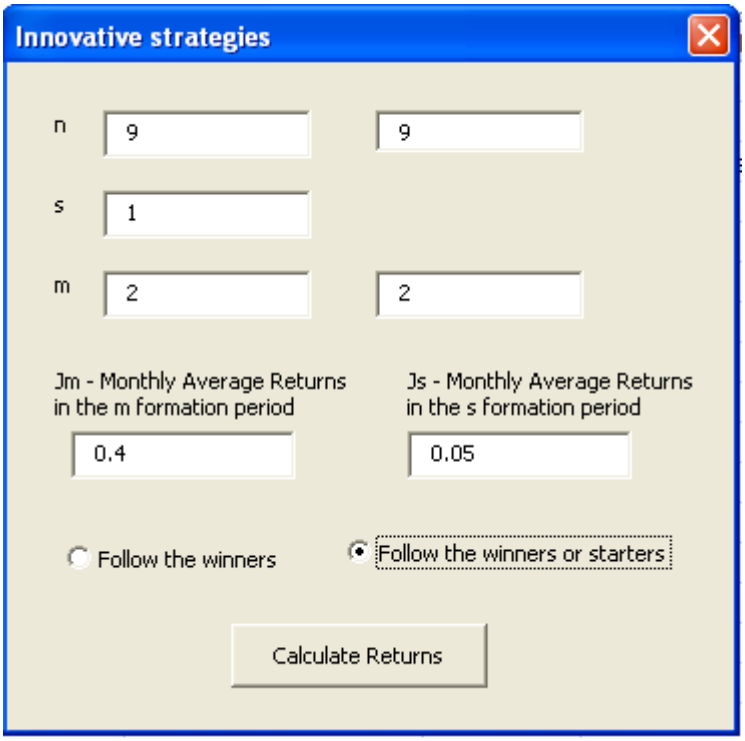


Figure 2 – UserForm for Innovative strategies using overlapping periods. Example of *K9-J1-J2* strategy with *Jm* = 40% and *Js* = 5% for "Follow the winners or starters".



2 - Literature review

This section gives a brief literature review on momentum and contrarian strategies, the possible causes pointed out for their abnormal average returns and their contradictions or compatibility.

2.1 – Momentum strategies

It is widely acknowledged that momentum strategies can generate significant profits. Jegadeesh and Titman (1993) is the first academic study that provides evidence on abnormal returns in the US market by using momentum strategies. Specifically, it consists of buying stocks that provided high returns over the previous three to twelve months and selling stocks that produced low returns over the same period. This strategy allows investors to earn profits of around one percent per month during the following year. Momentum strategy tries to take advantage of the market's under-reaction as it usually takes one to twelve months to incorporate the new information into prices, allowing "return continuation" on medium-term periods.

Research on momentum strategies has also been conducted in other countries.

Rouwenhorst (1998) provided evidence of momentum profits in the European market and was the first one to develop international evidence of momentum profits at the individual stock level. The time period under analysis was from 1980 to 1995 and the sample was composed of 2190 stocks from twelve European countries: Austria, Belgium, Denmark, France, Germany, Italy, Norway, Spain, Sweden, Switzerland, the Netherlands and United Kingdom. This international momentum strategy yields one percent profit per month after accounting for the risk. Moreover, momentum profits are presented in each of the twelve countries used in the sample and last around one year. Not only is return continuation present in all size deciles, but it is negatively related to firm size, and therefore small firms hold higher return continuation than large ones. The results obtained are very similar to those of the previous study by Jegadeesh and Titman on the United States stock market, thus suggesting an exposure to a common component that may be driving the profitability of these strategies. The findings of this paper reinforce the idea of market inefficiency and make it clear that results obtained on the U.S. market were not achieved by chance. The same author also found momentum profitability in 6 out of a sample of 20 emerging equity markets.

Some controversy is found in the Australian stock market: some authors support the idea that momentum strategies are profitable and statistically significant (Liew and Vassalou, 2000; Hurn an Pavlov, 2003; Demir, Muthuswamy, and Walter, 2004), while others take a contrasting position, showing evidence that momentum profits do not exist using monthly data (Durand, Limkriangkrai and Smith, 2006). The contradictory results seem to have two possible explanations: the test-period used in the sample, and seasonality in returns. Using daily data, Durand, Limkriangkrai and Smith (2006) find momentum profits during the 1990-2001 period but do not find this evidence for the period from 1980 to 2001. Thus, the momentum effect in the Australian stock market seems to be limited to the recent past. Recently Kassimatis (2008) provided evidence supporting that the momentum effect and Fama-French factors apparently do not work in the Australian stock market.

The profitability of momentum strategies was documented for Canada, (Foerster, Prihar, and Schmitz, 1995). They followed a similar procedure to Jegadeesh and Titman analyzing data from 1978 to 1993. Further evidence was provided by Korkei and Plas (1995) and Kan and Kirikos (1996) supporting momentum profits in the Canadian market. Nevertheless, Sean and Inglis (1998) show that momentum profits in Canada represent an adequate reward for risk and that these risk premiums vary over time. They also point out that momentum strategies may not work for a simple common investor due to the high transactions costs.

Studies on the Asian stock market prove that momentum strategies are profitable in all Asian countries except Korea and Japan (Chui, Titman, and Wei, 2000). However, some studies contradict these findings: abnormal profits were obtained with short-term momentum strategies in the Japanese equity market (Chang, McLeavey, and Rhee, 1995); Wu (2004) provides evidence that in general a pure momentum investment strategy in the Chinese stock market does not yield excess returns.

A paper focused on the past returns of national stocks indices showed that momentum strategies provide higher abnormal returns in emerging countries in Africa, Latin America, Asia, Europe and Middle East than for develop countries (Urritia Jorge L. and Vu Joseph D., 2004).

A study on the Istanbul Stock Exchange analyzed the period from 1991 to 2000 and proved that there are some profitable momentum strategies. Nevertheless, the contrarian strategies give higher returns (Bildik and Gülay, 2002, 2007).

The most relevant in depth study on the investigation of momentum profits in the Portuguese stock market is that of Soares and Serra (2005). The sample included 82 stocks over the period from 1988 to 2003 (16 years). The main findings obtained from ranking the stocks into five quintiles demonstrate the profitability of momentum strategies for short-term horizons up to 12 months; this is consistent with the results of Jegadeesh and Titman (1993, 2001). The momentum effects persist after risks have been accounted for and seem to be related to an insufficient response to the announcements of earnings. Nevertheless, most results are not statistically significant.

Moreover, a few studies have also addressed the Portuguese stock market in their study of international momentum profitability such as "Global Momentum Strategies – A Portfolio Perspective" done by Griffin, Ji and Martin (2003) that states that momentum profits do not exist for a 5% statistical significance level.

Table 1 – Studies documented on momentum strategies

Sample	***Authors***	***Momentum profits - Exist or not?***
U.S.A.	Jegadeesh and Titman (1993,2001)	Yes
Australia	Liew and Vassalou (2000)	Yes
	Hurn an Pavlov (2003)	Yes
	Demir, Muthuswamy and Walter (2004)	Yes
	Durand, Limkriangkrai and Smith (2006)	Yes/No
	Kassimatis (2008)	No
Austria Belgium Denmark France Germany Italy Norway Spain Sweden Switzerland The Netherlands The U.K.	Rouwenhorst (1998)	Yes
Canadian	Foerster, Prihar and Schmitz (1995)	Yes

	Korkei and Plas (1995)	Yes
	Kan and Kirikos (1996)	Yes
	Sean and Inglis (1998)	Yes/No
All Asian countries	Chui, Titman, and Wei (2000)	Yes, except for Korea and Japan
China	Wu Yangru (2004)	No
Japan	Chang, McLeavey and Rhee (1995)	Yes
Malaysia	Hameed and Ting (2000)	Yes
Turkey	Bildik and Gülay (2002,2007)	Yes
Portugal	Griffin, Ji and Martin (2003)	No
	Soares and Serra (2005)	Yes

Moreover, industry momentum investment was studied by Moskowitz and Grinblatt (1999) who provided evidence on the high profitability of industry momentum strategies (to buy past winner industry portfolios and to sell past loser industry portfolios), even after taking into account the individual stock momentum, possible microstructure weights, book-to-market equity, size and cross-sectional dispersion in mean returns. Industry momentum is stronger than individual stock momentum in the short-term (one month period) and after 12 months tends to disappear, and may reverse in the long run reverse. Industry momentum profits are therefore supported by behavioural models.

In an attempt to identify industry momentum profits and its sources, Pan, Liano and Huang used weekly returns from 1962 to 1998 and the results clearly showed significant positive profits, especially for periods of less than four weeks (short-term horizon).

2.2 - Contrarian strategies

The international evidence on the profitability of contrarian strategies is scarcer.

According to De Bondt and Thaler (1985, 1987) there are return reversals over long periods in the US market. Considering a formation period of three to five years, firms with lower past performance outperformed the companies with higher past performance during the following three to five years (holding period).

However, there is also some evidence that return reversal also occurs on shorter periods (months, weeks and days) according to the papers by Jegadeesh (1990) and Lehmann (1990)

who rely on the overreaction arguments, and the works of Jegadeesh and Titman (1991) and Lo and Mackinlay (1990) who do not support the idea that return reversals are due to overreaction. Short-term abnormal returns on contrarian strategies were also found in the Japanese market (Chang, McLeavey, and Rhee, 1995).

Power et al. (1991), McDonald and Power (1991) provided evidence of contrarian profits in the United Kingdom market. Later, Campbell and Linmack (1997) analyzed the U.K. stock market from the period 1979 to 1990 and also found that contrarian strategies yielded abnormal returns until one year period after portfolio formation. They also documented that the size was not a suitable explanation for the contrarian profits since the smallest winning companies did not present any return reversal (conversely to the smallest losing companies who experienced abnormal returns in the subsequent 12 months after portfolio formation.

Mai (1995) conducted a study in the French stock market and also found contrarian profits.

In Spain there are two notable works published on this matter: Alonso and Rubio (1990) and Forner and Marhuenda (2003). The latter study indicates that the three-year contrarian strategy provides positive abnormal returns but is not statistically significant, thus contradicting the evidence provided by Alonso and Rubio (1990). The five-year contrarian strategy shows significant profits even after accounting for the risk. Nevertheless, this result raises some suspicion when non-overlapping test periods are applied.

In the emerging markets there is also evidence that points to the profitability of contrarian strategies.

Contrarian profitability was documented in the Turkish market (Bildik and Gülay, 2002, 2007). Analyzing the period from 1991 to 2000, they proved that there is a "winners and losers effect" in the Turkish stock market (there is an average 1.14% return difference between top losers and top winners in the 10 year period under analysis). Accordingly, it is in consonance with the overreaction hypothesis, also explained in part by behavioural models and to some extent by factors such as market, size, price, book-to-market and earnings-per-price. It is most probably a size phenomena helped by other factors. Significant contrarian profits are partially explained by the risk factors of the Fama and French model: market, HML (High minus Low) and SMB (Small minus Big). Nevertheless, contrarian profits still exist after accounting for risk. They go even further by stating that new explanations and risk

factors have to be used to explain this phenomenon. Evidence found indicates that the longer the holding period the higher the returns.

In Brazil, Da Costa (1994) also found evidence for the arbitrage profits of contrarian strategies.

A study conducted in the Chinese stock market reveals that a pure contrarian investment strategy outperforms a pure momentum investment strategy and shows positive excess returns (Wu, 2004). Furthermore, the results obtained support the over-reaction hypothesis.

As with momentum strategies, very few studies have analyzed the predictability of Portuguese stock returns for long-term horizons based on past performances using long term-strategies. Specifically, just two papers have studied the contrarian profitability in the Portuguese stock market. Alves and Duque (1996) obtain inconclusive results after executing long-term strategies using a small sample of Portuguese stocks for the period from 1989 to 1994.

A broader study was carried out by Soares and Serra (2005) and analyzed a sample of 82 stocks from 1988 to 2003 (16 years). The main results show a negative self correlation between formation period returns and holding period returns, thus supporting the over-reaction hypothesis. Furthermore, contrarian strategies provide greater profitability. However, most results are not statistically significant

Table 2 – Studies documented on contrarian strategies

Countries	*Authors*	*Contrarian profits - Exist or not?*
U.S.A	De Bondt and Thaler (1985,1987)	Yes
U.K.	Power et al. (1991)	Yes
	McDonald and Power (1991)	Yes
	Campbell and Linmack (1997)	Yes
France	Mai (1995)	Yes
Spain	Alonso and Rubio (1990)	Yes
	Forner and Marhuenda (2003)	Yes/No
Turkey	Bildik and Gülay (2002,2007)	Yes
Brazil	Da Costa (1994)	Yes
China	Wu (2004)	Yes
Japan	Chang, McLeavey, and Rhee (1995)	Yes
Portugal	Alves and Duque (1995)	Yes/No
	Soares and Serra (2005)	Yes

Momentum and Contrarian strategies – causes

Behavioural models and cognitive psychology are commonly used to explain the abnormal returns from momentum and contrarian strategies.

Momentum strategies are usually associated to under-reaction which assumes that stocks show self-correlations over periods from one to twelve months, and thus gradually incorporate it into prices. Good and positive news will have a positive impact on near future returns. For further information see appendixes 9.1 and 9.3.

Contrarian strategies are based on negative self-correlations between long term formation and holding periods (market overreaction). Investors are too optimistic about good news and too pessimistic about bad news which can make the stock prices move away from their fundamental values. As a result, stocks with a long record of bad news tend to become underpriced and have high returns in the subsequent period (and vice-versa). For more details see appendix 9.2 and 9.3.

3 - Data

The sample consists of monthly return series of all Portuguese stocks traded on Euronext Lisbon from January 1994 to December 2008 (180 months). The period from January 1994 until December 1997 (36 months) is used to analyze past periods (formation periods) whereas the investment period (holding periods) occurs from January 1997 until December 2008 (144 months). The sample is also divided into three samples: 1997-2007 period to study the profitability of returns without the effect of Sub-prime crisis (for further information please see appendix 9.4); the 1997-2002 and 2003-2008 periods are analyzed to strengthen the results by evaluating the time-variation of returns (to know if results are consistent through time or are mainly obtained in just one sub-period). Additionally, it was studied a sample from 1999-2008 in order to use five years' portfolio formation essential to execute contrarian strategies (due to Bloomberg did not have older data available, previous to 1993) Prices are shown in the Portuguese currency (euro) and are adjusted for stock splits, dividends and right issues.

For a given equity to be included in the sample of Momentum, Contrarian and Innovative strategies, it must have traded continuously for the *J* months (past period) prior to the formation date, and have been traded at least once during the holding period (*k* months after portfolio formation). In the "innovative strategy", there are two options for a stock to be included in the sample: in a sub-strategy it must have been traded continuously for *Jm* and *Js* months while in the other sub-strategy it only has to have been traded in *Js*; and of course trading at least once in the holding period.

The number of stocks in the sample varies between 24 stocks at the beginning of the period analyzed and 57 stocks at the end of the study.

4 – Momentum and Contrarian strategies

4.1 – Methodology

Program developed in VBA to automatically execute strategies and give results

A Userform with macros was created in VBA in order to quickly and accurately compute all the desired strategies.

Two methods were applied for the study of Momentum and Contrarian strategies:

- Overlapping Method
- Non-Overlapping Method

The Overlapping method is commonly called CAR (Cumulative Abnormal/Market-Adjusted Returns) or AAR (Abnormal Average Returns). When Overlapping method is referred here it means that strategies are executed using overlapping periods and it is also done here the market Adjustment (returns above PSI or PSI-20). The so-called here Non-Overlapping method is the BHAR (Buy and Hold Abnormal Returns), using non-overlapping periods and considering returns above PSI or PSI-20.

Both methods were computed because each presents different advantages and are pertinent and valuable.

The overlapping method is more robust in terms of statistical tests, because it presents the maximum possible number of holding periods in a certain investment time-period, thus giving more reliable results. The non-overlapping method is relevant as it gives the accurate results that an investor would obtain starting to invest in month *t* and selling the stocks in month *w*.

For instance, suppose a six-month holding period starting in January and ending in December of the same year. Since monthly return series are used, in the non-overlapping method there would be only two holding periods (January-June and July-December), whereas in the overlapping method there would be seven holding periods (January-June, February-July, March-August, April-September, May-October, June-November, July-December). Accordingly, it can be concluded that the non-overlapping method would give the accurate return obtained by an investor using a six month strategy who had started to invest in January and sold their stocks in December, whereas the overlapping method gives a kind of average of

the different returns obtained by traders starting to invest in the different months of the investment time period.

The overlapping method consists of the following: at the beginning of each month *t*, stocks are ranked (descending order) according to their returns over the past *m* months, then they are selected according to the strategy (momentum which will select the highest past returns' stocks, or contrarian which will select the lowest past returns' stocks) and held for the *n* month holding period. The non-overlapping method is basically the same but has one important difference: instead of ranking and selecting the stocks every single month (irrespective of the holding period), the rank and stock selection is done every *n* months. These procedures are done for both methods and for four time periods: 1997-2008, 1997-2002, 2003-2008, and 1997-2007. The 1997-2008 period was the initial target period as there was a 12 year (144 months) time period to analyze. Then, to strengthen results and make them more reliable, the period was divided into two sub-periods: 1997-2002 and 2003-2008 (each with 72 months). Finally, taking into account that sub-prime crisis was one of the worst crises with extremely negative impacts in the financial markets, the 2008 year was excluded. By this way were also executed strategies for 1997-2007 (132 months).

Taking into account that VBA applied to excel was used to implement the strategies, this allowed the calculation of many strategies.

Thirty six past periods were considered:

m = from 1 to 36 months

There were sixty holding periods:

n = from 1 to 60 months

The VBA program for any strategy uses three sheets:

"Kn Jm" sheet

Firstly, the stock prices are copied from the "Data" sheet to this sheet and then all returns from a certain *n* and *m* period (*Kn Jm* strategy defined) during the 144 months (1997-2008) are computed in another table; the holding period always starts in January 1997.

"Kn Jm strategy" sheet

Then, the returns' table is copied from *Kn Jm* sheet and is pasted into this sheet with columns and rows transposed. Afterwards, the stocks are ranked according to five equally weighted groups (composed of the same number of stocks) for each *m* past period. The first group is composed of top winners, i.e. the stocks that performed best in that period (*P1* – Portfolio 1), the second comprises the next group of highest ranking stocks (*P2* – Portfolio 2), and so on, until the last one (*P5* – Portfolio 5) which is formed by the worst performing stocks in that period. When it is not possible to have exactly equal weights (20% of sample' stocks in each) in a certain period, the extra stocks, are respectively allocated from *P1* to *P4*.

Furthermore, based on rankings, strategies with three and seven portfolios were also executed always trying to find the most profitable strategies.

For a certain *t* month, the strategy in *P1* is based on buying the winner portfolio (according to *m* past month stocks' performance) and holding it for *n* months; the strategy in *P2* is to buy the second group of highest ranked stocks in the past period and hold them for *n* months; and so on, until *P5* which is composed of the group of stocks with the lowest past returns. In the next holding period, the stocks are ranked again according to the past period defined (*m*) and then selected and held again for *n* months. And the same procedure is applied until the end of the investment period (which can be 2008, 2002 or 2007 according to the investment period defined, that can be 1997-2008, 1997-2002, 2003-2008 and 1997-2007).

"Kn Jm results" sheet

For each holding period, the returns obtained in *Kn Jm strategy* sheet are copied and then pasted to this sheet. After all of them have been executed, the program proceeds to the calculation of:

- Mean Returns 97-08[1] = Average of the returns obtained for all holding periods performed (with *n* months) during the 1997-2008 period.
- Standard Deviation 97-08[2] = Standard deviation of all holding period returns during the 1997-2008 period.
- Mean Returns 97-08 / Standard Deviation 97-08 [3] = significance of statistical results to a 95% confidence level.

[1] Called "Mean" in the excel document
[2] Called "Std Deviation" in the excel document

- Monthly Mean 97-08 [4]= Mean returns 97-08 divided by the holding period (*n*).
- Monthly Standard Deviation 97-08 [5]= Standard deviation ÷ $\sqrt{n}$

For 1997-2002, 2003-2008 and 1997-2008 periods, only the monthly average returns were performed for all strategies. The standard deviation and the statistical significance was just performed for a few randomly selected strategies which showed high standard deviations and results that were not statistically significant for a 95% level of confidence (these conclusions had already reached for the 1997-2008 period). Hence, it was not worth computing these calculations.

In sum, two methods were used in this paper, namely in this section:

- Overlapping
- Non-Overlapping

Stocks were selected according to their past returns that were ranked and divided into:

- Three portfolios
- Five portfolios
- Seven portfolios

Each of these three choices corresponds to a different strategy and in which one of the portfolios is equal or almost equally weighted (each portfolio is formed by the same or almost same number of stocks).

The past periods and holding periods computed were respectively:

- *m* = [1; 36] months
- *n* = [1; 60] months

The 36 months times the 60 months execute a total of 2160 strategies. Considering the three ways of ranking the stocks, 6480 strategies were computed which totals 12960 possibilities (taking into account the two methods used).

[3] Called "Mean/Std Deviation" in the excel document
[4] Called "Monthly Mean" in the excel document
[5] Called "Monthly Std Dev 97-08" in the excel document

4.2 – Empirical Findings

The momentum and contrarian strategies studied in this study are based on 36 past months (*m* periods) and 60 holding months (*n* periods), and were executed according to three different main rankings: ranking the stocks according to their past performance into three portfolios, five portfolios and seven portfolios. And all strategies were computed with overlapping and non-overlapping methods. Once again it should be stated that in addition to computing all possible strategies, the analysis is based on previously defined reference periods. The transaction and custody costs were only analyzed at the end of this section.

Overlapping method – Five Portfolios – 1997-2008

Concerning the overlapping method and the five portfolios, the first main conclusion for the 1997-2008 period is that *P1* (portfolio based on top past winners) is globally 0.39% higher than the *P5* (portfolio based on top past losers). The analyses of the holding periods will be divided in short-medium term periods (from one to twelve months) and long-term periods (from 18 to 60 months) because they represent two different situations in terms of returns of losers versus winners. In the short-term (table 3), *P1* gives monthly average returns 0.69% higher than *P5*. The winner portfolios *P1* and *P2* with monthly average returns of 0.75% and 0.68%, respectively, clearly outperform loser portfolios *P4* and *P5* which have clearly low returns, 0.16% and 0.06%, respectively. The intermediary portfolio (*P3*) also gives average profitability, in general 0.49% monthly average returns. Thus, the average monthly returns in the short-term periods undoubtedly show a downward trend from the winner portfolios to the loser portfolios: 0.75% (*P1*), 0.68% (*P2*), 0.49% (*P3*), 0.16% and 0.06%.

Table 3 – Short-term monthly average returns using overlapping periods and five portfolios in which stocks were equally allocated (with just one exception: when the number of stocks was not multiple of 5, the extra stocks were allocated to *P1, P2, P3 and P4*). The investment period starts in January 1997 and ends in December 2008. The past periods used for the investment decision vary from January 1994 to December 1996 according to the different past periods.

Holding	Past	P1	P2	P3	P4	P5	Mean	P1-P5
K1	J1	0.66%	0.72%	0.13%	0.26%	0.10%	0.37%	0.56%
K1	J3	1.13%	0.64%	-0.01%	-0.20%	0.07%	0.33%	1.06%

K1	J6	1.44%	0.24%	0.27%	-0.16%	-0.33%	0.29%	1.77%
K1	J9	1.09%	0.38%	0.21%	0.04%	-0.28%	0.29%	1.37%
K1	J12	0.61%	0.83%	0.35%	-0.08%	-0.28%	0.29%	0.89%
K1	J18	0.63%	0.57%	0.30%	-0.17%	0.18%	0.30%	0.45%
K1	J24	0.69%	0.23%	0.59%	-0.01%	-0.01%	0.30%	0.70%
K1	J30	0.31%	0.81%	0.44%	-0.12%	0.20%	0.33%	0.11%
K1	J36	0.29%	0.83%	0.29%	-0.15%	0.55%	0.36%	-0.26%
K3	J1	0.79%	0.41%	0.40%	0.30%	0.08%	0.40%	0.71%
K3	J3	1.26%	0.32%	0.19%	0.36%	-0.26%	0.38%	1.53%
K3	J6	1.16%	0.57%	0.27%	0.06%	-0.56%	0.30%	1.73%
K3	J9	1.23%	0.43%	0.14%	0.14%	-0.42%	0.31%	1.65%
K3	J12	0.81%	0.58%	0.59%	-0.02%	-0.45%	0.30%	1.27%
K3	J18	0.79%	0.43%	0.47%	-0.21%	0.24%	0.34%	0.55%
K3	J24	0.54%	0.66%	0.55%	-0.15%	0.01%	0.32%	0.52%
K3	J30	0.25%	0.74%	0.61%	-0.06%	0.20%	0.35%	0.05%
K3	J36	0.40%	0.71%	0.10%	0.05%	0.68%	0.39%	-0.28%
K6	J1	0.99%	0.59%	0.60%	0.13%	0.16%	0.49%	0.83%
K6	J3	1.26%	0.59%	0.30%	0.45%	-0.34%	0.45%	1.60%
K6	J6	1.17%	0.75%	0.32%	0.22%	-0.40%	0.41%	1.57%
K6	J9	1.12%	0.61%	0.35%	0.31%	-0.34%	0.41%	1.45%
K6	J12	0.80%	0.65%	0.56%	0.29%	-0.20%	0.42%	1.00%
K6	J18	0.73%	0.58%	0.67%	-0.02%	0.32%	0.46%	0.42%
K6	J24	0.38%	0.80%	0.71%	0.20%	0.06%	0.43%	0.32%
K6	J30	0.36%	0.78%	0.60%	0.01%	0.56%	0.46%	-0.20%
K6	J36	0.50%	0.74%	0.51%	0.02%	0.65%	0.49%	-0.15%
K9	J1	0.88%	0.72%	0.58%	0.30%	0.16%	0.53%	0.72%
K9	J3	1.19%	0.64%	0.44%	0.49%	-0.25%	0.50%	1.44%
K9	J6	1.00%	0.85%	0.45%	0.32%	-0.28%	0.47%	1.29%
K9	J9	0.81%	0.88%	0.42%	0.42%	-0.18%	0.47%	0.99%
K9	J12	0.62%	0.79%	0.71%	0.31%	-0.01%	0.48%	0.63%
K9	J18	0.55%	0.74%	0.90%	0.07%	0.18%	0.49%	0.37%
K9	J24	0.37%	0.85%	0.70%	0.31%	0.18%	0.48%	0.19%
K9	J30	0.41%	0.72%	0.72%	0.06%	0.68%	0.52%	-0.27%
K9	J36	0.52%	0.88%	0.61%	0.14%	0.47%	0.52%	0.05%
K12	J1	0.85%	0.79%	0.66%	0.40%	0.09%	0.56%	0.76%
K12	J3	1.12%	0.66%	0.50%	0.50%	-0.13%	0.53%	1.26%
K12	J6	0.84%	0.92%	0.53%	0.39%	-0.13%	0.51%	0.96%
K12	J9	0.74%	0.90%	0.52%	0.46%	-0.02%	0.52%	0.76%
K12	J12	0.57%	0.87%	0.73%	0.30%	0.16%	0.53%	0.42%
K12	J18	0.50%	0.72%	0.89%	0.33%	0.18%	0.52%	0.32%
K12	J24	0.36%	0.81%	0.75%	0.39%	0.34%	0.53%	0.03%
K12	J30	0.46%	0.76%	0.83%	0.21%	0.49%	0.55%	-0.03%
K12	J36	0.57%	0.85%	0.63%	0.26%	0.47%	0.55%	0.10%
Mean		0.75%	0.68%	0.49%	0.16%	0.06%	0.43%	0.69%

Nevertheless, results obtained are only good if they beat the market. Thus, they were compared with the value-weighted General Portuguese Stock Index (PSI) and the value-weighted Portuguese Stock Index-20 (PSI-20) which can be seen in table 4 and in appendix 9.5 and 9.6. During the 1997-2008 period, PSI had 0.55% average monthly returns whereas PSI-20 had only 0.16%. This means that Winner portfolios (*P1* and *P2*) outperformed the PSI by 0.20% and 0.13%, respectively, while loser portfolios (*P4* and *P5*) underperformed the PSI by -0.39% and -0.49%, respectively. Considering the poor PSI-20 performance, the comparison with PSI is even more favourable. The winners (*P1* and *P2*) beat the market by 0.59 % and 0.52% per month, respectively, whereas *P4* got exactly the same profitability of PSI-20, and only *P5* continued to underperform the PSI-20 by 0.11% per month.

