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Finding Simple Strategies for High Returns

Value & Momentum

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Abstract

My objective throughout this paper is to provide useful insights to investors on simple ways to obtain high return focusing on Value & Momentum strategies applied to the US Market. Opposite from most existing literature, we were not able to prove the existence of both Price and Earnings Momentum. However, we see that past returns are explanatory of future for the same stock, as predicted by Moskowitz, Ooi and Pederson (2012). We observe that Value yield positive and abnormal returns, confirming past literature. Nonetheless, both strategies seem to be underperforming as they are not able to efficiently distinguish between true and false winners and losers. In order to solve this problem, I double sorted Value & Momentum using financial ratios and short-term trend indicators (acceleration indexes). For Momentum, generally, double sorting was either slightly or ineffective at all. For Value, double sorting improved returns suggesting that Price Earnings and Price to Cash-flow add complementary information to each other. After Accelerating Value & Momentum, we were able to establish the most profitable returns. However, the best possible risk-adjusted solution is the one proposed by Asness, Moskowitz & Pedersen (2013): an equal-weighted combination of returns.

Keywords: Value, Momentum, Earnings Momentum, Acceleration, Investment Strategies; Empirical Finance

Abstract

O objetivo principal deste *paper* é providenciar formas simples de obter retornos elevados focando em estratégias *Value & Momentum* aplicadas ao mercado Americano. Contrario à literatura existente, não pudemos provar a existência de *Price* e *Earnings Momentum*. Contudo, observamos que para a mesma Ação (Stock), retornos passados são indicadores relevantes de retornos futuros, tal como mencionado por Moskowitz, Ooi and Pederson (2012). Para além disso, podemos verificar que estratégias *Value* providenciam retornos anormais e positivos, confirmando os resultados de literatura existente. No entanto, ambas as estratégias *Value* e *Momentum* apresentam resultados aquém do esperado, uma vez que não são significativamente capazes de distinguir entre os verdadeiros e falsos *winners* e *losers.* De modo a resolver este problema, *Value* e *Momentum* foram filtrados duplamente utilizando rácios financeiros e indicadores de tendência de curto prazo (Índices de Aceleração). *Momentum* filtrado duas vezes por rácios financeiros, foi geralmente ineficiente. Por outro lado, para *Value*, pudemos observar que a dupla filtragem melhorou os resultados gerais, sugerindo que os rácios *Price-Earnings* e *Cash-Flow to Price* adicionam informação complementar um ao outro. Depois de acelerar *Value* e *Momentum,* fomos capazes de observar as estratégias com maior retorno. Contudo, a melhor solução ajustada ao risco é a mesma sugerida por Asness, Moskowitz & Pedersen (2013): uma combinação com pesos iguais de *Value* e *Momentum,* embora neste caso acelerados.

Palavras-chave: Value, Momentum, Earnings Momentum, Aceleração, Estratégias de Investimento; Empirical Finance

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Introduction & Methodology

Ever since its creation, stock markets have been having a growing importance on the economy. Many authors like Nelson (1976), Bodie (1976), Fama & Schwert (1977) claimed the existence of a negative correlation between stock returns and inflation, which is claimed by Fama (1981) to be negatively correlated to real activity[1]. The latter mentioned author also states the existence of a positive relation between stock returns and some other real variables: capital expenditure, real rate of return on capital and output (Fama (1981)) or even industrial production as proved by Domian & Louton (1997). Furthermore, according to Levine & Zervos (1998), stock market liquidity is a "robust predictor of real per capita gross domestic product (GDP) growth for more than 40 countries.

Sharpe (1964) and Lintner's (1965) Capital Asset Pricing Model (CAPM) marks the birth of asset pricing theory (Fama & French, 2004). According to the CAPM, the expected excess return of every security is proportional to its systematic risk (beta) with respect to the market portfolio. However, since shortly after it was published, research showed that the model empirically fails. Friend and Blume (1970) concluded that CAPM consistently overestimates the cost of equity for high beta stocks and underestimates for low ones. Also, other variables than Beta are proven to be positively correlated to stock returns, meaning that systematic risk is not the only factor useful to predict returns. Other ones have been proved valuable: Market Capitalization (Banz (1981)), leverage (Bhandari (1988)) and book-to-market ratio (Rosenberg et al. (1985), Chan, Hamao, and Lakonishok (1991)). Fama & French (1992) also mention that companies' size, book-to-market ratio, Earnings-Price or Dividend-price have a strong explanatory power over stock returns, while being low correlated to each other.
Most of these studies can be separated into two categories: **Value & Momentum**. Value strategies are supported by the fact that firms with low price-to-financials (Market to book, Price to Equity, Price to Cash-flow, …) are overvalued. Momentum strategies show that past stock performance is correlated to the futures'.

In fact, once we categorize these empirical studies one can realize that Momentum and value effects are some of the most studied capital market phenomena and yet still yielding positive abnormal returns. One of the most recent authors, Asness, Moskowitz & Pedersen (2013)

[1] Real Variables studied by Fama (1981) are mentioned below

showed that these methodologies are useful tools to predict returns on a global scale (U.S., U.K., Continental Europe and Japan and across different asset classes (individual stocks, equity index futures, government bonds, currencies and commodity futures). Bird, Ron and Whitaker (2004) also confirmed the predictive power of both strategies combined in major European markets, whereas Zhang, Brown, Yan Du and Rhee (2008) were not able to demonstrate Value effects in Asian markets.

Most times, Value and Momentum are studied separately and out of context. Therefore, the aim of this project is to extend and unify the analysis of phenomena, exposing connections between them and identifying the power of their combination to predict future stock performance. In order to keep a commonly known reference point, throughout this analysis results will be compared to the market returns.

Literature Review

A. Momentum Strategies

Momentum strategies are defined by Asness, Moskowitz & Pedersen (2013) as the "relationship between an asset's return and its recent relative performance in history".
Poterba & Summers (1988) and Fama & French (1988) prove that stock prices follow a mean reverting process in US markets, i.e. that there is a tendency for the price to return to its trend. Richards (1997), Balvers, Wu & Gilliland (2000) also prove this theory for international equity indexes. Therefore, it seems reasonable and intuitive to assume that if stocks provide high mid-term past performance, they will continue to do it in the future. However, Lo & Mckinlay (1988), Kim et. al (1991) argue that this phenomenon is not verified or only under certain conditions, respectively. Inclusively, Horne & Parker (1967) and Fama (1995) prove that stocks price variations are mostly independent from each other, meaning that they are not significantly predictable. The fact that Momentum's base assumptions do not seem to be clearly proved constitutes an argument in favor of studying this phenomenon.

Bird & Whitaker (2003) establish two different types of Momentum based on the different sources used to track relative performance and establish portfolio weights. Price Momentum theory states that historical stock market prices are a proxy for future returns while Earnings Momentum assumes that information provided by financial reports and/or analysts' forecasts can explain future returns on equity investments. Moskowitz, Ooi & Pedersen (2012) also mention a third form of Momentum based on each stock's time series instead focusing on the cross-sectional relative returns (Price and Earnings Momentum). They verified that across different markets and asset classes, each instrument's 12-month excess returns are positive predictors of its own future returns.

The history of the **Price Momentum** anomaly dates from 1993 with Jegadeesh & Titman (1993) who first proved that buying stocks with high returns and selling those with low ones yield positive and statistically significant results. Chan, Jegadeesh & Lakonishok (1996), Haugen & Baker (1996), Bird & Casavecchia (2007), Asness, Moskowitz & Pedersen (2013), among others, attested this phenomenon across different countries and asset classes such as U.S., U.K., Continental Europe and Japan, individual stocks, equity index futures, government bonds, currencies and commodity futures. Rouwenhorst (1998) also proves Price Momentum among 20 emerging market. However, others like Zhang et al (2008) were not

able to find the evidence of such effect in Asian markets. Some other authors also proved the success of Price Momentum under different circumstances: Bernard & Thomas (1989,1990) conclude that this type of investment strategy yield positive and significant abnormal returns even after controlling for post-earnings-announcement drift. The explanation of this phenomenon is still controversial. However, Conrad and Kaul (1998), Chordia and Shivakumar, (2002) state that it represents a compensation for the implicit increase in systematic risk when comparing to other strategies. De Long et al (1990) conclude that Price Momentum returns can be driven by investors' overreaction given the success of a certain asset. In another words, "trend-chasers" reinforce price movements, explaining the abnormal returns. Vayanos & Woolley (2013) by creating a model where Momentum depends on delegated management, shows that slow capital movement between investment funds can drive prices further from fundamentals causing future price reversals, explaining both value and Momentum. Thus, I expect that after applying this strategy, stocks with the highest (lowest) past returns, i.e. Momentum winners (losers), yield positive (negative) and significant future outcomes. This will lead to even better outcomes if we consider longing the winners and shorting the losers (spread portfolio).

Bird & Casavecchia (2007) claimed that Price Momentum returns can be enhanced using acceleration indexes. Not applying those can result into misleading conclusions as stocks with a positive or negative Momentum can have an upward, stabilizing or downward price trend. In another words, sole Momentum lacks the ability to sort between three types of stocks, according to the same authors: the first ones (Type One) are those which start performing soon after they were identified as winners) or losers, i.e., with high or low Value & Momentum, respectively. The second type (Type Two) includes stocks which only start suffering from a significant price variation towards a trend (up or downwards) in a mid-term range. The last ones (Type Three) are those which do never outperform (stable price returns) or have a price trend towards a different direction than the expected.

Distinguishing between these three types of assets will allow a better identification of both winners and losers (Type One), leading to potential higher spread portfolios – higher return for winners and lower for losers.

In order to solve this problem, we will try two different approaches: the first, using the acceleration indexes provided by Bird & Casavecchia (2007). Those are ratios between different time span Momentums, which allow determining the slope of the cumulated returns. I expect that after applied to Value & Momentum, high slopes (acceleration) imply higher

returns, then each of the phenomena on a stand-alone basis. On the other hand, low slopes should require lower returns than Value & Momentum alone.

Secondly, each Price Momentum portfolio will be sorted into others based on firm's financial ratios (Earnings Momentum). This will enable us to conclude whether past fundamental financial ratios[2], add or not any relevant information to the one absorbed by the market prices. It can also happen that Price Momentum's overall performance is negatively affected by Earnings Momentum. While ratios are released on a general basis within each three months, market prices are updated constantly with expectations and recent news[3] that can have a lagged impact on the company's financials. For that reason, one can expect Price Momentum's ability to explain future returns to decrease after double sorting by financial ratios. On the other hand, financial analysts are widely known amongst literature to overreact to information (De Bondt & Thaler (1985, 1987), Easterwood & Nutt (1998), Chopra, Lakonishok & Ritter (1992), Abarbanell & Bernard (1992), Lim (2001), …). As key financials represent pure firm conditions with low level of subjective opinions, from which stock prices calculations are derived, one can argue that firms that hold financially well in the present will perform well in the future. Concluding, accelerating and double sorting Momentum are my two hypotheses to distinguish Type One assets from the remaining and consequently obtain better results using a spread portfolio.

Several authors proved the existence of abnormal returns yielded by **Earnings Momentum**; According to Mao & Wei (2014), Ball & Brown (1968) were the first ones to mention this effect. However, there is a divergence on the methodology used. Most of them, such as Chan, Jegadeesh & Lakonishok (1996), Bird & Whitaker (2003), Mao & Wei (2014), among others estimate Earnings Momentum based on earnings' positive or negative surprise versus analyst consensus expectations. Using this approach, Griffin, Ji & Spencer (2003) proved the existence of earnings Momentum strategies across north and south American markets, most of European countries, some and Asian. Schneider & Gaunt (2012) stated the same conclusion for Australian equity markets.

Chan, Jegadeesh & Lakonishok (1996) claim that a possible explanation for Earnings Momentum approach's abnormal returns is the fact that it takes advantage of stock price delayed reactions to certain events. In other words, for good (bad) news, financials are already

2 Financial ratios and its respective analysis reason of application is explained below on Earnings Momentum
3 Note that we call news to any extra-ordinary event that may occur during the financial year that is publicly avaliable

high (lower) but stock prices are still lower (higher) than they should. Assuming market efficiency, stock prices will soon adjust to its fair value, driving undervalued prices to go up (winners) and overvalued to go down (losers) and consequently Earnings Momentum to yield a positive outcome. However, for this theory to be verified, one should expect a high correlation between Earnings and Price Momentum strategies, since Momentum exists due to stock prices' adaption to firms' financial reality.

On the other hand, the opposite situation can also happen: if market prices react immediately to released information and financial ratios do not, its explanatory power of future returns will decrease and Earnings Momentum will not likely yield positive and significant returns. In fact, Khotari & Warner (2005) claim that more than 500 papers have been published in top financial journals stating that stock prices significantly react to news. This means that financial ratios might not fully reflect future company reality as market prices. Therefore, adding market information to financial ratios is one of the reasons why Earnings Momentum will also be sorted by acceleration indexes. Also, even if Earnings Momentum portfolios are able to select stocks with future growth and decline, they fail to identify when it will happen. Similar to Price Momentum, exclusively based on Earnings Momentum it is difficult to distinguish between Type One, Two or Three assets. Therefore, acceleration might prove as useful as it is expected to Price Momentum: it is expected to enhance both winners' growing and losers' declining price trends, creating spread portfolios with even higher returns.

Despite occurring earlier in time and being updated more frequently than reported earnings, analysts' forecasts will not be used during the current study for two major reasons: (1) for some firms data is hard to obtain for a sample large enough to represent the analysts' consensus on a given price and (2) because one of this study's objectives is to conclude whether past/present information is better predictor of future stock prices than forward-looking one, such as an asset's market prices or analyst's forecasts. This changes a little the base hypotheses of Earnings Momentum. Instead of believing that firms with higher analyst recommendations or most number of earnings surprise outperform, we will try to prove if firms with highest (lowest) financial returns provide is the greatest and positive (lowest and negative) the future price returns.

Myers, Myers & Skinner (2007), followed our desired approach, proving that firms who present high levels of Earnings per Share (EPS) not only keep the trend on the forthcoming years but also show "abnormally strong market performances" during the same period. During

the current work, I will extend the previous author's methodology to other ratios, since I believe that one single indicator is not representative of the whole firm's condition. Thus, it is expected that sorting portfolios based on a combination of different financial ratios will yield better returns than each one solely, as I believe them to have complementary information. In my opinion, there are four critical areas which can affect a company's performance: Profitability (Earnings per Share - EPS), Liquidity (Current Ratio – current assets/current liabilities), Risk (Debt-to-equity – D/E) and Efficiency (Asset Turnover – Sales/Total Assets). The reason why we use ratios instead of sole financials (sales, earnings, assets or debt) is to control for size, as it might be argued that bigger companies provide higher financials but not necessary greater ratios and stock price returns. Fama & French (1995, 2012), for example, proved that smaller firms provide higher outcomes, stressing our need to control for this variable.

As mentioned before, my hypothesis is that firms with higher profitability, liquidity, risk or efficiency will yield positive and significant returns and firms which have a greater combination of those measurements will yield even higher. On the contrary, firms with the lowest levels of those measurements will provide negative and significant outcomes, leading to higher spread portfolios.

B. Value

According to Bird & Whitaker (2003), Value based strategies include investing on undervalued stocks (Value stocks) and selling those which are overly expensive, also called growth or glamour stocks. Previous authors such as Fama & French (1992, 2012), Lakonishok, Shleifer & Vishny (1994), Bird & Whitaker (2003), Bird & Casavecchia (2007), Asness, Moskowitz & Pedersen (2013), among others proved that on average higher returns are yielded by stocks with low levels of some price to fundamental value ratios such as: Price Earnings (P/E - Basu (1977), Jaffe, Keim, and Westerfield (1989), Chan, Hamao, and Lakonishok (1991), and Fama and French (1992)), book-to-market value of equity (B/M - Rosenberg, Reid, and Lanstein (1984), Asness, Moskowitz & Pedersen (2013), Fama & French (2012)) or price to Cash flow (P/CF - Chan, Hamao, and Lakonishok (1991)).

Asness, Moskowitz & Pedersen (2013) and Fama & French (2012) and other authors proved the existence of Value based strategies across international markets (U.S., U.K., Europe and

Asia Pacific[4]), through different industries (Moskowitz & Grinblatt (1999)) and asset classes, such as: government bonds (Asness, Moskowitz & Pedersen (2013)), currencies (Asness, Moskowitz & Pedersen (2013)), commodities (Erb & Harvey (2006)) and even international bond futures (Asness, Moskowitz & Pedersen (2013)).

The explanation why Value strategies yield abnormal returns still remains on controversial. However, most authors explained using behavioral arguments. Lakonishok, Shleifer & Vishny (1994) claim that investors tend to get "overly excited" regarding stocks with past high performance. This over-investment leads to a price inflation not reflected on the fundamentals to price ratio (glamour stocks). The same happens to assets with decreasing past returns, with which investors get "overly concerned", leading to an overall decrease in the investment and price to deflate (value stocks). As value strategies invest on low price to fundamentals, the counter-cycle investment leads to abnormal returns. Fama & French (1992) claim that value strategies bear high fundamental risk. Therefore proven abnormal returns are a compensation for bearing this risk.

Past literature focuses on one indicator to explain stocks' excess returns, either on PE, BM or P/CF. However, one can say that different indicators provide complementary information regarding a given firm. For example, Barbee, Mukherji & Rains (1996) proved that between 1971 to 1991 Sales to Price had a higher explanatory power over stock returns than Book-to-market. Therefore, when comparing to current literature, we will test if in fact this is true. In case it is, we expect that double sorting Earnings Momentum by two ratios will in general yield better (worse) returns for winners (losers) than one solely.

The fact that BM ratio is easy manipulable by accounting standards and its subjective principles cause problems in terms of comparability between firms, influencing our results and conclusions. Also, it was frequent to find negative BM ratios among our data sample, which had to be excluded, decreasing the overall sample size. Moreover, past literature focuses heavily on this ratio, decreasing the amount of added value by this paper. Therefore, during the current work, only the E/P and CF/P will be analyzed, following the approach used for Earnings Momentum – both an individual and combined analysis of the previously mentioned ratios.

[4] For Asness, Moskowitz & Pedersen (2013) Asia Pacific only includes Japan

We expect that firms with lowest price-to-fundamentals ratios yield the greatest, positive and significant returns while the ones with highest provide the smallest, negative and significant outcome. I also expect that firms with the best (worst) combination of both ratios provide better (worse) returns than single sorting winners (losers).

It is also worth mentioning that Value strategies carry a major drawback: similarly to both Price and Earnings Momentum, it allows the identification of future increases or decreases on stock prices based on reported and market information but it fails to identify when this growth/decline will happen. We can say that value strategies cannot separate stocks with short-term price variations (Type One) from the ones which will suffer a delayed change (Type Two) or a zero /opposite to what was expected price variation (Type Three). As Momentum provides the investor with the current direction of the stock price, one should expect that the combination between both strategies should result in a better outcome than each one standing alone, as confirmed by Asness, Moskowitz & Pedersen (2013) and Bird & Casavecchia (2007). In fact, during the current work, we provide a Value accelerated portfolio and an equal-weighted return analysis between those two strategies. Asness, Moskowitz & Pedersen (2013) stressed that these greater combined outcomes are caused by the expected high positive returns and the negative correlation between value and Momentum, which brings the portfolio much closer to the efficient frontier than the sole ones.

C. Final Remarks

Based on what was mentioned above, the current work adds value to current literature by (1) updating the sample used, since most past literature dates from a while ago; (2) Momentum is sorted by financial ratios to conclude whether they add or not information to stock prices and (3) both Earnings Momentum and Value are single and double sorted by different ratios in order to see if complementary information is provided by different ones.

This article will be organized as follow: Section I describes the sample and methodology and section II the empirical results of both value and Momentum separate and conjoint. Finally, section IV presents the major drawbacks from our analysis and the conclusions from my research.

I. *Data & Methodology*

On the following section I describe the data, sample and the methodology used to build our Value and Momentum portfolios.

I.I *The Sample*

Value and Momentum are obtained by using 571 randomly chosen stocks from the historical S&P 500 members obtained from Compustat. Given the different characteristics of the stocks included, I am able to build a more robust model and avoid having a biased and non-representative sample. Furthermore, the S&P 500 Index comprises very liquid stocks with high market-cap. This, according to Asness, Moskowitz & Pedersen (2013), drives to more conservative results, as Value and Momentum are larger among smaller and less liquid firms. Prices and ratios data were obtained from Bloomberg database. Also, as commonly practiced among current and past literature, we used monthly data in order to avoid possible speculating noises that can possibly be included on daily or weekly data. Furthermore, when comparing to daily or weekly, monthly data are known to be closer to normality, which is one of the necessary assumptions used for our performance measurements. In order to replicate the strategy for each past period, I use the time-corresponding members of the S&P 500 to each of the monthly rebalanced portfolios, avoiding survivorship bias.

Our sample time span goes from 1990 to 2015. When found relevant, I analyze our time period both globally and split into two similar ones (1990-2002 and 2002-2015) comprising events can contribute towards the broadness of our conclusions: economic growth period (1990-1999), the dot.com bubble burst (2000-2002), the Sub-prime crisis (2007-2009) and a post-crisis recovery (2010-2015).

