UNIVERSIDAD DEL CEMA
Buenos Aires
Argentina

Serie
DOCUMENTOS DE TRABAJO

Área: Finanzas

UNRAVELING THE VALUE PREMIUM: A REWARD FOR RISK OR MISPRICING?

Claudio E. Serur, Julián R. Siri, Juan A. Serur y José P. Dapena

Noviembre 2019
Nro. 704

www.cema.edu.ar/publicaciones/doc_trabajo.html
UCEMA: Av. Córdoba 374, C1054AAP Buenos Aires, Argentina
ISSN 1668-4575 (impreso), ISSN 1668-4583 (en línea)
Editor: Jorge M. Streb; asistente editorial: Valeria Dowding <jae@cema.edu.ar>

Unraveling the value premium: a reward for risk or mispricing?

Claudio E. Serur, Julián R. Siri, Juan A. Serur and José P. Dapena[*]

Universidad del CEMA

Abstract

A value investing strategy consists of purchasing stocks relatively undervalued to their fundamental values and selling those relatively overvalued. Finding this kind of companies has been one of the most challenging goals for investors throughout the history. The main objective of this paper is to test the value factor, but not limited to the traditional Price-To-Book ratio, but exploring diverse alternatives constructed on different metrics in order to determine if it possible to obtain excess returns relative to the traditional one. In addition, these factors were blended different quality factors. First, we tested the so-called high mispricing portfolios, with long positions in value/high quality stocks and short positions in growth/low quality stocks. When blending these portfolios with quality factors, we observe quite an improvement in terms of Sharpe Ratio and maximum drawdowns relative to pure value portfolios. In this case, we see that excluding riskier low-quality stocks reduces the overall risk of the portfolio. Regarding the low mispricing portfolio, the results show that growth/high quality stocks outperform value/low quality stocks. This is consistent with the hypothesis of behavioral-based theories as we see that only undervalued and high-quality stocks generate excess returns. Finally, we test the results against the three-factor Fama-French models, achieving statistically significant alphas in some cases.

JEL: C1, C3, N2, G11.
Key words: Factor investing, factor models, quality factor, excess returns, value investing.

[*] Claudio E Serur; emilianoserur@gmail.com. Julian Ricardo Siri, jrs06@ucema.edu.ar. Juan A. Serur, juanandresserur@gmail.com. José P. Dapena, jd@ucema.edu.ar. The authors' views are on their own and do not necessarily represent those of the Universidad del CEMA. We deeply thank comments of participants from World Finance Conference Santiago Chile 2019.

INTRODUCTION

Factor Investing

A factor can be thought as a set of characteristics or features that a certain asset possesses and that have explanatory power on its return and risk. Therefore, factor investing at its most basic level consists of systematically defining and following a set of rules aimed at producing a portfolio of assets that have been selected based on factors previously defined. The main goal is to find specific features that can explain returns and systematically select those assets with these characteristics and avoid, sell or even short those with the opposite characteristics.

This approach has become very popular among academics and practitioners over the years, leading to the appearance of hundreds of factors, to the point that some referred -not as a compliment- to the existence of a *zoo of factors*[1].

In this regard, when immersing ourselves in the search for factors within the current "zoo", it is crucial to identify those factors that can explain the performance of the assets in a systematic way from those that are simply the product of data mining[2]. For a factor to be considered as such, Berkin & Swedroe (2016) explain that must meet the following criteria. First, it must provide explanatory power to portfolio returns and have delivered a premium. Specifically, a factor has to be persistent (it holds across long periods of time and different economic regimes), pervasive (it holds across countries, regions, sectors and asset classes), robust (it holds for various definitions, for example, there is a value premium whether it is measured by price-to-book, earnings, cash-flow or sales), investable (it holds after considering implementation issues, such as trading costs) and intuitive (there are logical explanations for its premium).

Factor Models

Within the academic world, Capital Asset Pricing Model (CAPM), developed by Treynor (1961), Sharpe (1964) and Lintner (1965), is regarded as the first model formulated to explain the factors that generate asset returns. Even though it is known that CAPM explains asset returns

[1] The term was used by Professor John H. Cochrane at the 2011 presidential address of the *American Finance Association.*

[2] Data mining is the practice of determining an explanatory model through the extensive search of patterns statistically significant in a sample of data. In simple words, it is about digging repeatedly in the same data until something that apparently works is found. This generates risk of overfitting, leading to a poor performance out-of-sample.

only partially, it was the first model to introduce a precise definition of risk and how it explains expected returns.

CAMP is a one factor model: returns and risk of a portfolio are determined by their exposure to market. This exposure is measured by *beta*, which is a measure of sensitivity of the risk of an asset compared to the overall risk of the market. It is also called systematic risk or non-diversifiable because it cannot be eliminated through diversification. Provided that it cannot be eliminated, investors must be rewarded for bearing that risk. Therefore, returns of any asset can be plotted as a function of its market beta.

Next, Ross (1976) introduced the Arbitrage Pricing Theory model (APT), stating that asset returns can be explained by multiple macroeconomic factors. Given that this model is referred as a *multi-factor model*, Ross is usually credited for the creation of the term *factor*. This model, unlike CAPM, does not explicit the factors that can explain asset returns, but the nature of them can change along time and different markets.

Later, Fama & French (1992), proposed an alternative to CAPM model, introducing their three-factor model: besides market beta, they added the *size* and *value* factors. Size factor is calculated as the excess return of low market capitalization versus high market capitalization companies. On the other hand, value is measured as the return of relatively undervalued companies (*value* stocks) minus the return of relatively overvalued companies (*growth* stocks). The proposed way to classify stocks between value and growth is using the Price-To-Book ratio. In this sense, value stocks are those with a low ratio and growth stocks those with a high ratio.

Finally, even though it is not within the scope of this paper to deeply explain all existing factor models, we consider relevant to name other two factors that are highly accepted by both academics and practitioners. One of them is *momentum*, which is measured as the excess return of stocks with best past performance relative to those with worst performance. Some important publication on this subject are Jegadeesh & Titman (1993), Assnes (1994) and Carhart (1997). The latter introduced the four-factor model, adding momentum to the three-factor model of Fama & French.

The last factor what will be mentioned on this paper is *quality*, which is calculated as the excess return of *high-quality* stocks minus returns of *low-quality* stocks. Even though there is no

standard definition, high-quality stocks are usually companies with low earnings volatility, low leverage, high margins and high asset turnover, among others. We can mention Piotroski (2000) y Piotroski y So (2011) as important publications about the subject.

Goals and paper structure

The main objective of this paper is to test the *value* factor, but not limited to the traditional Price-To-Book ratio, but exploring diverse alternatives constructed on different metrics in order to determine if alternative measures provide excess returns relative to the traditional one. In addition, this factor will be blended with the above-mentioned quality factor.

The paper proceeds as follows: in section I we review the main contributions of the literature to the topic under analysis. In section II, we explain the data, methodology and strategies to be developed. In section III, we expose the main results and compare each strategy and, finally, under section IV, we include the main conclusions.

I. REVIEW AND PAST LITERATURE

A value investing strategy consists of purchasing stocks relatively undervalued to their fundamental values and selling those relatively overvalued. This practice has its origins in the 30s, when well-known investors Benjamin Graham and David Dodd published *Security Analysis* (1934). Even though these authors did not study value as a factor per se, they were precursors in applying strategies which consisted of buying stocks that they considered undervalued, after a comprehensive analysis of its financial statements.

Other investor, very famous for applying this kind of strategies and getting extraordinary returns is Warren Buffet, who has been Graham's student. Even though Buffet neither studied value as a factor, his strategies are known for selecting companies with these characteristics. Due to its remarkable success and skills for selecting winner stocks, many academics and practitioners have tried to find explanations for his success. For example, Frazzini, Kabiller & Pedersen (2013) suggested that his ability as stock picker is explained by a significant exposure to certain factors, such as value and quality, and a low exposure to market beta. In simple words, the stocks

that he chooses are safe (with low volatility and market beta), cheap (value stocks with low Price-To-Book ratio) and high-quality (profitable).