Concerning just **short-term strategies** (holding and formation periods until twelve months) the returns from the top winner portfolio increase considerably from 0.75% (table 3) to 0.97% (please see appendix table 9.7). The top winner portfolio (*P1*) gives average monthly returns 1.13% higher than the top loser portfolio (*P5*). The downward trend from the winner portfolios to the loser portfolios is even higher: 0.97% (*P1*), 0.65% (*P2*), 0.41% (*P3)*, 0.24% (*P4*) and -0.16% (*P5*). From 1997 to 2008, the pure momentum strategies (*P1)* beat PSI and PSI-20 by monthly average returns of 0.42% and 0.81%, respectively. The top loser portfolio underperformed PSI and PSI-20 by -0.71% and -0.32%.

Table 4 – Monthly average returns on PSI-20 and PSI

	PSI-20 Value Weighted Index	**PSI Value Weighted Index**
Monthly 1997-2008	0.16%	0.55%

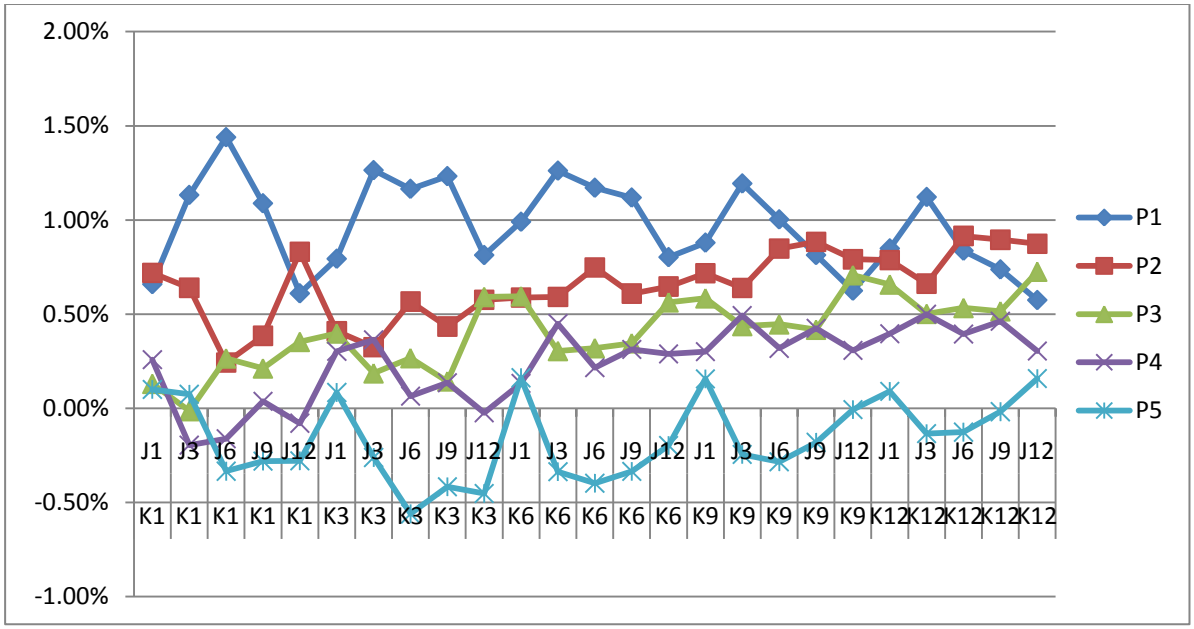
It is not a good choice to base the investment (for holding periods until 12 months) on the analysis of the past periods over 12 months (18, 24, 30 or 36 months) since the returns are low.

The most profitable strategies in the short-medium term are easily identified (table 3 and figure 3) as the strategies from the top winner portfolio (*P1*) with one, three or six months in the holding period combined with three, six, or nine months of the past period: *K1-J3, K1-J6, K1-J9, K3-J3, K3-J6, K3-J9, K6-J3, K6-J6, K6-J9* (all of them giving more than one percent

average monthly returns). In the nine and twelve holding periods, the strategies on *P1* also provide interesting profits, especially on *K9-J3* (1.19%) and *K12-J3* (1.12%).

The three best investment strategies during 1997-2008 were achieved with top-winner portfolio (*P1*), particularly with the strategies *K1-J6* (1.44%), *K3-J3* and *K6-J3* both with 1.26% (which can be seen in table 3 and figure 3); they clearly provide attractive monthly returns.

Figure 3 – Monthly average returns from Portfolio 1 (top winner portfolio) to Portfolio 5 (top loser portfolio) for the short-term strategies (formation and holding periods until twelve months).



Regardless of formation and holding periods, considering the 45 short-medium term strategies (Table 5), all winner portfolios (*P1* and *P2*) report positive returns, in *P3* just one strategy does not provide positive returns. However, just 33 strategies are profitable in *P4* and in *P5* almost half of them do not provide positive returns (just 26 strategies are profitable).

Such negative results prove that in short-medium term periods, losers continue to be losers and winners continue to be winners (tables 3 and 5, and figure 3). In general, extreme loser stocks probably face financial distress and in the short-medium term they are not able to solve this problem, thus showing continuing underperformance.

Moreover, in *P1* and *P2* most strategies beat the market (PSI), in *P3* just 20 generate returns above the PSI; on the other hand, in *P4* and *P5* (the loser portfolios) the strategies that outperform the market are not even one and four, respectively.

Table 5 – Number of short-term strategies with positive returns, returns above PSI and returns above PSI-20.

Number of strategies	**P1**	**P2**	**P3**	**P4**	**P5**
Positive returns	45	45	44	33	26
Positive returns above PSI	31	38	20	0	4
Positive returns above PSI-20	45	45	41	23	17

It is also found that almost all investment strategies computed with winner portfolios (*P1* and *P2*) produce higher returns than loser portfolios (*P4* and *P5*) with the exceptions of 6 for *P1* (but all of these with past periods of 30 or 36 months) and the notable exception in *P2* for the *K3-J3* strategy.

The highest return differences between extreme winners and losers occur in strategies *K1-J6* and in *K3-J6* where *P1* is 1.77% and 1.73%, respectively, higher than *P5*. The lowest return differences between *P1* and *P5* arise in *K12-J24* (0.09%) and *K12-J30* (0.03 and -0.03%, respectively). This can be seen in table 3.

In short, the most profitable choice is the evaluation of the past performance based on the last quarter, six months or nine months and then investing for one, three or six months always focusing on the extreme winner stocks (table 3 and figure 3).

The evidence provided here clearly shows that short term strategies provide abnormal returns. These results are in accordance with previous studies already mentioned in the literature review. Momentum profits were also found by Soares and Serra (2005) for the Portuguese stock market, although they found weak evidence in favour of it after controlling for risk.

Considering the **medium-long term strategies**, the evidence provided by previous studies in other countries shows that as formation and holding periods become longer, loser stocks start to outperform the winner stocks. However, results are somewhat mixed as the holding period and the past return extend to long periods in the Portuguese stock market (table 6). It is not easy to identify a trend. In some strategies, winners beat losers while in others the opposite

occurs, i.e. losers outperform winners. In many strategies, the returns generated by top winners and top losers are very similar to each other.

In general, the average monthly return difference between top winners and top losers is 0.09% in favour of the former; and on average strategies perform best in *P2* and *P3* (mean of 0.66% and 0.62%, respectively). The overall mean return from all these strategies is 0.50%.

The best investment strategies here consist of the investment in top-winners in strategy *K18-J3* (1.01%); and in the intermediate portfolio (*P3*) in strategy *K60-J36* (0.93%).

The highest return difference between extreme winners and extreme losers is achieved in *K18-J3* strategy and is 0.94% (in favour of the winners).

Table 6 - Long-term monthly average returns using Five Portfolios (1997-2008) and Overlapping Periods.

Holding	Past	P1	P2	P3	P4	P5	Mean	P1-P5
K18	**J1**	0.81%	0.62%	0.57%	0.49%	0.20%	0.54%	0.60%
K18	**J3**	1.01%	0.68%	0.43%	0.42%	0.07%	0.52%	0.94%
K18	**J6**	0.78%	0.81%	0.54%	0.28%	0.13%	0.51%	0.65%
K18	**J9**	0.55%	0.84%	0.59%	0.41%	0.15%	0.51%	0.40%
K18	**J12**	0.37%	0.86%	0.74%	0.38%	0.18%	0.51%	0.19%
K18	**J18**	0.38%	0.70%	0.64%	0.40%	0.45%	0.52%	-0.08%
K18	**J24**	0.36%	0.74%	0.60%	0.39%	0.53%	0.52%	-0.16%
K18	**J30**	0.45%	0.73%	0.72%	0.27%	0.49%	0.53%	-0.04%
K18	**J36**	0.53%	0.78%	0.60%	0.39%	0.42%	0.54%	0.12%
K24	**J1**	0.65%	0.60%	0.58%	0.51%	0.33%	0.53%	0.32%
K24	**J3**	0.75%	0.67%	0.47%	0.51%	0.18%	0.51%	0.57%
K24	**J6**	0.54%	0.75%	0.53%	0.38%	0.30%	0.50%	0.23%
K24	**J9**	0.38%	0.74%	0.56%	0.48%	0.35%	0.50%	0.03%
K24	**J12**	0.29%	0.74%	0.69%	0.37%	0.42%	0.50%	-0.13%
K24	**J18**	0.34%	0.71%	0.59%	0.30%	0.63%	0.51%	-0.29%
K24	**J24**	0.29%	0.74%	0.72%	0.25%	0.59%	0.52%	-0.30%
K24	**J30**	0.38%	0.65%	0.76%	0.29%	0.55%	0.53%	-0.16%
K24	**J36**	0.43%	0.76%	0.60%	0.34%	0.51%	0.53%	-0.08%
K36	**J1**	0.48%	0.55%	0.62%	0.55%	0.43%	0.53%	0.05%
K36	**J3**	0.58%	0.55%	0.54%	0.54%	0.39%	0.52%	0.19%
K36	**J6**	0.53%	0.64%	0.57%	0.43%	0.42%	0.52%	0.11%
K36	**J9**	0.41%	0.73%	0.61%	0.50%	0.36%	0.52%	0.05%
K36	**J12**	0.38%	0.73%	0.74%	0.44%	0.33%	0.52%	0.04%
K36	**J18**	0.37%	0.64%	0.72%	0.53%	0.42%	0.54%	-0.05%
K36	**J24**	0.36%	0.64%	0.80%	0.53%	0.37%	0.54%	-0.01%

K36	**J30**	0.39%	0.76%	0.77%	0.41%	0.34%	0.53%	0.05%
K36	**J36**	0.44%	0.82%	0.75%	0.34%	0.37%	0.54%	0.07%
K48	**J1**	0.43%	0.49%	0.53%	0.42%	0.33%	0.44%	0.11%
K48	**J3**	0.54%	0.44%	0.47%	0.50%	0.27%	0.44%	0.27%
K48	**J6**	0.55%	0.55%	0.46%	0.38%	0.32%	0.45%	0.24%
K48	**J9**	0.40%	0.56%	0.57%	0.46%	0.31%	0.46%	0.09%
K48	**J12**	0.30%	0.62%	0.68%	0.44%	0.29%	0.47%	0.00%
K48	**J18**	0.34%	0.63%	0.64%	0.49%	0.30%	0.48%	0.05%
K48	**J24**	0.37%	0.67%	0.73%	0.40%	0.26%	0.49%	0.11%
K48	**J30**	0.42%	0.75%	0.68%	0.41%	0.23%	0.50%	0.19%
K48	**J36**	0.38%	0.71%	0.77%	0.36%	0.36%	0.52%	0.02%
K60	**J1**	0.36%	0.50%	0.45%	0.42%	0.33%	0.41%	0.03%
K60	**J3**	0.41%	0.47%	0.42%	0.44%	0.34%	0.42%	0.07%
K60	**J6**	0.43%	0.55%	0.40%	0.34%	0.42%	0.43%	0.02%
K60	**J9**	0.33%	0.55%	0.58%	0.33%	0.41%	0.44%	-0.09%
K60	**J12**	0.23%	0.71%	0.59%	0.39%	0.32%	0.45%	-0.09%
K60	**J18**	0.31%	0.63%	0.62%	0.44%	0.33%	0.47%	-0.01%
K60	**J24**	0.33%	0.65%	0.69%	0.40%	0.34%	0.48%	-0.02%
K60	**J30**	0.30%	0.53%	0.79%	0.54%	0.38%	0.51%	-0.07%
K60	**J36**	0.21%	0.44%	0.93%	0.61%	0.49%	0.54%	-0.28%
Mean		0.44%	0.66%	0.62%	0.42%	0.35%	0.50%	0.09%

All strategies executed here in the long term provide positive returns (table 7). However, comparing the returns obtained with the PSI performance (table 7 and appendix 9.11), most strategies in *P1*, *P4* and *P5* provide returns lower than PSI; only in *P2* and *P3* do most strategies outperform the PSI. The returns obtained with all strategies are higher than those of PSI-20 (table 7 and appendix 9.12) with the exception of three strategies in loser portfolios (*K18-J3*, *K18-J6* and *K18-J9*). Furthermore, when long term strategies were compared, the mean monthly average return comparing was 0.05% lower than PSI, and just 0.34% higher than PSI-20.

Table 7 – Number of strategies with positive returns, positive returns above PSI and positive returns above PSI-20 for the 45 medium-long term holding period strategies

Number of strategies	**P1**	**P2**	**P3**	**P4**	**P5**
Positive returns	45	45	45	45	45
Positive returns above PSI	8	37	34	2	2
Positive returns above PSI-20	45	45	45	45	42

Generally, regardless of the investment in losers or winners, long-term strategies provide positive returns. It is impossible to identify a trend in returns as results of top winners and losers are mixed. Curiously, the best performing portfolios were *P2* and *P3*, with 0.66% and 0.62%. In general, results here provide evidence of the low profitability of momentum and contrarian strategies in long-time periods. Thus, investing in the long term does not seem attractive from the investor point of view (profitability).

Considering **variability (**appendix 9.8) shows that volatility is relatively high for short, medium and long term periods (the mean average monthly standard deviation for all strategies was 7.83%) due to the high return volatility in the Portuguese stocks. The 1997-2008 time period was characterized by the contrasting strong and stable positive growth in some sub-periods and by the abrupt and tough declines (high negative returns) during other sub-periods. The strong declines were mainly due to the "Dot-com bubble" and "Sub-prime" crises (for further information about these crises please see appendix .9.4).

The top-losers display higher volatility than top-winners (appendix 9.10) that shows that monthly standard deviation is on average 0.31% higher; 8.46% versus 8.16%). As expected, the volatility is obviously lower for the strategies based on a one month holding period (6.43% mean) because of the shorter time period. In the short term, strategies from top-winners present slightly lower volatility than strategies from top losers (appendix 9.8: -0.54%) while in the medium-long term the difference is almost insignificant (appendix 9.9: -0.07%).

In the short-term, the higher volatility of the top loser portfolio provides further evidence of the superiority of momentum strategies (top-winner portfolio) when compared with contrarian strategies (top-loser portfolio) for periods up to twelve months.

The results are not statistically significant to a 95% confidence level (results are not lower than -1.97 or higher than 1.97) which can be seen in appendix 9.18. This is easily explained by the relatively high return volatility (mostly due to the two main crises). However, results are economically significant.

Contrarian strategies (1999-2008): holding and formation periods from three to five years.

Considering that the analysis of contrarian strategies require not only holding periods from three to five years but also formation periods from three to five years, and taking into account that Bloomberg did not have older data available (complete data from 1993 and 1992 stocks prices are not available) it was used a sample that starts to invest in January 1999. By this way there is a five years' formation period (from 1994 to 1998) before the initial investment.

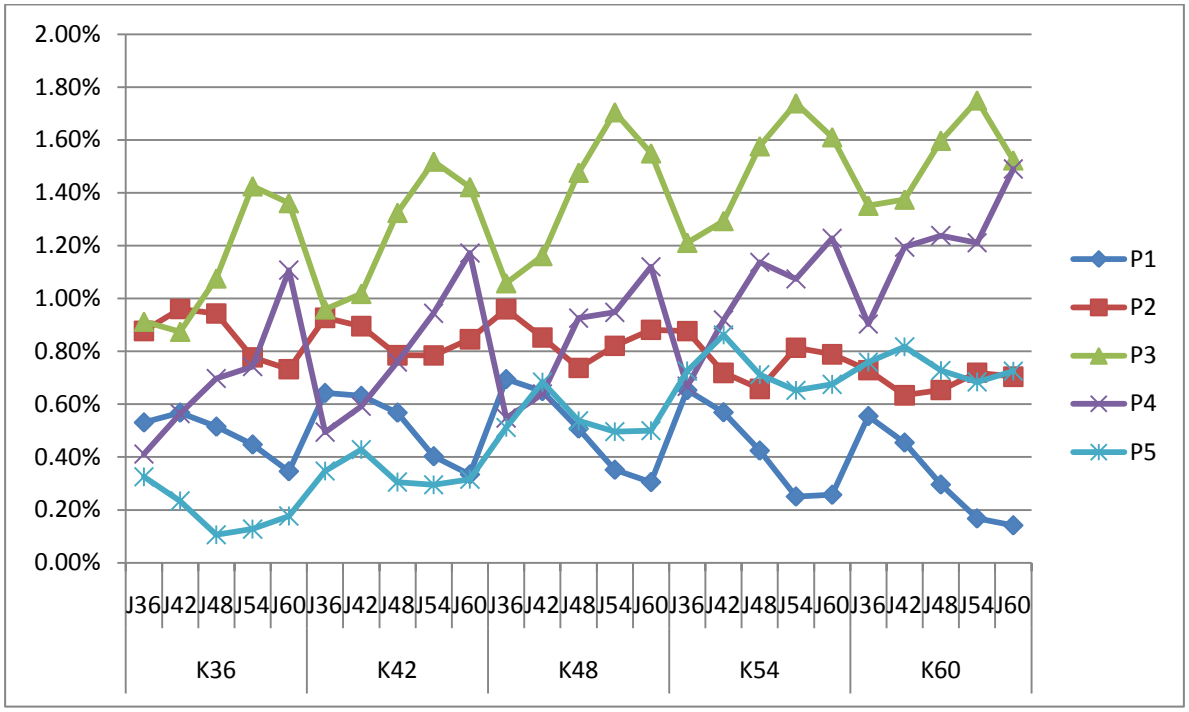
As it can be seen in figure 4, the top loser portfolio and top winner portfolio underperform the other portfolios. As the holding period becomes longer, the top loser portfolio beats the top winner portfolio (the outperformance starts on *K48*). The *P4* (second loser portfolio), regardless of the holding period get some high monthly average return rates, mainly for formation periods of 60 months. The intermediate portfolio generates the highest monthly average returns for almost all long term periods. The best strategy belongs to the intermediate portfolio and is *K60-J54* with monthly average returns of 1.75% (figure 4 and appendix 9.13). On average *P5* beats the *P1* by 0.06% (0.45% versus 0.51%). The highest mean returns are obtained by *P4* (0.91%) and *P3* (1.35%).

Returns observed by the implementation of long term strategies proves that contrarian profits exist, but surprisingly the best results from the loser portfolios are reached by *P4* (the second loser portfolio) and not by the top loser portfolio. Furthermore, the portfolio that clearly outperforms all the others is the intermediate portfolio (*P3*). These results are not so evident in terms of contrarian profitability as Soares and Serra (2005) and highlight the profitability of the intermediate portfolio.

All strategies from *P2* and *P3* and most strategies from *P4* clearly outperform the PSI-20 and the PSI. Results for the long term strategies from 1999 to 2008 are consistent for changes in the number of portfolios (three and seven portfolios, appendixes 9.16 and 9.15, respectively), but are lower when non-overlapping periods are used (and there is a high divergence when the sample is divided in two: the 1999-2003 has negative mean returns whereas the 2004-2008 has relatively high mean positive returns (appendix 9.14).

Furthermore, results are not statistically significant to a 95% confidence level.

Figure 4– Monthly average returns for the long-term from 1999 to 2008, for the five portfolios, using overlapping periods. *P1* and *P5* are the portfolios composed by top winner stocks and top loser stocks, respectively.



Overlapping method – Five Portfolios – 1997-2002; 2003-2008; 1997-2007

To increase the robustness of results, the investment period under analysis (1997-2008) was divided into two sub-periods: 1997-2002 and 2003-2008. The analysis was also made for the 1997-2007 period to observe the stocks' returns without the effects of the Subprime crisis (considering for instance a rational investor that would take his money out of the stock market by at least the end of 2007 since the crisis was already taking hold and no longer simply a threat in late 2007). For further information about the Sub-prime crisis see appendix 9.4.

Comparing the returns from 1997-2008 with the returns obtained for the 1997-2002, 2003-2008, and 1997-2007 periods (table 8 and appendixes from 9.19 to 9.24), the first main finding is that the better performances for the short-term and medium-long term strategies are generated during 2003-2008 (whose returns are even higher than the 1997-2007 period which excludes 2008 and the sub-prime crisis).

The returns generated by the two sub-periods (1997-2002 and 2003-2008) are quite different and always in favor of the strategies implemented in 2003-2008. Whereas the mean of the monthly average returns for the short-term strategies (from *K1* until *K12*) during 1997-2002 is 0.31%, during 2003-2008 it is more or less double (0.63%). In terms of medium-long periods, the difference is remarkably high: in 1997-2002 the mean of the monthly average returns are negative (-0.05%) while in 2003-2008 it is very high (1.33%). Globally, in 1997-2003 the results were 0.13% while in 2003-2008 they were 0.98%. All these results point out that in general short-term strategies are economically significant (relatively good profits are obtained) regardless of the chosen portfolio, whereas they are not economically significant in the long-term strategies because they will have low or even negative average returns. Another finding is that results depend on the periods; in some years it is easier to make high profits while in others these profits are very hard to obtain with these strategies.

In 1997-2007, the strategies produce the highest returns in the short-term (the mean of monthly average returns is 0.80%) and in the medium-long term it generates 0.54%. Compared with 1997-2008, the results generated in the medium-long term are almost the same, but in the short-term they are quite different and favour of the strategies applied during 1997-2007 (0.80% versus 0.43%).

An investor would decide to invest in the winner portfolios (because they are more profitable). On 1997-2008 in the short-term there is a downward trend in results from winners to losers. Although the same occurs for the 2003-2008 and 1997-2007 periods, in 1997-2002 the results differ and it is more profitable on average to invest in *P2* and *P3*. For the medium-long term there is an upward trend from *P1* to *P2* and then a downward trend until *P5* for all periods with the exception of 1997-2002 (higher mean returns are generated in the intermediary portfolio – *P3*). In general, the trend for all periods is exactly the same as in the medium-long term.

Therefore, regardless of the formation period, it can be concluded that for strategies with short holding periods, the best option is, in average, to choose the top winner portfolio (*P1*). However, in the 1997-2002 period the results are not consistent with this, as *P2* is on average the most profitable portfolio. For strategies with medium-long holding periods the best option is to choose *P2*.

In short, the winners in the Portuguese stock market generally continue to be winners and the losers still tend to be losers or to give relatively low returns not only in the short term but also

in the medium and long run (under-reaction regardless of the holding period), and therefore the profitability of contrarian strategies is not so evident as the findings from most studies performed in other countries and by Soares and Serra (2005) for the direct study of the Portuguese stock market. The different results might be explained by the different time periods (1997-2008 in this study compared with 1989-2003). Nevertheless, statistical significance of the conclusions is in accordance of Soares and Serra (2005) as the results are characterized by a lack of statistical significance.

Table 8 – Mean of the average monthly returns by portfolio and by investment time-period for short and medium-long term. Each investment period is divided into short-term strategies (*K1-K12*), medium-long term strategies (*>K12*) and overall strategies (*K1-K60*) which means all periods analyzed (from 1 month until 60 months strategies). The difference between top winners and top losers is also computed (*P1-P5*).

		P1	P2	P3	P4	P5	Mean	P1-P5
1997-2008	**K1-K12**	0.75%	0.68%	0.49%	0.16%	0.06%	0.43%	0.69%
	> K12	0.44%	0.66%	0.62%	0.42%	0.35%	0.50%	0.09%
	K1-K60	0.60%	0.67%	0.56%	0.29%	0.21%	0.46%	0.39%
1997-2002	**K1-K12**	0.36%	0.62%	0.53%	0.16%	-0.13%	0.31%	0.49%
	> K12	-0.29%	0.04%	0.12%	-0.03%	-0.11%	-0.05%	-0.17%
	K1-K60	0.04%	0.33%	0.32%	0.06%	-0.12%	0.13%	0.16%
2003-2008	**K1-K12**	1.17%	0.84%	0.57%	0.27%	0.28%	0.63%	0.89%
	> K12	1.30%	1.66%	1.55%	1.11%	1.05%	1.33%	0.25%
	K1-K60	1.23%	1.25%	1.06%	0.69%	0.67%	0.98%	0.57%
1997-2007	**K1-K12**	1.16%	1.10%	0.87%	0.50%	0.38%	0.80%	0.77%
	> K12	0.48%	0.69%	0.67%	0.46%	0.41%	0.54%	0.07%
	K1-K60	0.82%	0.89%	0.77%	0.48%	0.40%	0.67%	0.42%

Focusing on results (the investor perspective) - the most profitable strategies

The most profitable strategies in 1997-2008 were *K1-J6* (1.44%), *K3-J3* and *K6-J3* both with 1.26% gross monthly average returns. This takes into account that transaction costs (analyzed at the end of this section) are important and lower costs considerably. After considering the costs, the monthly average returns would be reduced to 1.33%, 1.22% and 1.24% for *K1-J6*, *K3-J3* and *K6-J3*, respectively. These returns are of course obtained with the optimal amounts

of money that minimize the costs for these strategies: €118,359 for *K1-J6*, €115,677 for *K3-J3*, and €111,619 for *K6-J3*.

Table 9 – Monthly average returns (gross rates) for the three most profitable strategies (*K1-J6*, *K3-J3*, and *K6-J3)*. It was used overlapping periods and the five portfolios. Results are shown for the four periods: 1997-2008, 1997-2002, 2003-2008 and 1997-2007.

		1997-2008	1997-2002	2003-2008	1997-2007
K1	**J6**	1.44%	1.29%	1.59%	1.98%
K3	**J3**	1.26%	0.83%	1.69%	1.78%
K6	**J3**	1.26%	0.72%	1.79%	1.65%

As can be seen in the table above (table 9) the results from the three most profitable strategies more than double the PSI performance (0.55%). They are also consistent and economically significant when the sample is divided into two sub-periods (1997-2002 and 2003-2008) and when 2008, i.e. year of the Sub-prime crisis, is excluded (1997-2007).

Overlapping Method – Three Portfolios and Seven Portfolios

Table 10 – Mean of the monthly average returns for 1997-2008 for the three, five and seven portfolios.