For some specific assets, Momentum and/or value could not be calculated: assets which were removed (included) from an index within less than one year away from the lower (higher) time-span boundary (1990-1991 and 2014-2015) as well as those which took part of an index for less than 12 months. On those cases, the respective assets were removed from our sample.

Each of the analyzed strategies is monthly rebalanced since performing it more frequently would yield in substantially higher transaction costs. Less frequently rebalancing could result in less significant data since at most we could have 80 years of sample (12x lower than monthly).

Throughout this analysis, I benchmark the results to S&P 500, used as proxy for the market. The reason to choose this index was (1) because it comprises very liquid and diverse set of mostly American blue chip stocks. This leads me to avoid high divergences on the trading volume and price. Also, (2) it represents a diversified portfolio within different industries, dodging any possible bias towards a specific sector. Finally, (3) we used this index as proxy for the market because it is familiar to most investors. From now on, S&P 500 can be referred as market.

I.II Price Momentum

Price Momentum is obtained based on the past 12-months cumulative monthly returns excluding the most recent period on each computation. In this way, 1-month reversals related to liquidity and microstructure are avoided, as mentioned in Asness, Moskowitz & Pedersen (2013), Grinblatt and Moskowitz (2004), Boudoukh, Richardson, and Whitelaw (1994)). Then, for each month, stocks are ranked into three portfolios based on each asset's prior year price Momentum performance – PM3 (winners), PM2 and PM1 (losers). Within each portfolio, past literature uses equal (Bird & Casaveccia (2004)) or value weighting (Asness, Moskowitz & Pedersen (2013)). However, the former method gives no importance to stocks with higher or lower Momentum and value weighting, under this circumstances, assumes that bigger firms in terms of market cap provide higher returns, which is not entirely true, as seen above. From my point of view, as our objective is to capture the maximum return on stocks, more weight should be given to the ones with higher Momentum within PM3 and lower weight to the ones with lower Momentum within PM2. Equal weighting will only be used for PM2 as its stocks are considered to be the ones with a track record of providing the most stable returns among the sample. Therefore, to obtain portfolio returns within Value and Momentum strategies we use a Rank based approach where each stock is weighted proportionally to its respective portfolio rank:

$$Return_{Stock} = Return_{Stock} * \frac{Stock\ Rank}{\sum Portfolio\ Ranks}$$

I.II.I Acceleration Index

Bird & Casavecchia (2007) measured Acceleration indexes price trend as a ratio between different time span Momentums. As the "periodicity of upward movements tends to be much longer than for downward movements" (Bird & Casavecchia (2007)) the authors claim that to identify a growing and a decreasing trend one should use the 12-month over 24 price Momentum and the 3-month over 6, respectively.[5] According to their methodology, the long term Momentum ratio will be applied to the 50% of the sample with higher Momentum and a short term to the 50% lower price Momentum.

After, within each Price Momentum Portfolio (PM3, PM2 and PM1), we will sort by the Acceleration Index, into other three portfolios: A3 (the winners), A2, and A1 (the losers), resulting in a total of 9 (3x3) different sets of stocks.

I.III Earnings Momentum & Value

First, similarly to Price Momentum, Earnings Momentum will be sorted based on each firms' ratios, separately (EPS, Current Assets/Current liabilities, D/E, Sales/Total Assets, individually), as well as Value (B/M, P/E and CF/P). Therefore, for each ratio we will obtain a winner, mid performers and a loser portfolio. Opposite from Asness, Moskowitz & Pedersen (2013), ratios are not lagged, since most enterprises release quarterly reports and investors have access to the most current information. Then, for both strategies we provide a double sorting analysis: after the first sorting, I re-rank each portfolio into another three different portfolios, similar to what was used on the acceleration index. It could be said that the four analyzed areas (Liquidity, Profitability, Risk and Efficiency) are somehow complementary. Therefore, defining the firms with highest financial situation would require a triple or even a higher number of sorts. However, once a sample is divided into three different portfolios, each one contains 1/(3*n) , being n the number of sorts. In a given year and a sample of almost 600 stocks, under a triple sorting, a portfolio holds less than 25 assets, which is not representative of the whole market, nor are results. In the end, each individual sort (sole Value and Earnings

[5] The rationale behind these ratios is related to the number of positive and negative Momentum for a given stock, as mentioned Bird, R., & Casavecchia, L. (2007). Sentiment and Financial Health Indicators for Value and Growth Stocks: The European Experience. *The European Journal of Finance*, 769-793.

Momentum) will be combined with an acceleration index in order to conclude whether market prices add information to the ratios.

I also provide an equal weighted combination (50%-50%) of value and Momentum strategies where returns are calculated as follow:

$$50\% - 50\%\ Returns = 0.5 * Value\ Returns + 0.5 * Momentum\ Returns$$

I.IV Performance Measures

In order to select our performance measurements we used as most important criteria the ease of interpretation and familiarity to a regular investor. Therefore, for both Value & Momentum strategies, we calculate average annual Raw Returns, average annual Standard Deviation and Returns controlled by Standard Deviation, commonly known as Sharpe Ratio. We also compare our results to the markets' in two different ways. The first is by considering the above mentioned value and/or Momentum's performance measurements against the ones obtained by the market. The second is to regress returns provided by a given strategy versus the markets' and confirm if there is an alpha statistically significant and different from zero. Both average returns and alphas are tested for statistical significance given their high importance to our analysis. To do it, we use a t-distribution due to the ease of calculation, simplicity to interpret and general acquaintance. Moreover, it is still one of the most used distributions given the central limit theorem. In another words, for large samples, t-statistic assumes asymptotically a normal distribution, which is the closest to our monthly returns'. This allows us to easily calculate critical values from which the null hypothesis is rejected using the following formula:

$$t = \frac{\bar{x} - \mu}{\frac{\delta}{\sqrt{n}}}$$

Table 0 - Critical Values of T-Student Distribuition

Sample Number	Critical Values		
40	1,684	2,021	2,704
50	1,676	2,009	2,678
60	1,671	2,000	2,660
80	1,664	1,990	2,639
100	1,660	1,984	2,626
1000	1,646	1,962	2,581
Large (z)	1,645	1,960	2,576
Confidence Level	90%	95%	99%

Note that during the current work our conclusions are based on a 95% confidence level.

II. Empirical Results

The following part is dedicated to showing the obtained results and compare it to what would be expected given what was mentioned before.

II.I Price Momentum Analysis

Before presenting the results of accelerated Momentum or the double sorted, I first provide a stand-alone analysis to the results yielded by Momentum strategy. Table I, found on the page below, show rank-weighted raw returns, t-statistic, standard deviation and Sharpe Ratio for Momentum alone portfolios. Between 1990 and 2015 the S&P 500 provided a total statistically significant average return of 6.85% per year and a Sharpe Ratio of 0.47.

One can perceive that all Momentum portfolios (P3, P2 and P1) yield positive, statistically significant and above market significant average annual raw returns (8.60%, 8.38% and 8.91%, respectively). This only shows the existence of Time-series Momentum proved by Moskowitz, Ooi & Pedersen (2012) - independently from being high or low momentum, using past returns as investment criteria yield on average positive and significant returns.
This positive abnormal return when comparing to the market is not captured by the alphas, which by not being significant cannot show whether our portfolios are able to reject a null hypothesis of average annual abnormal returns equal to zero. In terms of risk adjusted results, we see that only P3 and P2 hold Sharpe Ratios above the market. Another particularity of Momentum is the fact that the provided portfolios seem to be highly correlated with the market (Graph I). This is not surprising given that our sample comprises stocks from S&P 500, which is also our proxy for the market.
The P3-P1 portfolio represents the investment strategy of a long position on P3 and a short on P1. Contradictory to past literature, we observe Momentum's inexistence, i.e., despite high Momentum (PM3) stocks deliver a positive returns, low Momentum (PM1) does not imply a negative outcome, as it would be expectable by underperforming stocks. We even observe that losers (PM1) outperform winners (PM3) in terms of raw returns. However, once controlled for risk, we observe that Sharpe Ratios from P3 stocks outperform P1, reaching

values of 0.61 and 0.49, respectively. This means that on a risk adjusted basis, we can claim the existence of Price Momentum.

The conclusions obtained above seem to be valid historically. We verify positive, significant and above average and market cumulated returns within the two analyzed periods. Average annual returns provided by P3-P1 continue to be negative and statistically significant, claiming the inexistence of Momentum for this category. Out of the historical analysis, there are also two factors that should be mentioned: financial crisis (2000 and 2008) are highly visible on all portfolios and within our sample mostly due to the high correlation between the portfolios and the market. The second fact is that between 2003 and 2015, Sharpe Ratios have decreased significantly both in our portfolios and the market, despite reaching similar cumulated returns in both periods. The average return has fallen while on a general basis, volatility has increased. Taking a closer look, we observe that
between 1990 and 2000 the US was characterized by an economic prosperity with a constantly increasing GDP, number of jobs and low inflation. Between 1990 and 2003, there was only one crisis which stroke late in 2002/2003. Therefore, the second period, comprised between 2003 and 2015, includes the main effects of the dot.com bubble bust and the 2009 financial crisis which severely decreased returns and increased the total volatility within the stock markets.

I.I.I Momentum sorted by fundamental ratios

In order to pursue a broader analysis, I also sorted Price Momentum portfolios based on Earnings Momentum. In another words, we re-ranked PM3 (winners), PM2 and PM1 (losers) into other three portfolios for each of the Earnings Momentum ratios - EPS, Current Assets/Current Liabilities, D/E, Sales/Total Assets, representing different ways of evaluating a firm's condition: profitability, liquidity, risk and efficiency. As it was mentioned before, Momentum strategies fail to identify three different types of stocks: the ones with immediate price variation (Type One), those with delayed (Type Two) and the ones which will present a different than expected or a close to zero growth/decline (Type Three). By using fundamental ratios, our objective is to conclude whether they can serve as criteria to sort between the first and the remaining types.

Table I, II and III: Momentum Portfolio Performance

Chart I: Cumulative Returns to Price Momentum Portfolios

Table I, II and III & Chart I, II and III - Tables report for stand-alone Momentum, average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns. Chart I provides the cumulated returns for each portfolio compared to the market. Table and Charts II and III/ provide the same analysis split into two different periods.

	Price Momentum Analysis				Market
	P3	P2	P1	P3-P1	SPX
Mean (%)	8,60	8,38	8,91	-0,31	6,85
(t-stat)	10,57	10,57	10,57	10,57	8,11
St. Dev	14,04	14,24	18,09	12,44	14,57
Sharpe Ratio	0,61	0,59	0,49	-0,02	0,47
Alpha	2,84	2,43	1,59	1,24	-
(t-stat)	1,82	1,77	0,83	0,50	-

2003 - 2015

	P3	P2	P1	P3-P1	SPX
Mean (%)	7,14	7,06	7,06	0,07	4,12
(t-stat)	6,35	5,97	4,71	0,07	3,61
St. Dev	14,56	15,32	19,42	12,37	14,81
Sharpe Ratio	0,49	0,46	0,36	0,01	0,28
Alpha	3,65	3,65	3,65	3,65	
(t-stat)	1,90	2,50	1,09	0,53	

1990 - 2002

	P3	P2	P1	P3-P1	SPX
Mean (%)	10,51	10,09	11,30	-0,80	10,40
(t-stat)	8,35	8,84	7,84	-0,72	8,35
St. Dev	14,34	13,02	16,44	12,60	14,20
Sharpe Ratio	0,73	0,78	0,69	-0,06	0,73
Alpha	1,90	2,76	2,47	-0,55	
(t-stat)	0,73	1,05	0,70	-0,14	

Graph I - Cumulative returns to Price Momentum portfolios from 1990 to 2015, compared to the market

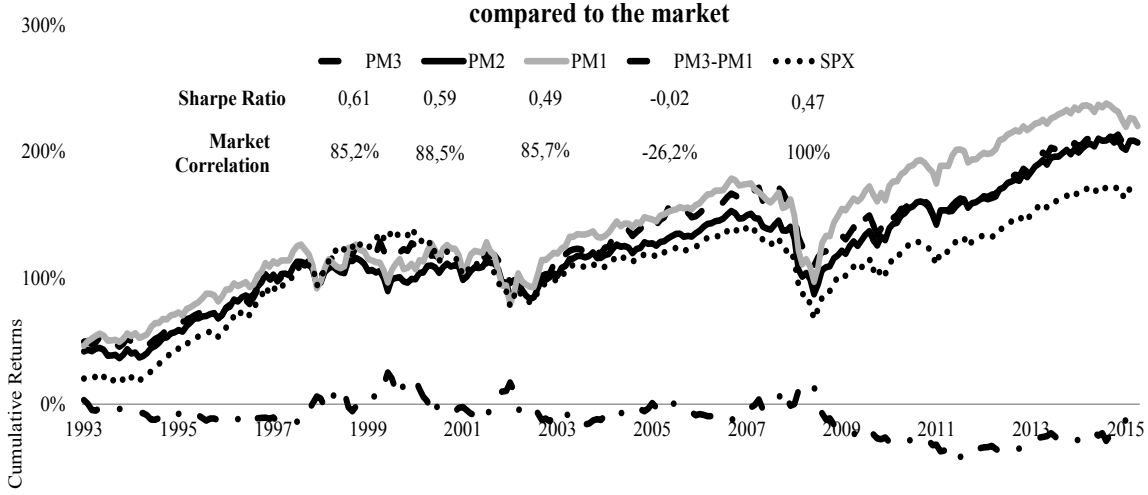
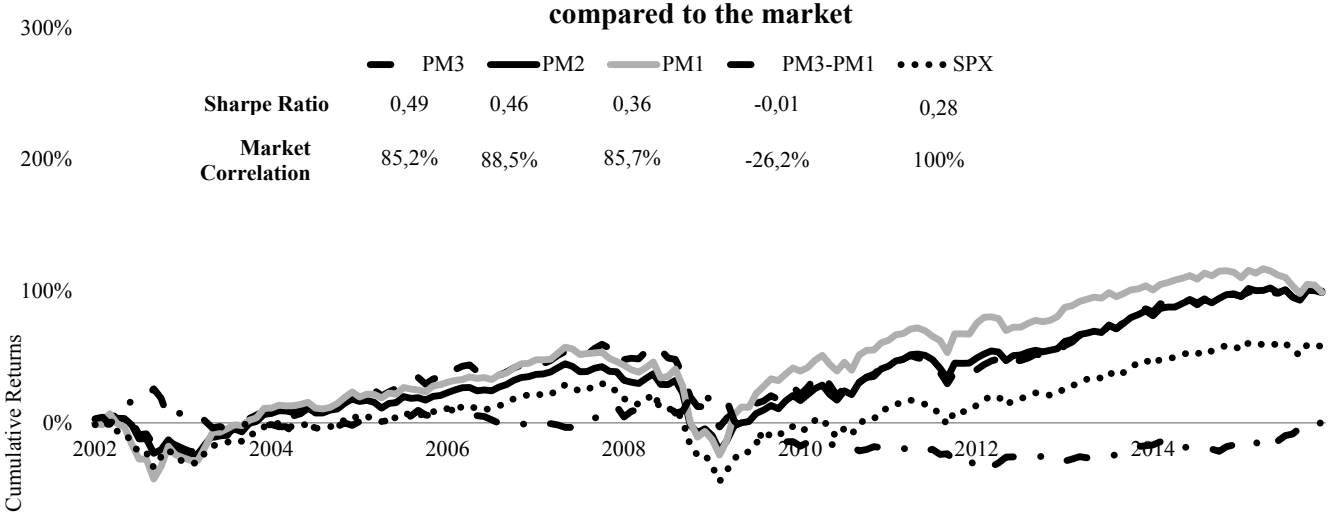


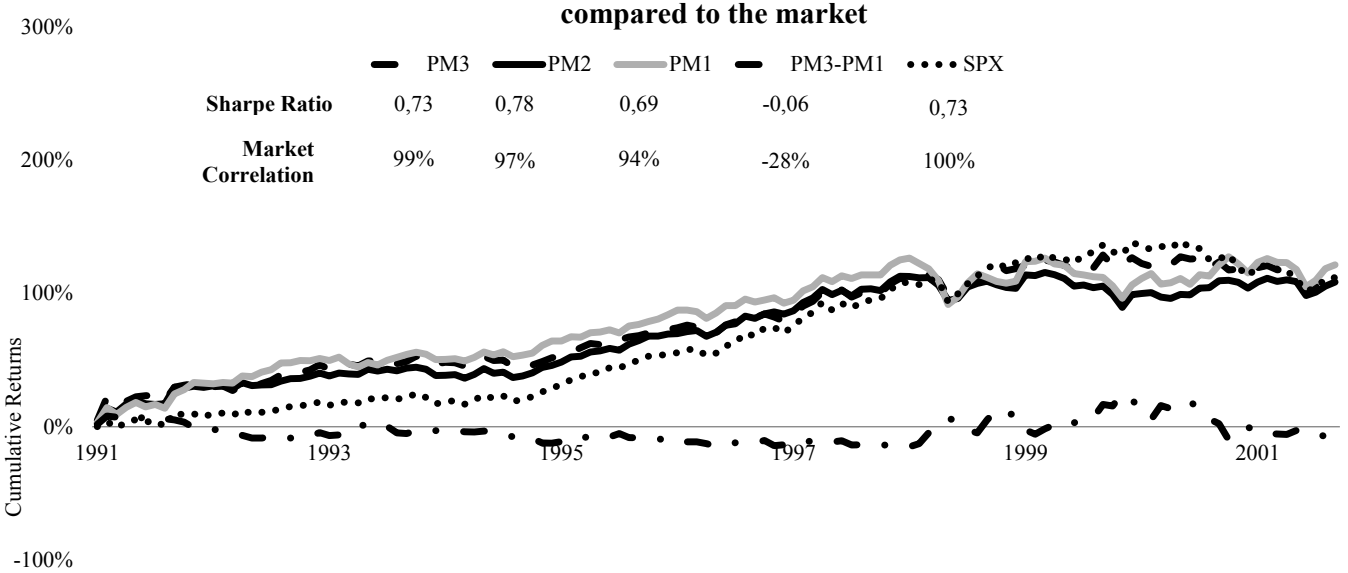
Chart II and III: Cumulative Returns to Historical Price Momentum Portfolios

Charts II and III - Charts II and III/ provide the cumulative returns to Momentum Portfolios split into two periods: 1990-2002 and 2003-2015.

Graph II - Cumulative returns to Price Momentum portfolios from 2002 to 2015, compared to the market



Graph III - Cumulative returns to Price Momentum portfolios from 1990 to 2002, compared to the market



Therefore, we expect that for a given sole Momentum portfolio (PM3, 2 or 1), firms with high financials will outperform both the lower ones and sole Momentum. Firms with low financials as they include type 2 and 3 stocks are expected to have a lower performance than sole Momentum. If what as mentioned above occurs, the best strategy to apply is the difference between true winners and true losers (both Type One stocks).

After double sorting, generally speaking, the four analyzed ratios lead to different results.
Double sorting by the Current Ratio, for all the three sole Momentum portfolios (PM3, PM2 and PM1), resulted in a decrease in average raw returns of firms with high financial ratios (CR3). We also observe a general stabilization of the same performance measurement for companies with mid (CR2) and low financials (CR1). As volatility stayed similar to sole Momentum's, Sharpe Ratios decreased for high financials (CR3) and remained between 0.4 and 0.60 for CR2 and CR1. This states the previous hypothesis that Current ratios are outdated by market information, as it decreases the overall sole Momentum performance.

Debt to Equity double sorting led to generally stable results when comparing to sole Momentum. Average Raw Returns kept between 8 and 9%. The slight increase in volatility to levels around 20%, led sometimes to small drops on Sharpe ratios. In light of what was mentioned above, we can say that the cause of these results might a positive correspondence of the information provided by the ratio and held by the market.
Therefore, we are able to conclude that both Current Ratio and Debt to Equity are not suitable criteria to solve our sole Momentum problem of distinguishing between the three types of stocks

Neither Earnings per Share seems to be, as we observe a negative spread portfolio for winners (EPS3). The same conclusions can be drawn, when comparing to the previous Debt to Equity ratio: despite a slight average return, its variation is followed by volatility, meaning that Sharpe Ratios will be kept the same. Therefore, this ratio also provides little information comparing to the one held by the market, overall performance kept stable after double sorting.

Table IV: Momentum Portfolio Performance double sorted by Asset Turnover, Earnings per Share, Current Ratio & Debt to Equity

Table reports for the performance of Momentum portfolios re-ranked based on each stock's fundamental ratios. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns.