Other publication that confirms the results above mentioned, was published by AQR (Superstar Investors, 2016). In this publication, they concluded that after controlling for a series of factors consistent with his trading style (such as value and quality) its alpha[3] is statistically insignificant. With this in mind, it is important to understand that these findings do not detract in any way from his performance, but all the opposite, given that he started applying these strategies even before that academics started studying these factors.

Finally, as mentioned in the introduction, Fama & French were responsible for introducing the term *value* in their three-factor model. In this publication they explained the importance of value and size as factors that can explain cross-sectional returns.

Now, having explained the origins of the value, an important question that must be answered when analyzing this factor is whether excess returns of value stocks relative to growth stocks are explained either as a compensation for risk or it is the result of persistent pricing errors made by investors. In this regard, there are plenty of theories and publications that support both views.

Risk-based theories holds that excess returns of value stocks comes from a compensation for greater risk associated with these stocks. This view supports the efficient market hypothesis (EMH) of Fama (1970), that states that market prices reflects all available information and that investors are rational. Therefore, asset prices reflect essentially the fair value of the investment. In this regard, value premium is explained as a reward for risk-averse investors for bearing riskier investments.

On the other side of the EMH, we find the behavioral-based explanations, which support the hypothesis that the value premium is not a compensation for risk but the result systematic mispricing of investor due to the existence of different biases.

Here we will refer to some of the most important publications that support both views.

Value premium: risk-based theories

[3] Excess returns that are not explained by any factor.

As we previously mentioned, those who support the risk-based theory state that value premium is a reward for bearing riskier investments. We found evidence supporting this view in Chen & Zhang (1998). The authors make the case that value stocks do contain a distress (risk) factor. They examined three intuitive measures of distress present in value companies: cutting dividends by at least 25 percent, a high ratio of debt to equity and a high standard deviation of earnings. They concluded that value stocks are usually cheaper because they tend to be firms in distress, with high leverage and high volatility in earnings. They therefore provide greater returns in order to compensate value investor for bearing greater risk.

Similarly, Peterkort & Nielsen (2005) analyzed the relation between leverage and returns of companies with low Price-To-Book ratio. They found that value premium is explained by high levels of leverage present in this firms. As high leverage is intuitively seen as sign of risk, returns could be explained as a reward for it. Additionally, when they considered only those value stocks with low amounts of debt (which they called "all-equity" firms), there was no Price-To-Book effect at all, showing that the premium existed only on those companies with high leverage.

Finally, we will mention Zhang (2005). The author concludes that value premium could be explained by asymmetric risk of value stocks. This means that value stocks are riskier than growth stocks in bad economic times and only moderately less risky than growth stocks in good times. Zhang explains that the asymmetric risk of value companies exists because value stocks are typically companies with unproductive capital, which makes them more vulnerable to economic downturns.

Value premium: behavioral-based theories

From a behavioralist perspective, value premium is originated due to existing biases in investors, which lead them to systematically misprice stocks. A possible explanation of this theory can be found in Lakonishok, Shleifer & Vishny (1994). The authors suggested that growth (value) stocks are usually related to companies with good (poor) past performance and investors tend to extrapolate these returns to the future, generating over (sub) valuation of growth (value) stocks. Then, prices correct when expectations are not met. Another explanation is that investors confuse familiarity with safety. Given that they are usually more familiar with popular growth stocks, those stocks tend to be overvalued.

Another possible explanation is the "loss aversion" bias. In this regard, Barberis & Huang (2001) suggest that investors tend to be less sensitive to losses when they come after prior gains, because the loss is "cushioned" by those earlier gains. On the other hand, when the loss comes after other losses, investors tend to be more sensitive. Therefore, growth stocks are usually firms that have performed well recently, as evidenced by their current high price. For this reason, investors tend to be less concerned about future losses, being cushioned by the gains from recent performance. Thus, they apply a lower risk premium to growth stocks, as they are willing to accept more risk. On the other hand, value stocks are generally associated with companies that have performed poorly in the recent past, as evidenced by their current low prices. The pain of the recent loss causes investors to perceive these stocks as even riskier. They therefore raise the required risk premium, driving prices even lower and expected future returns even higher.

II. DATA, METHODOLOGY AND STRATEGIES

Data

For this paper we considered the constituents of the American index *Standard & Poor's 500* as the sample for back testing. The period analyzed spans from 1995 to 2018 and all changes of constituents are considered in order to avoid survivorship biases.

We consider the selected period appropriate as it includes two unusual events, such as the "dot.com" bubble in 2000/2002 and then the subprime crisis in 2008 and 2009, being able to observe the results of the strategies along a complete economic cycle, in both bull and bear markets.

The constituents of the index and their prices were extracted from Eikon, property of Thomson Reuters. Regarding fundamental data used to construct the factors, we used quarterly financial statements of the companies (10-Q), also extracted from Eikon. When data was not available, stocks were excluded from the sample.

It is important to mention that the Security Exchange Commission (SEC) requires that 10-Q reports to be released within the forty-five days after the quarter ends. In this sense, in or-

der to avoid look-ahead bias we used the prices of 90 days after the end of the quarter in order to make sure that the fundamental data is known before the returns that are being explained.

Value factors construction

Portfolios will be constructed under the classification of value and growth, using four different metrics.

The classification is made for each metric individually and each of one is used to construct different independent portfolios. Finally, one fifth portfolio is constructed under using the four metrics combined.

Given that the four metrics include the market price in the numerator and a fundamental value in the denominator, a stock will be classified as value when it has a relatively low ratio -first decile- and as growth when it has a relatively high ratio -tenth decile-.

As mentioned above, fundamental data will be extracted from quarterly financial statements. At each day of rebalancing, the data used will be the last published at the end of each quarter, March 31, June 30, September 30 and December 31. In order to avoid look-ahead bias, stock price of 90 days after the end of each quarter is considered. We are aware that not every company reports financial information on these dates and therefore market value used in the numerator is not fully aligned with the fundamental value used in the denominator. However, this methodology is consistent with Fama & French, where values and the end of December are used, showing that the impact of this inconsistency is insignificant.

Next, we describe the metrics to be used in the classification of value and growth stocks:

Price-To-Book (P/B). It is the traditional metric used for value factor. It measures the relation between market capitalization and book value of equity. It is computed using stock price and book value per common share. Number of shares to be used is that as of the date of quarterly financial statements. The economic intuition behind the Price-To-Book premium could be explain by both, behavioral and risk-based perspectives. According to a behavioral-based explanation, too high or low relations between market capitalization and book value are caused by investors' irrational valuations and therefore both values should converge eventually for regression toward the mean. On the other side, from a risk-based perspective, it could be said that value

stocks are usually in distress and therefore riskier. Thus, investors require a higher expected rate of return, leading to low market capitalization in relation to book value. This metric has the advantage that is simple to calculate but it also has setbacks. Book value does not include the value of intangible assets such as brands, intellectual property or customer loyalty, to name a few. Hence, this could not be an appropriate proxy for firms that present a high value of these assets. Another consideration is that it cannot be used for companies with negative equity. Consequently, firms with negative equity are excluded.

Price-To-Earnings (P/E). It is the ratio between market price and twelve trailing months' earnings per share from continuing operations (ttm. EPS). Number of shares are the same as those considered for Price-To-Book. This measure is usually regarded as how much investors are willing to pay for every unit of earnings. Given that the value of the ratio is incongruent for negative values, those companies with negative ttm. EPS are excluded from the sample.

Total Enterprise Value/EBITDA (TEV/EBITDA). Total Enterprise Value is calculated as the market value of equity plus total debt (short and long term) plus preferred stock value minus cash and short-term investments. We defined EBITDA as operating income before depreciation & amortization. It is worth mentioning that for Total Enterprise Value market values should be considered for both equity and debt. However, due to the complexity of calculating market values for debt for all firms at all points in time, we considered book values. This approach is consistent with existing literature, such as Loughran and Wellman (2011) or Crawford, Grey, Vogel y Xu (2016). Finally, banks were excluded for this metric as EBITDA is not an appropriate measure for this industry as revenue comes mainly from interest. Firms with negative EBITDA were also excluded for the same considerations mentioned for the previous metrics.

Price-To-FCF (P/FCF). We obtained this metric dividing market capitalization by free cash flow to the firm (FCF). FCF is calculated by subtracting capital expenditures from operating cash flow, as presented in the statements of cash flow. It is similar to Price-To-Earnings, but earnings are replaced with FCF. We consider the latter a more suitable measure of the profitability of a firm's operations given that it is less subject to manipulations by management than net profit. Firms with negative FCF are also excluded from the sample.