1997-2008	P1	P2	P3	P4	P5	P6	P7	Mean	P1-P5
3 Portfolios	0.64%	0.54%	0.23%					0.47%	0.41%
5 Portfolios	0.60%	0.67%	0.56%	0.29%	0.21%			0.46%	0.39%
7 Portfolios	0.61%	0.66%	0.63%	0.57%	0.36%	0.24%	0.17%	0.46%	0.44%

The results from three portfolios and seven portfolios (table 10) are in accordance with those from the five portfolios which analyzed above.

The most profitable strategies (table 11) attained with the five portfolios (*K1-J6*, *K3-J3* and *K6-J3*) remain the same with the three and seven portfolios. Nevertheless, ranking the stocks in three portfolios provides lower returns for the most profitable strategies than those

generated by ranking the stocks into five portfolios. Moreover, ranking stocks in seven portfolios is the most profitable strategy.

Table 11 – Monthly average returns for the three most profitable strategies attained with the top winner portfolio, from ranking the stocks into three, five and seven portfolios.

1997-2008		3 portfolios	5 portfolios	7 portfolios
K1	**J6**	1.11%	1.44%	1.56%
K3	**J6**	1.03%	1.26%	1.42%
K6	**J6**	1.03%	1.26%	1.49%

The three portfolios and the seven portfolios provide high monthly standard deviations. The seven portfolios generate higher values (8.33%) while three portfolios show 7.30%; and the five portfolios are between the two (7.83%).

Moreover, the strategies based on the ranking the stocks into three portfolios and seven portfolios are also not statistically significant to a 95% confidence level.

Non-Overlapping method – Three, Five and Seven Portfolios

The results generated by ranking the stocks into three, five and seven portfolios using the non-overlapping method are similar to those of the overlapping method (table 12). Most of the results are not statistically significant for a 95% confidence level.

Table 12 – Mean of the monthly average returns for three, five and seven portfolios (1997-2008).

1997-2008	P1	P2	P3	P4	P5	P6	P7	Mean	P1-P5
3 portfolios	0.65%	0.52%	0.24%					0.47%	0.40%
5 portfolios	0.60%	0.63%	0.51%	0.47%	0.12%			0.47%	0.48%
7 portfolios	0.62%	0.69%	0.55%	0.56%	0.49%	0.28%	0.11%	0.47%	0.51%

The three most profitable strategies from the overlapping method when performed by the non-overlapping method provide lower returns for *K3-J6* and *K6-J6* which undoubtedly reduces the economical profitability and attractiveness. For the *K1-J6* strategy, the monthly average

returns are exactly the same whichever method is used because both methods involve precisely the same calculations as they are performed monthly (tables 13 and 14).

Table 13 – Non-overlapping method - Monthly average returns for the most profitable strategies for the three, five and seven portfolios (which belong to the winner portfolio)

1997-2008		3 portfolios	5 portfolios	7 portfolios
K1	**J6**	1.11%	1.44%	1.56%
K3	**J6**	0.61%	0.76%	1.05%
K6	**J6**	0.90%	0.87%	0.93%

Table 14 – Abnormal monthly returns from the overlapping method compared with the non-overlapping method.

1997-2008		3 portfolios	5 portfolios	7 portfolios
K1	**J6**	0.00%	0.00%	0.00%
K3	**J6**	0.42%	0.51%	0.37%
K6	**J6**	0.13%	0.39%	0.57%

Transaction costs, custody costs and returns

The stock's profitability is always reduced by the buying transaction costs, selling transactions costs and custody costs. The stock's returns can be drastically decreased if a small amount is invested and especially for short-term strategies (because transaction costs are far higher); on the other hand, costs can become almost residual for large amounts and medium-long term strategies.

Barclays Bank was chosen because it seems to be the cheapest one operating in Portugal for this purpose. It only charges a transaction cost of €5.2 per transaction lower than €10,000; for higher amounts, it charges a fixed percentage of the amount traded (0.09%)[6]. The custody costs are €10.285 per quarter[7].

The aim of this section is to identify the optimal investment amount that minimizes the costs, thus maximizing the returns obtained with a certain strategy, and also to determine the break-

[6] The bank was chosen according to the costs charged by banks in a full list from the CMVM website
[7] Custody costs on these strategies have a much lower weight compared with buying and selling transaction costs due to the relatively high number of different stocks traded. Custody costs are also listed on the CMVM website

even point, i.e., the amount of money for which the strategy starts to become profitable. Returns after accounting for costs were also calculated for the following scenarios: €1,000, €5,000, €10,000, €100,000 and €1,000,000.

For 1997-2008, net returns (after accounting for costs) were calculated for the best monthly, quarterly, half-yearly and yearly strategies, which were *K1-J6*, *K3-J6*, *K6-J3* and *K12-J3*, respectively. These strategies were implemented by ranking the stocks into three, five and seven portfolios (using the overlapping method). Ranking the stocks into three portfolios implies paying more buying and selling transaction costs because there are nineteen stocks in each portfolio; with five portfolios, the winner portfolios (P1 and P2) have twelve stocks and the others have eleven stocks; and with seven portfolios, there are nine stocks in the top-winner portfolio and eight stocks in the others (table 15). Fifty-seven stocks were considered and were divided by the number of portfolios desired to rank all stocks.

Table 15 – Number of stocks per portfolio according to the ranking into three, five or seven portfolios (1997-2008)

	P1	**P2**	**P3**	**P4**	**P5**	**P6**	**P7**	**Total**
3 Portfolios	19	19	19					57
5 Portfolios	12	12	11	11	11			57
7 Portfolios	9	8	8	8	8	8	8	57

The transaction costs were computed using two different approaches: 100% and 75% portfolio rotation. As the former considers that all stocks are bought and sold in every single period, it estimates and considers costs in excess because there is usually at least one stock that remains in the portfolio in the subsequent period. The 75% portfolio rotation is probably more realistic but there is the risk of undervaluing the number of transaction costs.

Assuming 100% portfolio rotation

By ranking the stocks into three, five and seven portfolios for monthly strategies, it is seen that *K1-J6* (using the top-winner portfolio – *P1*) only becomes profitable for amounts over €18270, €8973 and €6268, respectively, and the amounts that minimize the costs (the highest possible returns obtained with this strategy) are €188019, €118359 and €88664. This means that the monthly average returns for the top-winner portfolio decrease from 1.11% to 1% (for three portfolios), 1.44% to 1.33% (for the five portfolios), and 1.56% to 1.45% (for the seven

portfolios). Furthermore, it is interesting to note that return rates for three, five and seven portfolios decrease 9.72% (1% divided by 1.11% minus 1), 7.58% and 7.07%. Therefore, as expected, costs are minimized and the highest net return rate is obtained (1.50%) at *P1* in the seven portfolios approach followed by the *P1* in the five portfolios (1.33%); the worst is P1 in the three portfolios (Table16)

These results are explained by the fact that each of the three portfolios has a much larger number of stocks (19) which causes too much diversification; the strategy that should be focused on buying winner stocks ends up dealing with too many stocks, some of which have not had good results in the past *m* months and therefore fail to provide high returns in the subsequent month. Moreover, the larger number of different stocks invested implies higher transaction costs. The best diversification is found by ranking the stocks into seven portfolios.

Table 16 – Monthly average returns with 100% portfolio rotation for the most profitable strategies based on rankings (3, 5 and 7 portfolios)

		Monthly	**Quarterly**	**Half-Yearly**	**Yearly**
3 Portfolios	**Strategies**	**K1-J6**	**K3-J6**	**K6-J6**	**J12-J3**
	Return rate before costs	1.11%	1.03%	1.03%	1.00%
	Net Return rate	1.00%	1.00%	1.01%	0.98%
	Variation in the return rate	-9.72%	-3.69%	-2.03%	-1.23%
5 Portfolios	**Strategies**	**K1-J6**	**K3-J3**	**K6-J3**	**J12-J3**
	Return rate before costs	1.44%	1.26%	1.26%	1.12%
	Net return rate	1.33%	1.22%	1.24%	1.11%
	Variation in the return rate	-7.58%	-3.13%	-1.78%	-1.22%
7 Portfolios	**Strategies**	**K1-J6**	**K3-J3**	**K6-J3**	**J12-J3**
	Return rate before costs	1.56%	1.42%	1.49%	1.23%
	Net return rate	1.45%	1.38%	1.47%	1.21%
	Variation in the return rate	-7.07%	-2.88%	-1.60%	-1.22%

For three-month holding periods (quarters), the best strategy is *K3-J3* with *P1*. Cost weight in returns becomes much lower and moderate than when monthly strategies were implemented (table 16). When trading on a quarterly basis, the profitability of returns is only reduced by 3.69%, 3.13% and 2.88% for *P1* from the three, five and seven portfolios, respectively. For strategies based on a half-yearly basis (tables 16 and 17), the costs become even lower, and for yearly strategies (table 16) the weight of costs starts to become almost irrelevant (around

1%). For instance, the return rate would be 1.11% in *P1* from the five portfolios instead of monthly average returns of 1.12%. There is a continuous declining trend in costs from monthly to yearly holding periods and also from ranking the stocks into three to seven portfolios.

The three most profitable strategies assuming 100% portfolio rotation and ranking the stocks into seven portfolios were generated by the top winner portfolio whose returns after costs were accounted for: 1.47% for *K6-J3*, 1.45% for *K1-J6*, 1.38% for *K3-J3*.

For instance, to exemplify the further details computed and synthesized in table 16, a simple analysis is made of table 17 which provides the highest return rate. The strategy only starts to make money for an investment over €1320 whereas the optimal return rate (8.83% half-yearly or 1.47% monthly) is generated by an investment of €82,638. Moreover, it is worth mentioning that €5,000 would be enough to earn more than 1% monthly returns which is an excellent return rate, especially considering that this amount is small and accessible to most small investors. And €50,000 would be sufficient to earn 1.46% which is almost the optimal return rate. It is also noteworthy that for high amounts such as €100,000 or even €1,000,000 the return rate is the same as for an investment of €50,000 (1.46%) and a little bit lower (-0.01%) than the optimal investment amount.

Table 17 – Calculation of returns after accounted for costs for *K6-J3* for *P1* from the seven portfolios ranking, assuming 100% portfolio rotation. The amounts are in Euros.

7 Portfolios – K6-J3 (P1)								
Gross mean return (from Kn Jm)	8.97%	**8.97%**	8.97%	8.97%	8.97%	**8.97%**	8.97%	8.97%
Number of stocks in each portfolio	9	**9**	9	9	9	**9**	9	9
Amount to invest in each portfolio	1,000	**1,320**	5,000	10,000	50,000	**82,638**	100,000	1,000,000
Amount to invest in each stock	111	147	556	1,111	5,556	9,182	11,111	111,111
Buying transaction costs per stock	5.20	5.20	5.20	5.20	5.20	5.20	10.00	100.00
Amount to invest - Buying costs	106	141	550	1,106	5,550	9,177	11,101	111,011
Cash-flow generated per stock	115	154	600	1,205	6,048	10,000	12,097	120,968
Selling transaction costs per stock	5.20	5.20	5.20	5.20	5.20	5.20	10.89	108.87
Amount received per stock	110	149	595	1,200	6,043	9,995	12,086	120,860
Custody costs	20.57	20.57	20.57	20.57	20.57	20.57	20.57	20.57
Net Half-Yearly Return Rate	-2.87%	**0.00%**	6.60%	7.79%	8.73%	**8.83%**	8.75%	8.77%
Net Monthly Return Rate	-0.48%	**0.00%**	1.10%	1.30%	1.46%	**1.47%**	1.46%	1.46%

Assuming 75% and 78% portfolio rotation

The same procedure used to compute return rates after accounting for costs was followed but assuming a 75% portfolio rotation for the stocks ranking into five portfolios (*P1* has twelve stocks of which three stocks go from one period to the subsequent one) and around 78% portfolio rotation for the stocks ranking into 7 portfolios (*P1* has nine stocks of which two stocks go from one period to the subsequent one).

As expected, the results are quite similar to those presented with 100% portfolio rotation; the only difference is that return rates increase a little due to the smaller number of traded stocks and consequently lower transaction costs.

The 75% and 78% are more realistic approaches than the 100% rotation (that was overestimating the transaction costs) since it is quite reasonable to assume that three stocks out of twelve and two stocks out of nine go from one period to the next and this is likely to happen whereas it is unlikely that all stocks will change from one period to the subsequent one.

In the monthly strategy (*K1-J6*), profitability is still significantly reduced and is over 5.5%; in the quarterly strategy (*K3-J3*) the profits decline less than 2.5% and in the half-yearly strategy (*K6-J3*), the decline in profits is less than 1.5% while in the yearly strategy (*K12-J3*) it becomes almost residual at 0.85% (table 18).

Table 18 - Monthly average returns with 75% portfolio rotation (for the 5 portfolios) and 78% portfolio rotation (for the 7 portfolios) for the most profitable strategies.

		Monthly	**Quarterly**	**Half-Yearly**	**Yearly**
Strategies		**K1-J6**	**K3-J3**	**K6-J3**	**K12-J3**
5 Portfolios	**Return rate before costs**	1.44%	1.26%	1.26%	1.12%
	Net return rate	1.36%	1.23%	1.24%	1.11%
	Variation in the return rate	-5.73%	-2.41%	-1.39%	-0.85%
7 Portfolios	**Return rate before costs**	1.56%	1.42%	1.49%	1.23%
	Net return rate	1.47%	1.39%	1.48%	1.22%
	Variation in the return rate	-5.55%	-2.30%	-1.30%	-0.85%

The best strategies continue to come from the top winner portfolio (*P1*) by ranking the strategies into seven portfolios: *K6-J3*, *K1-J6* and *K3-J3* with 1.48%, 1.47% and 1.39%

monthly average returns (table 18). Considering monthly strategies, it is interesting to observe that a minimum amount of €4924 is required even for the most profitable monthly strategy *K1-J6* (appendix 9.25) to start earning money; this is almost four times the amount of money needed by the best half-yearly strategy *K6-J3* (table 19) which is €1,078. Furthermore, €4924 in the half-yearly strategy would be enough to earn 1.17% monthly average returns. Therefore, the selection of the amount of money to invest in the stock market as well as the time periodicity for trading the stocks is crucial in order to make money and maximize profits

Table 19 - Returns calculation after accounting for costs of *K6-J3* for *P1* from the seven portfolios ranking, assuming 78% portfolio rotation. The amounts are in Euros.

7 portfolios - K6-J3 (P1)								
Gross mean return (Kn Jm strategy)	8.97%	8.97%	8.97%	8.97%	8.97%	8.97%	8.97%	8.97%
Nr of stocks in each portfolio with rotation	7	7	7	7	7	7	7	7
Nr of stocks in each portfolio without rotation	2	2	2	2	2	2	2	2
Nr of stocks in each portfolio (total)	9	9	9	9	9	9	9	9
Amount to invest in each portfolio	1,000	1,078	5,000	10,000	50,000	82,638	100,000	1,000,000
Amount to invest in each stock	111	120	556	1,111	5,556	9,182	11,111	111,111
Buying transaction costs per stock	5.20	5.20	5.20	5.20	5.20	5.20	10.00	100.00
Amount to invest - Buying fee charged	106	115	550	1,106	5,550	9,177	11,101	111,011
Cash-flow generated per stock	115	125	600	1,205	6,048	10,000	12,097	120,968
Selling transaction costs per stock	5.20	5.20	5.20	5.20	5.20	5.20	10.89	108.87
Amount received per stock with rotation	110	120	595	1,200	6,043	9,995	12,086	120,860
Custody costs	20.57	20.57	20.57	20.57	20.57	20.57	20.57	20.57
Net Half-Yearly Return Rate	-0.69%	**0.01%**	7.04%	8.00%	8.78%	**8.85%**	8.80%	8.82%
Net Monthly Return Rate	-0.12%	**0.00%**	1.17%	1.33%	1.46%	**1.48%**	1.47%	1.47%

Out of curiosity, it is noted that two strategies perform even better than the strategies previously analyzed if the 2160 strategies executed are considered. The ***K4-J3*** and *K3-J4* strategies provide gross monthly average returns of 1.61% and 1.62%, respectively. After accounting for costs, *K4-J3* reveals to be the most profitable strategy with monthly average returns of 1.59% whereas *K3-J3* generates 1.58%.

5 - Innovative strategies

5.1 – Methodology

Momentum and contrarian strategies provide significant profits. However, it is useful and pertinent to question whether higher profits can be obtained using return past trends. At first sight the answer may seem blurry but one idea soon emerges: one could invest considering the past returns but defining percentages that would work as a filter to an investment decision. The rationale behind this strategy is basically the following: if a stock in the last *p* months has performed above the defined percentages, the investor buys that stock and holds it for *n* months; otherwise one invests in a safer investment at a risk-free rate e.g. in deposits, instead of investing in the stock market.

The "innovative strategy" is based on momentum strategy because it also follows the winners, but instead of investing every single period in a certain number of stocks that performed better in the past *p* months (even though the best performers could have been stocks with really low or even negative returns), one invests just in the stocks that have performed above the defined returns percentages. When no stocks meet the requirements, the investor simply does not invest in the stock market and allocates all his/her money into deposits or other very low risk investments, thus receiving the risk-free rate. Furthermore, in order to better capture the upward past trend, according to the innovative strategy the *p* past months were divided into two periods: the month preceding the holding period (called *s*), and the months previous to the *s* month (which here is called *m*). Therefore, by demanding strong past returns in both the past months and also in the month previous to the investment, one reinforces the upward past trend and guarantees that the stock also had a good performance in the month immediately before the holding period. Otherwise, the stock could for instance have had 40% positive past returns in the last *m* months, and minus five percent returns in the month preceding the holding period which would globally point to an upward trend, thus deceiving the investor.

Methodology – Returns calculation program created in VBA applied to Excel

The "innovative" investment strategy was implemented by a program developed in VBA (Visual Basic) which made it possible to test and run a vast number of investment strategies within this main framework.

Overlapping and non-overlapping methods were used with and without capitalization in order to know whether profitability of this innovative strategy increases with capitalization. At first sight it may seem obvious that capitalization is much better but in fact it is not so linear since the stock market has generally high volatility and a drop of 70%, for instance, requires a rise of 230% just to recover to the initial price. Therefore, I defined **two types of investor**:

- The one that does not use capitalization and therefore always invests the same amount of money (the profits are not reinvested)
- The other that uses capitalization, that is, invests a certain amount of money in the beginning and reinvests not just the initial amount but also all the cash flows generated during the subsequent periods, following the famous motto "money makes money, and the money that money makes, makes more money").

Overlapping periods are considered to be the most suitable and statistical significant method since is the maximum possible number of holding periods to each defined investment time horizon, which makes results undoubtedly more reliable. A method based on non-overlapping periods is important in that it gives us the accurate returns an investor would earn (or lose) with a certain strategy starting in month *t* and finishing in a month *w*. But what if instead of starting to invest in January for instance one started to invest in March or in any other month? Would the earnings be the same? That is why the overlapping method is more reliable and statistically robust because it gives an average of the returns obtained with an investment for a certain time horizon.

The Overlapping method is commonly called CAR (Cumulative Abnormal/Market-Adjusted Returns) or AAR (Abnormal Average Returns). When Overlapping method is referred here it means that strategies are executed using overlapping periods and it is also done here the market Adjustment (returns above PSI or PSI-20). The so-called here Non-Overlapping method is the BHAR (Buy and Hold Abnormal Returns), using non-overlapping periods and considering returns above PSI or PSI-20.

In short, four methods were developed in **VBA** to calculate returns:

- **Overlapping method without capitalization**
- **Non-Overlapping method without capitalization**
- **Overlapping method with Capitalization**
- **Non-Overlapping method without Capitalization**

The percentages defined to apply using each method were as follows:

- **> 30% and 5%**
- **> 30% and 10%**
- **> 40% and 5%**
- **> 40% and 10%**

For instance, the thirty percent and five percent is a strategy which invests in stocks that presented returns above five percent in the month preceding the holding period (variable called *Js*) and thirty percent in the last *p* months excluding the month previous to the holding period (variable *Jm*), and then holding them for a certain period (variable *n*).

- ***Jm* = above 30% or 40%** (returns during the past "t" months with the exception of the last month preceding the holding period)
- ***Js* = above 5% or 10%** (returns during the month previous to the holding period)

Much more percentages could have been used but given that these methods and strategies are very time consuming it was decided to focus on these four combinations which are realistic and moderate percentages.

Figure 5 - A practical example: Strategy *K3 J1 J5* with *Js* = 5% and *Jm* = 30%

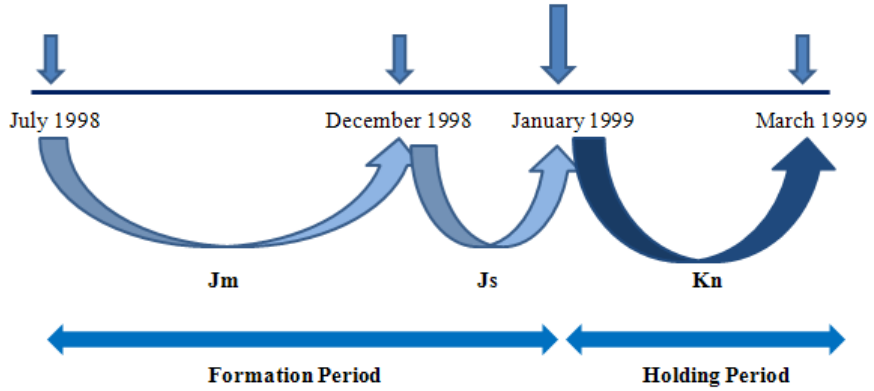


Figure 1 illustrates a strategy that selects the stocks based on performance of the last six months and then holds them during three months (holding period). The formation period/past period is composed by two past periods: the *m* which is from July 1998 until the end of November 1998 (five months) and the *s* which is the December (one month). Then, if *Jm* is

higher than 30% (if the stock had positive returns higher than 30% on these those five months) and *Js* is higher than 5% (if the stock had positive returns higher than 5% on December) then one buys that stock in the beginning of January and holds it for three months (until the end of March).

Reasons for Investing in stocks with positive past returns

After having performed some strategies based on an investment in stocks with positive past returns on the month preceding the holding period (*s* months) and strong negative past returns on the other past months (*m* months), the results obtained were disappointing from a statistical and economically significant perspective. Therefore, this type of strategy was no longer used and was not subject to further analysis.

Two sub-strategies using positive past returns

Another strategy was formed based on the upward past returns. Though essentially the same, it has one difference: the trader not only buys a stock when returns are higher than the two percentages defined for *s* and *m* periods, he/she also invests when data is not available (the firm did not exist during the *m* period) and the stock performed better than the minimum percentage defined for the *s* period (the month prior to the holding period).

Thus when *Jm* exists, *Js* and *Jm* are requirements that need to be fulfilled so that the investor buys a stock. Conversely, if data is not available on the last *m* months, and returns are above the defined percentage for the month preceding the holding period, the investment is made in that stock.

Hence, the two sub-strategies can be defined briefly as the following:

- **Strategy "Follow previous winners":** If data is available for the m months before the holding period and *Jn* and *Jm* returns are above the defined percentages, the investment is made;
- **Strategy "Follow previous winners or starters" / "Follow previous winners or data not available"**: If data is not available for the *m* months before the holding period, the returns on the last month preceding the investment only need to have been higher than the defined percentage for *Jn*.

Defining *n*, *s* and *m* periods

The time period under analysis is from 1 January of 1997 until 31 December of 2008, giving a total of 144 months. Monthly data was used and the holding period (*Kn*) was defined ranging from one to 60 months and the past periods ranging from one to 35 months for *Jm* and always one month for *Js*.

- ***n* = from 1 to 60 months**
- ***s* = always 1 month**
- ***m* = from 1 to 35 months**

This gives a total of 2100 possible strategies (60* 1 * 35). Given that four different combinations of percentages are possible (30%-5%, 30%-10%, 40%-5%, 40%-10%), the number of total strategies would be 2100 multiplied by four which gives a total of 8400 strategies. Considering that strategies can also be distinguished between "Follow previous winners" or "Follow previous winners or starters (data not available)", the number of strategies doubles to 16800. Finally, the number of possibilities would increase to 67200 due to the four methods used (overlapping and non-overlapping with or without capitalization) which would be far too time consuming. Hence, to simplify and structure the work focusing on the main objectives, I performed only the 2100 strategies (*n***s***m*) for the following main strategies:

- "Overlapping following previous winners with *Jm*=30% and *Js*=5%";
- "Overlapping following previous winners or data not available with *Jm*=30% and *Js*=5%";
- "Non-Overlapping following previous winners with *Jm*=30% and *Js*=5%";
- "Non-Overlapping following previous winners or data not available with *Jm*=30% and *Js*=5%";

The purpose of calculating all these strategies (2100*4 = 8400 possibilities) is to have an idea of the most profitable *m* and *n* periods that should be calculated and used to analyze results.

Therefore, only the following past months and holding months were considered:

n = 1, 3, 6, 9, 12, 18, 24, 36, 48 and 60

m = 3, 6, 9, 12, 18, 24, 30 and 35

(s = 1)

Prior to the calculation of these periods, there are 80 possible strategies (n*m = 10*8) which will be calculated for:

- Each one of the four methods (Overlapping without capitalization, Non-Overlapping without capitalization, Overlapping with Capitalization, Non-Overlapping without Capitalization)
- Each method can use the "Follow previous winners" or "Follow previous winners or data not available" strategies
- In addition, there are four possible combinations of *Jm* and *Js* (30% and 5%; 30% and 10%; 40% and 5%; 40% and 10%)

For each method and namely for each strategy there are three main procedures: "Kn Js Jm"; "Kn Js Jm strategy"; "Kn Js Jm results".

"Kn Js Jm" Sheet

A table composed of monthly returns for each company in the Portuguese stock market (data extracted from Bloomberg) is copied from "Data" Sheet to this sheet. Then, according to the strategy used, returns are calculated to another table which has always the following framework: company names, holding periods and past periods (dates), the returns for each period (*m, s,* and *n*) from January 1997 to December 2008).

Returns are calculated based on geometric rate:

$$R = \frac{Pz}{Pb} - 1 \qquad (1)$$

Pz = Price of the stock in month *z* (the final month of the investment)

Pb = Price of the stock in month *o* (the initial month of the investment)

For instance, if a six-month investment strategy starts in January 1997 and ends in June 1997, the *Pz* would be the closing price of the stock on 30th June and *Pb* would be the open price of the stock on *1st* of January.

"Kn Js Jm strategy" Sheet

The table created on sheet "Kn Js Jm" is copied and pasted (with columns and rows transposed) to this sheet. Then another table is produced copying the company names (in rows) and dates (in columns) and with the following condition:

- For each date (for *m* and *s* period) during the 12 years if the returns obtained in *m* and *s* are above the defined percentages (*Jm* and *Js*), then an investment is made in that stock and the respective percentage will be written in that period for the respective company. If the stock did not attain the minimum returns required (in the strategy), the investor chooses to put all his/her money during that period in deposits or some other safe investment that gives a risk-free rate.
- The mean (average return of all stocks in which investment is made because they succeeded fulfilling the past returns required) and the number of "Stocks per Portfolio" is found at the end of the table.

Sheet "Kn Js Jm results"

The dates, means (stock returns) and (number of) stocks per portfolio are copied to this sheet. During periods when the investor does not invest in the stock market, the money is invested in safe products such as deposits thus receiving a risk-free rate. For each month since 1st January 1997 until 31 December 2008 an estimation was made of the risk-free rate trying to be as realistic as possible.

Afterwards, ten scenarios were estimated for each holding period: an investor that is willing to invest 10,000€, another that has 20,000€ to invest, another that wants to invest 30,000€, and so on, until 100,000€ (these amounts are neither too high nor too low, thus representing ten possible average traders). Ten scenarios were created but many more could be made by means of just a few changes in the Visual Basic code. For each scenario (amounts invested), final returns for each holding period were calculated and transaction costs and custody costs were accurately considered and deducted.