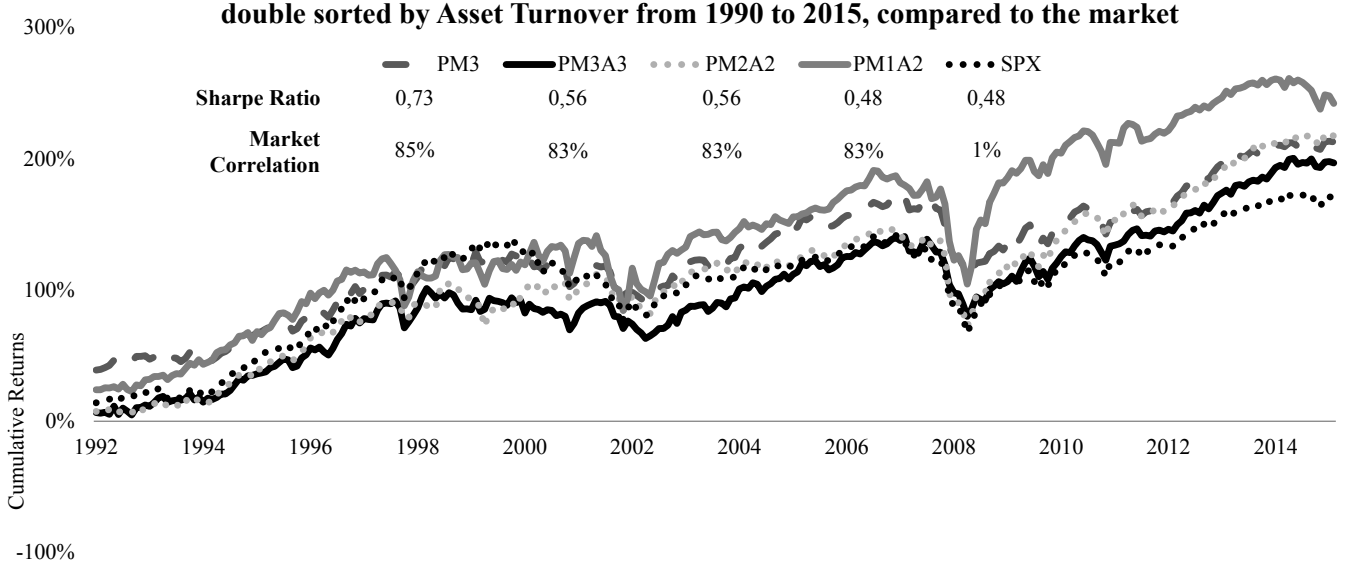
	Price Momentum sorted by Current Ratio (CR)				Price Momentum sorted by Debt to Equity (DtoE)				Market
PM3	CR3	CR2	CR1	CR3-CR1	DtoE3	DtoE2	DtoE1	DtoE3-DtoE1	SPX
Mean (%)	4,80	9,67	8,53	-3,73	7,64	7,43	7,78	-0,14	6,94
(t-stat)	4,72	11,57	10,56	-5,30	9,72	8,90	8,05	-0,22	8,18
St. Dev	17,24	14,19	13,71	11,95	13,34	14,16	16,39	10,74	14,61
Sharpe Ratio	0,28	0,68	0,62	-0,31	0,57	0,52	0,47	-0,01	0,48
Alpha	-1,91	4,46	3,97	-5,67	3,03	2,19	1,56	1,45	
(t-stat)	-0,94	2,49	1,86	-2,33	1,59	1,26	0,91	0,55	
PM2									
Mean (%)	4,54	8,88	8,78	-4,24	7,76	8,68	7,62	0,14	
(t-stat)	4,49	9,96	11,44	-6,88	9,49	10,02	8,07	0,27	
St. Dev	17,15	15,13	13,02	10,46	13,88	14,70	16,04	8,73	
Sharpe Ratio	0,26	0,59	0,67	-0,41	0,56	0,59	0,48	0,02	
Alpha	-2,26	2,98	4,12	-6,15	2,82	2,98	1,33	1,48	
(t-stat)	-1,30	1,60	2,58	-3,36	1,65	1,80	0,65	1,09	
PM1									
Mean (%)	7,31	7,17	8,64	-1,33	7,73	6,84	8,83	-1,10	
(t-stat)	5,24	5,74	7,10	-1,45	6,15	5,55	6,84	-1,34	
St. Dev	23,67	21,20	20,65	15,48	21,33	20,92	21,93	14,00	
Sharpe Ratio	0,31	0,34	0,42	-0,09	0,36	0,33	0,40	-0,08	
Alpha	-1,43	-0,76	1,27	-2,67	-0,03	-0,47	0,57	-0,60	
(t-stat)	-0,61	-0,46	0,31	-0,81	-0,18	-0,38	0,18	-0,33	

	Price Momentum sorted by Asset Turnover (AT)				Price Momentum sorted by Earnings Per Share (EPS)			
PM3	AT3	AT2	AT1	AT3-AT1	EPS3	EPS2	EPS1	EPS2-EPS1
Mean (%)	8,20	7,69	7,91	0,29	6,27	7,63	8,78	-2,51
(t-stat)	9,52	8,56	9,13	0,51	7,19	9,42	9,53	-4,27
St. Dev	14,61	15,25	14,70	9,57	14,80	13,74	15,64	9,99
Sharpe Ratio	0,56	0,50	0,54	0,03	0,42	0,55	0,56	-0,25
Alpha	2,73	1,80	2,67	0,06	1,10	2,46	2,80	-1,66
(t-stat)	1,76	0,98	1,12	0,49	0,66	1,38	1,66	-0,78
PM2								
Mean (%)	6,99	9,05	5,98	1,01	7,59	8,81	7,39	0,20
(t-stat)	7,93	9,56	6,92	1,97	9,11	10,58	7,70	0,41
St. Dev	14,95	16,07	14,67	8,68	14,13	14,13	16,28	8,37
Sharpe Ratio	0,47	0,56	0,41	0,12	0,54	0,62	0,45	0,02
Alpha	1,12	2,92	0,33	0,78	2,20	3,36	1,09	1,10
(t-stat)	0,83	1,47	0,17	0,58	1,46	2,19	0,51	0,85
PM1								
Mean (%)	8,22	10,09	4,95	3,27	10,85	8,95	6,58	4,27
(t-stat)	6,70	8,13	3,91	4,91	10,25	7,22	4,67	5,88
St. Dev	20,81	21,07	21,51	11,30	17,97	21,05	23,92	12,35
Sharpe Ratio	0,40	0,48	0,23	0,29	0,60	0,43	0,27	0,35
Alpha	0,38	2,06	-2,74	3,20	4,33	0,87	-2,36	6,83
(t-stat)	0,15	0,64	-1,20	1,57	1,86	0,25	-1,12	3,16

Chart IV, V and VI: **Momentum Portfolio Performance double sorted by Asset Turnover, Earnings per Share, Current Ratio & Debt to Equity**

Charts report for the cumulated returns to top performers of price Momentum portfolios double sorted by Asset Turnover (AT), Earnings per Share (EPS), Current Ratio (CR) or Debt to Equity ratio (DtoE).

Graph IV - Cumulative returns to top performers of Price Momentum portfolios double sorted by Asset Turnover from 1990 to 2015, compared to the market



Graph V - Cumulative returns to top performers of Price Momentum portfolios double sorted by Earnings Per Share from 1990 to 2015, compared to the market

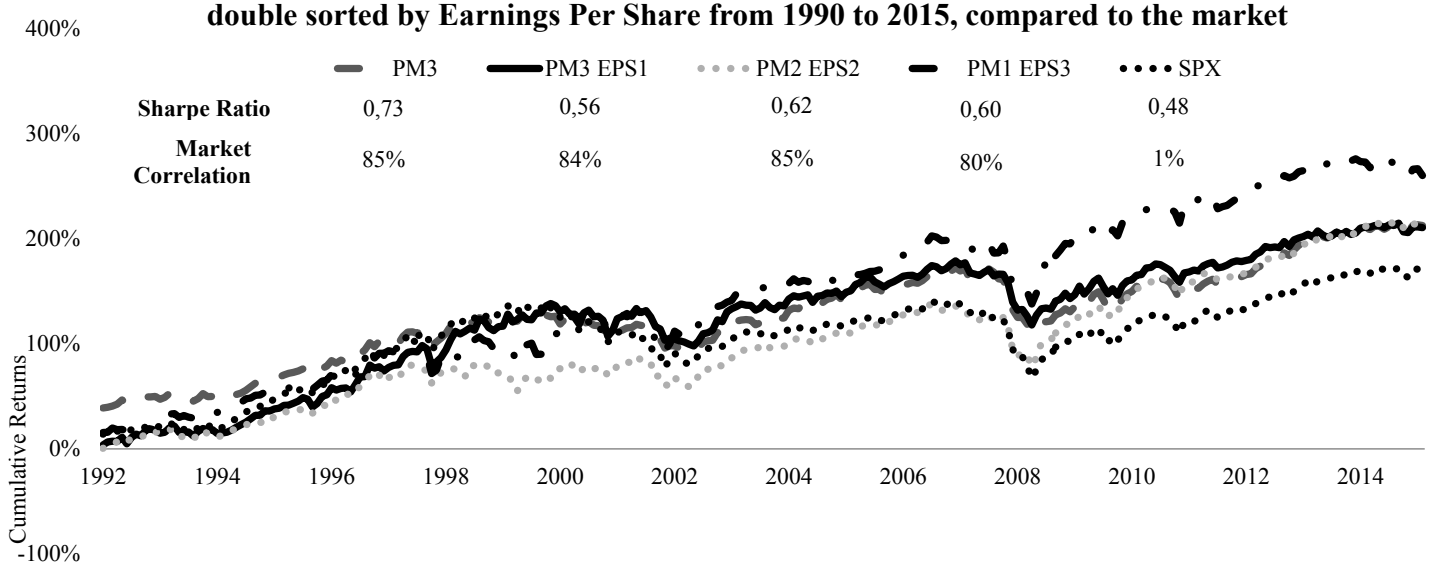
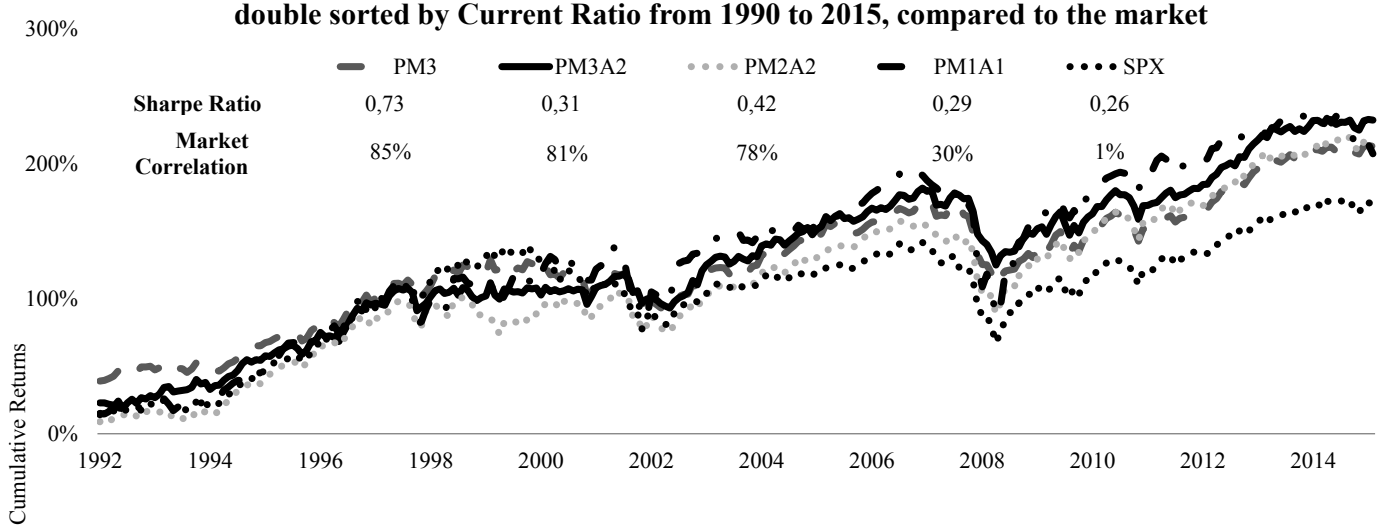


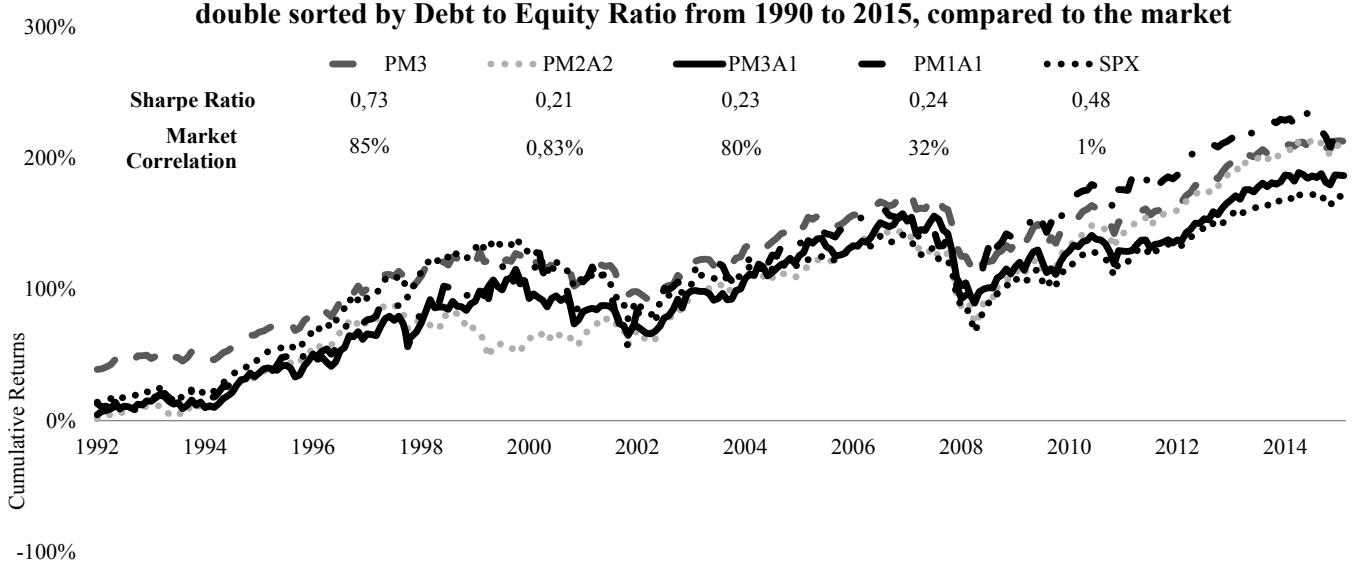
Chart IV, V and VI: Momentum Portfolio Performance double sorted by Asset Turnover, Earnings per Share, Current Ratio & Debt to Equity

Charts report for the cumulated returns to top performers of price Momentum portfolios double sorted by Asset Turnover (AT), Earnings per Share (EPS), Current Ratio (CR) or Debt to Equity ratio (DtoE).

Graph VI - Cumulative returns to top performers of Price Momentum portfolios double sorted by Current Ratio from 1990 to 2015, compared to the market



Graph VII - Cumulative returns to top performers of Price Momentum portfolios double sorted by Debt to Equity Ratio from 1990 to 2015, compared to the market



Regarding average raw returns, Momentum combined with Asset Turnover generated heterogeneous conclusions among the different Price Momentum portfolios (PM3, 2 and 1), when comparing to sole Momentums'. Our expected results were partially verified after double sorting for Asset Turnover ratio; instead of increasing returns for high AT (AT3) they remained fairly stable; meaning that for those stocks AT adds no extra value to Momentum. However, for mid performers (PM2) and Price Momentum losers (PM1) portfolios with low AT (AT1s) decreased its performance, leading to positive spread portfolios (PMx AT3 – PMx AT1). This takes us to conclude that AT seems to be a positive but weak identifier of firms which will have future decreasing revenues (overvalued stocks), delayed or stabilizing price reactions for Price Momentum losers and Mid Performers.

The same conclusions can be drawn if we split or time frame into two: 1990-2002 and 2003-2015 (Table IV.I and VI.II, respectively on appendix[6])

II.I.II Accelerated Momentum

Following Bird & Casavecchia (2007)'s methodology, stocks were double sorted according to its recent Momentum's growth rate – last 3 months versus 12 or 12 over 24, depending if the stock has a high or low Momentum. Results are available on table III and chart VII. I expected that within each sole Momentum portfolio, firms with high acceleration (A3) provide higher returns than lower ones (A1) and sole Momentum. In this way, we expect to be able to isolate true winners (Type One) on A3 and the remaining (Type Two and Three) on the remaining portfolios (A2 and A1). True losers should be isolated in A1 portfolios, as they seem to provide low returns with low short-term trend. Therefore, if the acceleration phenomenon is verified, PM3 A3 – PM1 A1 (true winners – true losers) will be the best combination.

In fact, that is what we observe for high and mid Momentum stocks (PM3 and PM2). Average annual returns increased for accelerated winners (A3) to above 27% while losers (A3) provide negative up to 15% p.a. Therefore, best case scenario, if we long A3 and short A1 stocks (spread portfolio) for Price Momentum winners (PM3), we obtain a higher return (on average 40% p.a.) and Sharpe ratio (2.26) than any individual strategy, sole Momentum and the

[6] Cumulative charts of the best performing portfolios can also be found on appendix (Charts IV, V and VI)

Market. Therefore, we are able to say that this strategy successfully separates Type Two and Three assets from Type one within Momentum Winners (PM3) and Mid Performers (PM2). Moreover, being long on A3 and short on A1 provides our portfolio with a negative correlation to the market (-18%), as perceived on chart VII. This would be expected given that the ideal strategy should prove itself resilient to crashes as it is supposed to pick the stocks with a greater growth (Type One) and decline (Type Three) in stock price returns, even when the market is crashing.

Within Price Momentum loser stocks (PM1) the acceleration index seems to have the reverse effect – assets with low acceleration yielded a very positive return (PM1 A1) of 15% - both above market and above sole Momentum. Also, within the same portfolio, high acceleration assets provided a negative 0.61% outcome and a Sharpe Ratio close to zero. This allows us to take two conclusions: (1) truly worse performers are the ones with low past performance but higher acceleration (PM1 A3) – even though they seem to be recovering, they end up decreasing in the longer term, leading to negative annual returns. The second conclusion (2) is that when comparing to sole Momentum, stocks with the lowest performance and acceleration (PM1 A1) bring both future higher average returns (15%) and Sharpe ratios (0.68). In fact, Bondt & Thaler (1985) confirm these results as they conclude that there is a natural tendency for investors to be over-pessimistic regarding current losers. Therefore, investing on current losers with lowest acceleration (PM1 A1) takes advantage of this behavioral bias, profiting from the stock price reversal. Therefore, among price momentum losers (PM1) the best alternative is investing on low momentum and acceleration (PM1 A1) and short the true losers (PM1 A3).

This strategy is therefore able to sort correctly truly growing stocks (Type One) and overvalued stocks (Type Three) for Price Momentum winners (PM3). For losers (PM1), it identifies the ones which are undervalued and the overvalued. This leads in both cases for high, positive and above market returns. In this case, we verify that the true winners (PM3 A3) minus true losers (PM1 A3) is not the best performing portfolio. It seems that investing on true winners (PM3 A3) and shorting false ones (PM3 A1) would be the best possible combination.

Table VIII: Accelerated Momentum portfolios performance

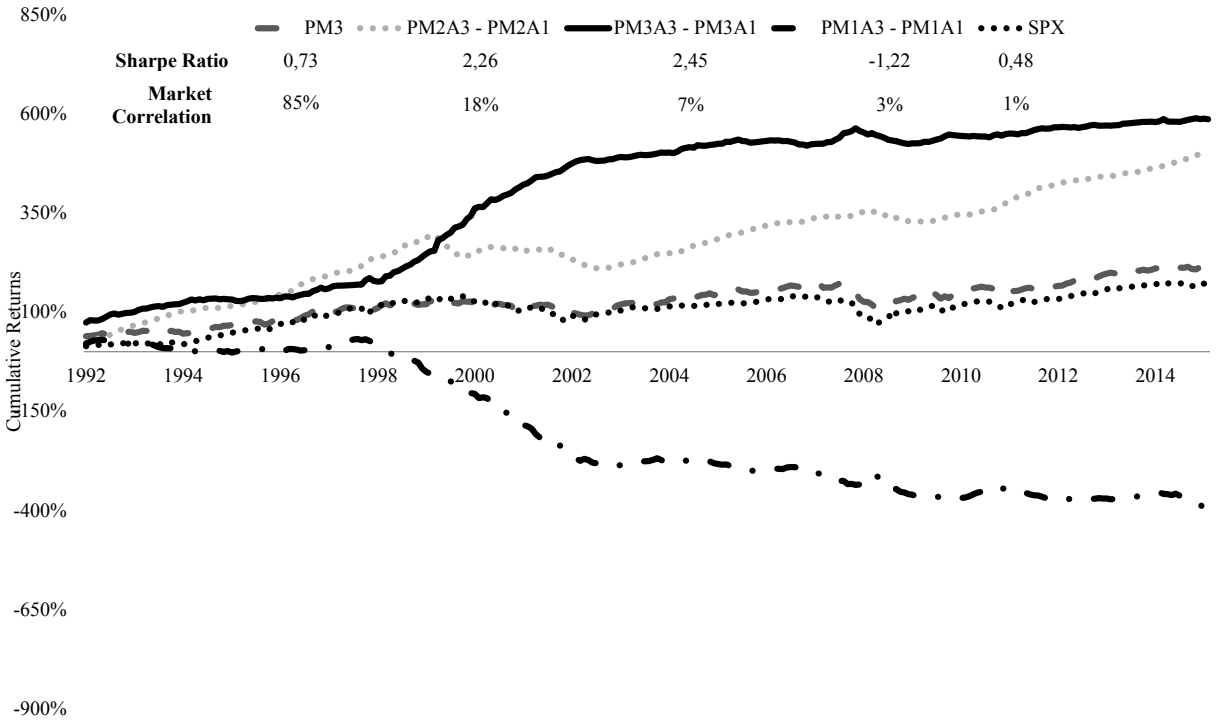
Chart VII: Cumulated returns of Spread Accelerated Mometum Portfolios

Table reports for the performance of Momentum portfolios re-ranked based on each stocks' acceleration ratios. The methodology used was the one provided by Bird & Casavecchia (2007). According to the same authors, positive trends take longer to be identified than negative ones. Therefore, the 50% higher Momentum stocks were accelerated based on a long term ratio between Momentum (12 months over 24) and the remaining using a short term one (3 months over 6). Then stocks within each portfolio (PM3, PM2 and PM1) were double sorted based on the value of the ratio obtained leading to a total of 9 (3x3) new portfolios (PMx A3, PMx A2 and PMx A1)

The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns.