Methodology

As mentioned before, portfolios will be constructed on value and growth stocks. Classification of value and growth stocks will be made quarterly, for each metric individually. That is, portfolios will be rebalanced each three months.

Accordingly, first portfolios will be constructed with the last published information as of March of 1995, considering prices as of June of 1996. After calculating the metrics, they will be sorted decreasingly, and we will take long positions on the first decile and short positions in the tenth decile, holding the positions until the next rebalancing date. Both long and short positions will be constituted in the same dollar amount, so that portfolios will be self-financed.

Regarding the weighting schemes, all portfolios will be equally weighted. This means that weight of each stock in a portfolio of N stocks will be 1/N.

Combination of value portfolios with quality factor: construction of the factor and methodology

As mentioned before, there are many theories that try to explain the value premium. The main goal of introducing the quality factor to the value portfolios is to find out whether the value premium exists as a reward for bearing higher risk or it is just the product of mispricing. Accordingly, we will take value-growth portfolios and both long and short positions will be classified as high or low quality, getting four portfolios: value/high quality, value/low quality, growth/high quality and growth/low quality. The objective is to separate those stocks that are cheap because of being in financial distress (value/low), from those undervalued but with high quality (value/high). The same logic applies to growth stocks.

Similar to Piotroski & So and Crawford, Grey, Vogel & Xu, we will construct portfolios with long positions in value/high stocks and short positions in growth/low stocks (called high mispricing portfolios). Conversely, we will also form portfolios with long positions in value/low and short positions in growth/high (called low mispricing portfolios). The intuition behind this test is that if the first long/short portfolios perform better than the second ones, behavioral-based theories would be more accurate than the risk-based when it comes to explain the value premium. The explanation would be that investors tend to undervalue (overvalue) firms with good (poor) financial performance.

For the purposes of the quality factor construction, we will follow a methodology similar to Piotroski, using metrics related to profitability, leverage/liquidity and operating efficiency:

Gross profit to Total Assets (GPTA). It is the first profitability measure that we will use. It is calculated as gross profit of last twelve months divided by total assets. We choose gross profit over the conventional measure of net income on assets or ROA[4] because as demonstrated in Novy-Marx (2012), GPTA has more explanatory power on cross-sectional returns.

Accruals. We calculated it as free cash flow to the firm (FCF) minus net income from continuing operations, divided by total assets. This is an indicative measure of quality of earnings as it shows a firm's ability to convert profit into cash. A ratio bigger than zero shows a high quality of earnings, meaning that the firms converts rapidly profits into cash.

Leverage. We calculated it as the ratio between total assets and net debt. We consider that a high level of leverage increases the financial risk of the company. Therefore, a high-quality firm will show a high ratio.

Asset-turn-over. It is the ratio of last twelve-months sales divided by total assets. A high ratio shows more operating efficiency.

The classification of high- and low-quality stocks is made using this five metrics combined. Thus, in order to combine them we need to standardize them so that they all have the same unit of measure and scale. To do so, we use the mean and the standard deviation of each relevant variable, getting a z-score that is calculated as following:

$$Z_{ijt} = \frac{x_{ijt} - \mu_{jt}}{\sigma_{jt}}$$

Where Z_{ijt} is the z-score of asset *i* in relation to the variable *j*, x_{ijt} is the value of the variable *j* of stock *i*, μ_{jt} is the mean of the variable *j* and σ_{jt} is the standard deviation of the variable *j*, all of them in period *t*.

Once we get all z-scores at the period *t* for all stocks, we combine them by calculation a simple average, thus getting a Quality Z-Score for each stock:

[4] Return on assets.

$$Quality\ Z\text{-}Score_{it} = \frac{\sum_j^N Z_{ijt}}{5}$$

Finally, having all Quality Z-Scores, we sort the stocks first selected for the value/growth portfolios into high and low quality, where high are half of the stocks with highest Quality Z-Score and low the half with the lowest.

III. MAIN RESULTS

In this section we expose the main results obtained with each strategy, beginning with those that utilize value metrics (P/B, P/E, TEV/EBITDA, P/FCF and the combined ratio), which are identified as pure value strategies. Secondly, we make comments on the results generated by blending the first strategies with quality factor, which are identified as value/quality. Lastly, we analyzed the performance of the strategies on certain events occurred during the period under analysis, such as the dot.com bubble and the subprime crisis.

Pure value strategies

Initially, we tested pure value strategies using for different metrics and a combination of all of them. Results suggest that in all cases, except for the conventional P/B ratio, value stocks outperform growth stocks in terms of CAGR[5] (Table 2 and Graph 1, 2, 3, 4 and 5). This could be explained by the considerations mentioned in section II, where it is indicated that currently, P/B ratio may not be a suitable proxy and lacks explanatory power of cross-sectional returns due to the existence of off-balance intangible assets. The same result is observed with the combined ratio, possibly due to the P/B influence.

In terms of Sharpe Ratio, we observe that in the case of P/B and TEV/EBITDA ratios, growth stocks outperformed value stocks. Additionally, growth stocks of the P/B strategy outperformed value stocks of the rest of all the other strategies. Given that we cannot find an intuitive and economical explanation for these results, this may confirm the fact that P/B ratio has lost any explanatory power of returns.

[5] Compound Annual Growth Rate.

In turn, when we compared all strategies to a benchmark such as S&P 500 (see main statistics of the index in Table 1), all portfolios outperform the index in terms of CAGR (Graph 6). However, is noteworthy that both value and growth portfolios have more pronounced maximum drawdowns.

In addition, we regressed the long-short strategies against the Fama-French three factors model. In all cases we observe a significant exposure to the traditional value factor (High minus Low) and additionally, in the case of the P/B ratio, a significant exposure to the size factor (Small minus Big) and significantly negative alpha (Table 5).

Last, it is important to mention that it is not profitable to execute long-short strategies, given that in all cases, short portfolios have positive returns.

Value/quality strategies

In this section we expose the results of the value strategies blended with the quality factor. First, we tested the so-called *High Mispricing* portfolios, consisting of long positions in *value/high quality* stocks and short positions in *growth/low quality* stocks. These strategies showed substantial improvements in terms of Sharpe Ratio and drawdowns, in relation to pure value strategies (Table 3). Thus, excluding from the low-quality stocks we reduced the overall risk in all portfolios. In turn, *value/high* portfolios outperform *growth/low* ones, so unlike what was observed in the pure value strategies, long-short portfolios are profitable (Graphs 7, 8, 9, 10 and 11). Secondly, we tested the *Low Mispricing* portfolios, with long positions in *value/low quality* stocks and short positions in *growth/high quality* stocks. This also resulted in better performance in relation to pure value strategies. However, the most noteworthy result is that *growth/high* portfolios outperformed *value/low* portfolios (Table 4). This outcome is consistent with behavioral based theories, which states that value premium is the result of mispricing due to biased investors.

The interpretation of the above mentioned is the following. According to the results exposed, *value* stocks only outperformed *growth* stocks when they are *high quality*. Thus, the value premium is mainly observed in undervalued and high-quality stocks. Therefore, the most intui-

tive reason for explaining why a high-quality stock is undervalued, is due to the existence of bias, which leads investor to misprice the stocks.

On the other hand, regarding *Low Mispricing* portfolios, *value/low* stocks -undervalued and low-quality- underperformed *growth/high* stocks. This outcome contradicts risk-based theories, which states that value premium is observed in riskier stocks, as a compensation for risk. According to our results, riskier stocks tend to have a worst performance. In other words, if value premium was indeed a compensation for higher risk, we should observe it in both, *High Mispricing* and *Low Mispricing* portfolios. This means that the value premium disappears when only low-quality stocks are selected. Therefore, if risk-based theories were true, low-quality stocks -riskier- should outperform high-quality stocks.

Lastly, we regressed *High Mispricing* long-short portfolios against Fama-French three factors model, getting statistically significant alpha for the portfolio constructed under P/E ratio. According to this, we may conclude that it is possible to get excess returns with *value* factor, only if it is combined with other factors such as *quality*. In addition, and in the same way as observed in pure value portfolios, we contemplate a significant exposure to the conventional High minus Low factor in all cases and a significant exposure to Size factor in the case of P/B ratio (Table 6).