Finally, at the end of the sheet, calculations were made to get the final results for each one of the ten scenarios:

- "Mean 97-08" which is the average return for the "n" months' investment (holding period that is repeated several times during the 144 month, 12 year period)

- "Std Dev 97-08" is the standard deviation of all return rates for the 12 year period
- "Mean/Std Dev" which as the name suggests is the "Mean 97-08" divided by the "Std Dev 97-08" in order to know if results are statistically significant. If the result of the "Mean/Std Dev" is higher than 1.97 or lower than -1.97, returns are statistical significant for a 95% confidence level, otherwise they are not statically robust.
- "Monthly Mean 97-08" is the "Mean 97-08" divided by the "n" months of the holding period
- "Mth Std Dev 97-08" that consists of the "Std Dev 97-08" divided by the square root of "n" months

For the Non-Overlapping Methods, these calculations were made just for the 1997-2008 period, while the same calculations were also performed for the 1997-2007, 1997-2002 and 2003-2008 periods for the Overlapping Methods. The reason behind this decision is that the first method (Non-Overlapping) is not so statistically robust, and therefore calculating 1997-2008 period is already enough to compare the methods and see if the same strategy is profitable using both methods.

The 1997-2007 period was constructed to see the effect of excluding 2008; this was a terrible year for the stock markets and for the economy when the crisis was already quite evident at least at the end of 2007.

The 1997-2002 and 2003-2008 was computed to divide the 12 year period in two sub-periods to strengthen results in order to analyze if 1997-2008 results are consistent or, alternatively, are almost attained in a sub-period while in the other hand are almost null, do not exist at all or are even negative.

In the 1997-2008, 1997-2007 and 1997-2002 periods, the first holding period starts on 1st January 1997 (it is assumed that the closing price of the previous month, 31st December 1996, is the opening price of the first day of the next month) and the last holding period ends on 31st December 2008, 2007 and 2002, respectively. In 2003-2008 period, the first holding period starts on 1st January 2003 (closing price of 31st December of 2002) and the last holding period ends on 31st December 2008.

Risk-Free Rate

It was not possible to get data on the EURIBID which is the reference for deposit rates. The monthly deposit rate was therefore calculated based on EURIBOR for the period from 1999 until 2008 (data on Bloomberg was just found for this period) and on the TBA (Annual Gross Rate) from "Saving Certificates" for 1997 and 1998.

The deposit rate was calculated for the months during 1997 and 1998 with the following formula:

$$\text{Monthly Risk-free rate 97\_98} = (60\% \times \frac{\text{TBA}}{12}) - 20\% \times (60\% \times \frac{\text{TBA}}{12}) \qquad (2)$$

The 60% multiplied by TBA is the basic deposit rate from Savings Certificate B Series from IGCP (Portuguese Treasury and Government Debt Agency). The 20% reduction is due to the overhead tax costs.

From 1999 until 2008, monthly deposit rates are computed using this formula: (3)

$$\text{Monthly Risk-free rate 99\_08} = (85\% \times \frac{\{\text{EURIBOR 1 Month [ACT/365]}\}}{12}) - 20\% \times (85\% \times \frac{\{\text{EURIBOR 1 Month [ACT/365]}\}}{12})$$

The 85% multiplied by EURIBOR 1 Month (ACT/365) is the base rate used in Savings Certificate C Series from IGCP.

The premiums offered in Savings certificates were not considered because the aim of the deposit rates here is to give a good approximation of an average deposit rate offered by banks during the monthly past periods; if premiums were added, rates would become too high.

The investment in deposits only occurs when the past return periods ("*Js*" and "*Jm*") did not attain the minimum levels defined by the investor. The deposit rate for a certain holding period (with *n* months) is the sum of *n* months' risk-free rates that are calculated on the "Deposit rate" sheet.

Transaction costs, custody costs and returns

For each amount invested in each holding period, returns are calculated and transaction and custody costs are deducted in an accurate way. Depending on the amount invested, costs can

have a small or really heavy negative impact on the strategy's profitability. The return rate calculation has the following steps:

- Amount to invest in the portfolio
- Amount to invest in each stock = $\frac{\text{Amount to invest in the portfolio}}{\text{Number of Stocks per portfolio}}$ (4)
- Buying Transaction costs per stock (according to the fee charged)
- Real amount invested per stock = Amount to invest in the portfolio - Buying Transaction costs per stock (5)
- Cash-flow generated per stock = Real amount invested per stock × (1 + mean return rate) (6)
- Selling Transaction costs per stock (according to the fee charged)
- Amount received per stock = Cash-flow generated per stock - Selling Transaction costs per stock (7)
- Custody costs
- Return rate = $\left(\frac{\text{Amount received per stock} \times \text{Number of Stocks per Portfolio} - \text{Custody costs}}{\text{Amount to invest in the portfolio}}\right) - 1$ (8)

The buying transaction costs, selling transaction costs and custody costs are based on the prices practiced by Barclays Bank. The costs were obviously the criteria used to select the bank. The banks were specifically chosen from the CMVM, which provides a list with all investment banks operating in Portugal by costs and fees charged. For small amounts (lower than around 10,000€) L.J. Carregosa Bank clearly seems the cheapest. Nevertheless, taking into account that the 10 scenarios created go from the 10,000€ through the 100,000€, Barclays bank seems to have the most attractive prices.

Barclays Bank charges a fixed cost of 5.2€ (which is the minimum fee) for amounts up to 10,000€; the charged for larger amounts is 0.0009 times the amount invested.

A quarterly commission of 10.285€ is charged on custody costs. The quarterly commission is paid whether the investor has just one stock or one thousand stocks in the portfolio. It is also paid even if the investor does not invest during that three month period; if the investor just hold the stocks for one month or even one day he/she must pay the full quarterly commission (10.285€).

Overlapping and Non-Overlapping Method (without Capitalization)

These methods without capitalization are calculated according to the above explanations. The monthly mean for 1997-2008, 1997-2007, 1997-2002 and 2003-2008 is a nominal return rate, that is, the return rate obtained by investing the same amount of money (ranging from 10,000€ to 100,000€ according to each of the ten scenarios created) in each holding period.

Specific features of Overlapping and Non-Overlapping methods with Capitalization

This way of investing money leads to some specific methods that use capitalization. Hence, some further and different calculations were computed which are explained below.

- **Overlapping Method with Capitalization**

The "Kn Js Jm" and "Kn Js Jm strategy" sheets are calculated exactly as explained above; differences only appear on "Kn Js Jm results" sheet.

Given that holding periods overlap and money capitalize in this method, the "gross" mean return rate for stocks (the average return rate for the chosen stocks to be invested) for the *n* months holding period was always transformed on a monthly "gross" mean return rate using the proper capitalization calculations:

$$\text{Rc} = (1 + Rn)^{(1/n)} - 1 \qquad (9)$$

Rc = Mean return rate

Rn = "Gross" mean return rate for *n* months

As the holding period is always considered to be monthly, since the mean return rate is always transformed in a monthly return rate by the capitalization calculations, obviously the custody costs in this method are also always charged considering the monthly holding period; thus, if a trader invest in January for instance, this will imply that custody costs will not be charged in the February and March holding periods (since custody costs are paid on a quarterly basis).

The mean return rate for deposits (holding periods when the stock returns are lower than the standards defined and the investment is therefore made in deposits) is first calculated in the same way as for the Overlapping Method without capitalization (it sums the returns for each month of the holding period); but it then transforms this "n" months' mean deposit rate in a monthly deposit rate using the formula above.

Once the final return rate for stocks or deposits have been calculated in the "Kn Js Jm results" sheet, the amount invested (10,000€ at the start for the first scenario for instance) is capitalized at this rate; and in the next holding period, the total amount obtained from the previous holding period is now reinvested at the newly calculated return rate, and so on until the last holding period that ends on 31 December 2008. Basically, the following capitalization formula is used:

$$\text{Capitalization value} = \text{Capital} * (1 + \text{return rate}) \qquad (10)$$

If the return rate is positive, the money increases exponentially. On the other hand, negative return rates have even more devastating impacts and can completely ruin the profits; this is easily illustrated by the fact that a 50% decrease in price requires an increase of much more than 50% so that the price would recover to the initial value (in fact, a 100% increase would be necessary in this example).

The "Monthly Mean 97-08" is also computed in a different manner because it must take capitalization into consideration. The formula is as follows:

$$\text{Effective monthly mean return rate 97\_08} = \left(\frac{\text{Final Value}}{\text{Initial Value}}\right)^{\frac{1}{\text{NPHP}}} - 1 \qquad (11)$$

The *NPHP* means the number of possible holding periods with *n* months during the 12 year period. As all rates were transformed into monthly rates in this method (as previously explained), the *NPHP* will be the number of possible monthly holding periods in the 12 year period (144 months). However, this does not mean that *NHP* is always 144; in fact the *NPHP* will be lower than 144 whenever the strategy has a periodicity higher than one month. For instance, if *n* is 3, *NPHP* would be 142. The *NPHP*, for 1997-2008 period can be calculated in 3 ways:

NPHP = 144 – n +1

NPHP = RoundDown(144/ n ; 0)

NPHP = counting the number of holding periods

Given that Monthly Mean 97-08 is a return rate that incorporates the capitalization effect, an "Equivalent Monthly Mean 97-08" was calculated, which is basically the nominal rate. This means that if someone invested 10,000€ every single holding period, for example, he/she would get exactly the same amount of money at the end of the time-period as if he/she were investing 10,000 in the first holding period and investing the capitalized money in the subsequent holding periods.

The "Equivalent Monthly Mean 97-08" is calculated by the formula:

$$\text{Nominal monthly mean return rate 97\_08} = \frac{\left(\frac{\text{Final Value}}{\text{Initial Value}} - 1\right)}{\text{NPHP}} \qquad (12)$$

For the sub-periods 1997-2007 and 1997-2002, the monthly mean and equivalent monthly mean (nominal rate) are calculated using the same formulas; the only difference is that the final value dates from 31 December 2007 and 31 December 2002 respectively instead of from 31 December 2008. Although exactly the same formulas are used for the sub-period 2003-2008, it should be noted that it starts on 1 January 2003 which implies that the amount invested on this date (initial value) is 10,000€ for the first scenario (and so on and so forth until the last scenario which is 100,000€)

- **Non-Overlapping Method with Capitalization**

The "Kn Js Jm" and "Kn Js Jm strategy" sheets are calculated precisely as explained above; differences on "Kn Js Jm results" sheet only appear after the final return rates for each holding period have been calculated. The amount invested is capitalized for each holding period; therefore the total amount is always reinvested. The formula is:

$$\text{Capitalization value} = \text{Capital} * (1 + \text{return rate}) \qquad (10)$$

The other differences occur in the calculation of the "Mean 97-08", "Monthly Mean 97-08" and the calculation of the "Equivalent Monthly Mean 97-08".

Here, the "Mean 97-08" formula is:

$$\text{Effective } n \text{ months mean return rate 97\_08} = \left(\frac{\text{Final Value}}{\text{Initial Value}}\right)^{\frac{1}{\text{NPHP}}} - 1 \qquad (11)$$

The *NPHP* (Number of Possible Holding Periods with *n* months during the 12 year period) is always lower than 144 months when the holding period is higher than one.

The "Monthly Mean 97-08" is calculated based on the formula:

$$\text{Effective monthly mean return rate 97\_08} = \left(\frac{\text{Final Value}}{\text{Initial Value}}\right)^{\frac{1}{(\text{NPHP})*\,\text{n}}} - 1 \qquad (13)$$

The "Equivalent Monthly Mean 97-08" is also calculated in order to get a nominal rate to compare to the Monthly Mean return rate obtained in the Non-Overlapping Method without capitalization. The formula is:

$$\text{Nominal monthly mean return rate 97\_08} = \frac{\left(\frac{\text{Final Value}}{\text{Initial Value}}\right)-1}{(\text{NPHP}*\,\text{n})} \qquad (14)$$

Visual Basic and "Innovative Strategy" advantages – User Friendly

The program developed in Visual Basic is user friendly and allows anybody to calculate easily the returns obtained with a certain strategy. The user only has to choose three parameters and write them in the textboxes of the User Form:

1) Defining *n* (the holding period), *s* (which is already set as one, as it is the month preceding the holding period) and *m* (the past month(s) previous to the month preceding the holding period);
2) Setting the percentages of past returns for *Js* and *Jm*, which basically work as follows: if past returns on those periods were higher than the percentages defined, the investment is made in the stock market, otherwise one invests in a risk-free rate product;
3) Decide between two strategies "follow previous winners" or "follow previous winners or data not available".

The calculations are automatically computed in "Kn Js Jm" sheet, in "Kn Js Jm strategy" and in "Kn Js Jm results". Furthermore, the final results of all the strategies calculated in the same worksheet are also presented in the following sheets: "1997-2008", "1997-2007", "1997-2002", "2003-2008" (the mean, standard deviation, mean/standard deviation, monthly mean, the equivalent monthly mean when capitalization is used, and monthly standard deviation of the most profitable scenario from each strategy are all copied to these sheets); "Amount

Invested 97-08", "Amount Invested 97-07", "Amount Invested 97-02", "Amount Invested 03-08" (the mean, standard deviation, mean/standard deviation, monthly mean, the equivalent monthly mean when capitalization is used, and monthly standard deviation, of the ten scenarios from each strategy are copied to these sheets). Only the "1997-2008" and "Amounted Invested 97-08" sheets are made for the Non-Overlapping methods for the purpose of comparing them with the Overlapping methods. In addition, in the Non-Overlapping methods an extra column is also computed in these sheets with the dates of the last holding period because, when strategies are not one or a multiple of 3, the last holding period does not end in December 2008 (this is another limitation of Non-Overlapping methods).

A Summary of main methods/strategies in the "Innovative Strategies" can be seen in appendix 9.26.

5.2 – Empirical findings

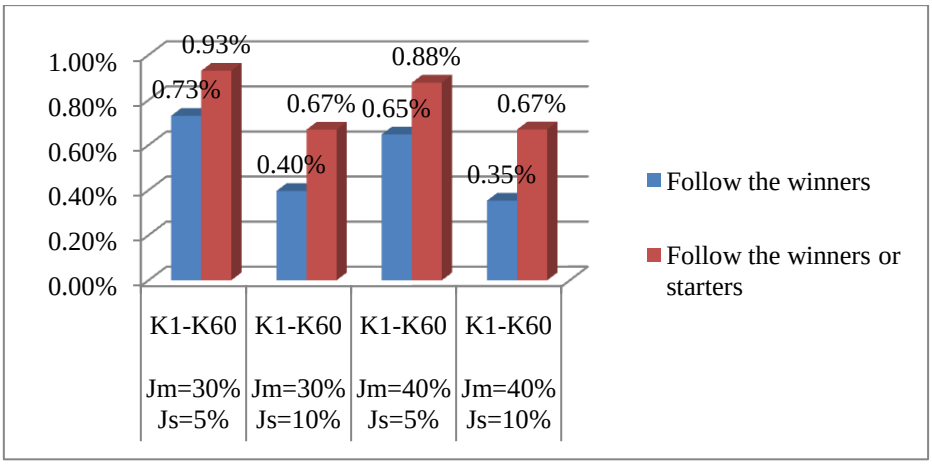
As previously explained in the methodology, strategies were executed in VBA by four methods: overlapping periods without capitalization; non-overlapping periods without capitalization, overlapping periods with capitalization; and non-overlapping periods with capitalization. The strategies are then based on four possible combinations of *Jm* and *Js*: 30% and 5%; 30% and 10%; 40% and 5%; 40% and 10%. Each method can use the "Follow previous winners" or "Follow previous winners or data not available" strategies.

First, it should be mentioned that most strategies have very variable returns, presenting a high monthly standard deviation (mostly higher than seven percent) and thus results are not statistically significant to a 95% confidence level. Although results are not robust from a statistically point of view, economically some results are very significant and show very profitable strategies.

After all strategies are implemented, it is seen that "follow the winners or starters" strategies provide higher average returns than just "follow the winners" strategies for all possible combinations of *Js* and *Jm* as seen in figure 6. The highest overall returns (for all *Kn Js Jm*) are generated by "follow the winners or starters" with *Js*=5% and *Jm*=30%, and with *Js*=5% and *Jm*=40%, with monthly average returns of 0.93% and 0.88%, respectively. The third highest overall performance is generated by "follow the winners" with *Js*=5% and *Jm*=30% which generates 0.73% monthly average returns.

It should also be noted that regardless of *Kn Js Jm* strategy and "follow the winners" or "follow the winners or starters", the worst overall performances are generated by strategies with *Js*=10% and *Jm*=30%, and by *Js*=10% and *Jm*=40%. Therefore, defining Js as 10% seems to be less profitable.

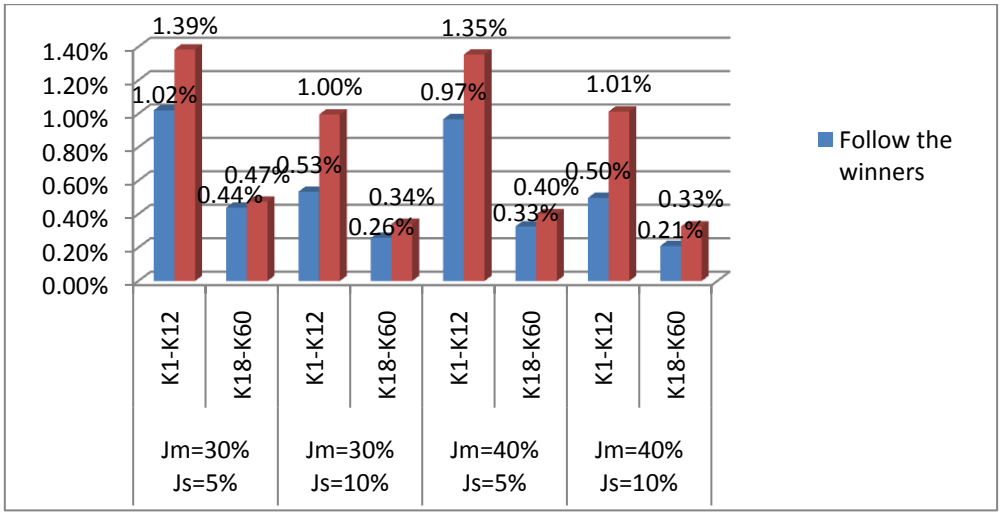
Figure 6 – Overall monthly average returns of all strategies (K1-K60) from "follow the winners" and "follow the winners or starters" for each possible combination of *Js* (5% or 10%) and *Jm* (30% or 40%). The overlapping method was used.



Mean returns from the short-term strategies generate much higher returns than the medium-long term strategies (figure 7). On average, strategies from the short-term *(K1-K12)* from the "follow the winners or starters" with *Js = 5%* and *Jm = 30%* or with *Js = 5%* and *Jm = 40%*, produce monthly average returns of 1.39% and 1.35% respectively, and are clearly the most profitable.

Regardless of the time period (short term or medium-long term) and of the *Js* and *Jm*, strategies from "follow the winners or starters" present higher returns than "follow the winners" which indicates that investing in stocks that had entered the stock market only a few months earlier (and that provided monthly returns higher than five or ten percent on preceding the holding period) usually provides superior returns.

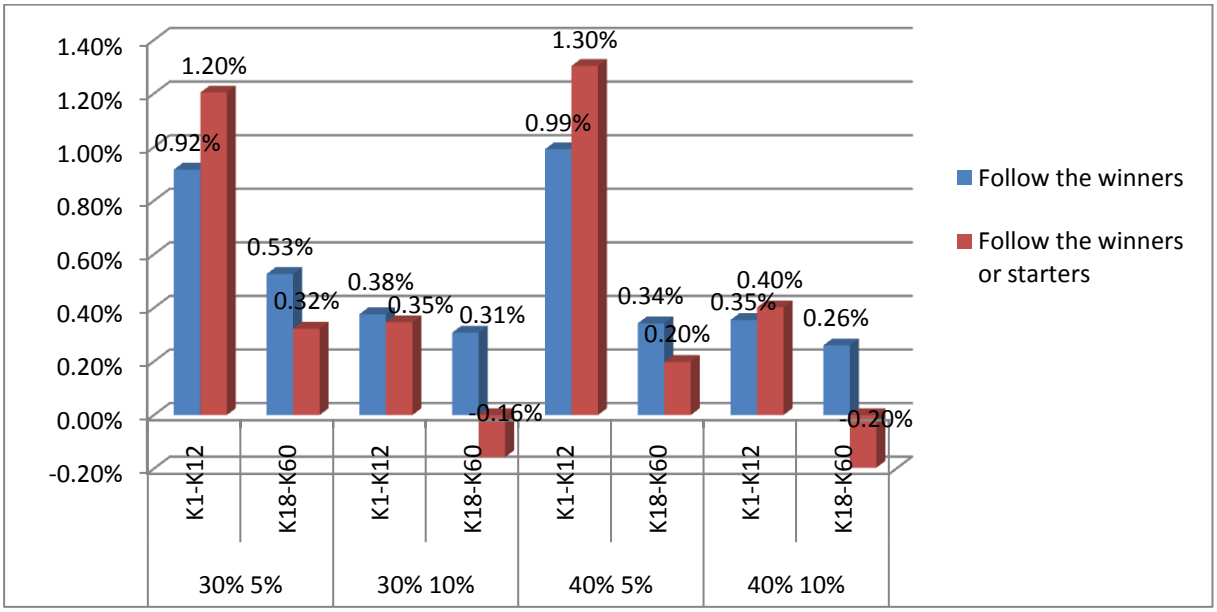
Figure 7 - Overall monthly average returns of all strategies divided into short-term strategies *(K1-K12)* and medium-long term strategies *(K18-K60)* from "follow the winners" and "follow the winners or starters" for each possible combination of *Js* (5% or 10%) with *Jm* (30% or 40%). The time period is from 1997 until 2008 and the Overlapping periods were used.



Relatively similar results are obtained using non-overlapping periods (figure 8). There is a clear emphasis on the high performance for short-term strategies of "follow the winners" and "follow the winners and starters" with *Js* = 5% and *Jm*=30% or 40%. This supports the main results of the overlapping method.

The great divergence between overlapping and non-overlapping results is that "follow the winners or starters" for the short-term periods with *Js* = 10% and *Jm*=30% or 40% in the non-overlapping method provide low monthly average returns (0.35% and 0.40%) unlike the high 1% and 1.01% in the overlapping method. For the same strategies but in the medium-long term, the results are also much lower using the non-overlapping method (here results are even negative).

Figure 8- Overall monthly average returns of all strategies divided into short-term strategies *(K1-K12)* and medium-long term strategies *(K18-K60)* from "follow the winners" and "follow the winners or starters" for each possible combination of *Js* (5% or 10%) with *Jm* (30% or 40%). The time period is from 1997 until 2008 and the Non-Overlapping method was used.



During 1997-2008, short-term strategies for "follow the winners" or "follow the winners or starters" with *Js = 5%* and *Jm = 30%* or with *Js = 5%* and *Jm = 40%* provide, on average, much higher returns than the Portuguese Stock Index-20 or the general Portuguese Stock Index, as can be seen in table 20, figures 8 and 9. The greatest differences occur for the short-term strategies "follow the winners or starters" for the *Js* and *Jm* previously mentioned which

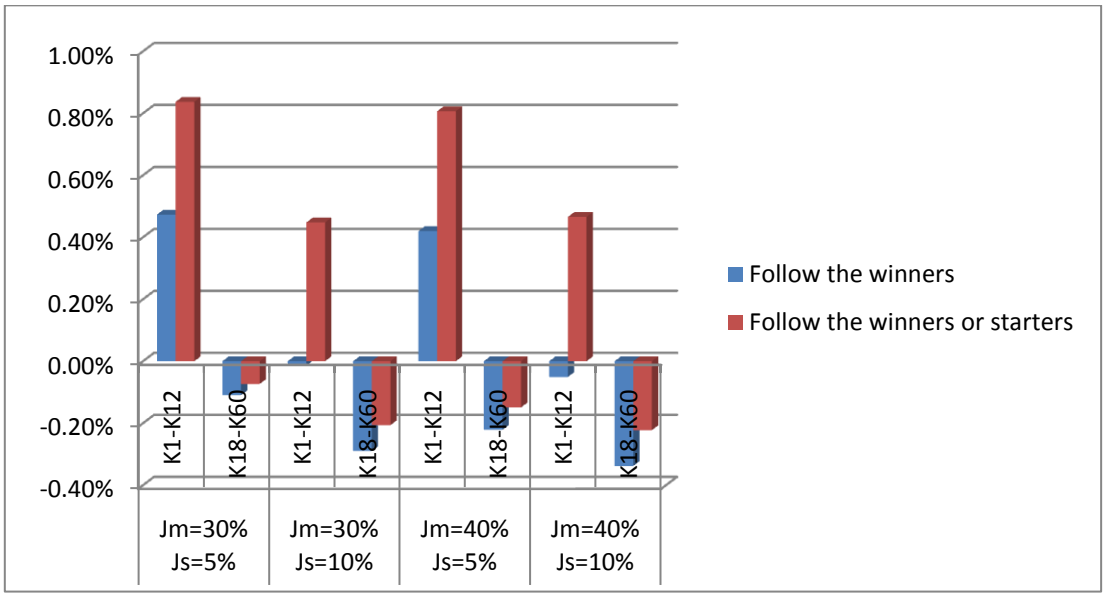
provide around 0.80% higher monthly average returns than PSI and more than 1.18% compared with PSI-20.

It is also worth mentioning that, on average, the innovative strategies generate lower returns than PSI in the medium-long term. Hence, medium-long term "innovative" strategies do not provide interesting profits (returns are very low).

Table 20– Monthly average returns of PSI and PSI-20 during 1997-2008

	PSI-20 Value Weighted Index	**PSI Value Weighted Index**
Monthly 1997-2008	0.16%	0.55%

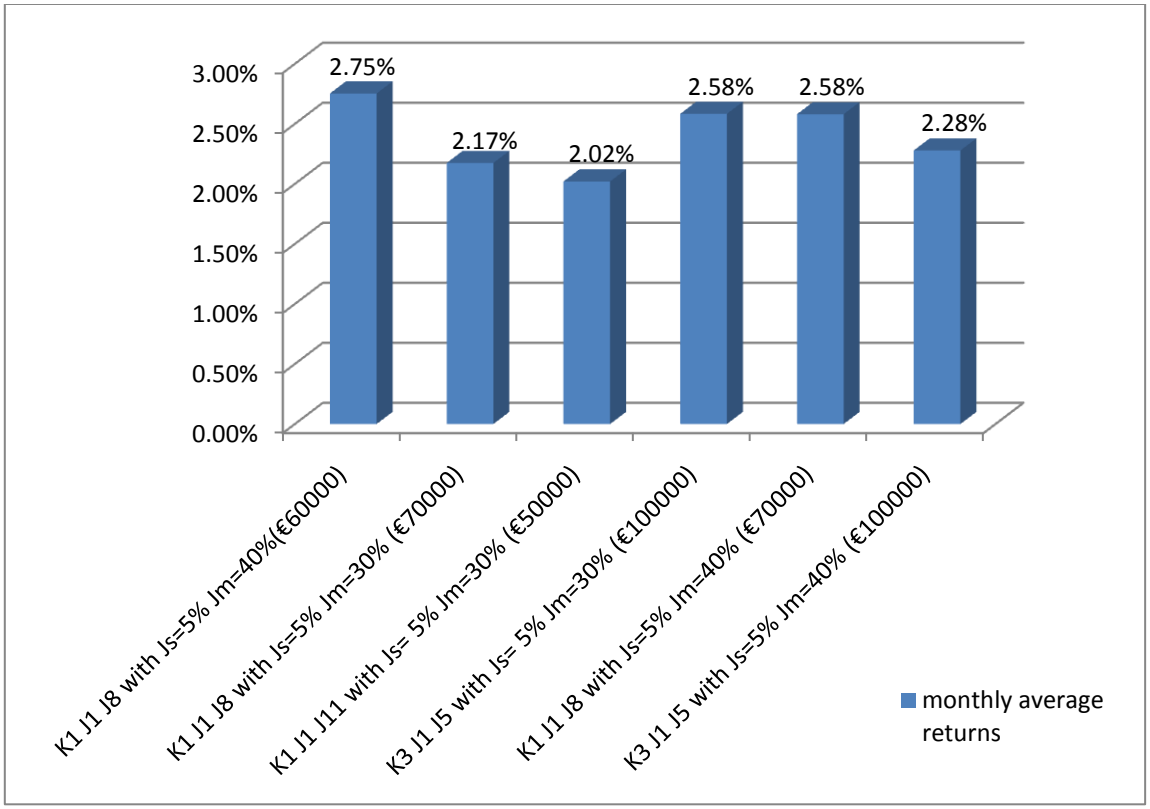
Figure 9 – Monthly average returns of "follow the winners" or "follow the winners or starters" (overlapping method) above PSI and PSI-20 during 1997-2008



The most profitable strategies

The three most profitable strategies (figure 10) are: *K1 J1 J8* from "follow the winners" with *Js=5%* and *Jm=40%* for the amount of €60,000 which provides the excellent monthly average return rate of 2.75%; the *K3 J1 J5* from "follow the winners or starters" with *Js=5%* and *Jm=30%* for the amount of €100,000 which generates 2.58% monthly average returns; and *K1 J1 J8* also from "follow the winners or starters" but with *Js=5%* and *Jm=40%* for the amount of €100,000 which also provides monthly average returns of 2.58%.