Table V: Accelerated Price Momentum					Market
PM3	A3	A2	A1	A3-A1	SPX
Mean (%)	27,74	23,59	-15,84	43,58	10,41
(t-stat)	10,36	8,43	1,87	12,63	0,06
St. Dev	14,86	15,21	18,99	19,32	14,26
Sharpe Ratio	1,87	1,55	-0,83	2,26	0,73
Alpha	23,38	16,58	-23,56	59,74	
(t-stat)	5,27	4,46	-6,29	7,73	
PM2					
Mean (%)	20,40	17,91	-5,78	26,19	
(t-stat)	13,48	12,28	-3,58	26,51	
St. Dev	16,37	15,78	17,47	10,68	
Sharpe Ratio	1,25	1,13	-0,33	2,45	
Alpha	14,86	10,58	-12,17	30,41	
(t-stat)	3,71	3,64	-3,10	5,29	
PM1					
Mean (%)	-0,61	13,55	18,91	-19,35	
(t-stat)	-0,37	8,93	12,50	-15,78	
St. Dev	21,14	19,66	19,61	15,90	
Sharpe Ratio	-0,03	0,69	0,96	-1,22	
Alpha	-10,44	4,16	9,80	-18,45	
(t-stat)	-2,10	0,88	1,92	-3,87	

Graph VII - Cumulative returns to Spread Accelerated Price Momentum portfolios 1990 to 2015, compared to the market



However, identifying correctly Type One, Two and Three stocks creates the following best investment strategy: within stocks with high momentum (PM3), invest in true winners and short false winners (PM3 A3 – PM3 A1). For stocks with low momentum (PM1), one should invest on those with low acceleration (PM1 A1) – false losers - and short the ones with high – true losers (PM1 A3). This would yield a total average annual return around 60%.

On an historical perspective, we observe that the period before the Dot.com bubble burst boosted our strategy's returns of investing on winner stocks with high acceleration, shorting winners with low acceleration (PM3 A3 - PM3 A2) and investing on losers with low acceleration – PM1A1 (Chart VII, VIII and VIII – last two in exhibit). A possible explanation is that this phenomenon is driven by short term results that compose a speculating bubble. In another words, during those periods, investors seem to be more risk prone, putting their money in more volatile stocks that provide high immediate returns, increasing those assets' acceleration, they can be called "trend chasers" (De Long et al (1990)). If we take in consideration the whole market, we might observe a phenomenon where there are higher than normal number of stocks "in trend" with very high accelerations. Once the bubble bursts, our strategy does not suffer severely from the crisis because it is able to detect decreases in investments by the drop in acceleration ratios, even though it decreased its average growth rate. We also see this type of results, even though in a much smaller scale on the 2008 sub-prime crisis.

II.II Earnings Momentum

As mentioned above, Earnings Momentum is a strategy fully based on firms' financials. Our hypothesis is that companies presenting the best financial health are the ones holding a higher future return. In order to perform this analysis, we used four different ratios evaluating four different critical areas for any firm: Profitability (Earnings per Share - EPS), Liquidity (Current Ratio – current assets/current liabilities), Risk (Debt-to-equity – D/E) and Efficiency (Asset Turnover – Sales/Total Assets). I not only provide a single but also a double sorting, since one ratio might not representative of the whole firm condition.

Results obtained from Earnings Momentum sole revealed two different conclusions:
Debt to Equity (DtoE) and Current Ratio (CR) provided not significant results, in general. This means that we cannot prove both annual average and abnormal returns different from

zero and therefore, these two criteria are not useful on a standalone basis to obtain positive and above market returns. One can interpret these results by saying that the information included on these ratios is fully reflected in the market prices, leading to indifferent reactions after sorting.

Using Asset Turnover (AT) and Earnings per Share (EPS) as criteria to allocate assets to portfolios yield similar and positive average annual returns across winners (AT3 and EPS3), mid performers (AT2 and EPS2) and losers (AT1 and EPS1) - between 6% and 9%. Despite being slightly higher than the market, the increase in volatility dropped Sharpe ratios to S&P 500's levels (between 0.4 and 0.6). Alphas also point the existence of positive and abnormal returns when compared to the index. Considering these results, high correlation observed on Chart X was expectable because I used S&P 500's past and present stocks both as sample and benchmark and this strategy was not able to select persistently the true winners (Type One). Concluding, we verify that sorting portfolios by efficiency (AT) and profitability (EPS) can lead to positive and similar to market returns. However, the same problem as Momentum is verified: this strategy does not have the ability to distinguish between winners (Type One) and losers (Type Three) stocks, as similar results are provided across portfolios. I also observe that among AT and EPS sorting, there is a winner-loser spread between the risk adjusted returns. This suggests that despite offering similar average annual returns, stocks with lower financial ratios (EPS1/AT1) tend to be more volatile than the ones with higher.

Also, we observe that Sole Earnings Momentum based on AT or EPS yield similar outcomes both in terms of average returns (between 8 and 9%) and Sharpe Ratios (between 0.5 and 0.6), when comparing to Price Momentum. I also find that both strategies (Earnings and Price Momentum) provide a very high correlation to the market (greater than 80%), suggesting they are much correlated to each other. This similarity in returns and correlation, leads us to presume that firms with high financials also have high past return. As we have seen above, within our sample, each firms' past returns seems to explain the future outcomes (Moskowitz, Ooi & Pedersen (2012)). If this holds, it can be the reason why all Earnings Momentum portfolios sorted by AT and EPS yield high returns among most of the portfolios.

Table X: Earnings Momentum Performance

Chart X: Top Earnings Momentum Portfolios Cumulated Performance

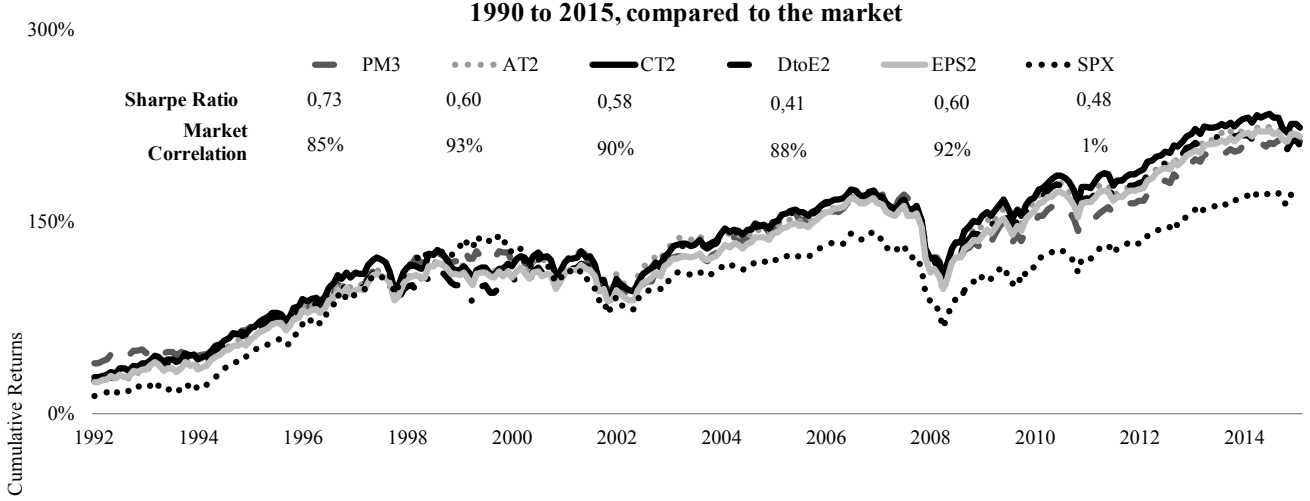
Table reports for the performance of Earnings Momentum stocks'. Portfolios were ranked based on each firms' fundamental ratios. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The EM3-EM1 portfolio represents the high minus low spread in returns.

Chart reports the Top Earnings Momentum portfolio's cumulated performance

	Asset Turnover (AT)				Debt to Equity (DtoE)				Market
PM3	CR3	CR2	CR1	CR3-CR1	DtoE3	DtoE2	DtoE1	DtoE3-DtoE1	SPX
Mean (%)	8,79	8,85	6,73	2,06	5,50	6,79	6,24	-0,74	6,94
(t-stat)	0,03	0,03	0,02	0,02	5,75	0,02	0,02	-0,01	8,18
St. Dev	15,58	16,35	15,47	7,05	16,80	16,46	17,13	7,02	14,61
Sharpe Ratio	0,56	0,54	0,43	0,29	0,33	0,41	0,36	-0,10	0,48
Alpha	2,22	1,74	0,08	2,13	-1,56	-0,19	-1,05	-0,51	
(t-stat)	1,60	1,39	0,06	1,48	-1,04	-0,13	-0,72	-0,36	

	Current Ratio (CR)				Earnings Per Share (EPS)			
	CR3	CR2	CR1	CR3-CR1	EPS3	EPS2	EPS1	EPS2-EPS1
Mean (%)	6,23	9,03	8,18	-1,94	8,70	8,77	8,17	0,54
(t-stat)	0,02	0,03	0,03	-0,01	10,76	10,53	7,99	1,05
St. Dev	18,84	15,44	13,99	10,87	14,20	14,62	17,93	8,99
Sharpe Ratio	0,33	0,58	0,58	-0,18	0,61	0,60	0,46	0,06
Alpha	-1,89	2,53	2,50	-4,29	2,92	2,48	0,37	2,55
(t-stat)	-1,26	1,82	1,76	-2,26	2,06	2,09	0,26	1,55

Graph X - Cumulative returns to top performing Earnings Momentum portfolios from 1990 to 2015, compared to the market



II.II.I Double Sorted Earnings Momentum

Double sorting by Earnings Momentum means trying to find the best combination of financial ratios that include information that is not yet absorbed by the market (investor under reaction). Assuming that prices will correct to financial based information, it is expected to provide useful insights to predict future returns. Results provided by double sorted earnings Momentum can be found on Chart XI and tables XI, XIII, XIV, XV and XVI (last four provided on appendix). The map of results and expectations can be found below on table XII.

As we concluded above, information provided by DtoE and CR seem to be fully absorbed by the market. Therefore, we expect that double sorting using these ratios would lead to similar results as not doing it and double sorting these ratios by the other variables will increase its explanatory power. As it can be observed on the table below, for DtoE and CR expectations almost matched the results. Average annual returns grew to normal values (between 7 and 9%) and Sharpe Ratios comprised within 0.4 and 0.6)

Table XII - Map of Results & Expectations

Table below compares the expectation versus the reality (Expectation | Reality) in light of the results obtained by single sorting - dark grey means they matched. The following legend can be used to interpret results: nv = normal values similar to single sorting; i = insignificant; ss = double sorting equals single sorting; g = growth in the explanatory power; d = decrease in explanatory power.

		Single Sorting			
		DtoE	**CR**	**AT**	**EPS**
Double Sorting	**DtoE**	x	i | nv	nv | nv	nv | nv
	CR	i | nv	x	nv | nv	nv | nv
	AT	g | g to nv	g | g to nv	x	g | nv
	EPS	g | g to nv	g | g to nv	g | nv	x

Like we were expecting, after double sorting the significant variables (AT and EPS) by the irrelevant ones (DtoE and CR), results stayed similar to the single sorted ones.

Surprisingly we found that Debt to Equity and Current Ratio have a greater explanatory power when combined when comparing to sole performance. Solely they are insignificant but together they yield positive, significant and sometimes above market returns (Table XIII & XIV). Average annual returns yielding returns between 6 and 9% with similar to market Sharpe Ratios (0.49)

We hoped that double sorting the significant variables by each other would yield better results than each one standing alone. However, it did not happen – average annual returns, Sharpe ratios and abnormal returns stayed similar to sole Earnings Momentum. This allows us to conclude that the complementary information that led to higher returns when single sorted is the same for the both ratios. In fact, the high correlation between the returns of each of the individual strategies is very high (between 90 and 97% for winners, mid performers and losers). One could argue that this could be expectable since both ratios depend on sales.
Concluding, after double sorting we find that DtoE and CR combine explain better future returns than each standing alone variable, yielding together similar average and risk adjusted returns to single EPS and AT. Other than it would be expected the combination of the last two does not yield higher returns - Their high correlation and origin on firms' sales seems to point towards that the insights they provide to stock prices when single sorted are the same. Overall, despite finding slightly positive and significant alphas on single sorts based on EPS, the remaining performance measurements do not seem highly different than the market, meaning that through this strategy we do not significantly beat the market.

II.II.II Accelerated Earnings Momentum

After sorting for individual ratios (sole Earnings Momentum), each portfolio was divided into other three split based on each stocks' acceleration ratios (A3, A2 and A1). We expect that after sorting by acceleration, firms with high financials and growing stock price performance (Type One) will yield high future returns (A3) versus stocks with delayed, decreasing or stagnating performance (Type Two and Three).

On an overall perspective we observe that winners' performance for EPS and AT stayed similar to single sorting, yielding average annual returns and Sharpe ratios between 8 and 10% and 0.4 and 0.6, respectively. Losers, however, saw its performance go down to average annual returns and Sharpe ratios amid 4 to 5% and 0.2 to 0.3, respectively (see Appendix tables XIII, XIV, XV and XVI). This is the reason why on average spread portfolios after acceleration yield positive and significant results.

Table XI: Top performance of Earnings Momentum Double Sorted Portfolios

Table reports for the performance of top Earnings Momentum portfolios' for each single sorting ratio. Portfolios were ranked based on each firms' fundamental ratios. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The EM3-EM1 portfolio represents the high minus low spread in returns.

	Debt to Equity (DtoE) sorted by Asset Turnover (AT)				**Asset Turnover (AT) sorted by Earnings per Share (EPS)**				**Market**
Winners (3)	AT3	AT2	AT1	AT3-AT1	DtoE3	DtoE2	DtoE1	DtoE2-DtoE1	SPX
Mean (%)	8,45	7,85	8,54	-0,09	8,48	8,00	8,45	0,03	6,94
(t-stat)	9,10	8,64	10,37	-0,18	9,24	9,41	10,19	0,05	8,18
St. Dev	15,75	15,42	13,97	8,67	15,57	14,43	14,08	8,20	14,61
Sharpe Ratio	0,54	0,51	0,61	-0,01	0,54	0,55	0,60	0,00	0,48
Alpha	2,42	1,89	3,56	-1,10	2,72	2,52	3,08	-0,35	
(t-stat)	1,47	1,03	1,93	-0,50	1,29	1,57	2,07	-0,49	
Mid (2)									
Mean (%)	8,89	9,62	6,99	1,90	7,62	9,26	8,39	-0,77	
(t-stat)	10,41	9,96	7,72	3,77	8,57	10,25	9,58	-1,70	
St. Dev	14,49	16,39	15,37	8,56	15,09	15,34	14,87	7,66	
Sharpe Ratio	0,61	0,59	0,45	0,22	0,51	0,60	0,56	-0,10	
Alpha	3,22	2,93	0,78	2,43	1,78	3,00	2,41	-0,62	
(t-stat)	2,07	1,90	0,35	1,59	0,97	2,15	1,61	-0,32	
Losers (1)									
Mean (%)	7,48	7,38	2,18	5,29	7,67	9,37	3,50	4,17	
(t-stat)	6,68	6,68	6,68	6,68	7,24	8,40	3,00	7,21	
St. Dev	18,99	19,04	18,95	11,04	17,98	18,94	19,80	9,82	
Sharpe Ratio	0,39	0,39	0,12	0,48	0,43	0,49	0,18	0,42	
Alpha	-0,16	-0,47	-5,15	5,24	0,26	1,71	-4,14	4,58	
(t-stat)	-0,35	-0,64	-2,86	2,41	0,13	0,71	-2,45	2,45	

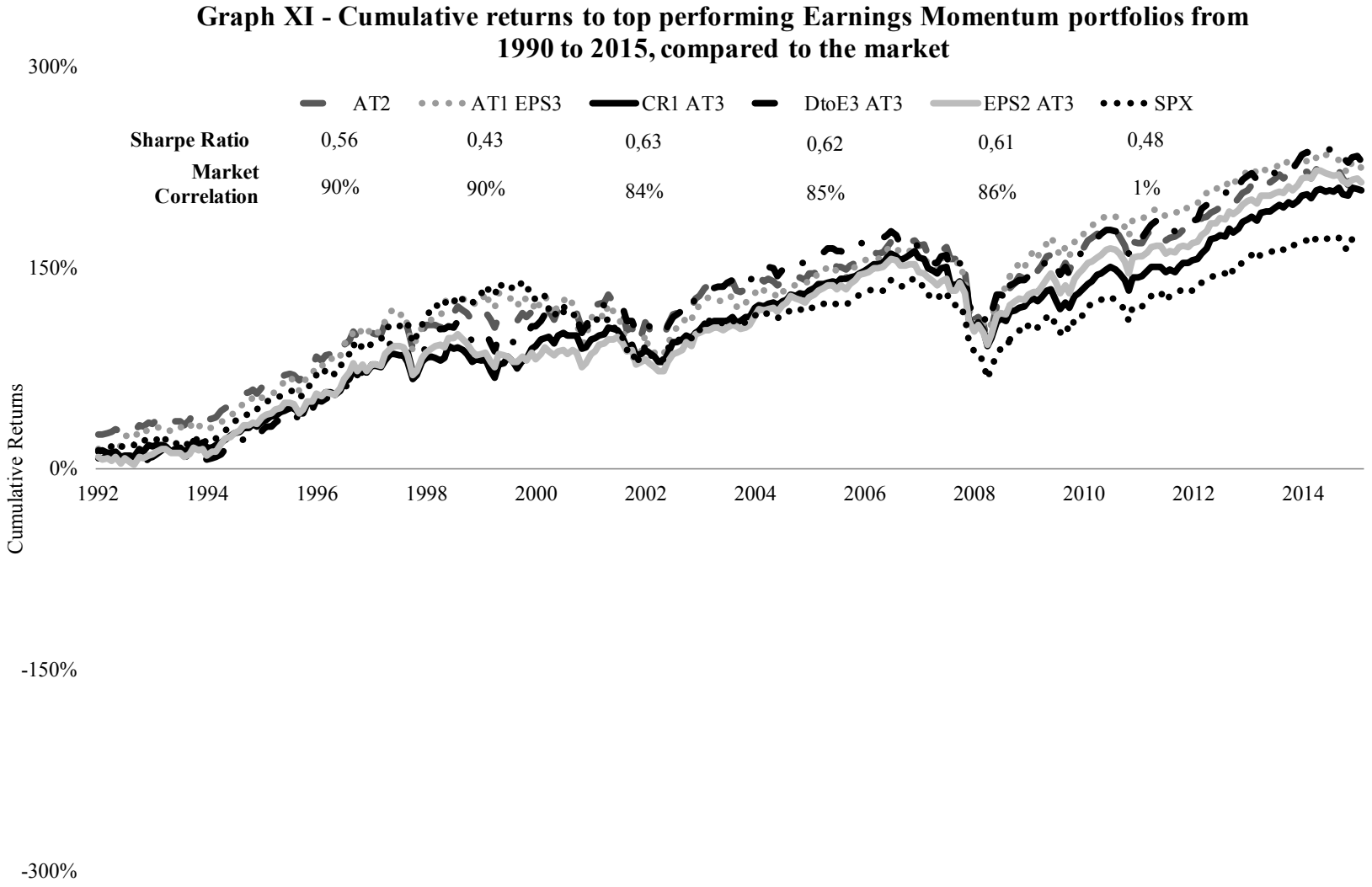
Table XI: Top performance of Earnings Momentum Double Sorted Portfolios (Continuation)

Table reports for the performance of top Earnings Momentum portfolios' for each single sorting ratio. Portfolios were ranked based on each firms' fundamental ratios. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The EM3-EM1 portfolio represents the high minus low spread in returns.

