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Performance of distinct mutual fund styles during bull and bear markets

Bachelor Economics & Business
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Abstract

The mutual fund industry has doubled in size in the last ten years alone, whilst the literature generally finds that it underperforms compared to indexes (Alp, 2009). Many researchers are devoted to solve this puzzle, trying to find an explanation that shows that mutual funds can be effective. One strand of literature attempts to do so by testing mutual fund performance during varying market conditions. Kosowoski (2001) found that mutual funds can add value during recessions, however, de Souze and Lynch (2012) found contradicting evidence for different fund styles. This paper, therefore, sets out investigate whether mutual funds of distinct styles are able to add value during up or down markets, since the literature seems to be inconclusive. It firstly tested benchmark adjusted performance and found that more than half of the nine fund styles outperformed their benchmark. A surprising result, which has not been found in earlier research. It then tested risk adjusted performance controlled for bull and bear markets, with the use of Carhart's (1997) four-factor model. The results found suggest that mutual fund managers are unable to alter their market exposure during varying market conditions meaningfully. Moreover, mutual funds of any style on average, when adjusted for common risk factors, are unable to show signs of outperformance, regardless of any market condition.

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1. Introduction

Mutual funds have long been a well-discussed topic in the economic literature, mainly because of its implications of market efficiency and implications to investors. It is not difficult to see why it is so well discussed, with 45,4% of U.S. households owning funds and a total net asset of worldwide open-ended mutual funds of $49,3 trillion as of 2017 (Investment Company Institute, 2018). Studies such as Jensen (1968), Malkiel (1995), and Carhart (1997) found that active portfolio managers are outperformed by passive indices, even before expenses. The authors indicate that when fees and expenses are considered, mutual funds destroy value. Therefore, people would be wise to invest in an index, rather than letting their money be managed by Wallstreet.

The puzzle of why mutual funds has grown to become so large, whilst their performance is generally inferior to that of indexes, remains unsolved. Gruber (1996) attempts to explain this puzzle by suggesting that future performance is in part predictable from past performance. He then conjectures that poor performing mutual funds are held by either uninformed investors or investors who either are not able or allowed to sell the fund. Other studies find that active managers do add some value. For instance, Grinblatt, Titman and Wermers (1995) found that mutual fund managers do appear to have some stock picking ability. Another perspective found in literature tries to find certain situations in which mutual funds could be useful. Kosowski (2001) studied mutual fund performance during recessions and found that the average U.S. mutual fund performs better in recession than boom period, suggesting mutual funds could be a hedging tool during recessions. However, de Souza and Lynch (2012) found evidence against this common conjecture; not all fund styles produce counter-cyclical performance, instead many fund styles are pro-cyclical or non-cyclical, suggesting that the real picture is more complicated. Literature has only provided marginal insight in the performance of different fund styles, de Souza and Lynch (2012) for instance only investigated three styles based on size and book-to-market ratios.

Since the literature seems to show conflicting results, this paper sets out to contribute to the discussion, by investigating whether U.S. equity mutual funds of distinct styles are able to outperform during bull or bear market conditions. The most recent study on mutual fund performance during bull and bear markets specifically was performed in 1980 (Alexander & D. Stover, 1980). This study found that fund performance is invariant relative to market conditions,

which suggests that if managers try to time the market, they have no success. This paper improves this research with the use of a multifactor model, improved market indicators and controlling for additional fund styles based on size and book-to-market ratios. It will also benefit from a more extensive dataset, including the credit crisis and the longest bull market in history, which both have not been researched. This paper attempts to answer the research question in three steps. First, it examines whether equity mutual funds of distinct styles outperform indexes. Second, it tests whether mutual fund styles under- or outperform when adjusted for common risk factors. Finally, it tests the second step controlled for varying market conditions.

Data will be gathered from the widely used CRSP's survivorship-bias free U.S. mutual fund database. To provide a clearer view of the performance of mutual fund, the funds are characterized by their fund style. The styles vary over market capitalization and value-growth orientation. The final dataset covers roughly 20.000 funds over the test period, from January 1999 up to January 2019. Fund style are first compared with their appropriate benchmark to test the benchmark-adjusted performance. The results find that more than half of mutual fund styles were able to outperform their corresponding benchmark, an occurrence which has not previously been found by the literature. Further empirical results on performance are gathered with the use of the Carhart (1997) four-factor model. This model adjusted for common risk factors to test whether funds are on average able to generate alpha or outperform. The results find that nearly all fund styles are unable to outperform or alter their market exposure indifferent to any market condition.