Figure 10 – Monthly average returns for the most profitable strategies for "follow the winners" and "follow the winners or starters" during 1997-2008 (overlapping method). The first three bars are the three most profitable strategies from the "follow the winners" while the other three bars represent the most profitable strategies of "follow the winners or starters".



By analyzing each of the three best strategies for "follow the winners" and for "follow the winners or starters" which are reported in table 21, it is seen that after dividing 1997-2008 into two equal sub-periods (1997-2002 and 2003-2008), results are very consistent in both periods. The results from the strategies implemented for 1997-2007 provide significantly higher returns than those from 1997-2008 which was already expected due to the exclusion of 2008 which was a terrible year characterized by abrupt declines in the stock markets all around the world (and PSI and PSI-20 were no exceptions).

Considering the Non-Overlapping method, results are exactly the same for the four monthly strategies because, with monthly strategies, they are implemented accurately using the same method of moving from one month to the next; therefore, these results were not surprising. Considering the two quarterly strategies, the *K3 J1 J5* with *Js*=5 % and *Jm*=30% and the *K3 J1 J5* with *Js*=5 % and *Jm*=40% provided monthly average returns of 2.07% (minus 0.51%)

and 1.66% (minus 0.62%), respectively. Although returns are a little lower, they are still high and economically significant, thus providing further evidence of the consistency of results.

Table 21 – Monthly average returns for the three most profitable strategies from "follow the winners" and the three most profitable strategies for "follow the winners or starters", for four time periods: 1997-2008, the two sub-periods which are 1997-2002 and 2003-2008, and 1997-2007 in order to exclude the effect of the sub-prime crisis. The overlapping method was used.

Strategies			Amount invested	1997-2008	1997-2002	2003-2008	1997-2007
Follow the winners	Jm=40% Js=5%	K1 J1 J8	€ 60,000	2.75%	2.47%	3.03%	3.22%
	Jm=30% Js=5%	K1 J1 J8	€ 70,000	2.17%	2.19%	2.16%	2.59%
	Jm=30% Js=5%	K1 J1 J11	€ 50,000	2.02%	2.16%	1.88%	2.42%
Follow the winners or starters	Jm=30% Js=5%	K3 J1 J5	€ 100,000	2.58%	2.60%	2.56%	3.24%
	Jm=40% Js=5%	K1 J1 J8	€ 70,000	2.58%	3.33%	1.83%	3.41%
	Jm=40% Js=5%	K3 J1 J5	€ 100,000	2.28%	2.36%	2.26%	2.89%

The ten scenarios

For each strategy 10 scenarios were created representing ten different investors according to the amount of money available to invest or that they are willing to invest)

The example of the ten scenarios estimated for the most profitable strategy, which is *K1 J1 J8* for "follow the winners" with *Js*=5% and *Jm*=40%, is presented below (table 22):

Table 22– Ten different scenarios (amounts to invest) for the strategy *K1 J1 J8* of "follow the winners" with *Js*=5% and *Jm*=40%.

Amount Invested	Mean/Standard Deviation	Monthly Mean	Monthly Standard Deviation
10000	0.23	2.67%	11.53%
20000	0.24	2.73%	11.54%
30000	0.24	2.75%	11.53%
40000	0.24	2.75%	11.53%
50000	0.24	2.75%	11.54%
60000	0.24	2.75%	11.54%
70000	0.24	2.75%	11.54%
80000	0.24	2.75%	11.54%
90000	0.24	2.75%	11.54%
100000	0.24	2.75%	11.54%

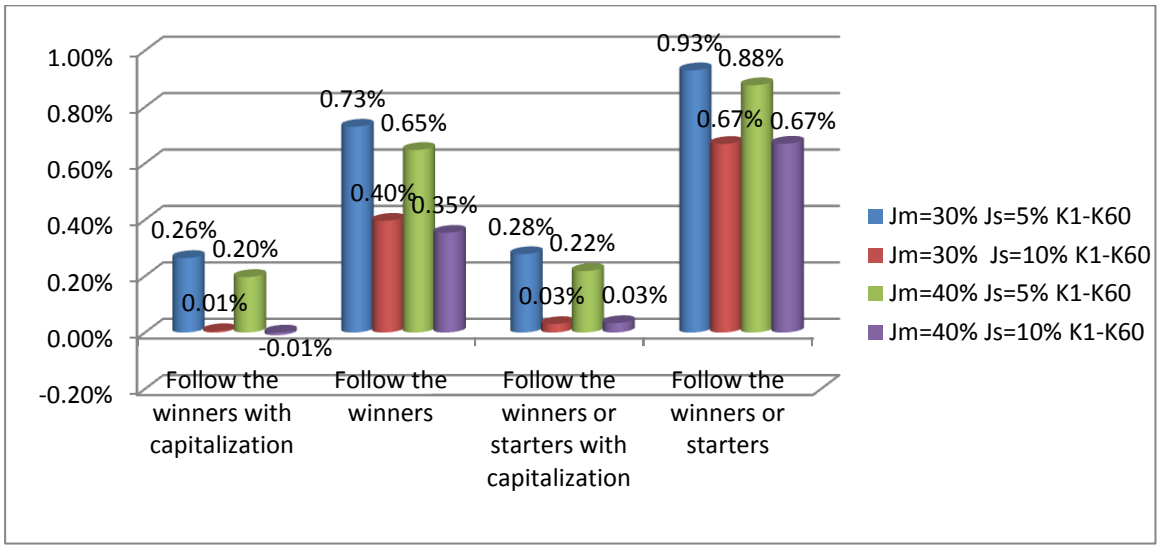
In short, the "innovative" strategies generate high positive returns which are economically very significant providing some excellent returns in the short-term. Results provided by the overlapping method were reinforced by the consistent and similar results obtained by returns of the two sub-periods and by using the non-overlapping method.

Capitalization

The strategies implemented with overlapping and non-overlapping periods were also executed using the capitalization scheme. At first sight, capitalization may seem excellent because "money makes money, and the money that money makes, makes more money" which is completely true. The problem is that most stocks are highly or at least moderately volatile which means an investor can also lose money; and given that if a stock declines 70%, it needs to rise 233% to recover from the loss and return to the initial value, it is plausible that capitalization may not be the best approach to use when investing in the stock market.

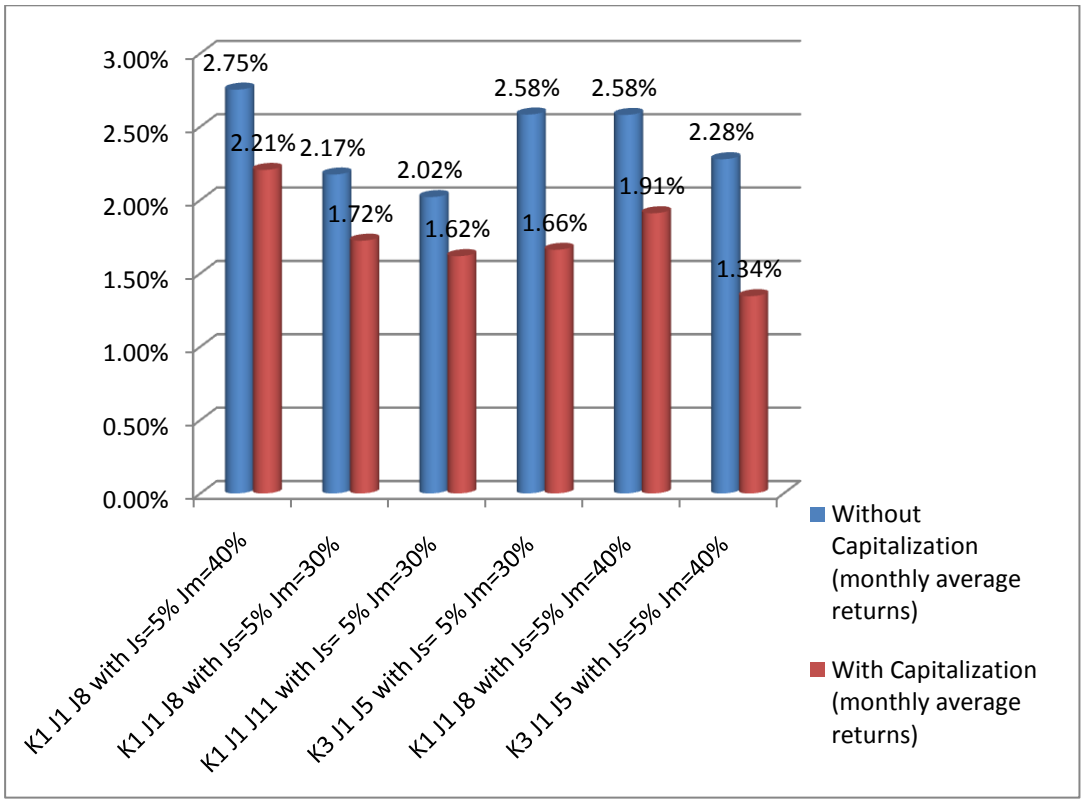
The innovative strategies implemented with capitalization provide evidence on the low returns generated by strategies that are always capitalizing the money. As can be observed in figure 4, strategies with capitalization generally provide much lower returns than those not using capitalization as seen in figure 11.

Figure 11 – Mean of the monthly average returns from "follow the winners" and "follow the winners and starters" for all *Kn Js Jm* for the four combinations of *Js* and *Jm*, both with and without capitalization. The time period is 1997-2008 and the overlapping method was used.



The three most profitable strategies from "follow the winners" and from "follow the winners or starters" without using capitalization all provide higher returns than when capitalization is used (figure 12). Therefore, capitalization does not increase the profitability of the strategies implemented in this study and this is probably explained by the volatility of the stock market.

Figure 12 – Monthly average returns for the most profitable strategies for "follow the winners" and "follow the winners or starters" with and without capitalization, during 1997-2008 (overlapping method). The first three bars are the three most profitable strategies from the "follow the winners" while the other three bars represent the most profitable strategies of "follow the winners or starters".



6 – Focusing on profits and not on the returns as explanatory factors

Some people prefer deposits because deposit rates are generally stable and safe, whereas in the stock market prices usually have a high variability and therefore investors cannot be so risk-averse. It is well-known that there are several factors that explain stocks' profitability such as the January effect (stock returns are higher every January), the size effect (small companies provide higher returns than big companies), the price effect (low price stocks generate higher returns than high price stocks), the Book-to-Market ratio (companies with a high BTM ratio usually provide higher returns in the future because they usually have a low market value and suffer from financial distress, thus incurring higher risks and therefore providing higher returns) Earnings/Price effect (companies with high E/P ratios generate higher returns than those with low E/P ratios). However, these factors will not be studied here. Although they probably explain most Portuguese stocks' returns, this paper is focused on achieving the most profitable strategies based on the analysis of past returns.

7 – Conclusion

Many studies have provided evidence on the profitability of momentum and contrarian strategies. Nevertheless, results are not consensual and studies conducted in some countries indicate that these strategies either only work in some periods of time or even that they do not work at all.

Hence, this study is particularly important to provide further evidence on the Portuguese stock market in order to strengthen the results from the two studies that addressed the Portuguese market and also to provide international evidence of the existence or not of momentum and contrarian abnormal returns.

The results obtained here generally support the existence of momentum profits (and under-reaction) in the Portuguese stock market for the 12 years period analyzed (1997-2008) whereas the contrarian profitability (and over-reaction) exist but are not so evident (1999-2008). Furthermore, the most profitable portfolio using long term strategies is the intermediate portfolio.

The profitability provided here by contrarian strategies is not so strong as the evidence provided by Soares and Serra (2005) that clearly supports the existence of a negative correlation of the stocks' performance between the formation and holding period (supportive of overreaction). This difference might be explained by the different samples (time periods) analyzed.

For holding periods and formation periods from one to twelve months, the monthly average returns of top winners portfolio are 0.97% (beat the PSI by 0.42%) while the top loser portfolio underperformed by -0.16% (-0.71% than PSI).

In short, the most profitable choice is to evaluate the stocks' past performance based on the last three, six or nine months, and then hold them for one, three or six months, always focusing on the top winner stocks. These strategies provide returns close to one percent.

Mean results are not very consistent for the two sub-periods: the monthly average returns for 1997-2002 are generally low while for 2003-2008 are quite high. When 2008 is excluded from the sample (1997-2007) to avoid the Sub-Prime crisis effect, profitability increases significantly.

The three most profitable strategies were obtained by the top winner portfolio by ranking the stocks into seven portfolios. Assuming a realistic 78% portfolio rotation, *K6-J3*, *K1-J6*, and *K3-J3* strategies start to be profitable for an investment of €1320, €4924, and 2490, respectively, and the optimal amounts are €82638 (1.48%), €88664 (1.47%), and €86375 (1.39%), respectively. It should be noted that the minimum amount required to start earning money in *K1-J6* is almost four times the amount of money needed in *K6-J3* strategy. Furthermore, €4924 in the half-yearly strategy would be enough to earn 1.17% monthly average returns.

For the monthly strategies for the optimal amounts, the custody and mainly the transaction costs have a significant weight of around 5.5% of the return rate. For quarterly strategies, the weight of costs decreases to 2.30%; for half-yearly strategies, they become really low at around 1.30% and for yearly or longer periods they become almost residual (0.85%).

Moreover, results from this study are robust to changes in portfolio sizes (number of stocks included in each portfolio by ranking the stocks into three, five and seven portfolios) and to overlapping and non-overlapping periods.

Considering the "innovative strategies", the highest mean results were generated for short term periods (*K1-K12*) from "follow the winners or starters" strategies with *Jm*=30% or 40% and *Js*=5%.

The three most profitable strategies are *K1-J1-J8* from "follow the winners" with *Js*=5% and *Jm*=40% which provides excellent average monthly returns of 2.75% for an investment starting at €30,000; the *K3-J1-J5* from "follow the winners or starters" with *Js*=5% and *Jm*=30% which generates 2.58% monthly returns for an investment of €30,000; and *K1-J1-J8* also from "follow the winners or starters" but with *Js*=5% and *Jm*=40% which also generate 2.58% monthly average returns.

The most profitable "innovative strategies" clearly provide returns that are not only much higher than PSI but also much higher than the most profitable strategies provided by momentum and contrarian strategies. This proves how useful and valuable "innovative strategies" are by providing an alternative way of analyzing past performance trends in order to get considerably higher returns.

The implementation of capitalization on the innovative strategies provides much lower returns than when capitalization is not used; this provides evidence that capitalization in the stock market is risky and generally not worthwhile (when returns are somewhat volatile).

Results are also robust for changes in time periods for the two sub-periods: 1997-2002 and 2003-2008, and for 1997-2007 (although in this case considerably higher returns were obtained); and also using overlapping and non-overlapping periods.

Most results from momentum, contrarian and innovative strategies are economically significant but not statistically significant.

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Comissão de Mercado de Valores Mobiliários, Apoio ao investidor/ Mediação de Conflitos, Custos e Comissões de Intermediação Financeira, Mercado Português, Canal Internet, Custos de Custódia.
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http://www.igcp.pt/gca/?id=63

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http://www.igcp.pt/gca/?id=83

9 – Appendix

9.1.-Explanations for Momentum strategies

In general, the profitability of momentum strategies seems to be well accepted. Nevertheless, there is controversy around their possible explanatory factors.

Many authors such as Daniel, Horshleifer, and Subrahmanyam (1998), Barberis, Sheifer, and Vishny (1998), and Hong and Stein (1999) suggest that **behavioral models** are the explanation for the abnormal returns of momentum strategies. Investors present bias when interpreting the information showing a delayed overreaction to it, which in turn leads to a continuous price increase in the winners' stocks and a continuous price decrease in losers' stocks. Investors tend to chase the winners and buy stocks that have performed well in the past because of the representative heuristic which in the short term leads to this upward trend in price. Shortly after this, the price stocks move to their fundamental values, and then losers start outperforming the winners.

According to Daniel et. al. (1998) and Hong and Stein (1999) investors present a "self-attribution" bias whereby they attribute the good performance of stocks they acquired to their selection skills, but cite bad luck to justify stocks' underperformance. Consequently, investors become overconfident and tend to buy winners, thus overestimating the potential of these stocks and pushing their prices over their fundamental values. It is only in the subsequent periods that prices ultimately revert (delayed overreaction).

Another explanation is market underreaction. Here, investors are slow learners and tend to underreact to new information such that the information is slowly and gradually incorporated into stock prices during the holding period. The investors present a conservatism bias which makes them underweight new information and not revise their beliefs sufficiently (Barberis, Shleifer, and Vishny, 1998).

Hong and Stein (1999) document that market underreaction is due to the heterogeneity of investors (the news watchers and the other investors), who perceive the different parts of private information at different points in time.

Conversely, **Conrad and Kaul (1998)** suggest that stock prices follow random drifting walks and defend that the higher returns of winners' stocks in the holding period represent the expected returns for compensation of risk; they therefore suggest momentum profits will be positive in any post-holding period.

Jegadeesh and Titman (2001) tested the opposed predictions of the behavioral models versus Conrad and Kaul's arguments by analyzing the various explanations of momentum profits published in their study in 1993. The profitability of momentum strategies still continues during the 1990's and thus their previous results (from 1993) were not due to data snooping biases. They scrutinized the profitability of momentum portfolios in the postholding period and found that investment in momentum portfolios is only profitable during the first 12 months after portfolio formation. The returns are negative from the 13^{th} to the 60^{th} month after portfolio formation thus definitely rejecting the Conrad and Kaul hypothesis and supporting the behavioral models (but with caution).

Hence, behavioral models explain a portion of momentum profitability. Profitability is also explained by January effects, book-to-market, size, industry and volume effects, and bid-ask spreads.

9.2. - Explanations for contrarian strategies

De Bond and Thaler (1985, 1987) stand their results on the cognitive psychology findings of Kahneman and Tversky (1982) who believe that investors overweight recent information (excessive optimism) and underweight past information (extreme pessimism). According to De Bond and Thaler (1987): the winner-loser effect is not a risk or size effect; the small firm effect is to a certain extent a losing firm effect; winners' and losers' return reversals are in accordance with overreaction; and losers' excess returns in the holding period have their roots in the negative performance during the formation period .

The contrarian profits do not depend on the size of the firm and do not show seasonality since they are obtained every month (Zarowin, 1989). Albert and Glenston separate the overreaction effect from size (1995). The overreaction effect is also documented by Chopra, Lakonishok, and Ritter (1992), although evidence is stronger for smaller than larger firms.

Short-term contrarian profits are also found in the Japanese stock market by Chang, McLeavey and Rhee (1995); even after risk and firm size have been considered, the seasonality effect does not explain these profits and there is a strong difference between top winners and top losers (contrary to the evidence found in the US market).

Jegadeesh and Titman (2001) documented that the profitability of contrarian strategies for small firms is reliable whereas the evidence is relatively weak for large firms, especially when using the Fama and French model (1993).

A study conducted by Kaul and Nimalendran (1990) documents that the bid-ask spread is the essential key to short-term contrarian profits in Nasdaq stocks. But profits disappear if returns are calculated based on successive bid prices. The evidence on market overreaction is considered somewhat weak.

9.3 - Overreaction versus underreaction: Compatible or contradictory?

For curiosity's sake, it should be noted that the underreaction hypothesis (related to momentum investment strategy) and overreaction hypothesis (related to contrarian investment strategy) are not necessarily contradictory. Indeed, they can be perfectly compatible with each other. The underreaction hypothesis presumes that investors are slow learners and take (too much) time to react to news; therefore prices still follow the same positive or negative trend even after the event occurs,. The overreaction presumes that market participants react to a series of good or bad new information with excessive optimism or excessive pessimism, and this initial overreaction causes the market prices to move away from their fundamental value which, in turn, eventually leads to a price reversal. Barberis et al. (1998), Hong and Stein (1999) and Daniel et al. (1998) have developed theories trying to clarify the co-existence of overreaction and underreaction.

9.4 - Two crises during the time-period analyzed –: "Dot-com" and "Sub-prime"

As mentioned above, the time period used in this study is from 1 January 1997 to 31 December 2008 (144 months). During this period, two relevant world crises occurred: the "Dot-com bubble" and the "Subprime".

From 1998 to 2001, new internet-based companies and related industries started to spread out and their stock prices in western countries went up very quickly (mainly in the internet sector but also in others) thus creating a speculative bubble called the "Dot.com bubble". The name "dot-com" is due to the appearance (and failure) of innumerous dot-com companies during this period. The rise in stock prices of companies' that added the "e-" prefix to their name or ended with ".com" was inexplicably fast. In March 2000, poor annual and quarterly reports of internet retailers were released and heralded the first signs that the bubble was about to burst. In 2001 stock prices were falling rapidly (bear market was installed). Most stock prices continued to fall and only started to recover in the last quarter of 2003.

The crisis spread from the U.S. to other markets; at the end of February 2000, the value-weighted PSI had 3332 base-points compared with just 1564 base-points at the end of April 2003. The Portuguese market fell 53% in three years.

A new crisis developed in 2007, following some prosperity and some years of strong growth in most of the stock markets: the "Subprime".

This crisis began at the turn of century but only became visible in 2007 when mortgage defaults and foreclosures in the United States dramatically soared due to the bad financial practices of banks and other financial institutions. This situation had a serious negative impact on banks and all financial markets around the world. Central Banks had clearly failed in their supervisory role.

As the crisis deepened in 2007, investors panicked and started to take their money out of the risky mortgage bonds and stocks.

In 2008, many financial institutions reported massive losses related with subprime. Consequently, banks' capital decreased to dangerous levels, the credit risk indicator accelerated and it became much harder to get credit (for households and firms). The Subprime crisis hit its peak in September 2008 with the bankruptcy of Leman Brothers and other important institutions. The TED spread[8] quadrupled in a short time period. Governments,

[8] Indicator of credit interbank lending risk

Federal Reserve and European Central Bank responded by injecting billions into the credit market, saving financial institutions from bankruptcy and unfreezing the global financial system that was close to collapse.

The "Sub-prime crisis is considered by Stiglitz[9] much worse than the dotcom crisis and probably the worst crisis in the last century if the Wall Street crisis that started with the great depression in 1929 and lasted through the 1930's is not taken into account. Furthermore, he stated that he and other s economists like Paul Krugman[10] had predicted this crisis at least three years earlier[11].

In 2008, PSI fell 50% (from 4130 to 2081 base-points). The dot-com crisis took nearly three years to reach this level in contrast with just one year. Thus, a rational investor would have taken his money from the stock market no later than the end of 2007 as the predicted crisis had started to become evident that year. Based on this assumption, a study has also been made of the momentum and contrarian strategies in the Portuguese stock market excluding 2008 from the time period analyzed.

In 2009, despites the economic crisis, there are some first tenuous positive indicators in the equity market and some countries are registering signs of economic recovery.

[9] Stiglitz, Nobel Prize winner for economics in 2001 (declarations in an interview on 7th November, 2008)
[10] Nobel Prize winner for economics in 2008

9.5 - Monthly average returns above PSI for short-term holding periods using overlapping periods and five portfolios.