Performance of strategies in dot.com and subprime crisis

We analyzed the performance of long Value and Value/High Quality portfolios constructed with P/E ratio on the aforementioned periods and compared it with the S&P 500 index (Table 7 and Graph 12).

First, we observed the dot.com crisis, whose period spans from March 2000 to October 2002. The S&P 500 index suffered a loss of more than 30%, while the portfolios barely moved. A possible explanation could be that strategies excluded almost every technological companies that had a high P/E ratio. For this reason, portfolios were less affected as they did not include this kind of companies that were highly overvalued. Then, a year later, we observe that pure value portfolios outperformed both, value/high portfolios and the index.

Regarding subprime crisis -between 2007 and 2009-, we can observe that both portfolios and the index faced huge losses. However, the value/high portfolio outperformed the other two.

On the other hand, pure value portfolio, which had a slight profit during the dot.com crisis, suffered the biggest loss and again, it had the worst performance the year after.

IV. CONCLUSIONS

Evidence shows that the existence of *pure value premium*, prevails only with alternative measures to traditional P/B. As observed, during the period under analysis, *value* portfolios constructed under P/B, underperformed *growth* portfolios. Also, it is important to highlight that long-short strategies are not profitable and it is not possible to get statistically significant alpha -under traditional three factor model of Fama-French-, using solely this factor. At the same time, the strategies showed a higher volatility compared to S&P 500 index.

On the other hand, when we combined value with quality factor, besides reducing volatility and drawdowns and getting significant alphas in some cases, we could also obtain evidence in favor of behavioral-based theories. As observed, riskier low-quality stocks -those with low *Quality Z-Score*-, underperformed those stocks with high *Quality Z-Score*. For that reason, risk-based theories -in favor of efficient markets theory-, that state that riskier stocks should reward investors, seem not to be true in this case.

Lastly, we consider that the obtained results leave us a wide space for further research, incorporating and combining more different factors to value based strategies.

REFERENCES

1. Asness, C. S. (1994). Variables that Explain Stock Returns: Simulated and Empirical Evidence. Dissertation: Ph.D. University of Chicago.
2. Asness, C. S., Frazzini , A., & Pedersen, L. H. (2012). Leverage Aversion and Risk Parity. Financial Analysts Journal, Vol. 68, N. 1, Pages. 47-59.
3. Bender, J., Briand, R., Melas, D., & Subramanian, R. A. (2013, December). Foundations of Factor Investing. Extracted from MSCI: https://www.msci.com/documents/1296102/1336482/Foundations_of_Factor_Investing.pdf/004e02ad-6f98-4730-90e0-ea14515ff3dc
4. Berkin, A. L., & Swedroe, L. E. (2016). Your complete guide to factor-based investing. St. Louis: Bam Alliance Press.
5. Carhart, M. M. (1997). On Persistence in Mutual Fund Performance. The Journal of Finance, Vol. 52, N. 1, Pages 57-82.
6. Chan, K. C., & Chen, N.-F. (1991). Structural and Return Characteristics of Small and Large Firms. The Journal of Finance, Vol. 46, N. 4, Pages 1467-1484.
7. Chen , N.-f., & Zhang, F. (1998). Risk and Return of Value Stocks. The Journal of Business, Vol. 71, N. 4, Pages 501-35.
8. Cochrane, J. H. (2011). Presidential Address: Discount Rates. The Journal of Finance, Vol. 66, N. 4, Pages 1047 - 1108.
9. Crawford, S., Gray, W., Vogel, J., & Xu, Y. (2016, Octubre 5). Why Do Enterprise Multiples Predict Expected Stock Returns? Extracted from SSRN: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2847874
10. Fama, E. F., & French, K. R. (1992). The Cross-Section of Expected Returns. The Journal of Finance, Vol. 47, N. 2, Pages 427-465.
11. Frazzini, A., Kabiller, D., & Pedersen, L. H. (2013). Buffet's Alpha. National Bureau of Economic Research, NBER Working Paper N. 19681.
12. Jegadeesh, N., & Titman, S. (1993). Returns to Buying Winners and Selling Losers: Implications for Stock Market. The Journal of Finance, Vol. 48, N. 1, Pages 65-91.
13. Lakonishok, J., Shleifer , A., & Vishny, R. W. (1994). Contrarian Investment, Extrapolation, and Risk. The Journal of Finance, Vol. 49, N. 5 , Pages 1541-1578.
14. Markowitz, H. (1952). Portfolio Selection. The Journal of Finance, Vol. 7, N. 1, Pages 77-91.

15. Novy-Marx, R. (2013). The Other Side of Profitability: The Gross Profitability Premium. Journal of Financial EcoNmics, Vol. 108, N. 1, Pages 1-28.
16. Peterkort , R. F., & Nielsen, J. F. (2005). Is the the Book-to-Market Ratio a Measure of Risk? Journal of Financial Research, Vol. 28, N. 4, Pages 487-502.
17. Piotroski, J. D. (2000). Value Investing: The Use of Historical Financial Statement Information to Separate Winners from Losers. Journal of Accounting Research, Vol. 38, Pages 1-41.
18. Piotroski, J. D., & So, E. C. (2012). Identifying Expectation Errors in Value/Glamour Strategies: A Fundamental Analysis Approach. The Review of Financial Studies, The Review of Financial Studies, Vol. 25, N. 9, Pages 2841–2875.
19. Villalon, D., Brooks, J., Bakrania, P., & Tsuji, S. (2016, Diciembre 6). Superstar Investors. Extracted from AQR: https://www.aqr.com/Insights/Research/Alternative-Thinking/Superstar-Investors
20. Zhang, L. (2005). The Value Premium. The Journal of Finance, Vol. 60, N. 1 , Pages 67-103.

GRAPHS AND TABLES

Table 1: Benchmark's descriptive statistics

In table 1, we expose the main descriptive statistics of S&P 500 index, from 1995 to 2018.

Standard & Poor's 500			
CAGR	**Volatility**	**SR**	**MaxDD**
7,34%	13,98%	0,53	-48,34%

Table 2: Pure Value strategies' results

In Table 2, we expose the main statistics of pure value strategies. We expose separately the results for the three portfolios: value stocks (long portfolio), *growth* stocks (short portfolio) and *value* minus *growth* (long – short portfolios).

		FCF	P/E	P/B	TEV/EBITDA	Combined
Value	**CAGR**	9,99%	10,24%	10,21%	11,36%	10,15%
	Volatility	27,98%	24,19%	35,66%	32,80%	30,31%
	SR	0,36	0,42	0,29	0,35	0,33
	MaxDD	-67,13%	-60,88%	-76,52%	-66,36%	-68,69%
Growth	**CAGR**	6,96%	8,54%	13,38%	10,49%	11,39%
	Volatility	21,19%	23,98%	22,01%	27,27%	26,13%
	SR	0,33	0,36	0,61	0,38	0,44
	MaxDD	-48,44%	-56,16%	-53,81%	-67,97%	-67,46%
Value - Growth	**CAGR**	2,02%	0,61%	-3,95%	-2,08%	-4,16%
	Volatility	22,19%	20,07%	31,03%	29,09%	28,28%
	SR	0,09	-0,03	-0,13	-0,07	-0,15
	MaxDD	-54,83%	-71,00%	-76,21%	-78,43%	-82,74%

Table 3: Results for *Value/Quality* strategies (Portfolios *High Mispricing*)

In Table 3 we expose the main statistics for value strategies incorporating quality factor (Portfolios *High Mispricing*). Results of 3 portfolios are separately exposed: *value/high quality* (portfolio *long*), *growth/low quality* (portfolio *short*) and *value/low* minus *growth/high* (portfolio *long - short*).