	Current Ratio (CR) sorted by Asset Turnover (AT)				**Debt to Equity (DtoE) sorted by Asset Turnover (AT)**			
Winners (3)	AT3	AT2	AT1	AT3-AT1	AT3	AT2	AT1	AT3-AT1
Mean (%)	6,28	8,03	3,97	2,32	9,58	8,07	8,31	1,27
(t-stat)	5,70	7,34	3,19	3,28	10,46	10,46	10,46	10,46
St. Dev	18,72	18,58	21,09	12,00	15,54	16,86	17,16	9,67
Sharpe Ratio	0,34	0,43	0,19	0,19	0,62	0,48	0,48	0,13
Alpha	-1,20	0,40	-4,19	3,11	3,63	1,39	1,60	2,00
(t-stat)	-0,57	0,12	-1,87	1,29	2,21	0,78	0,80	1,17
Mid (2)								
Mean (%)	9,17	10,52	7,72	1,46	8,63	8,65	5,15	3,47
(t-stat)	10,11	10,47	8,14	2,75	8,64	0,03	0,02	0,02
St. Dev	15,40	17,05	16,08	9,01	16,94	16,05	16,64	9,20
Sharpe Ratio	0,60	0,62	0,48	0,16	0,51	0,54	0,31	0,38
Alpha	3,16	3,98	1,47	1,67	1,67	2,23	-1,40	3,10
(t-stat)	1,67	1,90	0,75	1,04	0,91	1,28	-0,96	1,74
Losers (1)								
Mean (%)	8,67	8,47	6,87	1,80	6,80	7,16	6,24	0,56
(t-stat)	10,62	9,71	7,98	3,11	7,25	7,25	7,25	7,25
St. Dev	13,85	14,81	14,61	9,84	15,91	16,88	14,90	10,30
Sharpe Ratio	0,63	0,57	0,47	0,18	0,43	0,42	0,42	0,05
Alpha	3,39	2,82	2,19	1,18	0,32	0,25	0,91	-0,58
(t-stat)	1,93	1,50	0,97	0,51	0,17	-0,04	0,42	-0,27

Chart XI: Cumulative Returns to Top performance of Earnings Momentum Double Sorted Portfolios

Chart VII presents the cumulated returns for the top performers of Accelerated Momentum portfolios cumulative returns compared to the best single sorted (AT EM2)



Acceleration seems to be indifferent to stocks with high financials within each single sorted portfolio. Everything else constant, as stock prices are calculated based on firms' financials, for two similar firms, the one higher ratios will naturally have higher forecasted stock price than the other. If this is the case, enterprises with high financial ratios supposedly have higher Momentum, and, as investors start buying this stock ("trend followers"), leading to greater accelerations. Therefore, if the market can assume that firms with higher financials also have great accelerations, we find a feasible explanation why accelerating firms with high financials lead to similar results as not doing it.

Also, accelerating stocks sorted by financial ratios proves somewhat useful to investors to identify false growing or decreasing stocks (Type One) based on firms' financials. For companies with the same levels of fundamental ratios, on average, the ones with lower accelerations provide lower future returns.

Within single and double sorted Earnings Momentum by financial ratios, we observed that Mid performers most times offered a slightly higher average annual return, which was also followed by volatility. Therefore, Sharpe ratios for these stocks were similar or only somewhat better than the remaining portfolios (winners and losers). However, after accelerating single sorted Earnings Momentum, we verified that Mid performers suffered a boost on both average annual and risk adjusted revenues, reaching values around 13% p.a. and 1, respectively. Thus, it seems that accelerating firms according to its financial ratios concentrates short-term growth (Type One) on Mid Performers portfolios. However, we find no feasible explanation on why this happens.

II.III Value Analysis

As mentioned above, when using value strategies, our objective is to capture overreactions to prices that are not reflected on the financials – either when investors get "overly excited" or "concerned" (Lakonishok, Shleifer & Vishny (1994)). Therefore, we use two different essential price ratios that can reflect companies' situations versus the market. Price to Earnings compares asset prices against earnings variations and price to Cash-flow show the comparison between the changes in cash-flow and price.

Table XVII: Accelerated Earnings Momentum Portfolios

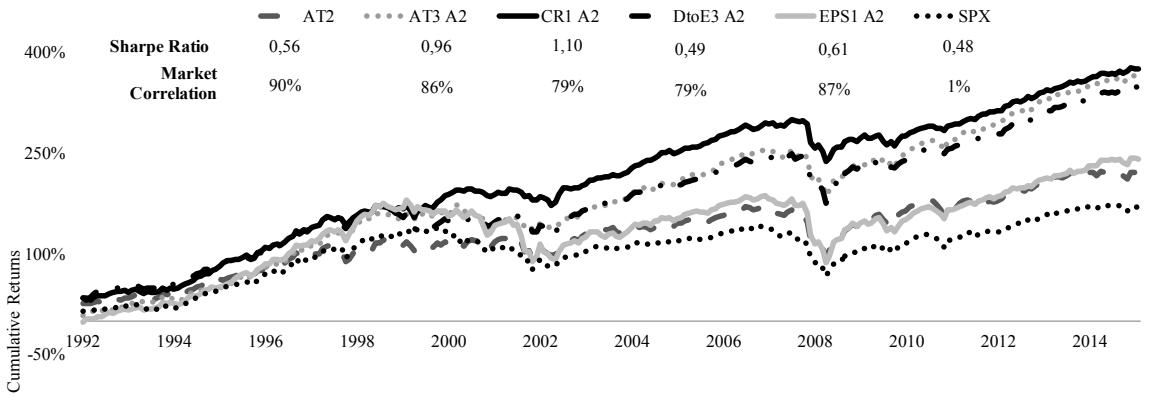
Table reports for the performance of accelerated Earnings Momentum portfolios' for each single sorting ratio. Portfolios were ranked based on each firms' fundamental ratios and then on acceleration indexes. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The EM3-EM1 portfolio represents the high minus low spread in returns.

	Accelerated Current Ratio (CR)				Accelerated Debt to Equity (DtoE)				Accelerated Earnings per Share (EPS)				Accelerated Asset Turnover (AT)				Market
PM3	A3	A2	A1	A3-A1	A3	A2	A1	A3-A1	A3	A2	A1	A3-A1	A3	A2	A1	A3-A1	SPX
Mean (%)	7,92	15,93	4,10	3,79	8,06	14,67	3,15	4,91	9.45	16.18	2.47	6.98	9.80	15.41	4.18	5.62	6.94
(t-stat)	8,72	18,44	4,87	6,03	8,45	15,53	3,44	7,32	10.03	18.67	2.78	12.27	9.51	0.06	0.02	0.03	8.18
St. Dev	15,28	14,53	14,14	10,61	16,10	15,93	15,45	11,33	15.89	14.63	14.98	9.60	17.40	15.97	16.46	10.56	14.61
Sharpe Ratio	0,52	1,10	0,29	0,36	0,50	0,92	0,20	0,43	0.59	1.11	0.16	0.73	0.56	0.96	0.25	0.53	0.48
Alpha	2,47	11,17	-1,02	3,49	2,48	9,19	-2,40	4,98	3.60	11.07	-3.01	6.79	3.22	9.37	-2.13	5.47	
(t-stat)	1,29	5,35	-0,48	1,51	1,06	4,40	-0,93	1,87	1.72	6.27	-1.53	3.24	1.51	5.73	-1.02	2.36	
PM2																	
Mean (%)	8,80	16,23	4,30	4,50	8,47	15,06	3,57	4,89	9.98	16.03	3.17	6.78	9.22	14.96	4.24	4.92	
(t-stat)	8,56	16,03	4,50	7,32	8,38	15,45	3,43	7,28	10.78	17.15	3.34	11.17	9.07	14.66	3.93	8.31	
St. Dev	17,36	17,06	16,13	10,37	17,03	16,46	17,52	11,34	15.61	15.75	16.00	10.25	17.06	17.20	18.13	10.00	
Sharpe Ratio	0,51	0,95	0,27	0,43	0,50	0,92	0,20	0,43	0.64	1.02	0.20	0.66	0.54	0.87	0.23	0.49	
Alpha	2,35	9,95	-1,86	4,29	2,25	8,86	-2,86	5,23	4.12	10.33	-2.88	7.17	2.33	8.23	-2.89	5.31	
(t-stat)	1,43	5,11	-0,91	2,28	1,03	4,76	-1,32	2,17	2.20	5.66	-1.55	3.27	1.37	4.76	-1.45	2.50	
PM1																	
Mean (%)	7,92	15,93	4,10	3,79	8,33	13,98	2,47	5,85	5.77	10.13	4.32	1.45	3.71	12.76	4.26	-0.54	
(t-stat)	8,72	18,44	4,87	6,03	7,15	12,91	2,28	6,80	5.14	8.23	3.88	1.87	3.60	0.05	0.02	0.00	
St. Dev	15,28	14,53	14,14	10,61	19,66	18,29	18,34	14,53	18.95	20.79	18.81	13.08	17.21	15.80	15.89	12.63	
Sharpe Ratio	0,52	1,10	0,29	0,36	0,42	0,76	0,13	0,40	0.30	0.49	0.23	0.11	0.22	0.81	0.27	-0.04	
Alpha	2,47	11,17	-1,02	3,49	0,52	6,69	-4,53	5,27	-1.50	1.69	-2.98	1.53	-2.45	7.01	-1.58	-0.87	
(t-stat)	1,29	5,35	-0,48	1,51	-0,24	3,87	-2,16	1,69	-0.63	0.92	-1.16	0.36	-1.20	3.55	-0.79	-0.33	

Chart XII: Cumulative Returns to Top performance of Accelerated Earnings Momentum Portfolios

Chart VII presents the cumulated returns for the top performers of Accelerated Momentum portfolios cumulative returns compared to the best single sorted (AT2)

Graph XII - Cumulative returns to top performing Accelerated Earnings Momentum portfolios from 1990 to 2015, compared to the market



Our hypothesis is that stocks with higher Price-to-financials ratios are overvalued and its price is going to decrease to normal values. Lower price-to-financials are believed to be undervalued and its price is going to increase.

Results were almost what we were expecting: in both cases stocks with higher value, i.e., lower price-to-financials ratios, yielded both higher average and risk adjusted returns than the market and all the other portfolios, as presented on table XVIII. Moreover, losers (V1) in the case of Price Earnings provided a significant negative average return of -3.21% and a Sharpe ratio of -0.19. Price to Cash-flow losers (V1) did not yield a negative outcome, but average returns are not significant, which means that one cannot reject the hypotheses that they are zero. Therefore, for Price Earnings we verify that spread portfolio is unconditionally the best outcome while for Price to Cash-flow, it is only better once controlling for risk. Moreover, both spread portfolios prove to yield greater abnormal returns against the market than winner strategies (alphas). This proves the existence of Value strategies and its ability to sort between under and overvalued stocks. According to what was mentioned above, high returns provided by Value strategies are caused by investors' overreactions that change prices more than it impacts the financial. Following the market efficiency theory, we can explain that overvalued stocks (high price earnings – V1) will suffer from a decrease in price and undervalued (low price earnings) from a price raise in order to reflect firms' financial conditions. Nonetheless, we verify that we obtain higher outcomes with Price Earnings ratio than with Price to Cash-flow.

It was also mentioned above that Value strategies can be underperforming due to the fact that they cannot identify when stock prices will revert back to reflect its financial conditions. It fails to separate stocks with short-term price variations (Type One) from the ones with delayed change (Type Two) and the ones with zero growth or decline (Type Three). Therefore, we will use the same methodology to try sorting them as we did for Earnings Momentum. First we will try to see if both ratios complement each other and improve the performance of the portfolios. Then, we will apply acceleration indexes to see if recent past performance is indicative of reversing price trends.

Table XVIII: Value Portfolios

Chart XIII: Cumulative Returns of Value Portfolios

Table reports for the performance of Value portfolios singly sorted by Price Earnings (PE) or Price to Cash-Flow. Tables below provide the analysis split into two periods. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The EM3-EM1 portfolio represents the high minus low spread in returns.

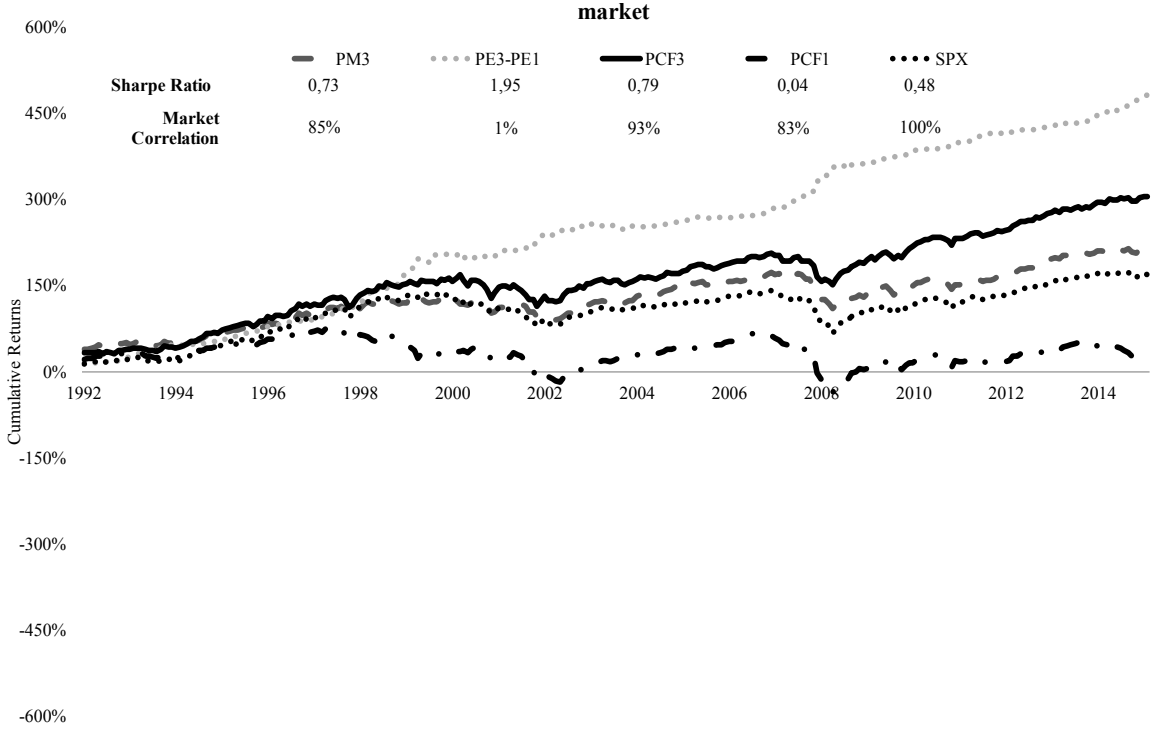
Chart XIII reports for the cumulative return of the spread portfolio singly sorted by PE and the composers of the PCF. As PCF1 (losers) were negative, I decided to detail the composers instead of showing the final effect.

	Price Earnings (PE)				Price to Cash-Flow (P/CF)			
	V3	V2	V1	V3-V1	V3	V2	V1	V3-V1
Mean (%)	16.23	7.62	-3.31	19.54	12.32	7.42	0.68	11.64
(t-stat)	18.42	9.20	-3.38	34.18	13.82	8.32	0.72	20.46
St. Dev	15.46	14.55	17.21	10.03	15.64	15.66	16.70	9.98
Sharpe Ratio	1.05	0.52	-0.19	1.95	0.79	0.47	0.04	1.17
Alpha	9.84	1.54	-9.60	21.31	5.62	0.88	-5.68	11.91
(t-stat)	8.49	1.13	-5.23	9.56	4.73	0.60	-3.10	5.61

2003-2015	Price Earnings (PE)				Price to Cash-Flow (P/CF)			
	V3	V2	V1	V3-V1	V3	V2	V1	V3-V1
Mean (%)	14.46	8.28	-5.14	19.61	11.10	6.80	-0.85	11.95
(t-stat)	11.90	7.18	-3.49	27.35	9.28	5.34	-0.59	17.11
St. Dev	15.76	14.95	19.08	9.29	15.50	16.53	18.56	9.05
Sharpe Ratio	0.92	0.55	-0.27	2.11	0.72	0.41	-0.05	1.32
Alpha	-15.48	-22.52	-43.71	47.37	-15.48	-22.52	-43.71	47.37
(t-stat)	7.25	3.87	-5.13	8.55	5.66	1.79	-2.74	5.31

1990-2002	Price Earnings (PE)				Price to Cash-Flow (P/CF)			
	V3	V2	V1	V3-V1	V3	V2	V1	V3-V1
Mean (%)	18.53	6.77	-0.93	19.46	13.91	8.23	2.67	11.23
(t-stat)	14.54	5.69	-0.77	21.04	10.41	6.69	2.29	12.04
St. Dev	15.08	14.07	14.30	10.95	15.81	14.55	13.82	11.04
Sharpe Ratio	1.23	0.48	-0.07	1.78	0.88	0.57	0.19	1.02
Alpha	8.61	-1.41	-7.83	17.71	3.53	-0.21	-4.31	8.16
(t-stat)	4.67	-0.53	-2.50	5.18	1.62	-0.07	-1.42	2.50

Graph XIII - Cumulative returns to Value portfolios from 1990 to 2015, compared to the market



II.III.I Double Sorted Value

Even though it can be common, firms with higher cash-flow do not necessarily have higher earnings, and vice-versa. Also, an event can have different impacts on cash-flow and earnings for the same variation of stock-price. Variations in CAPEX, or Depreciation and VAT payments over some products, for example, are some of the items that affect differently cash-flow and earnings. Therefore, we expected that the combination of Price Earnings and Price to Cash-flow could provide more certainty regarding the stock price future trends. In another words, firms with low PCF and PE (PCF 3 PE3 and PE3 PCF3) were expected to outperform each of the single sorted ratios, increasing winners performance. On the other hand, we also expect firms with high levels of both ratios (PCF 1 PE1 and PE1 PCF1) to decrease its performance to even lower values than any of the single sorted portfolios.

In both cases, as it could be expected, we observe that the overall performance was improved to better levels than before. For winners (PE3 PCF3 and PCF3 PE3) and firms with mid values (PE2 PCF2 and PCF2 PE2) average returns and Sharpe ratios increased to values above 20% and 1.10, respectively. However, losers within winner portfolios still yielded positive results and in case of PE3 PCF1, performance even increased to double digit average returns (Table XIX and Chart X). Also, for single sorted losers (PE1 and PCF1) the overall performance fell to even more negative values after double sorting with negative and significant abnormal returns (alphas). However, using PCF double sorted by PE allows us to distinguish between Type One, Two and Three as we see that within losers (PCF1) there are those which increase their performance despite having low PCF values. This distinction is not possible for winners (PCF 3 and PE3), as they still yield positive outcomes.

Concluding, as expected, we observe that double sorting increases the performance of Value strategies by increasing the performance of winners (X3 X3) and decreasing the losers (X1 X1). Therefore, the best value strategy to apply so far would be a short position on firms with low values of PE and PCF and long on firms with high amounts of both ratios, yielding a total average annual return between 26% and 30% p.a., depending on the double sorting order. These positive results mean that each ratio provides different and complementary information to each other, as I initially supposed.

Table XIX: Double Sorted Value Portfolios

Chart XIV: Cumulative Returns of Top performing double sorted Value Portfolios

Table reports for the performance of Value portfolios singly sorted by Price Earnings (PE) and then re-sorted by the Price to Cash-Flow (PCF). The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The EM3-EM1 portfolio represents the high minus low spread in returns.

Chart XIV reports for the cumulative return of the value top performers singly sorted by PE and the composers of the PCF and then re-sorted by the other financial ratio.