Holding	Past	P1	P2	P3	P4	P5	Mean	P1-P5
K1	**J1**	0.11%	0.17%	-0.42%	-0.29%	-0.45%	-0.17%	0.56%
K1	**J3**	0.58%	0.09%	-0.56%	-0.74%	-0.47%	-0.22%	1.06%
K1	**J6**	0.89%	-0.31%	-0.28%	-0.71%	-0.88%	-0.26%	1.77%
K1	**J9**	0.54%	-0.16%	-0.34%	-0.51%	-0.83%	-0.26%	1.37%
K1	**J12**	0.06%	0.28%	-0.19%	-0.63%	-0.83%	-0.26%	0.89%
K1	**J18**	0.08%	0.02%	-0.25%	-0.72%	-0.37%	-0.25%	0.45%
K1	**J24**	0.15%	-0.32%	0.04%	-0.56%	-0.56%	-0.25%	0.70%
K1	**J30**	-0.24%	0.26%	-0.10%	-0.67%	-0.35%	-0.22%	0.11%
K1	**J36**	-0.26%	0.29%	-0.26%	-0.70%	0.00%	-0.19%	-0.26%
K3	**J1**	0.25%	-0.14%	-0.15%	-0.25%	-0.46%	-0.15%	0.71%
K3	**J3**	0.72%	-0.22%	-0.36%	-0.18%	-0.81%	-0.17%	1.53%
K3	**J6**	0.62%	0.02%	-0.28%	-0.48%	-1.11%	-0.25%	1.73%
K3	**J9**	0.68%	-0.11%	-0.40%	-0.41%	-0.96%	-0.24%	1.65%
K3	**J12**	0.27%	0.03%	0.04%	-0.57%	-1.00%	-0.25%	1.27%
K3	**J18**	0.24%	-0.12%	-0.08%	-0.76%	-0.31%	-0.20%	0.55%
K3	**J24**	-0.01%	0.11%	0.00%	-0.70%	-0.54%	-0.23%	0.52%
K3	**J30**	-0.30%	0.19%	0.06%	-0.61%	-0.35%	-0.20%	0.05%
K3	**J36**	-0.14%	0.16%	-0.45%	-0.49%	0.13%	-0.16%	-0.28%
K6	**J1**	0.44%	0.04%	0.05%	-0.42%	-0.39%	-0.05%	0.83%
K6	**J3**	0.71%	0.04%	-0.24%	-0.10%	-0.89%	-0.09%	1.60%
K6	**J6**	0.62%	0.20%	-0.23%	-0.33%	-0.95%	-0.14%	1.57%
K6	**J9**	0.57%	0.06%	-0.20%	-0.23%	-0.88%	-0.14%	1.45%
K6	**J12**	0.25%	0.10%	0.01%	-0.26%	-0.75%	-0.13%	1.00%
K6	**J18**	0.18%	0.03%	0.12%	-0.56%	-0.23%	-0.09%	0.42%
K6	**J24**	-0.16%	0.26%	0.16%	-0.35%	-0.49%	-0.12%	0.32%
K6	**J30**	-0.19%	0.23%	0.06%	-0.53%	0.01%	-0.08%	-0.20%
K6	**J36**	-0.05%	0.19%	-0.03%	-0.53%	0.10%	-0.06%	-0.15%
K9	**J1**	0.33%	0.17%	0.04%	-0.25%	-0.39%	-0.02%	0.72%
K9	**J3**	0.65%	0.09%	-0.11%	-0.06%	-0.79%	-0.04%	1.44%
K9	**J6**	0.45%	0.30%	-0.10%	-0.23%	-0.83%	-0.08%	1.29%
K9	**J9**	0.27%	0.34%	-0.13%	-0.12%	-0.73%	-0.08%	0.99%
K9	**J12**	0.08%	0.24%	0.16%	-0.24%	-0.55%	-0.06%	0.63%
K9	**J18**	0.00%	0.19%	0.36%	-0.47%	-0.37%	-0.06%	0.37%
K9	**J24**	-0.18%	0.31%	0.15%	-0.24%	-0.37%	-0.07%	0.19%
K9	**J30**	-0.14%	0.18%	0.17%	-0.49%	0.13%	-0.03%	-0.27%
K9	**J36**	-0.03%	0.33%	0.06%	-0.41%	-0.08%	-0.03%	0.05%
K12	**J1**	0.30%	0.24%	0.11%	-0.15%	-0.46%	0.01%	0.76%
K12	**J3**	0.57%	0.11%	-0.05%	-0.05%	-0.68%	-0.02%	1.26%
K12	**J6**	0.29%	0.37%	-0.02%	-0.15%	-0.67%	-0.04%	0.96%
K12	**J9**	0.19%	0.35%	-0.03%	-0.09%	-0.57%	-0.03%	0.76%
K12	**J12**	0.03%	0.33%	0.18%	-0.24%	-0.39%	-0.02%	0.42%
K12	**J18**	-0.05%	0.17%	0.34%	-0.22%	-0.37%	-0.03%	0.32%

K12	**J24**	-0.19%	0.26%	0.20%	-0.16%	-0.21%	-0.02%	0.03%
K12	**J30**	-0.09%	0.21%	0.28%	-0.34%	-0.06%	0.00%	-0.03%
K12	**J36**	0.02%	0.30%	0.08%	-0.29%	-0.08%	0.01%	0.10%
Mean		0.20%	0.13%	-0.06%	-0.39%	-0.49%	-0.12%	0.69%

9.6– Monthly average returns above PSI-20 for short-term holding periods using overlapping periods and five portfolios

Holding	**Past**	**P1**	**P2**	**P3**	**P4**	**P5**	**Mean**	**P1-P5**
K1	**J1**	0.50%	0.56%	-0.03%	0.10%	-0.06%	0.21%	0.56%
K1	**J3**	0.97%	0.48%	-0.18%	-0.36%	-0.09%	0.16%	1.06%
K1	**J6**	1.28%	0.08%	0.10%	-0.32%	-0.50%	0.13%	1.77%
K1	**J9**	0.93%	0.22%	0.05%	-0.13%	-0.44%	0.13%	1.37%
K1	**J12**	0.45%	0.67%	0.19%	-0.24%	-0.44%	0.12%	0.89%
K1	**J18**	0.46%	0.41%	0.14%	-0.34%	0.02%	0.14%	0.45%
K1	**J24**	0.53%	0.06%	0.42%	-0.17%	-0.17%	0.13%	0.70%
K1	**J30**	0.14%	0.65%	0.28%	-0.28%	0.03%	0.17%	0.11%
K1	**J36**	0.12%	0.67%	0.13%	-0.31%	0.38%	0.20%	-0.26%
K3	**J1**	0.63%	0.25%	0.24%	0.14%	-0.08%	0.23%	0.71%
K3	**J3**	1.10%	0.16%	0.02%	0.20%	-0.42%	0.21%	1.53%
K3	**J6**	1.00%	0.40%	0.10%	-0.10%	-0.72%	0.14%	1.73%
K3	**J9**	1.07%	0.27%	-0.02%	-0.03%	-0.58%	0.14%	1.65%
K3	**J12**	0.65%	0.41%	0.43%	-0.19%	-0.62%	0.14%	1.27%
K3	**J18**	0.62%	0.27%	0.31%	-0.37%	0.08%	0.18%	0.55%
K3	**J24**	0.37%	0.50%	0.38%	-0.31%	-0.15%	0.16%	0.52%
K3	**J30**	0.08%	0.57%	0.45%	-0.22%	0.04%	0.18%	0.05%
K3	**J36**	0.24%	0.55%	-0.07%	-0.11%	0.52%	0.23%	-0.28%
K6	**J1**	0.83%	0.42%	0.43%	-0.03%	0.00%	0.33%	0.83%
K6	**J3**	1.10%	0.43%	0.14%	0.29%	-0.50%	0.29%	1.60%
K6	**J6**	1.01%	0.59%	0.16%	0.05%	-0.56%	0.25%	1.57%
K6	**J9**	0.96%	0.45%	0.18%	0.15%	-0.50%	0.25%	1.45%
K6	**J12**	0.64%	0.48%	0.40%	0.13%	-0.36%	0.26%	1.00%
K6	**J18**	0.57%	0.42%	0.50%	-0.18%	0.15%	0.29%	0.42%
K6	**J24**	0.22%	0.64%	0.54%	0.03%	-0.10%	0.27%	0.32%
K6	**J30**	0.20%	0.62%	0.44%	-0.15%	0.40%	0.30%	-0.20%
K6	**J36**	0.34%	0.58%	0.35%	-0.14%	0.49%	0.32%	-0.15%
K9	**J1**	0.72%	0.55%	0.42%	0.14%	-0.01%	0.36%	0.72%
K9	**J3**	1.03%	0.48%	0.27%	0.33%	-0.41%	0.34%	1.44%
K9	**J6**	0.84%	0.69%	0.28%	0.16%	-0.45%	0.30%	1.29%
K9	**J9**	0.65%	0.72%	0.25%	0.26%	-0.34%	0.31%	0.99%
K9	**J12**	0.46%	0.63%	0.54%	0.14%	-0.17%	0.32%	0.63%
K9	**J18**	0.39%	0.58%	0.74%	-0.09%	0.02%	0.33%	0.37%
K9	**J24**	0.21%	0.69%	0.53%	0.15%	0.02%	0.32%	0.19%
K9	**J30**	0.25%	0.56%	0.55%	-0.10%	0.51%	0.35%	-0.27%
K9	**J36**	0.35%	0.72%	0.45%	-0.03%	0.31%	0.36%	0.05%

K12	**J1**	0.69%	0.62%	0.49%	0.23%	-0.07%	0.39%	0.76%
K12	**J3**	0.96%	0.50%	0.34%	0.34%	-0.30%	0.37%	1.26%
K12	**J6**	0.67%	0.75%	0.37%	0.23%	-0.29%	0.35%	0.96%
K12	**J9**	0.57%	0.73%	0.35%	0.30%	-0.18%	0.36%	0.76%
K12	**J12**	0.41%	0.71%	0.56%	0.14%	-0.01%	0.36%	0.42%
K12	**J18**	0.34%	0.55%	0.73%	0.16%	0.02%	0.36%	0.32%
K12	**J24**	0.20%	0.64%	0.59%	0.23%	0.17%	0.37%	0.03%
K12	**J30**	0.29%	0.60%	0.67%	0.05%	0.33%	0.39%	-0.03%
K12	**J36**	0.41%	0.68%	0.47%	0.09%	0.31%	0.39%	0.10%
Mean		0.59%	0.52%	0.33%	0.00%	-0.11%	0.26%	0.69%

9.7 – Monthly average returns for short-term strategies (holding and formation periods up to twelve months) with overlapping periods and using five portfolios (1997-2008)

Holding	Past	P1	P2	P3	P4	P5	Mean	P1-P5
K1	J1	0.66%	0.72%	0.13%	0.26%	0.10%	0.37%	0.56%
K1	J3	1.13%	0.64%	-0.01%	-0.20%	0.07%	0.33%	1.06%
K1	J6	1.44%	0.24%	0.27%	-0.16%	-0.33%	0.29%	1.77%
K1	J9	1.09%	0.38%	0.21%	0.04%	-0.28%	0.29%	1.37%
K1	J12	0.61%	0.83%	0.35%	-0.08%	-0.28%	0.29%	0.89%
K3	J1	0.79%	0.41%	0.40%	0.30%	0.08%	0.40%	0.71%
K3	J3	1.26%	0.32%	0.19%	0.36%	-0.26%	0.38%	1.53%
K3	J6	1.16%	0.57%	0.27%	0.06%	-0.56%	0.30%	1.73%
K3	J9	1.23%	0.43%	0.14%	0.14%	-0.42%	0.31%	1.65%
K3	J12	0.81%	0.58%	0.59%	-0.02%	-0.45%	0.30%	1.27%
K6	J1	0.99%	0.59%	0.60%	0.13%	0.16%	0.49%	0.83%
K6	J3	1.26%	0.59%	0.30%	0.45%	-0.34%	0.45%	1.60%
K6	J6	1.17%	0.75%	0.32%	0.22%	-0.40%	0.41%	1.57%
K6	J9	1.12%	0.61%	0.35%	0.31%	-0.34%	0.41%	1.45%
K6	J12	0.80%	0.65%	0.56%	0.29%	-0.20%	0.42%	1.00%
K9	J1	0.88%	0.72%	0.58%	0.30%	0.16%	0.53%	0.72%
K9	J3	1.19%	0.64%	0.44%	0.49%	-0.25%	0.50%	1.44%
K9	J6	1.00%	0.85%	0.45%	0.32%	-0.28%	0.47%	1.29%
K9	J9	0.81%	0.88%	0.42%	0.42%	-0.18%	0.47%	0.99%
K9	J12	0.62%	0.79%	0.71%	0.31%	-0.01%	0.48%	0.63%
K12	J1	0.85%	0.79%	0.66%	0.40%	0.09%	0.56%	0.76%
K12	J3	1.12%	0.66%	0.50%	0.50%	-0.13%	0.53%	1.26%
K12	J6	0.84%	0.92%	0.53%	0.39%	-0.13%	0.51%	0.96%
K12	J9	0.74%	0.90%	0.52%	0.46%	-0.02%	0.52%	0.76%
K12	J12	0.57%	0.87%	0.73%	0.30%	0.16%	0.53%	0.42%
Mean		0.97%	0.65%	0.41%	0.24%	-0.16%	0.42%	1.13%

9.8 – Monthly average standard deviation for short-term strategies (1997-2008)**.**

Holding	Past	P1	P2	P3	P4	P5	Mean	P1-P5
K1	**J1**	7.60%	6.50%	5.00%	6.66%	7.52%	6.66%	0.07%
K1	**J3**	7.66%	5.80%	5.37%	5.61%	8.55%	6.60%	-0.88%
K1	**J6**	7.75%	5.73%	5.26%	6.10%	8.23%	6.62%	-0.48%
K1	**J9**	6.94%	5.58%	5.43%	5.85%	8.15%	6.39%	-1.21%
K1	**J12**	6.94%	6.22%	5.53%	5.40%	8.03%	6.42%	-1.09%
K1	**J18**	6.50%	5.99%	5.16%	5.61%	8.25%	6.30%	-1.75%
K1	**J24**	6.44%	5.40%	5.66%	5.46%	7.90%	6.17%	-1.47%
K1	**J30**	6.30%	6.57%	5.26%	5.52%	7.98%	6.33%	-1.68%
K1	**J36**	5.98%	6.53%	5.59%	5.84%	7.90%	6.37%	-1.91%
K3	**J1**	8.48%	6.11%	7.71%	8.09%	9.66%	8.01%	-1.18%
K3	**J3**	8.27%	7.12%	6.55%	10.34%	9.07%	8.27%	-0.81%
K3	**J6**	8.73%	7.27%	6.89%	6.47%	9.03%	7.68%	-0.30%
K3	**J9**	8.71%	6.45%	6.35%	7.49%	8.70%	7.54%	0.01%
K3	**J12**	8.34%	6.70%	7.75%	6.57%	8.56%	7.58%	-0.21%
K3	**J18**	8.04%	6.67%	6.77%	6.16%	10.05%	7.54%	-2.01%
K3	**J24**	7.26%	8.05%	6.47%	6.18%	9.44%	7.48%	-2.18%
K3	**J30**	6.98%	7.23%	7.49%	6.60%	9.05%	7.47%	-2.07%
K3	**J36**	7.38%	7.13%	6.22%	8.12%	9.52%	7.67%	-2.15%
K6	**J1**	8.96%	7.54%	8.36%	7.55%	9.14%	8.31%	-0.18%
K6	**J3**	9.15%	8.42%	6.86%	8.26%	8.50%	8.24%	0.65%
K6	**J6**	9.07%	8.47%	7.03%	6.73%	8.65%	7.99%	0.42%
K6	**J9**	9.29%	7.45%	6.90%	7.57%	8.21%	7.88%	1.08%
K6	**J12**	8.78%	7.78%	7.51%	7.26%	8.38%	7.94%	0.40%
K6	**J18**	8.66%	7.35%	7.97%	6.19%	9.33%	7.90%	-0.67%
K6	**J24**	7.37%	8.29%	7.31%	7.58%	8.32%	7.77%	-0.95%
K6	**J30**	7.93%	7.93%	7.53%	6.74%	9.22%	7.87%	-1.30%
K6	**J36**	8.13%	7.81%	8.37%	6.85%	9.13%	8.06%	-0.99%
K9	**J1**	8.26%	8.21%	8.22%	7.81%	9.52%	8.40%	-1.26%
K9	**J3**	9.02%	7.90%	7.52%	8.36%	8.66%	8.29%	0.35%
K9	**J6**	8.89%	8.65%	7.71%	7.50%	8.37%	8.22%	0.52%
K9	**J9**	8.66%	8.47%	7.12%	8.01%	8.28%	8.11%	0.38%
K9	**J12**	8.62%	7.92%	8.22%	7.15%	8.97%	8.18%	-0.35%
K9	**J18**	7.91%	8.04%	8.76%	6.18%	8.62%	7.90%	-0.71%
K9	**J24**	7.50%	8.27%	7.46%	7.97%	7.81%	7.80%	-0.30%
K9	**J30**	8.34%	7.46%	8.19%	7.21%	9.64%	8.17%	-1.30%
K9	**J36**	8.17%	8.31%	8.66%	6.93%	8.72%	8.16%	-0.56%
K12	**J1**	8.87%	8.18%	8.52%	8.29%	7.96%	8.36%	0.91%
K12	**J3**	9.45%	8.20%	7.83%	8.15%	8.48%	8.42%	0.96%
K12	**J6**	9.03%	9.10%	8.03%	7.56%	8.31%	8.41%	0.72%
K12	**J9**	8.92%	8.57%	8.12%	7.73%	8.82%	8.43%	0.10%
K12	**J12**	8.66%	8.24%	8.67%	6.35%	9.37%	8.26%	-0.71%
K12	**J18**	8.26%	7.99%	8.69%	7.12%	8.17%	8.05%	0.09%
K12	**J24**	7.98%	7.94%	8.15%	8.52%	8.21%	8.16%	-0.23%

K12	**J30**	8.64%	7.83%	9.53%	7.53%	8.83%	8.47%	-0.20%
K12	**J36**	8.70%	8.28%	9.17%	7.12%	8.79%	8.41%	-0.09%
Mean		8.12%	7.46%	7.26%	7.07%	8.67%	7.72%	-0.54%

9.9 – Monthly average standard deviation for medium-long term strategies (1997-2008)

Holding	**Past**	**P1**	**P2**	**P3**	**P4**	**P5**	**Mean**	**P1-P5**
K18	**J1**	8.81%	7.82%	7.83%	8.04%	7.88%	8.07%	0.94%
K18	**J3**	10.24%	7.78%	7.26%	7.39%	8.04%	8.14%	2.21%
K18	**J6**	9.54%	7.95%	7.21%	6.89%	8.05%	7.93%	1.49%
K18	**J9**	8.46%	7.89%	6.90%	7.28%	8.36%	7.78%	0.10%
K18	**J12**	7.93%	7.59%	7.67%	6.44%	8.46%	7.62%	-0.52%
K18	**J18**	7.52%	7.43%	7.35%	7.08%	9.20%	7.72%	-1.68%
K18	**J24**	8.14%	7.16%	7.65%	7.35%	8.98%	7.86%	-0.84%
K18	**J30**	8.20%	7.79%	8.64%	5.81%	9.14%	7.91%	-0.94%
K18	**J36**	8.29%	8.60%	7.39%	7.17%	8.90%	8.07%	-0.60%
K24	**J1**	7.87%	7.33%	7.80%	7.91%	7.63%	7.71%	0.24%
K24	**J3**	9.10%	7.44%	6.90%	7.25%	7.68%	7.68%	1.42%
K24	**J6**	7.73%	7.53%	6.62%	6.38%	8.39%	7.33%	-0.67%
K24	**J9**	7.06%	7.60%	6.29%	6.77%	8.55%	7.25%	-1.49%
K24	**J12**	6.91%	7.53%	7.24%	5.21%	8.87%	7.15%	-1.96%
K24	**J18**	6.84%	7.94%	7.16%	5.71%	9.01%	7.33%	-2.18%
K24	**J24**	7.08%	7.48%	7.51%	5.95%	9.40%	7.48%	-2.32%
K24	**J30**	6.92%	7.91%	8.04%	5.55%	9.25%	7.53%	-2.33%
K24	**J36**	7.63%	8.24%	6.84%	5.76%	8.58%	7.41%	-0.95%
K36	**J1**	7.25%	7.53%	8.36%	7.82%	7.71%	7.73%	-0.46%
K36	**J3**	7.92%	7.50%	7.98%	7.77%	7.90%	7.81%	0.02%
K36	**J6**	8.27%	8.22%	7.74%	7.01%	7.96%	7.84%	0.31%
K36	**J9**	7.88%	8.36%	7.61%	7.98%	7.70%	7.91%	0.18%
K36	**J12**	7.62%	8.05%	8.99%	6.71%	7.23%	7.72%	0.39%
K36	**J18**	7.38%	7.81%	8.49%	7.49%	6.79%	7.59%	0.59%
K36	**J24**	7.34%	7.82%	8.66%	7.96%	7.45%	7.85%	-0.11%
K36	**J30**	7.93%	9.50%	8.48%	6.11%	7.33%	7.87%	0.60%
K36	**J36**	8.61%	9.97%	8.52%	5.86%	6.82%	7.95%	1.79%
K48	**J1**	8.63%	7.74%	9.34%	8.25%	7.84%	8.36%	0.79%
K48	**J3**	9.65%	7.41%	8.43%	9.25%	8.05%	8.56%	1.61%
K48	**J6**	10.14%	7.88%	8.29%	8.33%	8.00%	8.53%	2.13%
K48	**J9**	8.47%	8.47%	8.48%	9.12%	8.34%	8.58%	0.13%
K48	**J12**	7.50%	9.09%	9.17%	7.81%	8.78%	8.47%	-1.28%
K48	**J18**	7.78%	9.19%	8.75%	8.25%	8.07%	8.41%	-0.28%
K48	**J24**	8.54%	9.69%	8.58%	8.06%	8.78%	8.73%	-0.24%
K48	**J30**	9.75%	10.83%	8.15%	7.40%	8.70%	8.96%	1.05%
K48	**J36**	9.66%	11.33%	8.85%	6.28%	8.63%	8.95%	1.04%

K60	**J1**	6.90%	8.54%	7.70%	6.96%	8.05%	7.63%	-1.15%
K60	**J3**	7.62%	7.50%	6.81%	7.65%	9.18%	7.75%	-1.57%
K60	**J6**	8.46%	7.89%	6.64%	7.69%	8.26%	7.79%	0.19%
K60	**J9**	8.17%	7.63%	7.42%	7.10%	8.11%	7.69%	0.07%
K60	**J12**	7.61%	8.99%	7.54%	6.34%	7.90%	7.68%	-0.29%
K60	**J18**	8.30%	9.46%	7.52%	6.41%	7.42%	7.82%	0.88%
K60	**J24**	8.75%	9.95%	6.73%	6.37%	8.93%	8.15%	-0.19%
K60	**J30**	9.03%	9.65%	6.89%	7.87%	8.75%	8.44%	0.28%
K60	**J36**	9.06%	8.25%	9.35%	7.61%	8.53%	8.56%	0.53%
Mean		8.19%	8.29%	7.82%	7.14%	8.26%	7.94%	-0.07%

9.10 – Monthly mean standard deviation (1997-2008) Table 1.3 is a summary of the tables 1.1 and 1.2, showing the mean for the monthly average standard deviations for 1997-2008.

Form K1 to K60	P1	P2	P3	P4	P5	Mean	P1-P5
Mean	8.16%	7.88%	7.54%	7.11%	8.46%	**7.83%**	**-0.31%**

9.11 -Medium-Long term Monthly average returns above PSI by ranking the stocks into Five Portfolios (1997-2008).

Holding	Past	P1	P2	P3	P4	P5	Mean	P1-P5
K18	**J1**	0.26%	0.07%	0.02%	-0.06%	-0.34%	-0.01%	0.60%
K18	**J3**	0.46%	0.13%	-0.12%	-0.13%	-0.48%	-0.03%	0.94%
K18	**J6**	0.23%	0.27%	-0.01%	-0.27%	-0.42%	-0.04%	0.65%
K18	**J9**	0.01%	0.29%	0.05%	-0.14%	-0.40%	-0.04%	0.40%
K18	**J12**	-0.18%	0.31%	0.19%	-0.17%	-0.37%	-0.04%	0.19%
K18	**J18**	-0.17%	0.16%	0.09%	-0.15%	-0.09%	-0.03%	-0.08%
K18	**J24**	-0.18%	0.19%	0.06%	-0.16%	-0.02%	-0.02%	-0.16%
K18	**J30**	-0.10%	0.18%	0.17%	-0.28%	-0.06%	-0.02%	-0.04%
K18	**J36**	-0.01%	0.23%	0.05%	-0.16%	-0.13%	0.00%	0.12%
K24	**J1**	0.10%	0.06%	0.03%	-0.04%	-0.22%	-0.02%	0.32%
K24	**J3**	0.20%	0.12%	-0.08%	-0.04%	-0.37%	-0.03%	0.57%
K24	**J6**	-0.01%	0.21%	-0.02%	-0.17%	-0.25%	-0.05%	0.23%
K24	**J9**	-0.17%	0.19%	0.01%	-0.07%	-0.20%	-0.05%	0.03%
K24	**J12**	-0.26%	0.19%	0.15%	-0.18%	-0.13%	-0.04%	-0.13%
K24	**J18**	-0.21%	0.16%	0.05%	-0.25%	0.08%	-0.03%	-0.29%
K24	**J24**	-0.26%	0.19%	0.17%	-0.30%	0.05%	-0.03%	-0.30%
K24	**J30**	-0.16%	0.10%	0.21%	-0.26%	0.00%	-0.02%	-0.16%
K24	**J36**	-0.12%	0.21%	0.05%	-0.20%	-0.04%	-0.02%	-0.08%

K36	**J1**	-0.07%	0.00%	0.08%	0.00%	-0.12%	-0.02%	0.05%
K36	**J3**	0.03%	0.00%	-0.01%	-0.01%	-0.16%	-0.03%	0.19%
K36	**J6**	-0.02%	0.09%	0.02%	-0.12%	-0.13%	-0.03%	0.11%
K36	**J9**	-0.14%	0.18%	0.07%	-0.04%	-0.19%	-0.03%	0.05%
K36	**J12**	-0.17%	0.18%	0.19%	-0.11%	-0.21%	-0.02%	0.04%
K36	**J18**	-0.18%	0.09%	0.17%	-0.02%	-0.13%	-0.01%	-0.05%
K36	**J24**	-0.19%	0.09%	0.25%	-0.02%	-0.18%	-0.01%	-0.01%
K36	**J30**	-0.16%	0.21%	0.23%	-0.14%	-0.21%	-0.02%	0.05%
K36	**J36**	-0.11%	0.28%	0.20%	-0.21%	-0.18%	0.00%	0.07%
K48	**J1**	-0.11%	-0.06%	-0.02%	-0.13%	-0.22%	-0.11%	0.11%
K48	**J3**	-0.01%	-0.11%	-0.08%	-0.05%	-0.28%	-0.10%	0.27%
K48	**J6**	0.01%	0.00%	-0.09%	-0.17%	-0.23%	-0.10%	0.24%
K48	**J9**	-0.15%	0.01%	0.02%	-0.08%	-0.24%	-0.09%	0.09%
K48	**J12**	-0.25%	0.07%	0.13%	-0.11%	-0.26%	-0.08%	0.00%
K48	**J18**	-0.20%	0.08%	0.09%	-0.06%	-0.25%	-0.07%	0.05%
K48	**J24**	-0.18%	0.12%	0.19%	-0.15%	-0.29%	-0.06%	0.11%
K48	**J30**	-0.13%	0.20%	0.13%	-0.14%	-0.32%	-0.05%	0.19%
K48	**J36**	-0.17%	0.17%	0.22%	-0.19%	-0.18%	-0.03%	0.02%
K60	**J1**	-0.19%	-0.05%	-0.10%	-0.13%	-0.22%	-0.14%	0.03%
K60	**J3**	-0.14%	-0.07%	-0.13%	-0.10%	-0.20%	-0.13%	0.07%
K60	**J6**	-0.12%	0.01%	-0.14%	-0.21%	-0.13%	-0.12%	0.02%
K60	**J9**	-0.22%	0.00%	0.03%	-0.22%	-0.14%	-0.11%	-0.09%
K60	**J12**	-0.32%	0.16%	0.04%	-0.16%	-0.23%	-0.10%	-0.09%
K60	**J18**	-0.23%	0.08%	0.07%	-0.11%	-0.22%	-0.08%	-0.01%
K60	**J24**	-0.22%	0.10%	0.14%	-0.15%	-0.20%	-0.07%	-0.02%
K60	**J30**	-0.24%	-0.02%	0.24%	-0.01%	-0.17%	-0.04%	-0.07%
K60	**J36**	-0.34%	-0.11%	0.38%	0.06%	-0.06%	-0.01%	-0.28%
Mean		-0.11%	0.11%	0.08%	-0.13%	-0.19%	-0.05%	0.09%

9.12 - Medium-Long Monthly average returns above PSI-20 by ranking the stocks into Five Portfolios (1997-2008).