		FCF	P/E	P/B	TEV/EBITDA	Combined
Value/High	**CAGR**	6,59%	8,49%	8,47%	8,06%	7,85%
	Volatility	15,21%	12,33%	19,05%	17,95%	15,74%
	SR	0,43	0,69	0,44	0,45	0,50
	MaxDD	-39,32%	-33,34%	-47,80%	-42,01%	-44,29%
Growth/Low	**CAGR**	2,77%	3,49%	6,13%	3,64%	5,76%
	Volatility	10,48%	11,83%	13,18%	14,44%	16,84%
	SR	0,26	0,30	0,47	0,25	0,34
	MaxDD	-26,52%	-27,37%	-37,50%	-40,62%	-45,53%
Value/High - Growth/Low	**CAGR**	3,40%	4,24%	1,35%	3,33%	0,54%
	Volatility	13,67%	11,48%	18,70%	17,25%	17,80%
	SR	0,25	0,37	0,07	0,19	0,03
	MaxDD	-35,61%	-39,37%	-47,02%	-52,01%	-56,93%

Table 4: Results for *Value / Quality* (Portfolios *Low Mispricing*)

In Table 4 we expose the main statistics of value strategies incorporating quality factor (Low Mispricing Portfolios). Results of 3 portfolios are separately exposed: *value/low quality* (portfolio *long*), *growth/high quality* (portfolio *short*) and *value/low* minus *growth/high* (portfolio *long - short*).

		FCF	P/E	P/B	TEV/EBITDA	Combined
Value/Low	**CAGR**	4,29%	3,39%	3,72%	4,02%	3,96%
	Volatility	8,75%	8,73%	9,47%	9,81%	14,70%
	SR	0,49	0,39	0,39	0,41	0,27
	MaxDD	-27,28%	-28,68%	-29,13%	-28,62%	-40,17%
Growth/High	**CAGR**	6,20%	5,97%	6,14%	6,39%	7,29%
	Volatility	8,84%	8,42%	9,41%	9,47%	11,65%
	SR	0,70	0,71	0,65	0,67	0,63
	MaxDD	-26,07%	-26,11%	-28,20%	-26,63%	-32,20%
Value/Low - Growth/High	**CAGR**	-1,86%	-2,48%	-2,34%	-2,26%	-3,53%
	Volatility	2,69%	3,02%	3,03%	3,30%	12,53%
	SR	-0,69	-0,82	-0,77	-0,68	-0,28
	MaxDD	-35,03%	-42,86%	-40,96%	-40,96%	-59,22%

Table 5: *Value* Portfolios against three factors Fama-French Model

This Table exposes the results of regressing long/short portfolios of Pure Value strategies against three factor model of Fama-French. T-statistics in bold are significant at a 95% level.

	Alpha	RMRF	SMB	HML	Adj.R2
EV/EBITDA	0,003	-0,06	0,327	1,56	0,68
	(0,35)	(-0,06)	(1,69)	**(13,56)**	
P/FCF	0,004	0,158	-0,122	1,166	0, 62
	(0,55)	(1,66)	(-0,76)	**(12,23)**	
P/B	-0,015	0,282	0,691	1,719	0, 82
	(-2,15)	(3,05)	**(3,86)**	**(18,53)**	
P/E	0,002	-0,114	-0,041	1,06	0, 65
	(0,36)	(-1,38)	(-0,29)	**(12,90)**	
Combined	-0,008	-0,07	0,433	1,563	0,74
	(-1,06)	(-0,7)	(2,56)	**(15,45)**	

Table 6: *Value/Quality* portfolios against three factors Fama-French Model

This Table exposes the results of regressing long/short portfolios of Value/Quality strategies against three factors Fama-French model. T-statistics in bold are significant at a 95% level.

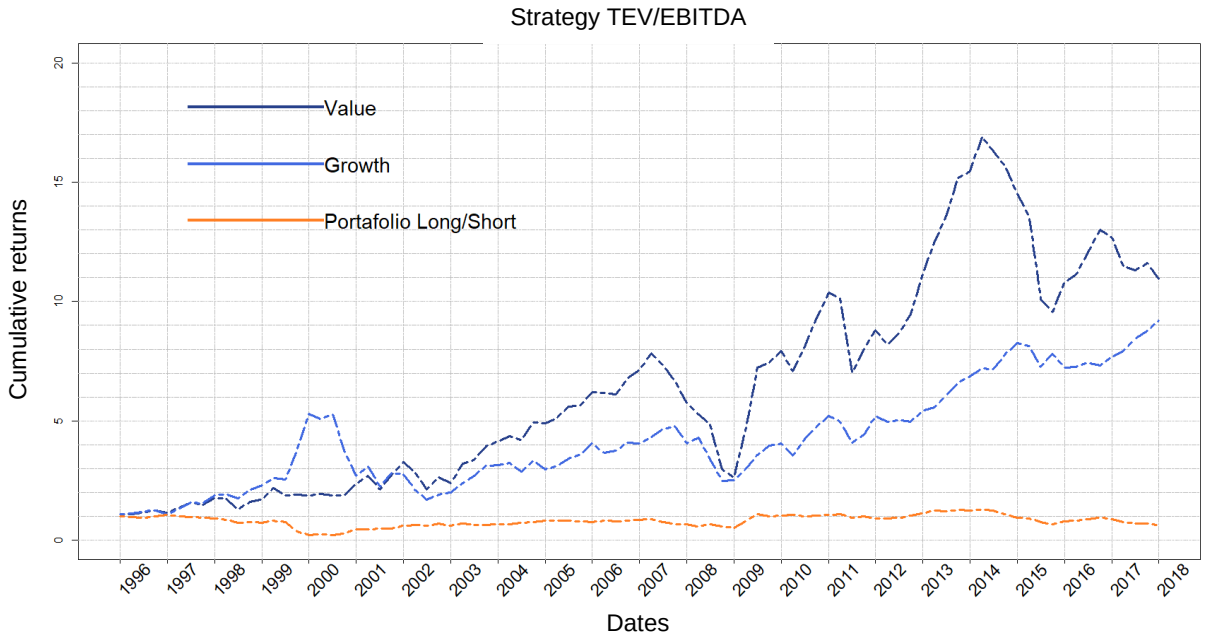
	Alpha	RMRF	SMB	HML	Adj.R2
EBITDA	0,01	0,015	0,125	0,844	0,56
	(1,15)	(0,20)	(0,92)	**(10,41)**	
FCF	0,01	0,053	0,041	0,696	0,60
	(1,39)	(0,86)	(0,39)	**(11,39)**	
P/B	-0,0001	0,088	0,274	1,041	0,77
	(-0,03)	(1,39)	**(2,59)**	**(16,47)**	
P/E	0,011	-0,031	-0,027	0,493	0,41
	(2,28)	(-0,5)	(-0,26)	**(7,93)**	
Combined	0,002	-0,091	0,171	0,97	0,70
	(0,40)	(-1,34)	(1,49)	**(14,14)**	

Table 7: performance of strategies during dot.com and subprime crisis

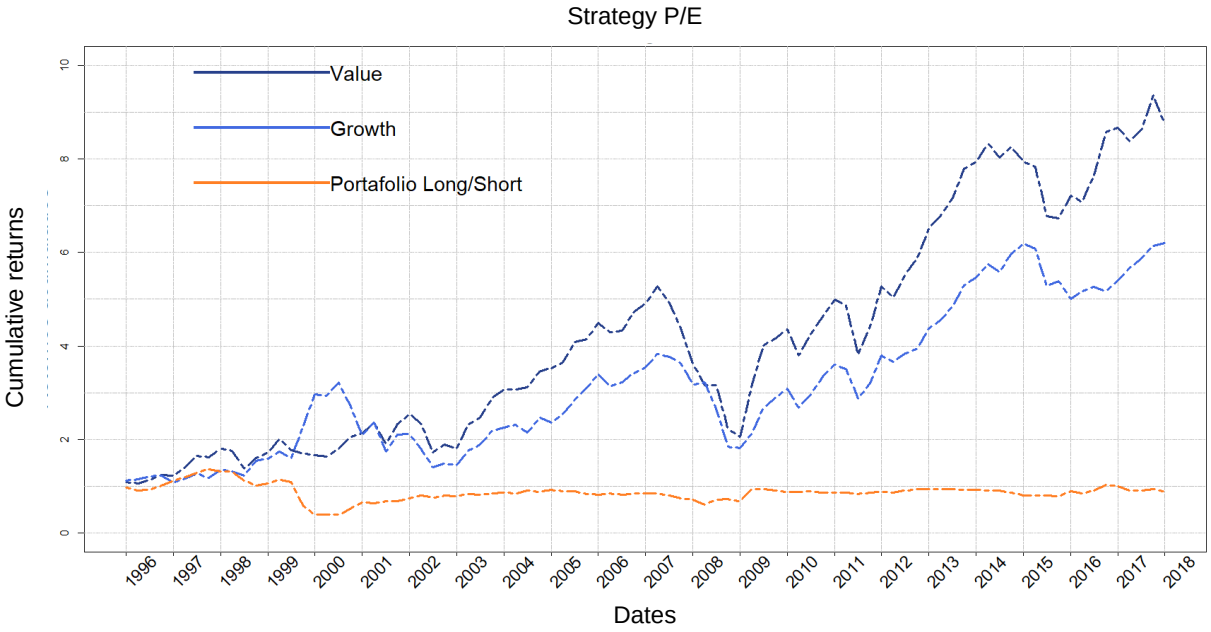
In this Table we expose returns of long value and long Value/High strategies constructed with P/E ratio, as well as S&P 500 index performance.