The rest of this paper is structured as follows. Section 2 discusses the literature and theory of mutual fund performance and market conditions. Section 3 describes the data selection process and section 4 describes the empirical methodology. Section 5 will provide the results and section 6 concludes.

2. Theoretical framework

2.1 Mutual fund performance

According to Investment Company Institute (2018) the definition of "A mutual fund is an investment company that pools money from shareholders and invests in a portfolio of securities." (p. 56). The main security classes are bonds, money markets and equity. This research, however, will only look at the equity asset class. Equity is the most common asset class, with more than half of the total net asset value of U.S. mutual funds being equity (Investment Company Institute, 2018).

The mutual fund industry has grown tremendously over the past sixty years. With this development has come an extensive literature, which addresses a vast amount of topics. One of the pioneers is Jensen (1968). He found with the use of the CAPM model that actively managed funds during 1945-1964 were on average not able to outperform the market. On top of that, there was very little evidence that any individual fund was performing better than a randomly selected portfolio. These results were all found without taking managerial expenses into consideration. Earlier research focused more on these kinds of straightforward performance measures and benchmarking (Anderson & Schnusenberg, 2005). In more recent years the focus has shifted from performance-based studies towards style-based studies, which also addresses information such as fund characteristics and managerial skills (Alp, 2009).

When a mutual fund underperforms its appropriate benchmark, it not only implies that is better to invest in a passive index, but also implies that that the manager possesses no stock picking ability (Carhart, 1997; Jensen, 1968; Malkiel, 1995). This subject has seen some recent debate. Kosowski, Timmermann, Wermers, & White (2006) findings suggest that good and bad performance is not entirely determined by luck. They found evidence suggesting that the best performing funds possess some stock picking skill and the worst performing funds possess bad skills. The abnormal performance was not due to 'luck'. There was especially strong evidence amongst growth-oriented funds. A later study by Cuthbertson, Nitzsche, & O'Sullivan (2008) based on U.K. mutual funds finds similar results in this regard. They do, however, add that the positive abnormal performance of the majority of mutual funds is due to 'good luck'; only 5% of funds are true outperformers. Even when there is a long history of data available, it is still difficult to identify the managers with skill. Adding to this idea, Fama and French (2008) found evidence that the average fund returns of individuals are mainly due to luck rather than skill.

As a result, it is generally believed that managers possess little stock picking ability and that most of the performance is due to luck (Alp, 2009).

The strong evidence of mangers skill found by Kosowski et. Al. (2006) for growth orientated funds, suggest that general findings might not hold for different fund styles. With the development of the mutual fund industry has come many fund styles within the equity asset class. Some of the most important fund styles are defined by their market capitalization and the value- growth orientation. This is primarily due to the Fama and French (1993) three-factor model. It shows that abnormal return can be assigned to risk associated with firm size and value-growth orientation. Fama and French (1996) suggest that there is a value- and size premium, value funds tend to outperform growth or core funds and small size funds tend to outperform larger sized ones. Considering styles of mutual funds improves performance evaluation by providing a clearer picture (Chan, Chen, & Lakonishok, 2002).

Older studies like Jensen (1968) and McDonald (1974) only used one benchmark in a single factor CAPM model to measure performance of different fund styles. This method has received a lot of criticism. Roll (1978) for instance showed that this measure is sensitive to the choice of benchmark portfolio. It is evident that appropriate benchmarks are required to provide meaningful results. However, for that time there were a limited amount of index funds to cover different fund styles. A more recent study by Malkiel (2003) tried to solve this problem by testing performance of different fund style using appropriate benchmarks. He tested for the period of 1970-2001 and found that mutual funds of every style, except small cap growth, underperformed the appropriate index. Upon closer inspection Malkiel found that the small cap growth style's average market cap was larger than that of the benchmark. While it just so happened to be the case that during his test period, larger cap companies outperformed smaller cap companies. A fund not matching its style is not unheard of. Sensoy (2009) found that nearly a third of actively managed U.S. equity mutual funds specify a size and value or growth benchmark index in the fund prospectus, that does not match the fund's actual style. This method of performance evaluation might therefore not be the most accurate method. In addition, Malkiel measured performance using average annual return, which can provide a misguided picture since return compounds rather than combine. This research will look at annualized return to provide a baseline and to test whether results of Malkiel have changed in the recent dataset. It is expected that each fund style will underperform its benchmark. Therefore, the following hypothesis is formulated:

Hypothesis 1: Mutual funds of each style on average underperforms its appropriate benchmark.

Another major problem of the traditional CAPM is that it does not utilize information about the portfolio's composition (Grinblatt & Titman, 1993). A more common and sophisticated method of measuring performance is with multi-factor models. One of the most influential works was that of Fama and French (1993). They added a factor for firm size and value- and growth orientation to the CAMP model and created what is now known as the three-factor model. Carhart (1997) added a fourth factor to that model, capturing the momentum anomaly found by Jegadeesh and Titman (1993). The four-factor model has significantly better explanatory power (Otten & Bams, 2004); therefore, it is used in this research. Higher returns can often be assigned to exposure to these common risk factors, positive alpha can only be generated outside of these risk factors and is therefore seen as a sign of outperformance or stock picking skill. It is worth pointing out that this method should not suffer from a fund's style not matching their prospectus style. This is because a change in style is still likely to be captured by the risk factors; if a small cap fund were to hold large cap stocks, it would be captured by the four-factor model. In general, studies find that on average funds are not able to outperform when adjusted for risk (Mateus, Mateus, & Todorovic, 2018). Since the factor model should capture the risk of each fund style in this research, it is expected that little or negative alpha will remain. Therefore, the following hypothesis is formulated:

Hypothesis 2: Mutual fund of each style on average are unable to outperform when adjusted for risk factors.

2.2 Market conditions

The fact that mutual funds have grown extensively, whilst the evidence of its underperformance is convincing, remains puzzling. One strand of literature tries to solve this puzzle by assessing fund performance during varying market conditions. Kosowski (2001) studied mutual fund performance during recessions and found that the average U.S. mutual fund performs better in recession than boom period, suggesting mutual funds could be used as a hedge for recessions. Moskowitz (2000) in accordance also found that mutual funds perform well during economic downturns. However, de Souza and Lynch (2012) found evidence against this common conjecture with the use of conditional models. Not all fund styles produce counter-cyclical performance, instead many fund styles are pro-cyclical or non-cyclical. De Souza and Lynch suggested that the underlying mechanisms, that causes this difference in performance,

may be more complicated. Research in this field only offer small insight in different fund style, De Souza and Lynch for instance only test for three different styles based on size and value-growth orientation. This research aims to provide a more comprehensive picture by testing for more fund styles, such as value and large cap.

Several of these studies use elaborate conditional models to identify market conditions, while others use market indicators in unconditional models (de Souza & Lynch, 2012; Kosowski, Timmermann, Wermers, & White, 2006). The NBER indicator is most often used, indicating whether a month is either in a recessionary or expansionary period. This way of identifying market conditions has two flaws. First, the NBER classifications only becomes available in retrospect, making it difficult to predict or react upon. Second, the NBER indicator is a rather binary classifications, which does not capture important factors like market sentiment. For this reason, there are certain months where the classification can be debatable. Bull and bear market indicators can alleviate the second flaw. Bull and bear markets generally represents markets in which prices either are rising (bull) or falling (bear), but it does not have a clear definition. It is typically defined by a stock market fall or rise after its previous low or high of 20%, with some practitioners adding factors like employment rate to enhance the classification (Invesco, 2019). Both methods possess the first flaw, which can only be alleviated by using conditional models. Kosowski (2001) used a Markov switching model and showed that unconditional models understate the value added by mangers during recession periods. Performing conditional models is beyond this research, this possible bias is therefore important to keep in mind. It is finally worth pointing out that the choice of indicator does ultimately provide more or less the same results (Kole & van Dijk, 2010).