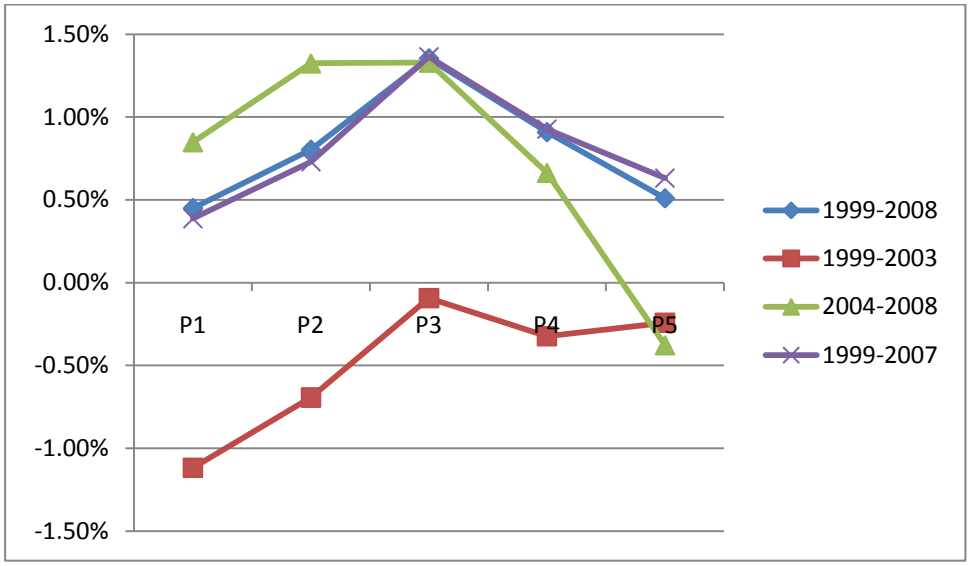
Holding	**Past**	**P1**	**P2**	**P3**	**P4**	**P5**	**Mean**	**P1-P5**
K18	**J1**	0.64%	0.45%	0.41%	0.32%	0.04%	0.37%	0.60%
K18	**J3**	0.84%	0.52%	0.27%	0.26%	-0.09%	0.36%	0.94%
K18	**J6**	0.62%	0.65%	0.38%	0.12%	-0.03%	0.35%	0.65%
K18	**J9**	0.39%	0.68%	0.43%	0.24%	-0.01%	0.35%	0.40%
K18	**J12**	0.21%	0.69%	0.58%	0.22%	0.02%	0.34%	0.19%
K18	**J18**	0.21%	0.54%	0.48%	0.24%	0.29%	0.35%	-0.08%
K18	**J24**	0.20%	0.57%	0.44%	0.23%	0.37%	0.36%	-0.16%
K18	**J30**	0.29%	0.57%	0.56%	0.11%	0.33%	0.37%	-0.04%
K18	**J36**	0.37%	0.62%	0.43%	0.23%	0.25%	0.38%	0.12%
K24	**J1**	0.48%	0.44%	0.41%	0.35%	0.16%	0.37%	0.32%

K24	**J3**	0.59%	0.51%	0.30%	0.35%	0.01%	0.35%	0.57%
K24	**J6**	0.37%	0.59%	0.36%	0.21%	0.14%	0.34%	0.23%
K24	**J9**	0.22%	0.58%	0.39%	0.32%	0.18%	0.34%	0.03%
K24	**J12**	0.13%	0.58%	0.53%	0.21%	0.26%	0.34%	-0.13%
K24	**J18**	0.17%	0.55%	0.43%	0.14%	0.47%	0.35%	-0.29%
K24	**J24**	0.13%	0.57%	0.56%	0.09%	0.43%	0.36%	-0.30%
K24	**J30**	0.22%	0.49%	0.59%	0.13%	0.38%	0.36%	-0.16%
K24	**J36**	0.27%	0.60%	0.44%	0.18%	0.35%	0.37%	-0.08%
K36	**J1**	0.31%	0.39%	0.46%	0.39%	0.27%	0.36%	0.05%
K36	**J3**	0.41%	0.39%	0.38%	0.38%	0.23%	0.36%	0.19%
K36	**J6**	0.37%	0.48%	0.40%	0.27%	0.26%	0.35%	0.11%
K36	**J9**	0.25%	0.56%	0.45%	0.34%	0.19%	0.36%	0.05%
K36	**J12**	0.22%	0.57%	0.57%	0.28%	0.17%	0.36%	0.04%
K36	**J18**	0.21%	0.48%	0.56%	0.37%	0.25%	0.37%	-0.05%
K36	**J24**	0.20%	0.48%	0.64%	0.37%	0.21%	0.38%	-0.01%
K36	**J30**	0.22%	0.60%	0.61%	0.24%	0.17%	0.37%	0.05%
K36	**J36**	0.28%	0.66%	0.59%	0.18%	0.21%	0.38%	0.07%
K48	**J1**	0.27%	0.33%	0.37%	0.26%	0.17%	0.28%	0.11%
K48	**J3**	0.38%	0.28%	0.31%	0.34%	0.11%	0.28%	0.27%
K48	**J6**	0.39%	0.38%	0.29%	0.22%	0.16%	0.29%	0.24%
K48	**J9**	0.24%	0.40%	0.40%	0.30%	0.15%	0.30%	0.09%
K48	**J12**	0.13%	0.45%	0.51%	0.28%	0.13%	0.30%	0.00%
K48	**J18**	0.18%	0.47%	0.48%	0.32%	0.13%	0.32%	0.05%
K48	**J24**	0.21%	0.50%	0.57%	0.24%	0.10%	0.32%	0.11%
K48	**J30**	0.26%	0.59%	0.51%	0.25%	0.07%	0.34%	0.19%
K48	**J36**	0.22%	0.55%	0.61%	0.20%	0.20%	0.36%	0.02%
K60	**J1**	0.19%	0.33%	0.28%	0.26%	0.17%	0.25%	0.03%
K60	**J3**	0.25%	0.31%	0.26%	0.28%	0.18%	0.26%	0.07%
K60	**J6**	0.27%	0.39%	0.24%	0.18%	0.25%	0.27%	0.02%
K60	**J9**	0.16%	0.38%	0.42%	0.16%	0.25%	0.28%	-0.09%
K60	**J12**	0.07%	0.54%	0.42%	0.22%	0.16%	0.28%	-0.09%
K60	**J18**	0.15%	0.47%	0.46%	0.28%	0.16%	0.30%	-0.01%
K60	**J24**	0.16%	0.49%	0.52%	0.23%	0.18%	0.32%	-0.02%
K60	**J30**	0.14%	0.36%	0.63%	0.38%	0.21%	0.34%	-0.07%
K60	**J36**	0.05%	0.28%	0.76%	0.44%	0.33%	0.37%	-0.28%
Mean		0.28%	0.50%	0.46%	0.26%	0.19%	0.34%	0.09%

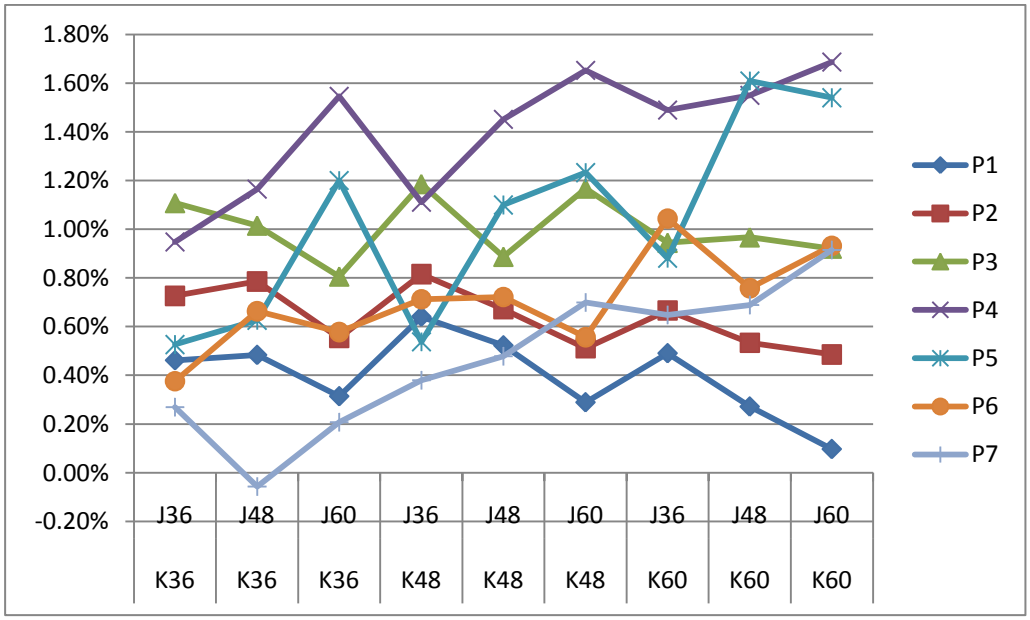
9.13 – Monthly average returns for Long term strategies, using overlapping periods and ranking the stocks into five portfolios. The time period considered is from 1999 to 2008.

Holding	Past	P1	P2	P3	P4	P5	Mean	P1-P5
K36	J36	0.53%	0.88%	0.91%	0.41%	0.33%	0.61%	0.21%
	J42	0.57%	0.96%	0.87%	0.56%	0.23%	0.64%	0.33%
	J48	0.52%	0.94%	1.08%	0.70%	0.11%	0.67%	0.41%
	J54	0.45%	0.78%	1.42%	0.74%	0.13%	0.70%	0.32%
	J60	0.35%	0.73%	1.36%	1.11%	0.18%	0.74%	0.17%
K42	J36	0.64%	0.93%	0.96%	0.49%	0.35%	0.67%	0.30%
	J42	0.63%	0.90%	1.02%	0.59%	0.43%	0.71%	0.20%
	J48	0.57%	0.79%	1.32%	0.76%	0.31%	0.75%	0.26%
	J54	0.40%	0.78%	1.52%	0.94%	0.30%	0.79%	0.11%
	J60	0.33%	0.85%	1.42%	1.17%	0.32%	0.82%	0.02%
K48	J36	0.69%	0.96%	1.06%	0.55%	0.51%	0.75%	0.18%
	J42	0.65%	0.85%	1.16%	0.64%	0.68%	0.80%	-0.03%
	J48	0.51%	0.74%	1.48%	0.93%	0.54%	0.84%	-0.03%
	J54	0.35%	0.82%	1.71%	0.95%	0.50%	0.86%	-0.14%
	J60	0.31%	0.88%	1.55%	1.12%	0.50%	0.87%	-0.20%
K54	J36	0.65%	0.88%	1.21%	0.67%	0.73%	0.83%	-0.07%
	J42	0.57%	0.72%	1.29%	0.92%	0.86%	0.87%	-0.29%
	J48	0.42%	0.66%	1.58%	1.14%	0.71%	0.90%	-0.29%
	J54	0.25%	0.81%	1.74%	1.07%	0.65%	0.91%	-0.40%
	J60	0.26%	0.79%	1.61%	1.23%	0.67%	0.91%	-0.42%
K60	J36	0.55%	0.73%	1.35%	0.90%	0.76%	0.86%	-0.20%
	J42	0.45%	0.63%	1.37%	1.19%	0.82%	0.89%	-0.36%
	J48	0.30%	0.65%	1.60%	1.24%	0.73%	0.90%	-0.43%
	J54	0.17%	0.72%	1.75%	1.21%	0.68%	0.91%	-0.52%
	J60	0.14%	0.70%	1.52%	1.49%	0.73%	0.92%	-0.58%
Mean		0.45%	0.80%	1.35%	0.91%	0.51%	0.81%	-0.06%

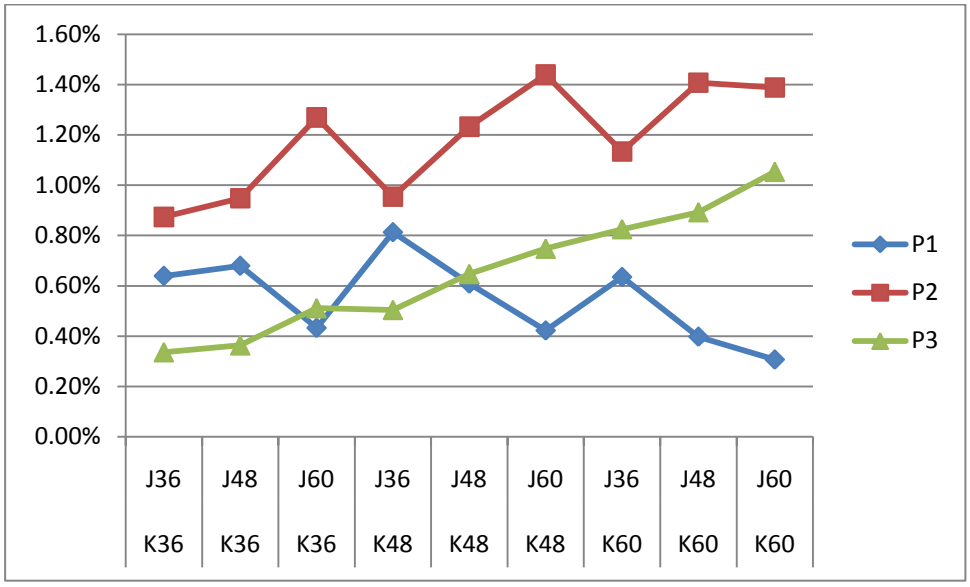
9.14 – Global monthly average returns from long term strategies from 1999 to 2008, sub-periods 1999-2003 and 2004-2008, and excluding the sub-prime effect from 2008 (1999-2007). It was used overlapping periods and the stocks were ranking into five portfolios.



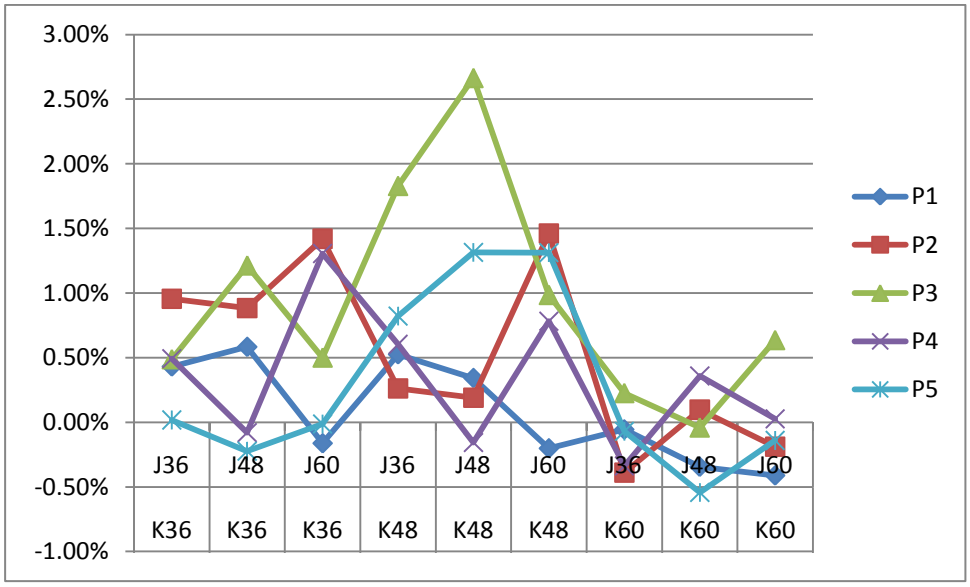
9.15 – Monthly average returns for the long-term from 1999 to 2008, for the seven portfolios, using overlapping periods. P1 and P7 are the portfolios composed by top winner stocks and top loser stocks, respectively.



9.16 – Monthly average returns for the long-term from 1999 to 2008, for the three portfolios, using overlapping periods. P1 and P3 are the portfolios composed by top winner stocks and top loser stocks, respectively.



9.17 – Monthly average returns for the long-term from 1999 to 2008, for the five portfolios, using non-overlapping periods. P1 and P5 are the portfolios composed by top winner stocks and top loser stocks, respectively.



9.18 – Statistic significance at the 95% confidence level (1997-2008). The table shows the statistic significance for the 90 reference strategies under analyses obtained with the overlapping method and the five portfolios.

Holding	Past	P1	P2	P3	P4	P5
K1	**J1**	0.09	0.11	0.03	0.04	0.01
K1	**J3**	0.15	0.11	0.00	-0.03	0.01
K1	**J6**	0.19	0.04	0.05	-0.03	-0.04
K1	**J9**	0.16	0.07	0.04	0.01	-0.03
K1	**J12**	0.09	0.13	0.06	-0.01	-0.03
K1	**J18**	0.10	0.10	0.06	-0.03	0.02
K1	**J24**	0.11	0.04	0.10	0.00	0.00
K1	**J30**	0.05	0.12	0.08	-0.02	0.02
K1	**J36**	0.05	0.13	0.05	-0.03	0.07
K3	**J1**	0.16	0.12	0.09	0.06	0.02
K3	**J3**	0.26	0.08	0.05	0.06	-0.05
K3	**J6**	0.23	0.13	0.07	0.02	-0.11
K3	**J9**	0.25	0.12	0.04	0.03	-0.08
K3	**J12**	0.17	0.15	0.13	-0.01	-0.09
K3	**J18**	0.17	0.11	0.12	-0.06	0.04
K3	**J24**	0.13	0.14	0.15	-0.04	0.00
K3	**J30**	0.06	0.18	0.14	-0.02	0.04
K3	**J36**	0.09	0.17	0.03	0.01	0.12
K6	**J1**	0.27	0.19	0.17	0.04	0.04
K6	**J3**	0.34	0.17	0.11	0.13	-0.10
K6	**J6**	0.32	0.22	0.11	0.08	-0.11
K6	**J9**	0.30	0.20	0.12	0.10	-0.10
K6	**J12**	0.22	0.20	0.18	0.10	-0.06
K6	**J18**	0.21	0.19	0.20	-0.01	0.08
K6	**J24**	0.13	0.24	0.24	0.06	0.02
K6	**J30**	0.11	0.24	0.20	0.00	0.15
K6	**J36**	0.15	0.23	0.15	0.01	0.18
K9	**J1**	0.32	0.26	0.21	0.12	0.05
K9	**J3**	0.40	0.24	0.17	0.18	-0.08
K9	**J6**	0.34	0.29	0.17	0.13	-0.10
K9	**J9**	0.28	0.31	0.18	0.16	-0.07
K9	**J12**	0.22	0.30	0.26	0.13	0.00
K9	**J18**	0.21	0.28	0.31	0.04	0.06
K9	**J24**	0.15	0.31	0.28	0.12	0.07
K9	**J30**	0.15	0.29	0.26	0.02	0.21
K9	**J36**	0.19	0.32	0.21	0.06	0.16
K12	**J1**	0.33	0.33	0.27	0.17	0.04
K12	**J3**	0.41	0.28	0.22	0.21	-0.05
K12	**J6**	0.32	0.35	0.23	0.18	-0.05
K12	**J9**	0.29	0.36	0.22	0.21	-0.01

K12	**J12**	0.23	0.37	0.29	0.17	0.06
K12	**J18**	0.21	0.31	0.36	0.16	0.08
K12	**J24**	0.16	0.35	0.32	0.16	0.14
K12	**J30**	0.18	0.34	0.30	0.10	0.19
K12	**J36**	0.23	0.35	0.24	0.13	0.19
K18	**J1**	0.39	0.33	0.31	0.26	0.11
K18	**J3**	0.42	0.37	0.25	0.24	0.04
K18	**J6**	0.35	0.43	0.32	0.17	0.07
K18	**J9**	0.28	0.45	0.36	0.24	0.08
K18	**J12**	0.20	0.48	0.41	0.25	0.09
K18	**J18**	0.21	0.40	0.37	0.24	0.21
K18	**J24**	0.19	0.44	0.33	0.22	0.25
K18	**J30**	0.23	0.40	0.35	0.20	0.23
K18	**J36**	0.27	0.39	0.34	0.23	0.20
K24	**J1**	0.40	0.40	0.36	0.32	0.21
K24	**J3**	0.40	0.44	0.33	0.34	0.11
K24	**J6**	0.34	0.49	0.39	0.29	0.18
K24	**J9**	0.26	0.48	0.43	0.35	0.20
K24	**J12**	0.21	0.48	0.47	0.35	0.23
K24	**J18**	0.24	0.44	0.41	0.26	0.34
K24	**J24**	0.20	0.48	0.47	0.21	0.31
K24	**J30**	0.27	0.40	0.46	0.26	0.29
K24	**J36**	0.28	0.45	0.43	0.29	0.29
K36	**J1**	0.40	0.44	0.45	0.42	0.34
K36	**J3**	0.44	0.44	0.41	0.42	0.30
K36	**J6**	0.38	0.47	0.44	0.37	0.32
K36	**J9**	0.31	0.52	0.48	0.38	0.28
K36	**J12**	0.30	0.54	0.49	0.39	0.28
K36	**J18**	0.30	0.49	0.51	0.42	0.37
K36	**J24**	0.29	0.49	0.55	0.40	0.30
K36	**J30**	0.29	0.48	0.55	0.40	0.27
K36	**J36**	0.31	0.50	0.53	0.35	0.33
K48	**J1**	0.35	0.44	0.40	0.35	0.29
K48	**J3**	0.39	0.41	0.39	0.37	0.23
K48	**J6**	0.38	0.48	0.38	0.32	0.28
K48	**J9**	0.33	0.46	0.46	0.35	0.26
K48	**J12**	0.27	0.47	0.51	0.39	0.23
K48	**J18**	0.31	0.48	0.51	0.41	0.25
K48	**J24**	0.30	0.48	0.59	0.34	0.20
K48	**J30**	0.30	0.48	0.58	0.38	0.18
K48	**J36**	0.27	0.44	0.60	0.40	0.29
K60	**J1**	0.40	0.45	0.45	0.47	0.32
K60	**J3**	0.42	0.49	0.48	0.45	0.29
K60	**J6**	0.40	0.54	0.47	0.34	0.39
K60	**J9**	0.31	0.55	0.61	0.36	0.39
K60	**J12**	0.23	0.61	0.60	0.47	0.32

K60	**J18**	0.29	0.52	0.64	0.53	0.34
K60	**J24**	0.29	0.51	0.79	0.48	0.30
K60	**J30**	0.26	0.42	0.89	0.53	0.33
K60	**J36**	0.18	0.42	0.77	0.62	0.45

9.19 – Monthly average returns on the short-term periods during 1997-2002 using five portfolios and overlapping periods.

Holding	Past	P1	P2	P3	P4	P5	Mean	P1-P5
K1	**J1**	0.80%	1.02%	0.49%	-0.38%	0.16%	0.42%	0.64%
K1	**J3**	0.94%	0.81%	0.31%	-0.51%	0.10%	0.33%	0.84%
K1	**J6**	1.29%	0.36%	0.45%	-0.16%	-0.55%	0.28%	1.83%
K1	**J9**	0.87%	0.40%	0.47%	0.07%	-0.27%	0.31%	1.14%
K1	**J12**	-0.01%	1.06%	0.64%	0.29%	-0.45%	0.31%	0.44%
K1	**J18**	0.67%	0.74%	0.31%	-0.05%	0.20%	0.37%	0.46%
K1	**J24**	0.96%	0.48%	0.62%	-0.06%	-0.19%	0.36%	1.15%
K1	**J30**	0.40%	1.23%	0.73%	-0.35%	0.00%	0.40%	0.40%
K1	**J36**	0.29%	1.11%	0.29%	0.45%	0.23%	0.48%	0.06%
K3	**J1**	0.77%	0.35%	0.39%	-0.01%	0.18%	0.34%	0.59%
K3	**J3**	0.83%	0.28%	0.11%	0.71%	-0.45%	0.30%	1.28%
K3	**J6**	0.73%	0.48%	0.34%	0.18%	-0.81%	0.18%	1.54%
K3	**J9**	0.76%	0.25%	0.24%	0.40%	-0.59%	0.21%	1.35%
K3	**J12**	0.36%	0.39%	0.92%	0.33%	-0.82%	0.24%	1.18%
K3	**J18**	0.64%	0.46%	0.52%	-0.20%	0.27%	0.34%	0.37%
K3	**J24**	0.40%	1.11%	0.62%	-0.29%	-0.33%	0.30%	0.73%
K3	**J30**	0.10%	1.09%	0.84%	-0.06%	-0.31%	0.33%	0.42%
K3	**J36**	0.20%	0.73%	0.16%	0.62%	0.40%	0.42%	-0.20%
K6	**J1**	0.75%	0.37%	0.52%	-0.22%	0.03%	0.29%	0.72%
K6	**J3**	0.72%	0.51%	0.03%	0.48%	-0.59%	0.23%	1.31%
K6	**J6**	0.45%	0.63%	0.21%	0.29%	-0.67%	0.18%	1.12%
K6	**J9**	0.46%	0.31%	0.34%	0.49%	-0.57%	0.21%	1.03%
K6	**J12**	0.18%	0.32%	0.68%	0.49%	-0.38%	0.26%	0.56%
K6	**J18**	0.39%	0.55%	0.69%	-0.16%	0.23%	0.34%	0.16%
K6	**J24**	0.05%	0.93%	0.84%	0.05%	-0.37%	0.30%	0.42%
K6	**J30**	0.27%	0.81%	0.54%	-0.01%	0.20%	0.36%	0.06%
K6	**J36**	0.30%	0.50%	0.66%	0.10%	0.58%	0.43%	-0.28%
K9	**J1**	0.37%	0.51%	0.38%	-0.01%	0.07%	0.26%	0.30%
K9	**J3**	0.49%	0.42%	0.11%	0.42%	-0.27%	0.24%	0.76%
K9	**J6**	0.10%	0.68%	0.39%	0.28%	-0.43%	0.20%	0.53%
K9	**J9**	-0.06%	0.67%	0.37%	0.47%	-0.23%	0.24%	0.17%
K9	**J12**	-0.15%	0.50%	0.86%	0.31%	-0.04%	0.30%	-0.11%
K9	**J18**	-0.04%	0.76%	1.04%	-0.09%	-0.07%	0.32%	0.03%
K9	**J24**	0.04%	0.78%	0.73%	0.29%	-0.32%	0.30%	0.36%

K9	**J30**	0.24%	0.46%	0.57%	0.11%	0.52%	0.38%	-0.28%
K9	**J36**	0.29%	0.60%	0.70%	0.10%	0.38%	0.41%	-0.09%
K12	**J1**	0.24%	0.56%	0.46%	0.16%	-0.25%	0.23%	0.49%
K12	**J3**	0.36%	0.41%	0.26%	0.33%	-0.30%	0.21%	0.66%
K12	**J6**	-0.20%	0.77%	0.48%	0.32%	-0.29%	0.22%	0.08%
K12	**J9**	-0.21%	0.69%	0.45%	0.47%	-0.09%	0.26%	-0.12%
K12	**J12**	-0.27%	0.67%	0.78%	0.24%	0.10%	0.30%	-0.36%
K12	**J18**	-0.10%	0.63%	0.91%	0.27%	-0.17%	0.31%	0.07%
K12	**J24**	0.05%	0.52%	0.75%	0.36%	-0.11%	0.31%	0.16%
K12	**J30**	0.29%	0.31%	0.83%	0.21%	0.23%	0.37%	0.05%
K12	**J36**	0.37%	0.44%	0.63%	0.36%	0.17%	0.39%	0.20%
Mean		0.36%	0.62%	0.53%	0.16%	-0.13%	0.31%	0.49%

9.20 – Monthly average returns on the medium-long term periods during 1997-2002 using five portfolios and overlapping periods.