Event	Period	Value	Value/High	S&P 500
Dot.com bubble	March 2000 – October 2002	1,33%	-4,49%	-36,59%
Post dot.com bubble	October 2002 – October 2003	42,98%	19,41%	17,01%
Subprime crisis	August 2007 – March 2009	-57,85%	-40,73%	-45,03%
Post subprime crisis	March 2009 – March 2010	87,20%	43,86%	31,13%

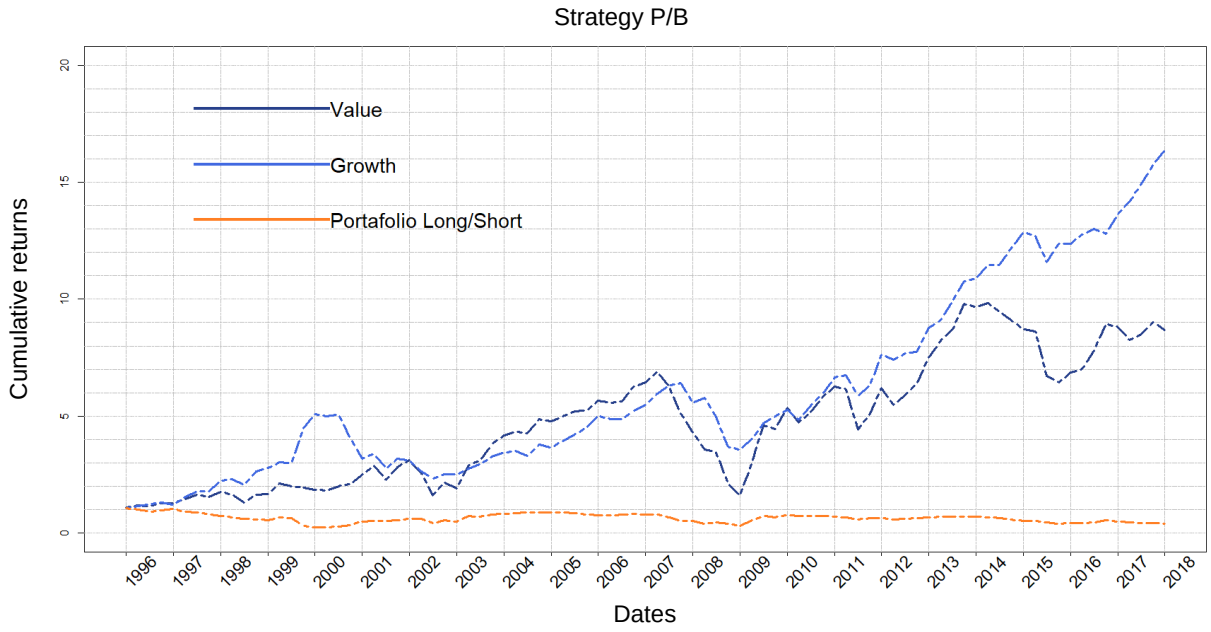
Graph 1. Pure Value strategies with TEV/EBITDA