	Price Earnings (PE) Double Sorted by Price to Cash Flow (P/CF)			
PE3	PCF3	PCF2	PCF1	PCF3-PCF1
Mean (%)	21.75	16.72	12.89	8.85
(t-stat)	18.85	16.59	12.36	10.13
St. Dev	19.58	17.11	17.70	14.83
Sharpe Ratio	1.11	0.98	0.73	0.60
Alpha	15.39	10.21	6.16	8.74
(t-stat)	6.44	6.03	2.95	3.00
PE2				
Mean (%)	6.18	7.72	10.06	-3.88
(t-stat)	7.10	8.82	10.92	-7.31
St. Dev	14.77	14.85	15.63	9.00
Sharpe Ratio	0.42	0.52	0.64	-0.43
Alpha	0.23	1.96	4.29	-3.91
(t-stat)	0.07	1.08	2.12	-1.99
PE1				
Mean (%)	-3.48	-1.48	-4.68	1.20
(t-stat)	-3.25	-1.52	-4.26	1.96
St. Dev	18.17	16.60	18.64	10.42
Sharpe Ratio	-0.19	-0.09	-0.25	0.12
Alpha	-9.85	-7.26	-10.66	0.89
(t-stat)	-4.82	-3.67	-4.63	0.42

Graph XIV - Cumulative returns to top performing PE portfolios double sorted by PCF from 1990 to 2015, compared to the market

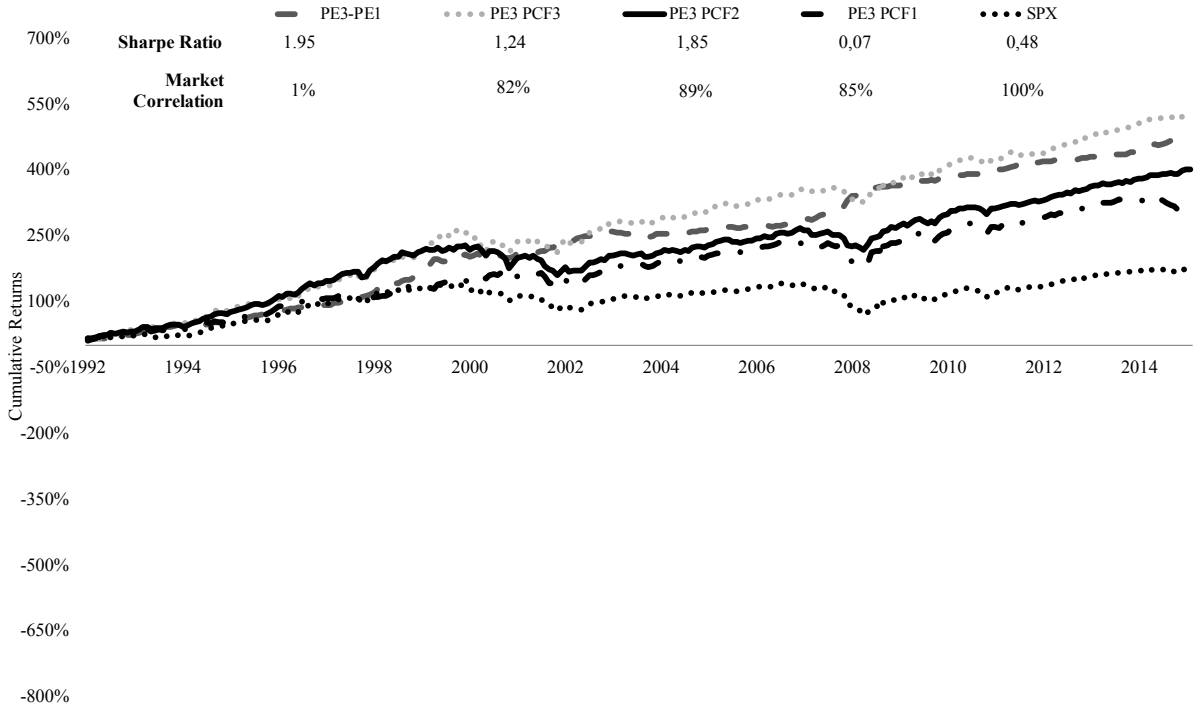


Table XX: Double Sorted Value Portfolios

Chart XV: Cumulative Returns of Top performing double sorted Value Portfolios

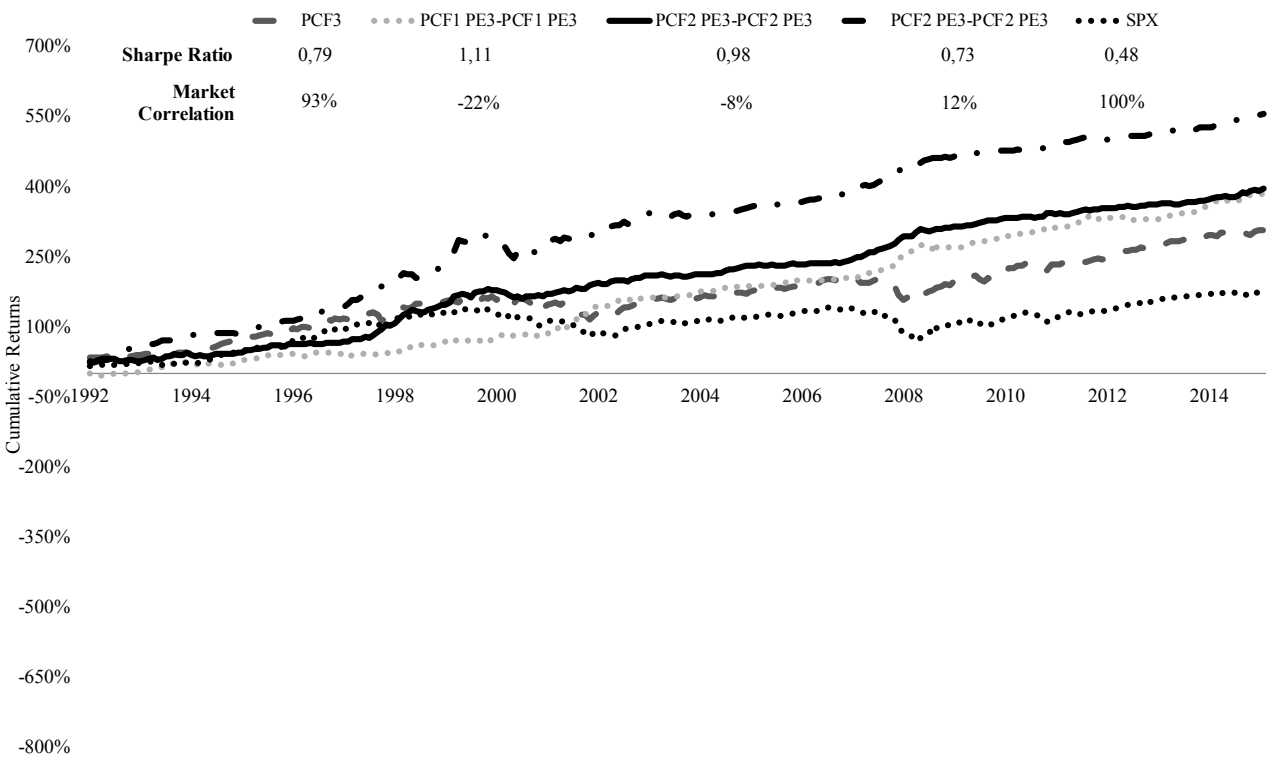
Table reports for the performance of Value portfolios singly sorted by Price Earnings (PE) and then re-sorted by the Price to Cash-Flow (PCF). The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The EM3-EM1 portfolio represents the high minus low spread in returns.

Chart XV reports for the cumulative return of the value top performers singly sorted by PE and the composers of the PCF and then re-sorted by the other financial ratio.

Price to Cash-Flow (P/CF) Double Sorted by Price Earnings (PE)

PCF3	PE3	PE2	PE1	PE3-PE1
Mean (%)	24.34	13.26	1.18	23.16
(t-stat)	21.10	14.42	1.25	26.46
St. Dev	19.58	15.61	16.06	14.86
Sharpe Ratio	1.24	0.85	0.07	1.56
Alpha	18.58	7.04	-5.06	24.78
(t-stat)	7.13	5.19	-3.00	7.20
PCF2				
Mean (%)	14.54	7.70	-1.99	16.52
(t-stat)	16.15	8.46	-1.93	30.17
St. Dev	15.28	15.44	17.43	9.29
Sharpe Ratio	0.95	0.50	-0.11	1.78
Alpha	8.74	1.62	-8.13	18.22
(t-stat)	5.09	0.80	-4.00	8.55
PCF1				
Mean (%)	8.40	0.99	-7.63	16.03
(t-stat)	9.04	1.07	-6.56	24.76
St. Dev	15.76	15.80	19.74	10.99
Sharpe Ratio	0.53	0.06	-0.39	1.46
Alpha	2.63	-4.67	-13.60	18.55
(t-stat)	1.37	-2.62	-5.60	7.70

Graph XV - Cumulative returns to top performing PCF portfolios double sorted by PE from 1990 to 2015, compared to the market



II.III.II Accelerated Value

Accelerating value portfolios should provide us with some insight on whether each stock price trend is increasing or not. In another words, by truly identifying the price trend, one should be able to choose which stocks will suffer from a price revert in the near future. Therefore, we expected real winners to be the ones with lower ratio values and high acceleration (X3 A3), indicating an ongoing a price reverse. We are able to verify that the highest growth in performance measurements was mostly on Mid Accelerated ones (A2) to values above 20%. For V3, the portfolio with high acceleration (A3) shown similar returns as sole Value. Stocks with low acceleration (A1) also have had their returns increased from negative/close to zero values to around 10%. In light of our theory that Value takes advantage from price over/under reactions, we find that stocks with mid-levels of accelerations are the ones more likely to be suffering from a price trend revert as they yield the best returns and Sharpe ratios. However, we find no feasible explanation for this event. For loser portfolios (X1), we expected true losers to be those with low price to financial ratios and low accelerations, indicating an ongoing trend reverse - ratios decrease. However, we find that stocks with lowest performance (-5.5% p.a. for Price Earnings) are those with lowest ratios and highest acceleration. The same phenomenon was observed in accelerated Price Momentum and we attributed its cause to investors overreaction to negative news (Bondt & Thaler (1985)). Then, soon after, prices will react back again to its higher values.

Therefore, we see that through an Accelerated Value strategy using both Price to Earnings and price to Cash-flow we do not obtain what was expected within each Value portfolio (V3, 2 and 1). However, we can still define a strategy that yield positive, abnormal and higher than market average and risk adjusted returns: a long position on Winners with Mid-levels of acceleration (V3 A2) and a short position on stocks with low value and high acceleration (V1 A3), leading to an average annual return of 34% p.a. (29.29-(-5.23)).

Table XXI: Accelerated Value Portfolios

Chart XVI: Cumulative Returns of Top performing Accelerated Value Portfolios

Table reports for the performance of Value portfolios singly sorted by Price Earnings (PE) and then re-sorted by the degree of the short-term price variation (Acceleration). The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The EM3-EM1 portfolio represents the high minus low spread in returns.

Chart XVI reports for the cumulative return of accelerated value top performing portfolios

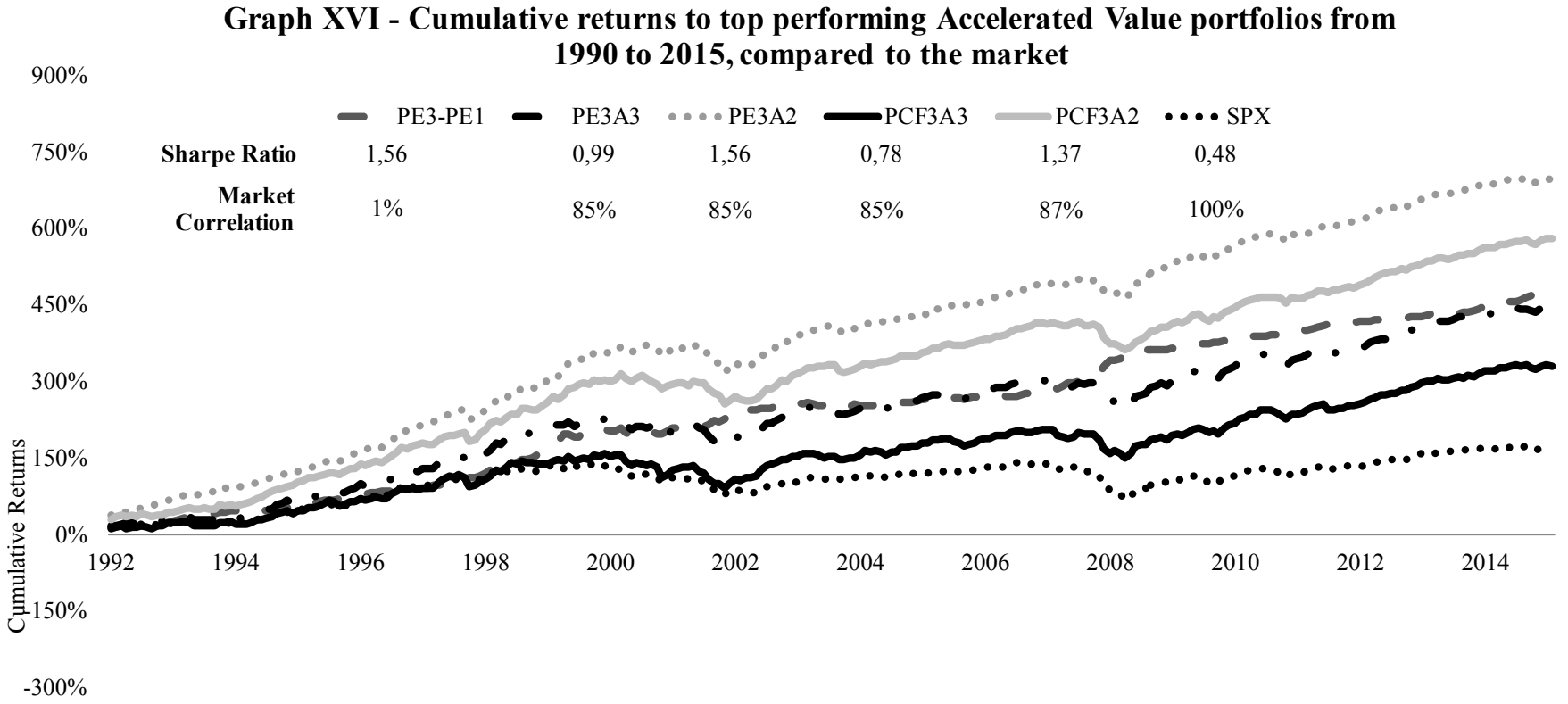
	Accelerated Price Earnings (PE)				Accelerated Price to Cash-Flow (P/CF)			
X3	A3	A2	A1	A3-A1	A3	A2	A1	A3-A1
Mean (%)	18.72	29.29	12.67	6.05	13.91	24.40	9.34	4.57
(t-stat)	16.77	26.36	12.94	7.02	13.14	23.17	10.48	5.85
St. Dev	18.84	18.76	16.52	14.55	17.87	17.78	15.05	13.19
Sharpe Ratio	0.99	1.56	0.77	0.42	0.78	1.37	0.62	0.35
Alpha	11.80	24.10	6.67	4.84	6.97	18.57	3.71	3.15
(t-stat)	5.62	10.81	3.30	1.59	3.65	9.83	2.13	1.16
X2								
Mean (%)	8.40	14.00	5.18	3.22	8.17	12.98	4.53	3.63
(t-stat)	8.60	14.54	6.07	4.67	8.05	12.47	5.13	5.89
St. Dev	16.48	16.22	14.41	11.62	17.12	17.57	14.87	10.41
Sharpe Ratio	0.51	0.86	0.36	0.28	0.48	0.74	0.30	0.35
Alpha	2.18	8.07	-0.09	2.27	1.77	6.19	-1.22	3.00
(t-stat)	1.03	4.13	0.30	0.69	0.85	3.16	-0.72	1.39
X1								
Mean (%)	-5.53	-2.38	-1.57	-3.95	-0.15	0.70	1.06	-1.19
(t-stat)	-4.90	-2.00	-1.64	-5.52	-0.14	0.58	1.09	-1.59
St. Dev	19.03	20.14	16.11	12.08	18.63	20.17	16.22	12.68
Sharpe Ratio	-0.29	-0.12	-0.10	-0.33	-0.01	0.03	0.07	-0.09
Alpha	-11.79	-9.09	-6.99	-5.13	-6.69	-6.09	-4.59	-2.19
(t-stat)	-5.27	-3.37	-3.40	-2.15	-3.09	-1.86	-2.28	-0.85

Table XXI: Accelerated Value Portfolios

Chart XVI: Cumulative Returns of Top performing Accelerated Value Portfolios

Table reports for the performance of Value portfolios singly sorted by Price Earnings (PE) and then re-sorted by the degree of the short-term price variation (Acceleration). The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The EM3-EM1 portfolio represents the high minus low spread in returns.

Chart XVI reports for the cumulative return of accelerated value top performing portfolios



III. Overall Best

Below we provide the summary of the best strategies performed obtained by our analysis. They are presented both raw and adjusted for 10% annual volatility in order to ease comparison between different strategies and because it seems a reasonable acceptable by most investors.

We observe that in terms of raw average annual returns Value strategies seem to be the most profitable (30% p.a.). Despite the fact that Momentum presents lower returns and higher volatility than Value, we see that its low correlation can actually bring benefits for a combined strategy, in terms of risk adjusted returns. The equal weight portfolio of Value & Momentum raw returns seems to yield the best risk adjusted outcome – Sharpe ratio of 2.5. Moreover, we see that all strategies yield positive and significant abnormal returns versus the market (alphas) both before and after risk adjustments.

Thus, once we compare to the US Market, we observe that we hold a simple strategy that outperforms the market consistently.

Table XXII (XXIII): Best performing Value, Momentum and combined Portfolios (all adjusted for 10% annual volatility)

Chart XVII (XVIII): Cumulative Returns of Top performing Value & Momentum Portfolios (all adjusted for 10% annual volatility)

Table reports for the performance of Value & Momentum best performing portfolios. I also provide a 50-50 weight portfolio which is composed by the sum of equally weighted Value & Momentum best strategies. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. Table XXIII presents the same statistics for raw returns adjusted proportionally to 10% annual volatility.

Chart XVII reports for the cumulative return of Value & Momentum top performing portfolios. Chart XVII reports the same portfolios with returns adjusted for 10% annual volatility.

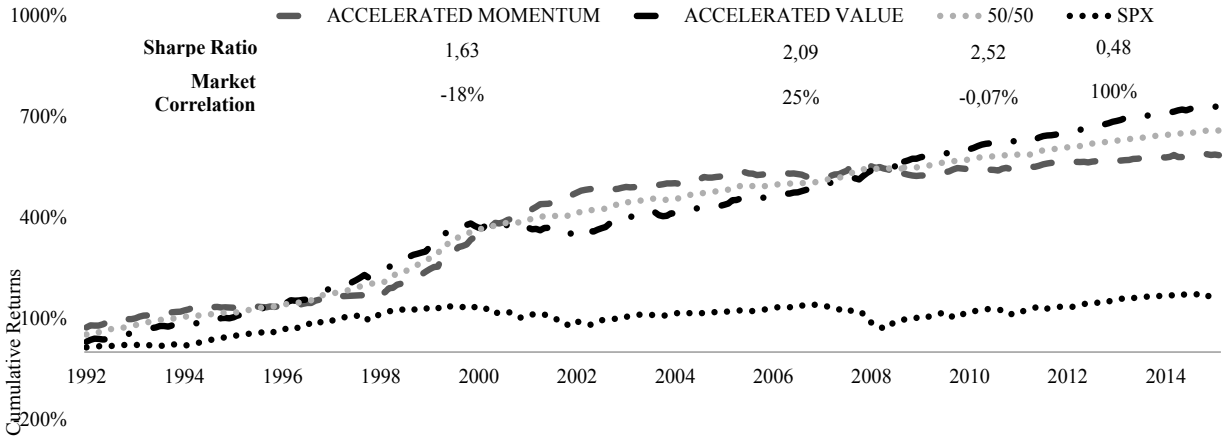
Table XXII
Best Strategies Summary

	Accelerated Momentum	Accelerated Value	50%-50%	SPX
Mean (%)	24,68	30,86	27,77	6,83
(t-stat)	27,44	35,24	42,48	8,11
St. Dev	15,18	14,78	11,03	14,57
Sharpe Ratio	1,63	2,09	2,52	0,47
Alpha	29,34	33,28	31,30	-
(t-stat)	8,64	9,79	12,56	-
(val,mom) correlation = 8,45%				

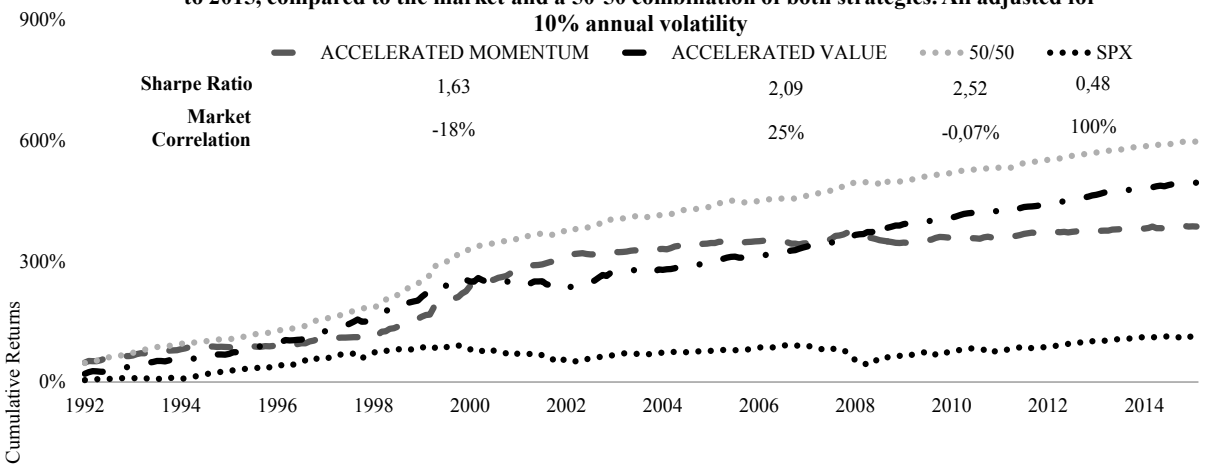
Table XXIII
Best Strategies Summary Controled for 10% Volatility

	Accelerated Momentum	Accelerated Value	50%-50%	SPX
Mean (%)	16,25	20,87	25,17	4,69
(t-stat)	27,44	35,24	42,48	7,92
St. Dev	10,00	10,00	10,00	10,00
Sharpe Ra	1,63	2,09	2,52	0,47
Alpha	18,54	21,54	28,02	-
(t-stat)	8,64	9,79	12,56	-

Graph XVII - Cumulative returns to top performing Value & Momentun portfolios from 1990 to 2015, compared to the market and a 50-50 combination of both strategies



Graph XVIII - Cumulative returns to top performing Value & Momentum portfolios from 1990 to 2015, compared to the market and a 50-50 combination of both strategies. All adjusted for 10% annual volatility



I. Drawbacks & Conclusions

III.I Model Drawbacks

Despite the extent of this analysis, we find that there are several issues that might compromise the viability of our model. The first one regards the sample: after all, 671 stocks might not be a significant amount of stocks to represent the total market throughout the analyzed period. It this is the case, despite significant t-tests, the presented results might not be true once applied in practice. Moreover, we only used stocks from the S&P 500, meaning that this model only works for high-cap stocks.