Holding	**Past**	**P1**	**P2**	**P3**	**P4**	**P5**	**Mean**	**P1-P5**
K18	**J1**	-0.03%	0.11%	-0.01%	0.05%	-0.38%	-0.05%	0.35%
K18	**J3**	0.02%	0.15%	-0.06%	-0.06%	-0.27%	-0.04%	0.29%
K18	**J6**	-0.33%	0.35%	0.19%	-0.01%	-0.31%	-0.02%	-0.02%
K18	**J9**	-0.39%	0.32%	0.30%	0.00%	-0.21%	0.00%	-0.18%
K18	**J12**	-0.48%	0.44%	0.31%	0.12%	-0.28%	0.02%	-0.20%
K18	**J18**	-0.27%	0.23%	0.13%	0.22%	-0.15%	0.03%	-0.12%
K18	**J24**	-0.12%	0.14%	0.25%	0.01%	0.02%	0.06%	-0.14%
K18	**J30**	-0.03%	0.14%	0.48%	0.00%	-0.18%	0.08%	0.15%
K18	**J36**	0.01%	0.15%	0.32%	0.16%	-0.12%	0.10%	0.13%
K24	**J1**	-0.15%	-0.01%	-0.09%	-0.15%	-0.27%	-0.13%	0.12%
K24	**J3**	-0.26%	0.14%	-0.05%	-0.08%	-0.36%	-0.12%	0.10%
K24	**J6**	-0.47%	0.13%	0.10%	0.07%	-0.33%	-0.10%	-0.14%
K24	**J9**	-0.55%	0.10%	0.09%	0.09%	-0.16%	-0.09%	-0.39%
K24	**J12**	-0.53%	0.08%	0.10%	0.13%	-0.16%	-0.08%	-0.37%
K24	**J18**	-0.44%	0.10%	0.02%	-0.07%	0.07%	-0.06%	-0.51%
K24	**J24**	-0.38%	0.08%	0.40%	-0.26%	-0.16%	-0.06%	-0.23%
K24	**J30**	-0.39%	0.07%	0.33%	-0.06%	-0.16%	-0.04%	-0.23%
K24	**J36**	-0.35%	0.09%	0.19%	-0.01%	-0.08%	-0.03%	-0.27%
K36	**J1**	-0.11%	0.11%	0.11%	0.01%	0.17%	0.06%	-0.28%
K36	**J3**	-0.12%	0.06%	0.09%	0.10%	0.21%	0.07%	-0.33%
K36	**J6**	-0.18%	0.06%	0.16%	0.10%	0.21%	0.07%	-0.39%
K36	**J9**	-0.21%	0.14%	0.21%	0.09%	0.12%	0.07%	-0.34%
K36	**J12**	-0.17%	0.13%	0.20%	0.11%	0.04%	0.06%	-0.21%
K36	**J18**	-0.36%	0.20%	0.20%	0.08%	0.14%	0.05%	-0.50%
K36	**J24**	-0.27%	0.00%	0.41%	0.18%	-0.09%	0.04%	-0.18%
K36	**J30**	-0.31%	0.02%	0.28%	0.18%	-0.07%	0.02%	-0.24%
K36	**J36**	-0.32%	0.12%	0.19%	-0.01%	0.17%	0.03%	-0.49%
K48	**J1**	-0.28%	-0.06%	-0.15%	-0.29%	-0.09%	-0.17%	-0.19%

K48	**J3**	-0.29%	-0.12%	-0.16%	-0.15%	-0.17%	-0.18%	-0.12%
K48	**J6**	-0.36%	-0.22%	-0.11%	-0.15%	-0.05%	-0.18%	-0.31%
K48	**J9**	-0.38%	-0.23%	-0.06%	-0.21%	-0.05%	-0.19%	-0.32%
K48	**J12**	-0.36%	-0.24%	-0.03%	-0.10%	-0.27%	-0.20%	-0.08%
K48	**J18**	-0.38%	-0.30%	0.04%	-0.07%	-0.25%	-0.19%	-0.13%
K48	**J24**	-0.38%	-0.26%	0.20%	-0.25%	-0.29%	-0.20%	-0.09%
K48	**J30**	-0.59%	0.08%	0.25%	-0.44%	-0.27%	-0.19%	-0.33%
K48	**J36**	-0.59%	-0.07%	-0.08%	-0.22%	-0.10%	-0.21%	-0.49%
K60	**J1**	-0.13%	0.05%	0.01%	-0.18%	-0.13%	-0.07%	0.00%
K60	**J3**	-0.02%	-0.11%	-0.16%	0.02%	-0.09%	-0.07%	0.07%
K60	**J6**	-0.07%	-0.10%	-0.10%	-0.22%	0.18%	-0.06%	-0.25%
K60	**J9**	-0.18%	-0.05%	-0.22%	0.08%	0.05%	-0.06%	-0.22%
K60	**J12**	-0.12%	-0.22%	0.02%	0.18%	-0.24%	-0.07%	0.12%
K60	**J18**	-0.22%	-0.16%	0.23%	0.00%	-0.21%	-0.07%	-0.01%
K60	**J24**	-0.30%	-0.08%	0.49%	-0.36%	-0.22%	-0.09%	-0.08%
K60	**J30**	-0.49%	0.01%	0.61%	-0.34%	-0.17%	-0.08%	-0.32%
K60	**J36**	-0.53%	0.08%	-0.24%	0.44%	-0.04%	-0.06%	-0.49%
Mean		-0.29%	0.04%	0.12%	-0.03%	-0.11%	-0.05%	-0.17%

9.21 – Monthly average returns on the short-term periods during 2003-2008 using five portfolios and overlapping method.

Holding	**Past**	**P1**	**P2**	**P3**	**P4**	**P5**	**Mean**	**P1-P5**
K1	**J1**	0.52%	0.41%	-0.23%	0.90%	0.04%	0.33%	0.48%
K1	**J3**	1.32%	0.47%	-0.34%	0.12%	0.05%	0.32%	1.27%
K1	**J6**	1.59%	0.12%	0.08%	-0.16%	-0.12%	0.30%	1.72%
K1	**J9**	1.31%	0.37%	-0.04%	0.01%	-0.30%	0.27%	1.60%
K1	**J12**	1.23%	0.60%	0.06%	-0.45%	-0.11%	0.27%	1.34%
K1	**J18**	0.58%	0.41%	0.29%	-0.30%	0.15%	0.23%	0.43%
K1	**J24**	0.43%	-0.02%	0.55%	0.04%	0.18%	0.23%	0.25%
K1	**J30**	0.21%	0.40%	0.16%	0.12%	0.39%	0.26%	-0.18%
K1	**J36**	0.28%	0.56%	0.29%	-0.76%	0.86%	0.25%	-0.57%
K3	**J1**	0.83%	0.54%	0.39%	0.66%	-0.01%	0.48%	0.84%
K3	**J3**	1.69%	0.45%	0.23%	0.09%	-0.06%	0.48%	1.75%
K3	**J6**	1.62%	0.68%	0.23%	0.03%	-0.36%	0.44%	1.97%
K3	**J9**	1.68%	0.63%	0.09%	-0.03%	-0.27%	0.42%	1.95%
K3	**J12**	1.26%	0.75%	0.33%	-0.30%	-0.10%	0.39%	1.36%
K3	**J18**	0.94%	0.40%	0.51%	-0.16%	0.15%	0.37%	0.79%
K3	**J24**	0.68%	0.29%	0.46%	0.06%	0.33%	0.36%	0.35%
K3	**J30**	0.37%	0.48%	0.43%	-0.03%	0.75%	0.40%	-0.38%
K3	**J36**	0.62%	0.72%	0.11%	-0.43%	0.95%	0.39%	-0.33%
K6	**J1**	1.26%	0.84%	0.75%	0.54%	0.36%	0.75%	0.90%
K6	**J3**	1.79%	0.79%	0.63%	0.52%	-0.10%	0.73%	1.89%

K6	**J6**	1.88%	0.91%	0.55%	0.25%	-0.15%	0.69%	2.03%
K6	**J9**	1.75%	0.96%	0.41%	0.28%	-0.08%	0.66%	1.83%
K6	**J12**	1.42%	0.99%	0.52%	0.19%	0.05%	0.63%	1.37%
K6	**J18**	1.08%	0.70%	0.75%	0.19%	0.39%	0.62%	0.69%
K6	**J24**	0.69%	0.85%	0.63%	0.42%	0.47%	0.61%	0.21%
K6	**J30**	0.46%	0.85%	0.79%	0.09%	0.98%	0.63%	-0.52%
K6	**J36**	0.76%	1.04%	0.49%	0.04%	0.83%	0.63%	-0.07%
K9	**J1**	1.45%	1.05%	0.98%	0.78%	0.37%	0.92%	1.08%
K9	**J3**	1.98%	1.03%	0.92%	0.78%	-0.22%	0.90%	2.20%
K9	**J6**	1.98%	1.13%	0.69%	0.54%	-0.07%	0.85%	2.05%
K9	**J9**	1.74%	1.22%	0.62%	0.62%	-0.07%	0.83%	1.81%
K9	**J12**	1.43%	1.19%	0.79%	0.46%	0.13%	0.80%	1.30%
K9	**J18**	1.17%	0.91%	1.01%	0.36%	0.46%	0.78%	0.72%
K9	**J24**	0.73%	1.15%	0.85%	0.43%	0.76%	0.78%	-0.02%
K9	**J30**	0.65%	1.15%	1.09%	0.14%	0.95%	0.80%	-0.30%
K9	**J36**	0.85%	1.32%	0.77%	0.35%	0.70%	0.80%	0.15%
K12	**J1**	1.60%	1.19%	1.11%	0.90%	0.50%	1.06%	1.09%
K12	**J3**	2.03%	1.11%	0.98%	0.93%	0.06%	1.02%	1.97%
K12	**J6**	2.02%	1.26%	0.84%	0.65%	0.09%	0.97%	1.93%
K12	**J9**	1.76%	1.29%	0.79%	0.77%	0.13%	0.95%	1.63%
K12	**J12**	1.47%	1.25%	0.99%	0.56%	0.36%	0.93%	1.11%
K12	**J18**	1.12%	1.06%	1.20%	0.55%	0.57%	0.90%	0.55%
K12	**J24**	0.73%	1.33%	1.01%	0.58%	0.89%	0.91%	-0.16%
K12	**J30**	0.73%	1.47%	1.14%	0.39%	0.88%	0.92%	-0.15%
K12	**J36**	0.89%	1.53%	0.94%	0.39%	0.90%	0.93%	-0.01%
Mean		1.17%	0.84%	0.57%	0.27%	0.28%	0.63%	0.89%

9.22 – Monthly average returns on the medium-long term periods during 2003-2008 using five portfolios and overlapping periods.

Holding	**Past**	**P1**	**P2**	**P3**	**P4**	**P5**	**Mean**	**P1-P5**
K18	**J1**	1.85%	1.29%	1.35%	1.11%	0.70%	1.26%	1.15%
K18	**J3**	2.18%	1.44%	1.18%	1.04%	0.25%	1.22%	1.93%
K18	**J6**	1.97%	1.56%	1.14%	0.71%	0.46%	1.17%	1.51%
K18	**J9**	1.54%	1.58%	1.07%	1.06%	0.45%	1.14%	1.09%
K18	**J12**	1.18%	1.54%	1.46%	0.72%	0.66%	1.11%	0.51%
K18	**J18**	1.02%	1.46%	1.39%	0.68%	0.99%	1.11%	0.03%
K18	**J24**	0.85%	1.69%	1.22%	0.82%	1.00%	1.11%	-0.14%
K18	**J30**	0.98%	1.68%	1.25%	0.62%	1.14%	1.13%	-0.16%
K18	**J36**	1.13%	1.84%	1.13%	0.67%	0.96%	1.15%	0.17%
K24	**J1**	1.71%	1.44%	1.61%	1.48%	0.98%	1.44%	0.73%
K24	**J3**	1.94%	1.61%	1.36%	1.35%	0.67%	1.39%	1.27%
K24	**J6**	1.61%	1.79%	1.35%	0.88%	1.01%	1.33%	0.60%

K24	**J9**	1.32%	1.76%	1.30%	1.20%	0.96%	1.31%	0.36%
K24	**J12**	1.09%	1.80%	1.65%	0.74%	1.19%	1.29%	-0.10%
K24	**J18**	1.10%	1.83%	1.54%	0.77%	1.23%	1.29%	-0.14%
K24	**J24**	0.99%	1.88%	1.47%	0.86%	1.34%	1.31%	-0.35%
K24	**J30**	1.17%	1.77%	1.62%	0.71%	1.36%	1.33%	-0.19%
K24	**J36**	1.32%	1.96%	1.42%	0.75%	1.21%	1.33%	0.11%
K36	**J1**	1.47%	1.45%	1.89%	1.62%	1.11%	1.51%	0.36%
K36	**J3**	1.66%	1.57%	1.68%	1.51%	0.94%	1.47%	0.71%
K36	**J6**	1.57%	1.82%	1.62%	1.20%	1.05%	1.45%	0.52%
K36	**J9**	1.31%	1.94%	1.61%	1.49%	0.88%	1.45%	0.43%
K36	**J12**	1.20%	1.97%	2.01%	1.09%	0.92%	1.44%	0.28%
K36	**J18**	1.28%	1.72%	2.00%	1.39%	0.87%	1.45%	0.41%
K36	**J24**	1.23%	1.82%	1.98%	1.43%	0.92%	1.48%	0.31%
K36	**J30**	1.29%	2.20%	1.98%	1.03%	0.98%	1.50%	0.31%
K36	**J36**	1.47%	2.42%	1.96%	0.95%	0.84%	1.53%	0.63%
K48	**J1**	1.58%	1.40%	1.95%	1.61%	1.16%	1.54%	0.42%
K48	**J3**	1.76%	1.40%	1.82%	1.69%	1.01%	1.54%	0.75%
K48	**J6**	1.81%	1.76%	1.65%	1.41%	1.01%	1.53%	0.80%
K48	**J9**	1.34%	1.93%	1.70%	1.75%	0.96%	1.54%	0.37%
K48	**J12**	1.03%	1.92%	2.16%	1.30%	1.25%	1.53%	-0.22%
K48	**J18**	1.05%	1.87%	2.03%	1.72%	1.05%	1.55%	0.00%
K48	**J24**	1.23%	1.99%	2.06%	1.56%	1.01%	1.57%	0.22%
K48	**J30**	1.59%	2.36%	1.79%	1.22%	1.11%	1.61%	0.48%
K48	**J36**	1.57%	2.58%	1.97%	1.04%	1.23%	1.68%	0.34%
K60	**J1**	1.03%	0.85%	1.40%	1.19%	0.97%	1.09%	0.07%
K60	**J3**	0.83%	1.02%	1.22%	1.36%	1.04%	1.09%	-0.21%
K60	**J6**	0.89%	1.08%	1.05%	1.07%	1.37%	1.09%	-0.47%
K60	**J9**	0.67%	1.05%	1.31%	0.85%	1.58%	1.09%	-0.91%
K60	**J12**	0.42%	1.30%	1.41%	0.67%	1.64%	1.09%	-1.22%
K60	**J18**	0.59%	1.18%	1.36%	1.12%	1.28%	1.11%	-0.69%
K60	**J24**	1.06%	1.38%	1.03%	0.98%	1.28%	1.15%	-0.22%
K60	**J30**	1.33%	1.35%	1.17%	0.71%	1.44%	1.20%	-0.11%
K60	**J36**	1.17%	1.49%	1.31%	0.72%	1.78%	1.29%	-0.61%
Mean		1.30%	1.66%	1.55%	1.11%	1.05%	1.33%	0.25%

9.23 – Monthly average returns on the short term periods during 1997-2007 using five portfolios and overlapping periods.

Holding	**Past**	**P1**	**P2**	**P3**	**P4**	**P5**	**Mean**	**P1-P5**
K1	**J1**	1.30%	1.14%	0.61%	0.70%	0.36%	0.82%	0.94%
K1	**J3**	1.85%	1.05%	0.38%	0.18%	0.37%	0.77%	1.48%
K1	**J6**	1.98%	0.75%	0.68%	0.27%	-0.05%	0.73%	2.03%
K1	**J9**	1.54%	0.91%	0.71%	0.34%	0.13%	0.73%	1.41%

K1	**J12**	1.06%	1.37%	0.71%	0.34%	0.13%	0.72%	0.93%
K1	**J18**	1.11%	1.06%	0.80%	0.15%	0.56%	0.73%	0.54%
K1	**J24**	1.22%	0.76%	0.97%	0.32%	0.37%	0.73%	0.85%
K1	**J30**	0.73%	1.41%	0.83%	0.24%	0.56%	0.75%	0.16%
K1	**J36**	0.78%	1.42%	0.57%	0.28%	0.88%	0.79%	-0.10%
K3	**J1**	1.35%	0.80%	0.87%	0.71%	0.51%	0.85%	0.84%
K3	**J3**	1.78%	0.78%	0.60%	0.83%	0.12%	0.82%	1.65%
K3	**J6**	1.57%	1.07%	0.71%	0.52%	-0.18%	0.74%	1.74%
K3	**J9**	1.60%	0.90%	0.63%	0.54%	0.04%	0.74%	1.55%
K3	**J12**	1.19%	1.07%	1.04%	0.42%	-0.01%	0.74%	1.20%
K3	**J18**	1.25%	0.88%	0.95%	0.16%	0.69%	0.79%	0.56%
K3	**J24**	0.97%	1.16%	1.00%	0.27%	0.39%	0.76%	0.59%
K3	**J30**	0.66%	1.26%	1.06%	0.36%	0.53%	0.77%	0.13%
K3	**J36**	0.84%	1.23%	0.53%	0.47%	1.04%	0.82%	-0.21%
K6	**J1**	1.42%	0.92%	0.98%	0.51%	0.56%	0.88%	0.86%
K6	**J3**	1.65%	1.01%	0.64%	0.84%	0.03%	0.83%	1.62%
K6	**J6**	1.51%	1.18%	0.68%	0.59%	-0.04%	0.79%	1.55%
K6	**J9**	1.45%	1.05%	0.71%	0.67%	0.04%	0.78%	1.41%
K6	**J12**	1.15%	1.10%	0.96%	0.62%	0.17%	0.80%	0.98%
K6	**J18**	1.13%	1.00%	1.08%	0.30%	0.66%	0.84%	0.47%
K6	**J24**	0.78%	1.24%	1.09%	0.55%	0.35%	0.80%	0.43%
K6	**J30**	0.77%	1.20%	1.00%	0.35%	0.85%	0.83%	-0.08%
K6	**J36**	0.89%	1.19%	0.90%	0.32%	0.96%	0.85%	-0.06%
K9	**J1**	1.24%	1.01%	0.93%	0.64%	0.50%	0.86%	0.75%
K9	**J3**	1.50%	1.01%	0.77%	0.82%	0.08%	0.84%	1.42%
K9	**J6**	1.34%	1.19%	0.81%	0.61%	0.02%	0.79%	1.31%
K9	**J9**	1.15%	1.29%	0.75%	0.73%	0.11%	0.80%	1.04%
K9	**J12**	0.98%	1.18%	1.07%	0.60%	0.28%	0.82%	0.70%
K9	**J18**	0.93%	1.12%	1.28%	0.34%	0.45%	0.82%	0.48%
K9	**J24**	0.75%	1.25%	1.02%	0.59%	0.43%	0.81%	0.32%
K9	**J30**	0.82%	1.05%	1.06%	0.34%	0.95%	0.84%	-0.13%
K9	**J36**	0.88%	1.26%	0.95%	0.39%	0.75%	0.85%	0.13%
K12	**J1**	1.14%	1.06%	0.99%	0.68%	0.33%	0.84%	0.80%
K12	**J3**	1.42%	0.99%	0.78%	0.74%	0.13%	0.81%	1.29%
K12	**J6**	1.14%	1.24%	0.84%	0.64%	0.11%	0.79%	1.03%
K12	**J9**	1.05%	1.25%	0.81%	0.70%	0.22%	0.81%	0.83%
K12	**J12**	0.89%	1.22%	1.04%	0.51%	0.41%	0.82%	0.48%
K12	**J18**	0.83%	1.04%	1.22%	0.53%	0.41%	0.81%	0.42%
K12	**J24**	0.70%	1.12%	1.04%	0.64%	0.54%	0.81%	0.16%
K12	**J30**	0.82%	1.03%	1.09%	0.47%	0.73%	0.83%	0.09%
K12	**J36**	0.91%	1.13%	0.92%	0.48%	0.72%	0.83%	0.18%
Mean		1.16%	1.10%	0.87%	0.50%	0.38%	0.80%	0.77%

9.24 – Monthly average returns on the medium-long term periods during 1997-2007

Holding	Past	P1	P2	P3	P4	P5	Mean	P1-P5
K18	**J1**	0.98%	0.81%	0.76%	0.64%	0.35%	0.71%	0.63%
K18	**J3**	1.21%	0.87%	0.62%	0.54%	0.22%	0.69%	0.99%
K18	**J6**	0.98%	1.01%	0.71%	0.43%	0.29%	0.68%	0.68%
K18	**J9**	0.74%	1.04%	0.76%	0.53%	0.33%	0.68%	0.41%
K18	**J12**	0.53%	1.06%	0.94%	0.49%	0.36%	0.68%	0.17%
K18	**J18**	0.56%	0.87%	0.82%	0.54%	0.63%	0.68%	-0.07%
K18	**J24**	0.60%	0.84%	0.77%	0.57%	0.70%	0.69%	-0.10%
K18	**J30**	0.67%	0.83%	0.88%	0.42%	0.69%	0.70%	-0.02%
K18	**J36**	0.71%	0.92%	0.77%	0.56%	0.60%	0.71%	0.11%
K24	**J1**	0.74%	0.73%	0.69%	0.61%	0.45%	0.64%	0.29%
K24	**J3**	0.85%	0.78%	0.58%	0.59%	0.31%	0.62%	0.54%
K24	**J6**	0.60%	0.85%	0.63%	0.49%	0.46%	0.60%	0.14%
K24	**J9**	0.44%	0.85%	0.64%	0.57%	0.51%	0.60%	-0.07%
K24	**J12**	0.36%	0.85%	0.80%	0.44%	0.58%	0.61%	-0.22%
K24	**J18**	0.44%	0.80%	0.72%	0.40%	0.76%	0.62%	-0.32%
K24	**J24**	0.42%	0.78%	0.85%	0.34%	0.74%	0.63%	-0.32%
K24	**J30**	0.46%	0.74%	0.86%	0.41%	0.70%	0.63%	-0.23%
K24	**J36**	0.51%	0.85%	0.72%	0.44%	0.67%	0.64%	-0.16%
K36	**J1**	0.49%	0.59%	0.62%	0.53%	0.50%	0.55%	-0.01%
K36	**J3**	0.58%	0.58%	0.59%	0.56%	0.43%	0.55%	0.15%
K36	**J6**	0.55%	0.70%	0.60%	0.46%	0.44%	0.55%	0.11%
K36	**J9**	0.43%	0.77%	0.67%	0.55%	0.38%	0.56%	0.05%
K36	**J12**	0.40%	0.75%	0.82%	0.49%	0.35%	0.56%	0.05%
K36	**J18**	0.38%	0.67%	0.78%	0.61%	0.43%	0.57%	-0.05%
K36	**J24**	0.38%	0.66%	0.86%	0.60%	0.39%	0.58%	-0.01%
K36	**J30**	0.43%	0.82%	0.79%	0.44%	0.37%	0.57%	0.05%
K36	**J36**	0.46%	0.87%	0.80%	0.37%	0.43%	0.58%	0.02%
K48	**J1**	0.44%	0.49%	0.51%	0.42%	0.34%	0.44%	0.10%
K48	**J3**	0.54%	0.42%	0.44%	0.53%	0.30%	0.45%	0.24%
K48	**J6**	0.55%	0.49%	0.44%	0.39%	0.39%	0.45%	0.16%
K48	**J9**	0.38%	0.47%	0.59%	0.45%	0.42%	0.46%	-0.05%
K48	**J12**	0.27%	0.57%	0.62%	0.50%	0.40%	0.47%	-0.13%
K48	**J18**	0.34%	0.60%	0.61%	0.48%	0.40%	0.49%	-0.06%
K48	**J24**	0.38%	0.63%	0.70%	0.40%	0.36%	0.49%	0.02%
K48	**J30**	0.41%	0.71%	0.65%	0.43%	0.33%	0.51%	0.08%
K48	**J36**	0.32%	0.66%	0.77%	0.38%	0.50%	0.52%	-0.18%
K60	**J1**	0.24%	0.46%	0.30%	0.32%	0.24%	0.31%	0.00%
K60	**J3**	0.34%	0.38%	0.30%	0.31%	0.27%	0.32%	0.07%
K60	**J6**	0.35%	0.50%	0.29%	0.21%	0.30%	0.33%	0.05%
K60	**J9**	0.27%	0.48%	0.47%	0.24%	0.24%	0.34%	0.03%
K60	**J12**	0.20%	0.62%	0.46%	0.34%	0.13%	0.35%	0.08%
K60	**J18**	0.28%	0.56%	0.51%	0.35%	0.18%	0.37%	0.10%
K60	**J24**	0.21%	0.56%	0.63%	0.30%	0.22%	0.38%	0.00%

K60	**J30**	0.14%	0.41%	0.73%	0.52%	0.23%	0.41%	-0.09%
K60	**J36**	0.06%	0.27%	0.89%	0.62%	0.29%	0.42%	-0.22%
Mean		0.48%	0.69%	0.67%	0.46%	0.41%	0.54%	0.07%

9.25 - Returns calculation after accounting for costs of *K1-J6* for *P1* from the seven portfolios ranking, assuming 78% portfolio rotation.

7 Portfolios - K1-J6 (P1)								
Gross mean return (Kn Jm strategy)	1.56%	1.56%	1.56%	1.56%	1.56%	1.56%	1.56%	1.56%
Nr of stocks in each portfolio with rotation	7	7	7	7	7	7	7	7
Nr of stocks in each portfolio without rotation	2	2	2	2	2	2	2	2
Nr of stocks in each portfolio (total)	9	9	9	9	9	9	9	9
Amount to invest in each portfolio	1,000	4,924	5,000	10,000	50,000	88,664	100,000	1,000,000
Amount to invest in each stock	111	547	556	1,111	5,556	9,852	11,111	111,111
Buying transaction costs per stock	5.20	5.20	5.20	5.20	5.20	5.20	10.00	100.00
Amount to invest - Buying fee charged	106	542	550	1,106	5,550	9,846	11,101	111,011
Cash-flow generated per stock	108	550	559	1,123	5,637	10,000	11,274	112,743
Selling transaction costs per stock	5.20	5.20	5.20	5.20	5.20	5.20	10.15	101.47
Amount received per stock with rotation	102	545	554	1,118	5,632	9,995	11,264	112,641
Custody costs	3.43	3.43	3.43	3.43	3.43	3.43	3.43	3.43
Net Monthly Return Rate	-6.12%	**0.00%**	0.02%	0.79%	1.41%	**1.47%**	1.41%	1.42%

9.26 - Summary of main methods/strategies in the "Innovative Strategy" calculated

- 1. Overlapping Periods (without Capitalization)
  - 1.1- Follow the winners ("Só Sub" or "Só Subidas")
    - 1.1.1 – Jm = 30% and Js = 5%
    - 1.1.2 – Jm = 30% and Js = 10%
    - 1.1.3 – Jm = 40% and Js = 5%
    - 1.1.4 – Jm = 40% and Js = 10%
  - 1.2- Follow the winners or starters ("Só Sub ou NHD")
    - 1.2.1 – Jm = 30% and Js = 5%

1.2.2 – Jm = 30% and Js = 10%

1.2.3 – Jm = 40% and Js = 5%

1.2.4 – Jm = 40% and Js = 10%

- 2. Non-Overlapping Periods (without Capitalization)

2.1- Follow the winners ("Só Sub" or "Só Subidas")

2.1.1 – Jm = 30% and Js = 5%

2.1.2 – Jm = 30% and Js = 10%

2.1.3 – Jm = 40% and Js = 5%

2.1.4 – Jm = 40% and Js = 10%

2.2- Follow the winners or starters ("Só Sub ou NHD")

2.2.1 – Jm = 30% and Js = 5%

2.2.2 – Jm = 30% and Js = 10%

2.2.3 – Jm = 40% and Js = 5%

2.2.4 – Jm = 40% and Js = 10%

- 3. Overlapping Method with Capitalization

3.1- Follow the winners ("Só Sub" or "Só Subidas")

3.1.1 – Jm = 30% and Js = 5%

3.1.2 – Jm = 30% and Js = 10%

3.1.3 – Jm = 40% and Js = 5%

3.1.4 – Jm = 40% and Js = 10%

3.2- Follow the winners or starters ("Só Sub ou NHD")

3.2.1 – Jm = 30% and Js = 5%

3.2.2 – Jm = 30% and Js = 10%

3.2.3 – Jm = 40% and Js = 5%

3.2.4 – Jm = 40% and Js = 10%

- 4. Non-Overlapping Periods with Capitalization

4.1- Follow the winners ("Só Sub" or "Só Subidas")

4.1.1 – Jm = 30% and Js = 5%

4.1.2 – Jm = 30% and Js = 10%

4.1.3 – Jm = 40% and Js = 5%

4.1.4 – Jm = 40% and Js = 10%

4.2- Follow the winners or starters ("Só Sub ou NHD")

4.2.1 – Jm = 30% and Js = 5%

4.2.2 – Jm = 30% and Js = 10%

4.2.3 – Jm = 40% and Js = 5%

4.2.4 – Jm = 40% and Js = 10%

For each of the strategies defined above there are 60 possible holding periods (n), 35 possible past periods (m) and one past period (s):

n = from 1 month to 60 months

s = 1 month (the month preceding the holding period)

m = from 1 month to 35 months