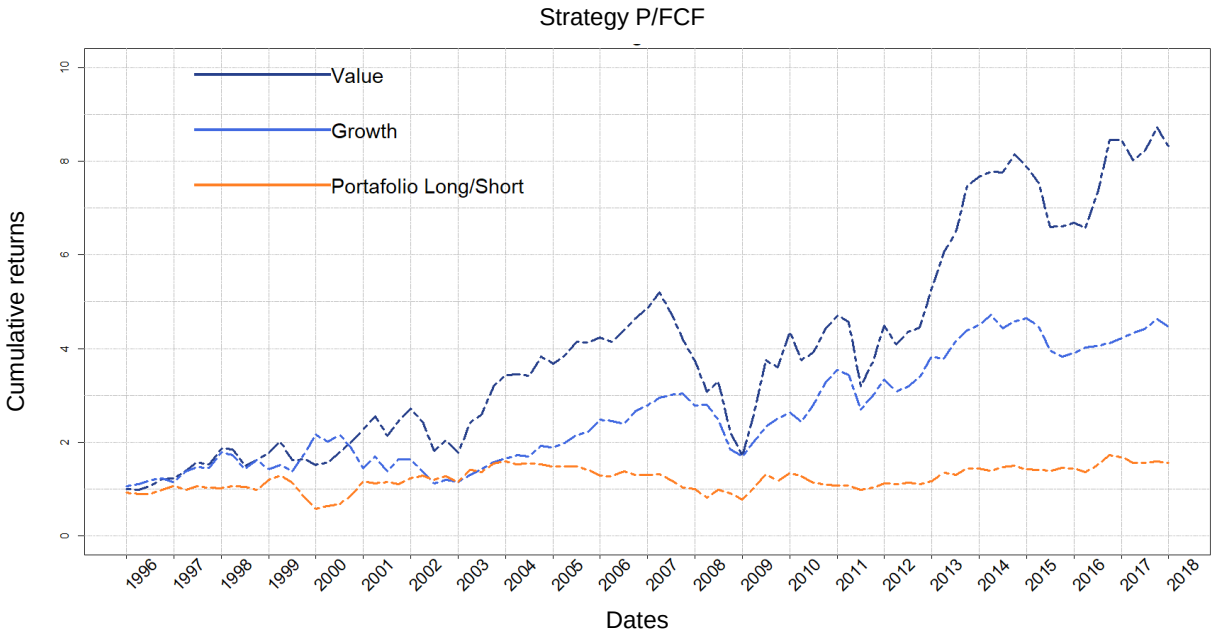
Graph 2. *Value* with P/E



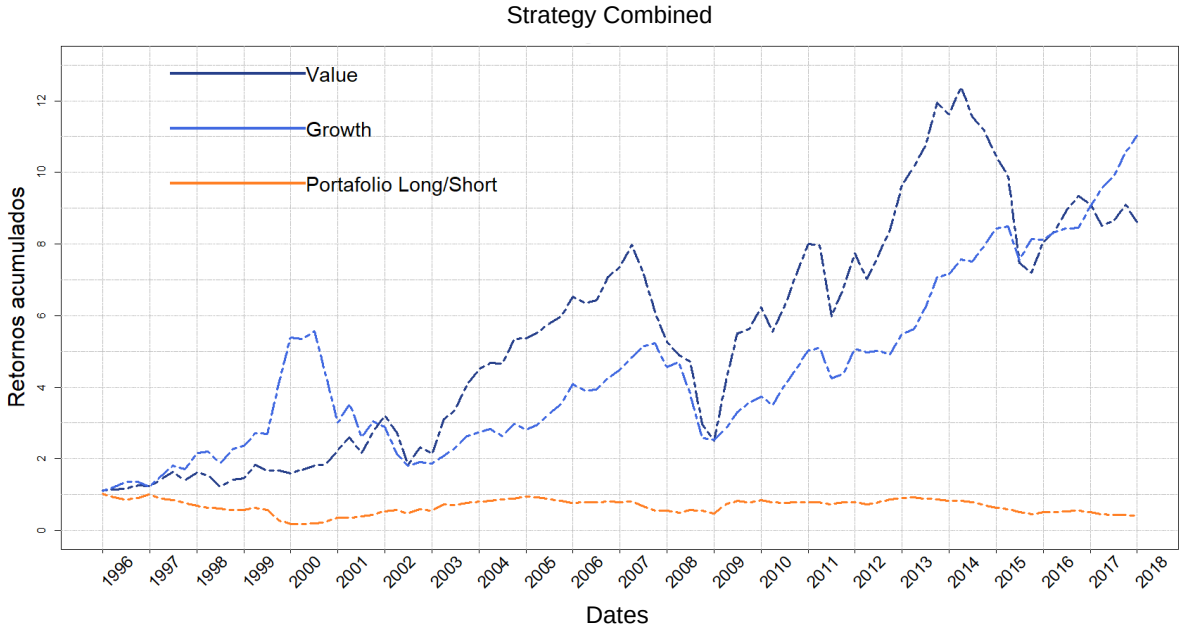
Graph 3. *Value* with P/B



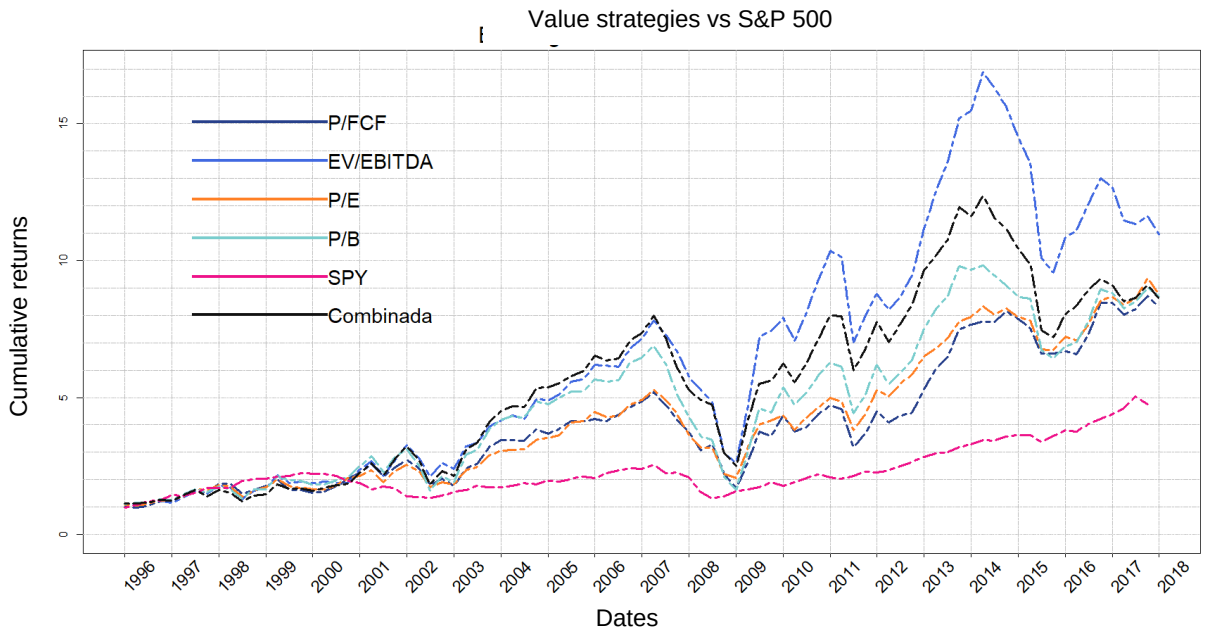
Graph 4. *Value* with P/FCF



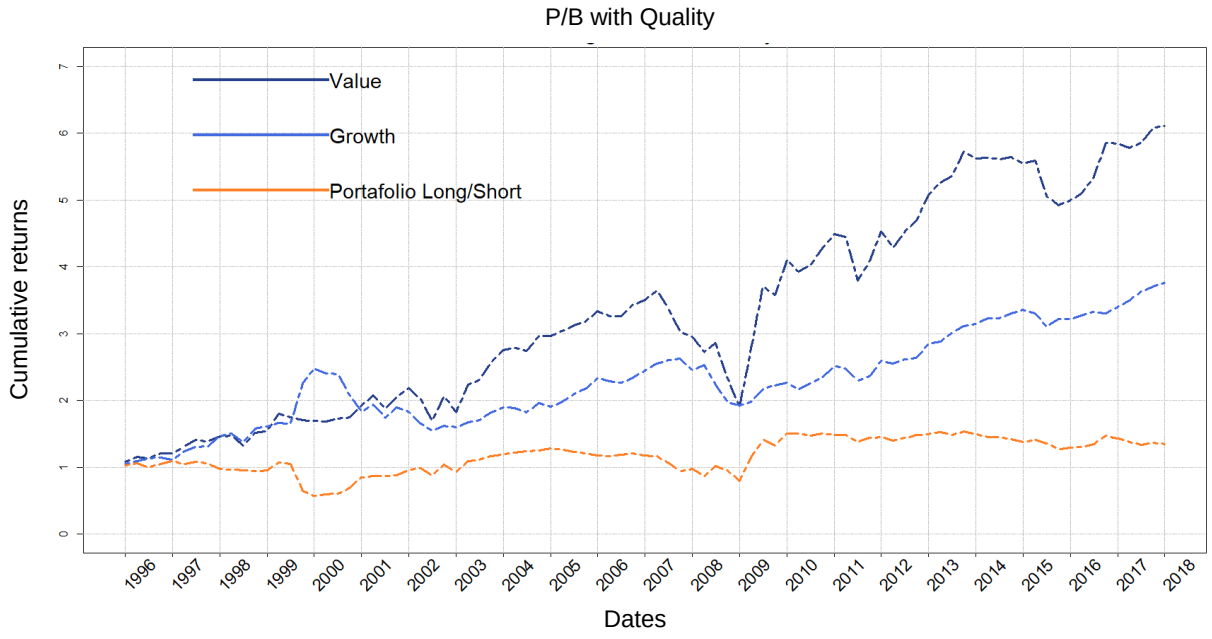
Graph 5. *Value* with ratio Combined



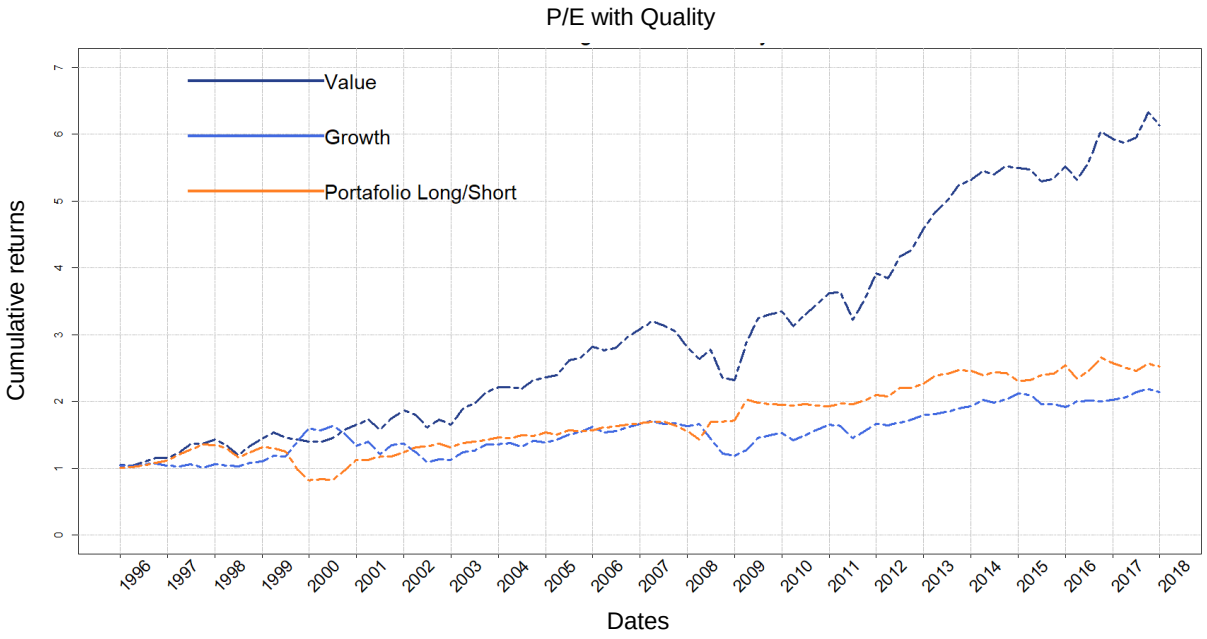
Graph 6. Pure Value (only *long* portfolios) vs S&P 500