Regarding both Value & Momentum strategies, I verify that the only assumptions made were to explain the results or the phenomenon itself. For example, we claimed that mean-reverse price theory would help explaining Price Momentum - as undervalued stocks will have an increase in price and overvalued a decrease. This price variation is captured by Price Momentum.

III.II Concluding Remarks

During the following paper, we had the chance to analyze in depth Value & Momentum. We verified that these two strategies solely applied hold a major drawback: they cannot distinguish between the three types of stocks: the first ones (Type One) are those which start performing soon after they were identified as high (winners) or low (losers). The second type (Type Two) includes stocks which only start suffering from a significant price variation towards a trend (up or downwards) in a mid-term range. The last ones (Type Three) are those which do never outperform (stable price returns) or have a price trend towards a different direction than the expected. Therefore, I decided to we applied different methodologies in order to sort between true winner and loser stocks (Type One). Below we can find the main conclusions all the studied phenomena.

III.II.I Momentum

For sole **Price Momentum**, we were able to verify that all portfolios, including loser yielded positive, significant and above market returns and Sharpe Ratios. Based on this, we were able to conclude that independently from the portfolios, on average, past returns are a proxy for future, confirming what was claimed by Moskowitz, Ooi and Pedersen (2012). We were not able to prove the existence sole Momentum phenomena itself on raw returns - despite the fact that winners provide a positive and significant outcome; losers also do it, refuting current and past literature.

To verify a positive distinction between Type One and the others, we should see within each Price Momentum portfolio (Winners, Mid Performers and Losers) an increase in performance for firms with higher financial ratios or acceleration and a decrease for those with lower, reaching values above and below sole Momentum's, respectively

In order to increase Momentum's performance I first re-sorted stocks based on Earnings Momentum ratios: Current Ratio (CR), Debt to Equity (DtoE), Earnings per Share (EPS) and Asset Turnover (AT).

For CR, we observed an overall decrease in performance caused, perhaps by the lag of information held by the market and represented in the ratios. DtoE and EPS, presented fairly equal conclusions: slight variation in average returns were followed by volatility, meaning that Sharpe Ratios remained similar. A probable explanation for this happening is the match between the information held by the market and one represented by the ratios, causing a general indifference after double sorting. When double sorting by Asset Turnover: for stocks with high past returns (Price Momentum winners), this ratio seems to be indifferent, similar to DtoE and EPS, but for mid performers and losers, while keeping the return for firms with high AT, it somehow decreased the performance measurements for the ones with lower levels of the ratio. This can mean that for firms presenting lower levels of AT, double sorting is somehow effective to distinguish the three types of stocks. One possible cause is that for lower performing stocks, information provided by the ratio was not fully absorbed yet. Concluding, despite outperforming the market, it is due to sole Momentum and not to by ratio re-sort. Asset turnover was the only ratio that presented some weak evidences of distinction between the three types of stocks.

Accelerated Price Momentum provided a clear distinction between the three previously mentioned types of stocks, maximizing sole Momentum's returns. It was in fact so clear that we were able to find true and false winners and losers. Meaning that the best investment possible strategy is: within stocks with high momentum, investing on assets with high accelerations (true winners) and shorting those with low acceleration (false winners). Meanwhile, for stocks with lower momentum, one should short assets with high acceleration (true losers) and invest on those with low acceleration (false losers) – this strategy can be called Sum of Spreads between winners and losers. It should also be stressed that opposite from what we were expecting, true losers have high and false ones have lower acceleration. We attributed this result to investor's overreaction to negative information, as expressed by Bondt & Thaler (1985). We therefore confirm the maximization of Momentum strategies using accelerating ratios as expressed by Bird & Casavecchia (2007).

With Earnings Momentum, we expected to verify if pure financial performance, without any influence of subjective information was a significant predictor of future returns. Inclusively, if it outperformed both the market and Price Momentum.

Generally, **Earnings Momentum** provided unsatisfactory results. We proved that Debt to Equity (DtoE) and Current Ratios (CR) were not relevant stock return predictor on a stand-alone basis, probably because asset prices reflect accurately the information provided by this ratio. On the contrary, using Asset Turnover (AT) and Earnings per Share (EPS) individually provided mostly positive return portfolios. The fact that both Earnings and Price Momentum seem to be highly correlated to each other means that possibly, firms with similar level of AT and EPS also have similar past returns. Therefore, high positive returns among Earnings Momentum portfolios can be attributed to the fact that past returns seem to explain futures'. We can also verify that AT and EPS strategies also provided similar to market results. I attribute these results to the fact that we used both S&P as sample and benchmark while at the same time, this strategy was not able to select persistently the true winners (Type One). In order to distinguish between the three types, we combined ratios on using a double sorting methodology and accelerated Earnings Momentum.

After double sorting we find that DtoE and CR combine explain better future returns than each standing alone variable, yielding together similar average and risk adjusted returns to single EPS and AT. Other than it would be expected the combination of the last two does not yield higher returns - Their high correlation and origin on firms' sales seems to point towards that the insights they provide to stock prices when single sorted are the same. Overall, despite

finding slightly positive and significant alphas on single sorts based on EPS, the remaining performance measurements do not seem highly different than the market, meaning that through this strategy we do not distinguish the three types of stocks nor significantly beat the market. Therefore, we can also conclude that using financials is not better than using information that encompasses subjective data (stock prices or price-to-financials).

Despite not having a plausible explanation for it, we observed that after Earnings Momentum acceleration, firms with mid financial ratios suffered a boost on their average annual returns which seems to point that growing stocks (Type One) are on Mid Financial level portfolios. Also, we observed that acceleration seems to be indifferent to stocks with high financials within each single sorted portfolio. As stock prices derive from financial ratios, we concluded that for two similar firms, the one with higher financials will draw attention from investors creating a "trend". If this happens, it means that higher financials imply higher accelerations and therefore, double sorting one by the other will lead to similar results. Also, we found that Accelerated Earnings Momentum can prove itself slightly useful to distinguish true losers (Type Three) from the remaining, as firms with lower short-term price returns seem to yield lower returns than the ones with higher acceleration.

III.II.II Value

According to what was mentioned above, high returns provided by Value strategies are caused by investors' overreactions that change prices more than it impacts firms' financials. Thus, we believed that low price to financial stocks can be undervalued stocks while high price to financials can be overvalued. The main assumption is that big price variations imply big financials. This means that if there's only a variation in one of them, prices will adjust in the future to the expected value

Value phenomena proved to exist amongst both Price Earnings and Price to Cash-flow, sole. However, when comparing different portfolios (V3, 2 and 1) the first ratio's spread portfolio provided both a higher average annual and risk adjusted returns while Price to Cash-flow's spread only offered higher Sharpe ratios. Nonetheless, in both strategies the high minus low value portfolios yielded greater abnormal returns.

I also sorted Value by financial ratios and acceleration to test if we could maximize Value's returns by sorting efficiently stocks of Types One, Two and Three.

Double sorting each of the two ratios for each other maximized Value performance, increasing the performance of winners (V3 A3) and decreasing the losers (V1 A1). Therefore, the best value strategy to apply so far would be a short position on firms with high values of PE and PCF and long on firms with low amounts of both ratios, yielding a total average annual return between 26% and 30% p.a., depending on the double sorting order. This means that each ratio provides different and complementary information to each other

Accelerated value did not prove itself useful to distinguish between the three types of stocks, as results were not the expected and we found no feasible explanation for it. We expected that true winners would be high value (low price to financials) and high acceleration and true losers would have low value (high price to financials) and low acceleration. Despite not finding the expectable, one can take some conclusions about the portfolio that yields positive and abnormal returns comparing to the market: a long position on assets with low price to financials and mid-levels of acceleration and a short on those with high values of price to financial will yield positive, significant outcomes and above market.

As a summary, we can find above a comparison between the best Value, Momentum and equal weight of both strategies. We were therefore able to find consistent strategies that not only yield positive abnormal returns but also are able to beat consistently the market. When combining best performers of both Value & Momentum, we see that it is the best risk adjusted strategy, perhaps due to the low correlation between both phenomena.

APPENDIX

Table V: Momentum Portfolio Performance double sorted by Asset Turnover, Earnings per Share, Current Ratio & Debt to Equity between 1990 and 2002

Table reports for the performance of Momentum portfolios re-ranked based on each stock's fundamental ratios. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns.

	Price Momentum sorted by Current Ratio (CR)				Price Momentum sorted by Debt to Equity (DtoE)				Market
PM3	CR3	CR2	CR1	CR3-CR1	DtoE3	DtoE2	DtoE1	DtoE3-DtoE1	SPX
Mean (%)	0,02	0,03	0,02	-0,01	0,02	0,02	0,02	-0,01	10,41
(t-stat)	2,63	3,44	3,39	-0,40	3,10	3,77	2,77	-0,61	0,06
St. Dev	0,06	0,04	0,05	0,05	0,04	0,05	0,05	0,04	14,26
Sharpe Ratio	0,25	0,64	0,48	-0,15	0,43	0,35	0,44	-0,12	0,73
Alpha	-0,02	0,00	0,00	-0,02	0,00	-0,01	-0,01	0,01	
(t-stat)	-1,74	0,39	-0,02	-1,34	-0,25	-0,91	-0,76	0,36	
PM2									
Mean (%)	0,01	0,02	0,03	-0,02	0,02	0,02	0,03	-0,01	
(t-stat)	0,10	0,23	0,41	-0,28	0,27	0,21	0,29	-0,18	
St. Dev	1,13	1,14	0,80	0,77	0,83	0,89	1,13	0,55	
Sharpe Ratio	0,01	0,02	0,04	-0,03	0,03	0,02	0,03	-0,02	
Alpha	-0,02	0,00	0,01	-0,03	0,00	-0,01	0,00	0,00	
(t-stat)	-1,62	-0,06	1,13	-2,58	0,35	-0,59	0,16	0,24	
PM1									
Mean (%)	6,11	9,72	12,46	-6,35	10,61	8,93	10,95	-0,34	
(t-stat)	1,16	1,23	2,46	-1,03	3,00	1,19	1,55	-0,07	
St. Dev	25,24	19,42	16,01	18,41	17,35	18,33	22,38	14,81	
Sharpe Ratio	0,24	0,50	0,78	-0,34	0,61	0,49	0,49	-0,02	
Alpha	-6,75	0,02	5,07	-11,30	2,30	1,12	-1,21	3,54	
(t-stat)	-1,39	-0,20	0,99	-2,17	0,29	-0,06	-0,32	0,61	

	Price Momentum sorted by Asset Turnover (AT)				Price Momentum sorted by Earnings Per Share (EPS)			
PM3	AT3	AT2	AT1	AT3-AT1	EPS3	EPS2	EPS1	EPS2-EPS1
Mean (%)	0,02	0,02	0,02	0,00	0,02	0,02	0,02	-0,01
(t-stat)	3,23	3,23	3,23	3,23	3,10	3,10	3,10	3,10
St. Dev	0,05	0,05	0,05	0,03	0,04	0,05	0,05	0,04
Sharpe Ra	0,51	0,41	0,45	0,14	0,43	0,35	0,44	-0,12
Alpha	0,00	-0,01	0,00	0,00	0,00	-0,01	-0,01	0,01
(t-stat)	-0,32	-0,98	-0,57	0,25	-0,25	-0,91	-0,76	0,36
PM2								
Mean (%)	0,02	0,03	0,02	0,00	0,02	0,02	0,03	-0,01
(t-stat)	0,20	0,20	0,20	0,20	0,27	0,27	0,27	0,27
St. Dev	0,95	1,24	0,87	0,46	0,83	0,89	1,13	0,55
Sharpe Ra	0,02	0,02	0,02	0,00	0,03	0,02	0,03	-0,02
Alpha	-0,01	0,01	-0,01	0,00	0,00	-0,01	0,00	0,00
(t-stat)	-0,76	0,39	-0,78	0,02	0,35	-0,59	0,16	0,24
PM1								
Mean (%)	7,92	13,78	6,58	1,34	10,61	8,93	10,95	-0,34
(t-stat)	5,07	5,07	5,07	5,07	3,00	3,00	3,00	3,00
St. Dev	20,24	17,95	19,91	10,97	17,35	18,33	22,38	14,81
Sharpe Ra	0,39	0,77	0,33	0,12	0,61	0,49	0,49	-0,02
Alpha	-2,50	4,62	-3,47	1,00	2,30	1,12	-1,21	3,54
(t-stat)	-0,57	0,81	-1,06	0,62	0,29	-0,06	-0,32	0,61

Table VI: Momentum Portfolio Performance double sorted by Asset Turnover, Earnings per Share, Current Ratio & Debt to Equity between 2003 and 2015

Table reports for the performance of Momentum portfolios re-ranked based on each stock's fundamental ratios. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns.

	Price Momentum sorted by Current Ratio (CR)				Price Momentum sorted by Debt to Equity (DtoE)				Market
PM3	CR3	CR2	CR1	CR3-CR1	DtoE3	DtoE2	DtoE1	DtoE3-DtoE1	SPX
Mean (%)	0,20	0,25	0,22	-0,02	0,20	0,21	0,22	-0,02	4,30
(t-stat)	3,11	4,07	4,02	-0,48	3,67	4,46	3,28	-0,72	0,02
St. Dev	0,81	0,79	0,71	0,66	0,70	0,61	0,87	0,38	14,80
Sharpe Ratio	0,24	0,31	0,31	-0,04	0,28	0,34	0,25	-0,06	0,29
Alpha	0,10	0,16	0,15	-0,05	0,13	0,14	0,12	0,00	
(t-stat)	0,51	0,83	0,85	-0,28	0,72	0,92	0,58	0,03	
PM2									
Mean (%)	0,05	0,05	0,29	-0,24	0,25	0,17	0,16	0,09	
(t-stat)	0,53	0,54	4,65	-4,05	3,87	2,55	1,81	2,10	
St. Dev	1,13	1,14	0,80	0,77	0,83	0,89	1,13	0,55	
Sharpe Ratio	0,04	0,04	0,36	-0,31	0,30	0,20	0,14	0,16	
Alpha	-0,07	-0,06	0,21	-0,27	0,16	0,08	0,05	0,11	
(t-stat)	-0,24	-0,21	1,02	-1,33	0,76	0,35	0,16	0,74	
PM1									
Mean (%)	8,17	5,35	5,91	2,26	5,68	5,34	7,32	-1,65	
(t-stat)	1,74	0,58	0,80	0,52	1,17	0,58	1,07	-0,37	
St. Dev	22,55	22,44	23,42	12,95	23,81	22,63	21,66	13,43	
Sharpe Ratio	0,36	0,24	0,25	0,17	0,24	0,24	0,34	-0,12	
Alpha	2,64	-0,24	0,34	2,30	-0,08	-0,10	2,07	-2,11	
(t-stat)	0,93	-0,09	0,10	0,65	-0,03	-0,03	0,73	-0,59	

	Price Momentum sorted by Asset Turnover (AT)				Momentum sorted by Earnings Per Share			
PM3	AT3	AT2	AT1	AT3-AT1	EPS3	EPS2	EPS1	EPS2-EPS1
Mean (%)	0,20	0,27	0,33	-0,13	0,20	0,21	0,22	-0,02
(t-stat)	3,82	4,37	4,91	-2,56	3,67	3,67	3,67	3,67
St. Dev	0,67	0,80	0,87	0,66	0,70	0,61	0,87	0,38
Sharpe Ratio	0,30	0,34	0,38	-0,20	0,28	0,34	0,25	-0,06
Alpha	0,12	0,18	0,25	-0,13	0,13	0,14	0,12	0,00
(t-stat)	0,74	0,92	1,13	-0,72	0,72	0,92	0,58	0,03
PM2								
Mean (%)	0,04	0,18	0,15	-0,12	0,25	0,17	0,16	0,09
(t-stat)	0,53	1,88	2,29	-3,24	3,87	3,87	3,87	3,87
St. Dev	0,95	1,24	0,87	0,46	0,83	0,89	1,13	0,55
Sharpe Ratio	0,04	0,15	0,18	-0,25	0,30	0,20	0,14	0,16
Alpha	-0,06	0,07	0,06	-0,12	0,16	0,08	0,05	0,11
(t-stat)	-0,26	0,21	0,27	-0,95	0,76	0,35	0,16	0,74
PM1								
Mean (%)	8,44	7,45	3,79	4,65	5,68	5,34	7,32	-1,65
(t-stat)	5,14	5,14	5,14	5,14	1,17	1,17	1,17	1,17
St. Dev	21,26	23,06	22,64	11,54	23,81	22,63	21,66	13,43
Sharpe Ratio	0,40	0,32	0,17	0,40	0,24	0,24	0,34	-0,12
Alpha	3,17	1,66	-1,47	4,70	-0,08	-0,10	2,07	-2,11
(t-stat)	1,24	0,62	-0,44	1,48	-0,03	-0,03	0,73	-0,59

Table VIII: Accelerated Momentum portfolios performance

Chart VIII: Cumulated returns of Spread Accelerated Momentum Portfolios between 2003 and 2015

Table reports for the performance of Momentum portfolios re-ranked based on each stock's acceleration ratios. The methodology used was the one provided by Bird & Casavecchia (2007). According to the same authors, positive trends take longer to be identified than negative ones. Therefore, the 50% higher Momentum stocks were accelerated based on a long term ratio between Momentum (12 months over 24) and the remaining using a short term one (3 months over 6). Then stocks within each portfolio (PM3, PM2 and PM1) were double sorted based on the value of the ratio obtained leading to a total of 9 (3x3) new portfolios (PMx A3, PMx A2 and PMx A1)

The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns.