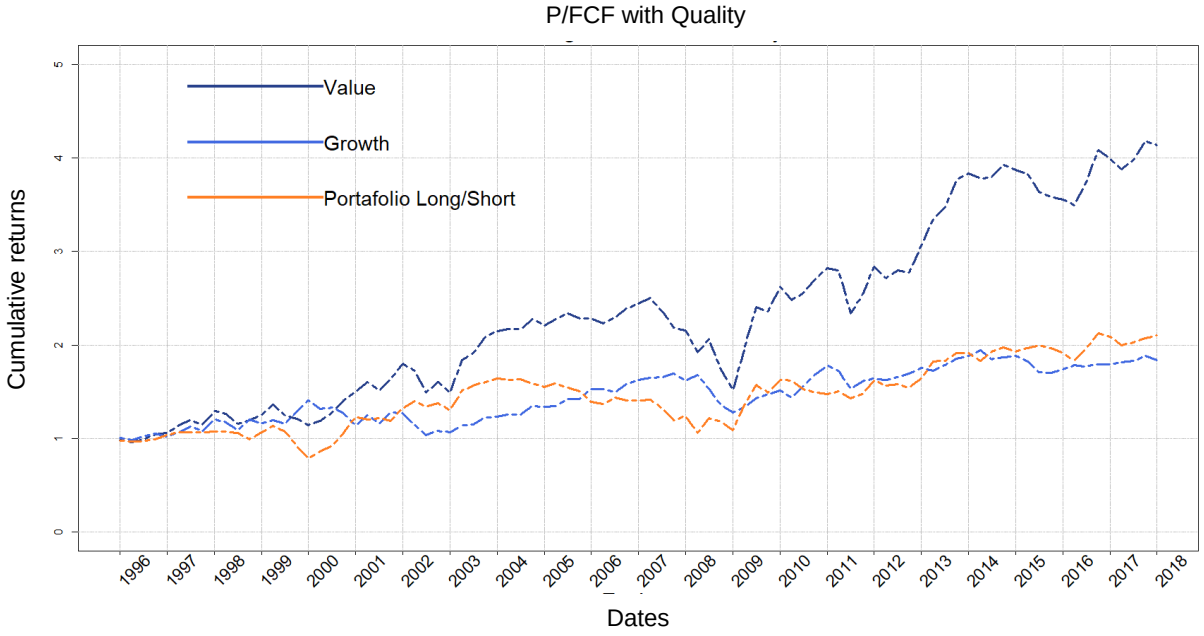
Graph 7. *Value/quality* with P/B (*High Mispricing*)



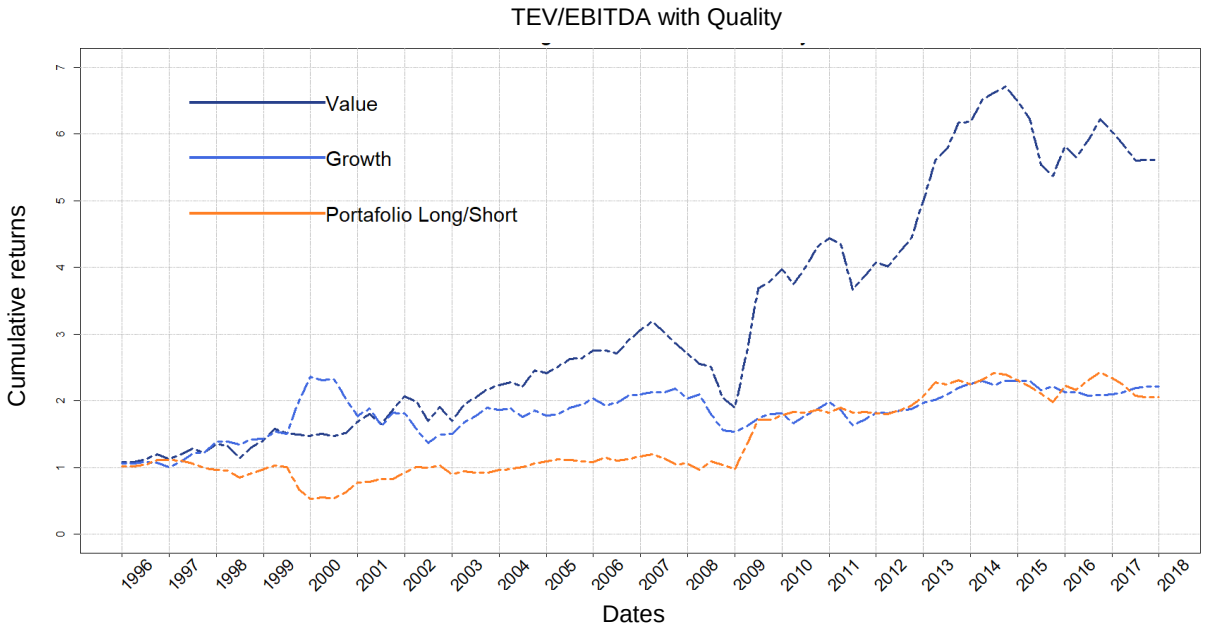
Graph 8. *Value/quality* with P/E (*High Mispricing*)



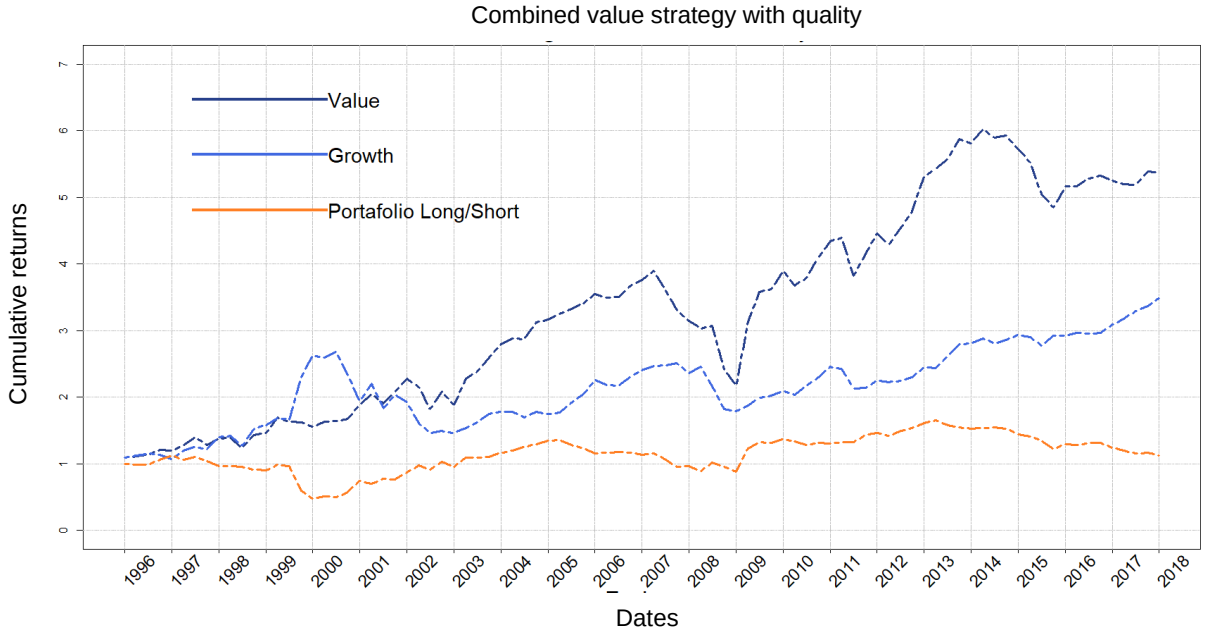
Graph 9. *Value/Quality* with P/FCF (*High Mispricing*)



Graph 10. V*alue/Quality* with TEV/EBITDA (*High Mispricing*)



Graph 11. V*alue/Quality* with ratio Combined (*High Mispricing*)



Graph 12. Value/Quality strategies (only *long High Mispricing portfolios*) vs S&P 500