Chart VIII presents the cumulated returns for the spread Accelerated Momentum portfolios

Table VIIIAccelerated Price Momentum					Market
PM3	A3	A2	A1	A3-A1	SPX
Mean (%)	14,15	11,61	2,63	11,51	4,30
(t-stat)	12,42	10,14	2,24	15,14	0,02
St. Dev	14,76	14,84	15,21	9,86	14,80
Sharpe Ratio	0,96	0,78	0,17	1,17	0,29
Alpha	11,47	8,47	-1,03	12,62	
(t-stat)	4,47	3,73	-0,51	4,56	
PM2					
Mean (%)	14,57	15,15	-2,99	17,56	
(t-stat)	11,54	12,45	-2,21	21,30	
St. Dev	16,37	15,78	17,47	10,68	
Sharpe Ratio	0,89	0,96	-0,17	1,64	
Alpha	11,02	11,76	-7,11	19,38	
(t-stat)	5,33	6,28	-3,55	6,24	
PM1					
Mean (%)	-2,53	9,39	12,36	-14,89	
(t-stat)	-1,54	5,22	6,78	-13,16	
St. Dev	21,24	23,30	23,62	14,67	
Sharpe Ratio	-0,12	0,40	0,52	-1,02	
Alpha	-7,36	3,68	7,06	-13,54	
(t-stat)	-2,62	1,27	1,98	-3,69	

Graph VIII - Cumulative returns to Spread Accelerated Price Momentum portfolios 1990 to 2015, compared to the market

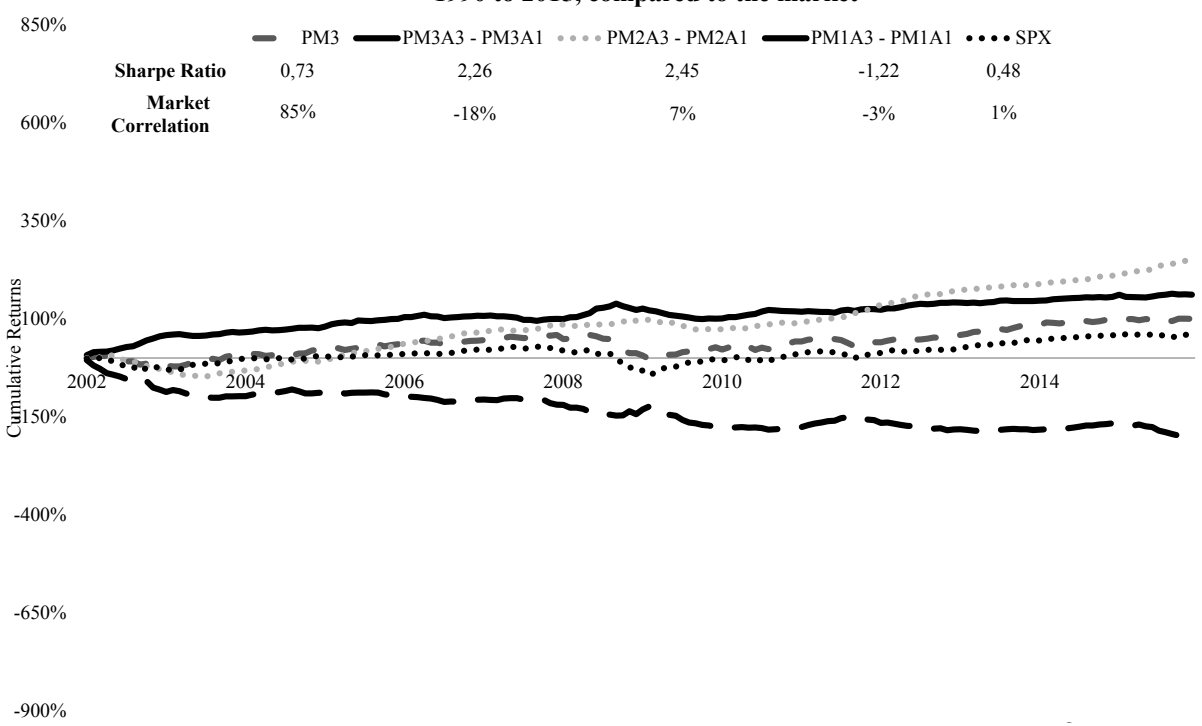


Table IX: Accelerated Momentum portfolios performance

Chart IX: Cumulated returns of Spread Accelerated Momentum Portfolios between 1990 and 2002

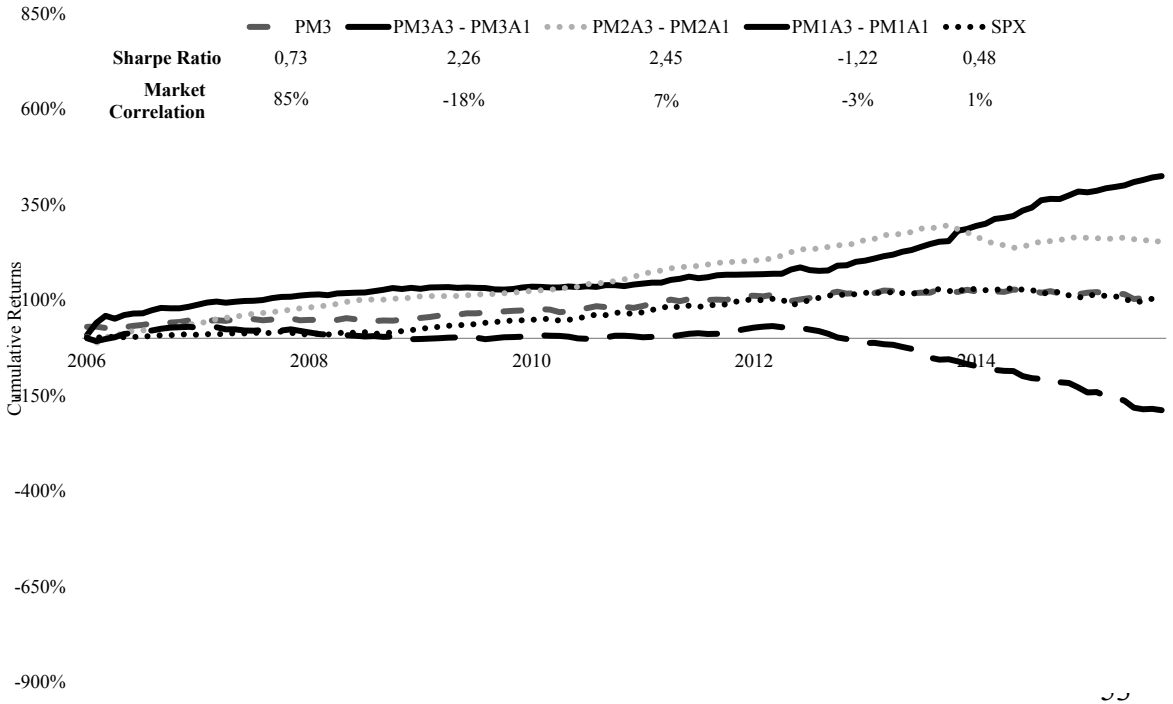
Table reports for the performance of Momentum portfolios re-ranked based on each stock's acceleration ratios. The methodology used was the one provided by Bird & Casavecchia (2007). According to the same authors, positive trends take longer to be identified than negative ones. Therefore, the 50% higher Momentum stocks were accelerated based on a long term ratio between Momentum (12 months over 24) and the remaining using a short term one (3 months over 6). Then stocks within each portfolio (PM3, PM2 and PM1) were double sorted based on the value of the ratio obtained leading to a total of 9 (3x3) new portfolios (PMx A3, PMx A2 and PMx A1)

The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns.

Chart VII presents the cumulated returns for the spread Accelerated Momentum portfolios

Table IX : Accelerated Price Momentum					Market
PM3	A3	A2	A1	A3-A1	SPX
Mean (%)	27,74	23,59	-15,84	43,58	10,41
(t-stat)	10,36	8,43	1,87	12,63	0,06
St. Dev	14,86	15,21	18,99	19,32	14,26
Sharpe Ra	1,87	1,55	-0,83	2,26	0,73
Alpha	23,38	16,58	-23,56	59,74	
(t-stat)	5,27	4,46	-6,29	7,73	
PM2					
Mean (%)	20,40	17,91	-5,78	26,19	
(t-stat)	13,48	12,28	-3,58	26,51	
St. Dev	16,37	15,78	17,47	10,68	
Sharpe Ra	1,25	1,13	-0,33	2,45	
Alpha	14,86	10,58	-12,17	30,41	
(t-stat)	3,71	3,64	-3,10	5,29	
PM1					
Mean (%)	-0,61	13,55	18,91	-19,35	
(t-stat)	-0,37	8,93	12,50	-15,78	
St. Dev	21,14	19,66	19,61	15,90	
Sharpe Ra	-0,03	0,69	0,96	-1,22	
Alpha	-10,44	4,16	9,80	-18,45	
(t-stat)	-2,10	0,88	1,92	-3,87	

Graph IX - Cumulative returns to Spread Accelerated Price Momentum portfolios 1990 to 2015, compared to the market



Tables XIII, XIV, XV & XVI: Double sorted Earnings Momentum portfolios performance by ratio

Table reports for Earnings Momentum portfolio performance with double sorting based on Current Ratio (Table XIII), Debt to Equity (Table XIV), Earnings per Share (Table XVI) and Asset Turnover (Table XVII). The methodology used was similar to acceleration's, provided by Bird & Casavecchia (2007). After single sorting, stocks within each portfolio (EM3, EM2 and EM1) were double sorted based on the value of the ratio obtained leading to a total of 9 (3x3) new portfolios for each ratio. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns.

Tables XIII – Earnings Momentum Double Sorted by Debt to Equity

	Current Ratio (CR) sorted by Asset Turnover (AT)				Current Ratio (CR) sorted by Earnings Per Share (EPS)				Current Ratio (CR) sorted by Debt to Equity (DtoE)				Market
PM3	AT3	AT2	AT1	AT3-AT1	EPS3	EPS2	EPS1	EPS2-EPS1	DtoE3	DtoE2	DtoE1	DtoE3-DtoE1	SPX
Mean (%)	6,28	8,03	3,97	2,32	5,88	5,45	8,13	-2,25	5,11	6,27	6,58	-1,48	6,94
(t-stat)	5,70	7,34	3,19	3,28	5,86	4,87	6,14	-2,76	4,72	5,82	4,94	-1,66	0,03
St. Dev	18,72	18,58	21,09	12,00	17,04	18,98	22,47	13,85	18,37	18,29	22,61	15,13	14,61
Sharpe Ratio	0,34	0,43	0,19	0,19	0,35	0,29	0,36	-0,16	0,28	0,34	0,29	-0,10	0,48
Alpha	-1,20	0,40	-4,19	3,11	-0,80	-2,32	-0,72	-0,08	-1,98	-1,26	-2,06	0,09	
(t-stat)	-0,57	0,12	-1,87	1,29	-0,46	-1,40	-0,30	-0,05	-1,16	-0,72	-0,80	-0,10	
PM2													
Mean (%)	9,17	10,52	7,72	1,46	8,46	11,08	7,94	0,51	8,46	8,71	10,25	-1,79	
(t-stat)	10,11	10,47	8,14	2,75	9,27	12,89	7,92	0,97	8,49	8,88	11,63	-3,20	
St. Dev	15,40	17,05	16,08	9,01	15,47	14,58	17,01	8,92	16,91	16,65	14,95	9,49	
Sharpe Ratio	0,60	0,62	0,48	0,16	0,55	0,76	0,47	0,06	0,50	0,52	0,69	-0,19	
Alpha	3,16	3,98	1,47	1,67	2,51	5,52	1,20	1,29	2,13	2,38	4,32	-2,11	
(t-stat)	1,67	1,90	0,75	1,04	1,23	3,48	0,60	0,69	0,93	1,07	2,96	-1,18	
PM1													
Mean (%)	8,67	8,47	6,87	1,80	9,48	8,78	7,31	2,17	7,59	7,59	8,63	-1,05	
(t-stat)	10,62	9,71	7,98	3,11	12,27	11,45	7,68	4,00	8,84	10,01	9,36	-2,12	
St. Dev	13,85	14,81	14,61	9,84	13,12	13,01	16,16	9,24	14,57	12,87	15,65	8,38	
Sharpe Ratio	0,63	0,57	0,47	0,18	0,72	0,67	0,45	0,24	0,52	0,59	0,55	-0,12	
Alpha	3,39	2,82	2,19	1,18	4,92	3,78	1,20	3,68	2,36	3,11	2,57	-0,21	
(t-stat)	1,93	1,50	0,97	0,51	2,94	2,31	0,39	2,43	1,19	1,59	1,38	-0,07	

Tables XIII, XIV, XV & XVI: Double sorted Earnings Momentum portfolios performance by ratio

Table reports for Earnings Momentum portfolio performance with double sorting based on Current Ratio (Table XIII), Debt to Equity (Table XIV), Earnings per Share (Table XVI) and Asset Turnover (Table XVII). The methodology used was similar to acceleration's, provided by Bird & Casavecchia (2007). After single sorting, stocks within each portfolio (EM3, EM2 and EM1) were double sorted based on the value of the ratio obtained leading to a total of 9 (3x3) new portfolios for each ratio. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns.

Tables XIV – Earnings Momentum Double Sorted by Asset Turnover

	Debt to Equity (DtoE) sorted by Asset Turnover (AT)				Debt to Equity (DtoE) sorted by Earnings Per Share (EPS)				Debt to Equity (DtoE) double sorted by Current Ratio (CR)				Market
PM3	AT3	AT2	AT1	AT3-AT1	EPS3	EPS2	EPS1	EPS2-EPS1	CR3	CR2	CR1	CR3-CR1	SPX
Mean (%)	9,58	8,07	8,31	1,27	7,58	8,40	7,42	0,17	7,72	8,02	8,35	-0,63	6,94
(t-stat)	10,46	10,46	10,46	10,46	9,38	9,38	9,38	9,38	6,97	8,32	9,15	-0,94	0,03
St. Dev	15,54	16,86	17,16	9,67	13,72	15,21	18,59	11,86	18,78	16,36	15,48	11,48	14,61
Sharpe Ratio	0,62	0,48	0,48	0,13	0,55	0,55	0,40	0,01	0,41	0,49	0,54	-0,06	0,48
Alpha	3,63	1,39	1,60	2,00	2,59	2,14	-0,02	2,61	0,12	1,57	2,57	-2,40	
(t-stat)	2,21	0,78	0,80	1,17	1,55	1,38	-0,15	1,37	0,08	0,89	1,34	-1,03	
PM2													
Mean (%)	8,63	8,65	5,15	3,47	8,55	8,57	7,34	1,21	4,72	8,51	9,34	-4,62	
(t-stat)	8,64	0,03	0,02	0,02	9,87	0,03	0,02	0,01	4,03	0,03	0,04	-0,02	
St. Dev	16,94	16,05	16,64	9,20	14,71	15,55	18,73	11,35	19,89	15,86	14,54	12,84	
Sharpe Ratio	0,51	0,54	0,31	0,38	0,58	0,55	0,39	0,11	0,24	0,54	0,64	-0,36	
Alpha	1,67	2,23	-1,40	3,10	2,83	2,31	-0,21	3,05	-3,36	2,20	3,90	-7,01	
(t-stat)	0,91	1,28	-0,96	1,74	1,52	1,43	-0,21	1,37	-2,01	1,27	2,14	-3,01	
PM1													
Mean (%)	6,80	7,16	6,24	0,56	8,15	8,24	9,21	-1,06	5,14	6,64	9,25	-4,10	
(t-stat)	7,25	7,25	7,25	7,25	8,69	0,03	0,03	-0,01	4,58	7,10	11,55	-5,20	
St. Dev	15,91	16,88	14,90	10,30	15,91	15,02	18,50	11,03	19,07	15,87	13,58	13,39	
Sharpe Ratio	0,43	0,42	0,42	0,05	0,51	0,55	0,50	-0,10	0,27	0,42	0,68	-0,31	
Alpha	0,32	0,25	0,91	-0,58	2,11	2,31	1,79	0,31	-2,60	0,45	4,45	-6,77	
(t-stat)	0,17	-0,04	0,42	-0,27	1,17	1,55	0,93	0,20	-1,51	0,07	2,43	-2,86	

Tables XIII, XIV, XV & XVI: Double sorted Earnings Momentum portfolios performance by ratio

Table reports for Earnings Momentum portfolio performance with double sorting based on Current Ratio (Table XIII), Debt to Equity (Table XIV), Earnings per Share (Table XVI) and Asset Turnover (Table XVII). The methodology used was similar to acceleration's, provided by Bird & Casavecchia (2007). After single sorting, stocks within each portfolio (EM3, EM2 and EM1) were double sorted based on the value of the ratio obtained leading to a total of 9 (3x3) new portfolios for each ratio. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns.

Tables XV – Earnings Momentum Double Sorted by Debt to Equity

Earnings per Share (EPS) sorted by Asset Turnover (AT)					**Earnings per Share (EPS) sorted by Debt to Equity (DtoE)**				**Earnings per Share (EPS) double sorted by Current Ratio (CR)**				**Market**
PM3	AT3	AT2	AT1	AT3-AT1	DtoE3	DtoE2	DtoE1	DtoE2-DtoE1	CR3	CR2	CR1	CR3-CR1	SPX
Mean (%)	8,45	7,85	8,54	-0,09	8,82	8,85	7,27	1,55	6,28	8,71	8,47	-2,19	6,94
(t-stat)	9,10	8,64	10,37	-0,18	11,20	9,65	8,06	3,28	6,37	9,71	11,11	-3,70	0,03
St. Dev	15,75	15,42	13,97	8,67	13,37	15,56	15,32	8,01	16,72	15,22	12,93	10,03	14,61
Sharpe Ratio	0,54	0,51	0,61	-0,01	0,66	0,57	0,47	0,19	0,38	0,57	0,65	-0,22	0,48
Alpha	2,42	1,89	3,56	-1,10	3,95	3,04	1,54	2,37	-0,19	2,88	4,01	-4,05	
(t-stat)	1,47	1,03	1,93	-0,50	2,41	1,55	1,00	1,33	-0,10	1,63	2,41	-2,31	
PM2													
Mean (%)	8,89	9,62	6,99	1,90	9,85	8,46	7,80	2,05	6,09	10,11	8,49	-2,40	
(t-stat)	10,41	9,96	7,72	3,77	11,65	9,28	8,33	3,59	5,78	11,63	10,17	-3,82	
St. Dev	14,49	16,39	15,37	8,56	14,34	15,48	15,90	9,68	17,90	14,76	14,17	10,65	
Sharpe Ratio	0,61	0,59	0,45	0,22	0,69	0,55	0,49	0,21	0,34	0,69	0,60	-0,23	
Alpha	3,22	2,93	0,78	2,43	4,68	2,34	1,24	3,41	-1,23	4,30	3,08	-4,19	
(t-stat)	2,07	1,90	0,35	1,59	2,46	1,33	0,80	1,92	-0,79	2,80	1,97	-2,15	
PM1													
Mean (%)	7,48	7,38	2,18	5,29	3,33	6,98	7,06	-3,73	6,14	5,82	4,08	2,06	
(t-stat)	6,68	6,68	6,68	6,68	3,05	6,44	5,57	-3,97	4,47	5,34	3,78	2,19	
St. Dev	18,99	19,04	18,95	11,04	18,53	18,40	21,50	15,93	23,34	18,49	18,31	15,98	
Sharpe Ratio	0,39	0,39	0,12	0,48	0,18	0,38	0,33	-0,23	0,26	0,31	0,22	0,13	
Alpha	-0,16	-0,47	-5,15	5,24	-3,48	-0,34	-1,23	-2,27	-2,89	-1,59	-2,97	0,09	
(t-stat)	-0,35	-0,64	-2,86	2,41	-1,81	-0,36	-0,77	-0,78	-1,38	-0,95	-1,82	0,11	

Tables XIII, XIV, XV & XVI: Double sorted Earnings Momentum portfolios performance by ratio

Table reports for Earnings Momentum portfolio performance with double sorting based on Current Ratio (Table XIII), Debt to Equity (Table XIV), Earnings per Share (Table XVI) and Asset Turnover (Table XVII). The methodology used was similar to acceleration's, provided by Bird & Casavecchia (2007). After single sorting, stocks within each portfolio (EM3, EM2 and EM1) were double sorted based on the value of the ratio obtained leading to a total of 9 (3x3) new portfolios for each ratio. The following performance measurements can be found: average return, t-statistic of the return, annualized standard deviation of the returns and the average annual Sharpe ratio. It is also presented the alphas or intercepts, and their t-statistics from a time series regression of each return series on the return of the S&P 500 index stocks. The P3-P1 portfolio represents the high minus low spread in returns.

Tables XVI – Earnings Momentum Double Sorted by Asset Turnover

Asset Turnover (AT) sorted by Debt to Equity (DtoE)					**Asset Turnover (AT) sorted by Earnings per Share (EPS)**				**Asset Turnover (AT) double sorted by Current Ratio (CR)**				**Market**
PM3	AT3	AT2	AT1	AT3-AT1	DtoE3	DtoE2	DtoE1	DtoE2-DtoE1	CR3	CR2	CR1	CR3-CR1	SPX
Mean (%)	7,29	7,80	6,88	0,40	8,48	8,00	8,45	0,03	6,18	9,14	8,76	-2,59	6,94
(t-stat)	7,26	9,12	8,03	0,80	9,24	9,41	10,19	0,05	5,46	9,93	9,90	-4,05	0,03
St. Dev	17,05	14,51	14,56	8,55	15,57	14,43	14,08	8,20	19,20	15,63	15,02	10,84	14,61
Sharpe Ratio	0,43	0,54	0,47	0,05	0,54	0,55	0,60	0,00	0,32	0,58	0,58	-0,24	0,48
Alpha	0,90	2,42	1,79	-0,87	2,72	2,52	3,08	-0,35	-1,46	3,04	3,04	-4,38	
(t-stat)	0,39	1,45	0,88	-0,54	1,29	1,57	2,07	-0,49	-0,66	1,88	1,77	-2,05	
PM2													
Mean (%)	8,04	7,47	9,64	-1,60	7,62	9,26	8,39	-0,77	7,98	8,69	8,88	-0,90	
(t-stat)	8,87	0,03	0,03	-0,01	8,57	10,25	9,58	-1,70	7,02	8,65	9,10	-1,19	
St. Dev	15,38	16,53	16,90	7,83	15,09	15,34	14,87	7,66	19,29	17,05	16,57	12,85	
Sharpe Ratio	0,52	0,45	0,57	-0,20	0,51	0,60	0,56	-0,10	0,41	0,51	0,54	-0,07	
Alpha	2,25	1,09	3,06	-0,80	1,78	3,00	2,41	-0,62	0,08	1,96	2,66	-2,52	
(t-stat)	1,13	0,47	1,58	-0,58	0,97	2,15	1,61	-0,32	-0,15	1,01	1,18	-0,91	
PM1													
Mean (%)	7,31	8,85	3,95	3,35	7,67	9,37	3,50	4,17	2,60	6,54	7,94	-5,34	
(t-stat)	7,53	8,95	2,98	4,10	7,24	8,40	3,00	7,21	2,19	7,23	9,58	-5,88	
St. Dev	16,45	16,78	22,53	13,86	17,98	18,94	19,80	9,82	20,19	15,34	14,06	15,41	
Sharpe Ratio	0,44	0,53	0,18	0,24	0,43	0,49	0,18	0,42	0,13	0,43	0,56	-0,35	
Alpha	0,56	1,93	-4,53	5,31	0,26	1,71	-4,14	4,58	-5,15	0,73	3,28	-8,19	
(t-stat)	0,22	1,24	-1,90	1,93	0,13	0,71	-2,45	2,45	-2,56	0,30	1,56	-3,11	

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