The most recent study on mutual fund performance during bull and bear markets specifically was performed in 1980 (Alexander & D. Stover, 1980). They found with the use of the CAPM model that mutual funds were unable to adjust systematic risk levels during varying market conditions. This study improves upon this method by employing a more sophisticated four-factor model, which adjust for common risk factors. Further improvements are made by differentiating for fund styles, applying better bull and bear market indicators and the use of a more extensive dataset. Furthermore, the test period includes the final part of the dotcom bubble and the not yet researched credit crises. Interest rates are at an all-time low and the current bull market has been the longest in history. It is remarkable that the literature on mutual funds seems to have tempered and started to diminish, while worldwide, mutual funds total net asset value

has more than doubled in size between 2008 and 2017 (Investment Company Institute, 2018). De Souza and Lynch (2012) found evidence that small cap growth was very (pro)cyclical, though it is not yet clear how the other fund styles behave. Therefore, the following hypothesis is formulated:

Hypothesis 3: Mutual funds' performance of different styles is variant relative to market conditions, especially for small cap and growth funds.

3. Data

Mutual fund data is gathered from the widely used CRSP survivorship-bias free U.S. mutual fund database. Survivorship bias could lead to an overestimation of performance by misrepresenting the sample by excluding funds that have closed. Closed funds generally performed poorly and by excluding them the historical returns will have an upward bias. This is not a problem in this data because it includes those closed funds. Returns of those closed funds are included up until the date of closing so the overall returns do not suffer from survivorship conditioning (Carpenter & Lynch, 1999). Three different sources for fund style classification are used in the CRSP database, spanning different periods of time. Lipper's classifications are used from 1999 onwards. To prevent complications with merging different fund style classifications, the data will range from January 1999 to January 2019. As mentioned before, this recent period benefits from two crises and interesting bull and bear movements, which have not been researched yet. The Lipper classifications are based on how a fund invest, meaning Lipper runs the funds holding through an internal model and assigns a classification based on the portfolio characteristics. These classifications will be used to identify samples for the nine different fund styles. These styles vary over size and value-growth orientations. Core orientated funds have an average price-earnings and book-market ratio compared to an index, whereas value funds for instance have lower price-earnings and higher book-market ratios. Further classification criteria and details can be found in appendix A. Table 1 provides an overview of the fund styles, including the number of funds during the test period.

The return per share data is gathered for all funds during the test period, both dead and alive. The final dataset contains roughly 20.000 funds, after removing missing or erroneous values. The data frequency is monthly, as is most frequently used in the literature. Using more frequent data can create more precise estimates, as Bollen and Bush (2001) showed for testing fund managers timing ability. Increasing the frequency, however, can also increases noise and thus reduces the efficiency of the estimate. Furthermore, daily data for 20-year period of roughly 20.000 funds will yield too much data to process for the scope of this research.

Table 1

Overview of fund styles and their benchmarks. The choice of benchmarks is based on the Lipper classifications codes, which identify the funds based on these benchmarks. The number of funds include active and dead funds from January 1999 up to January 2019.

Fund style		**Growth**	**Core**	**Value**
Large cap	# Funds	2.996	3.908	2.167
	Benchmark	S&P 500 growth	S&P 500	S&P 500 value
Mid cap	# Funds	1.792	1.666	1.142
	Benchmark	S&P MidCap 400 growth	S&P MidCap 400	S&P MidCap 400 value
Small cap	# Funds	1.767	2.621	1.269
	Benchmark	S&P SmallCap 600 growth	S&P SmallCap 600	S&P SmallCap 600 value

Total funds = 19.328

Note. Data is from the CRSP survivorship-bias free U.S. mutual fund database.

For benchmark-adjusted performance it is important that the choice of benchmark is well considered. The guidelines from Lipper's fund style classifications are used to select the benchmarks. These are the best possible benchmarks, since Lipper classified these funds based upon those benchmarks. The return data for each index is taken from Compustat[1]. See Table 1 for an overview of the benchmarks.

Two market phase indicators are used. Data for the NBER indicator is gathered from the database of Federal Reserve Bank of St. Louis[2]. Bull and bear markets do not have a clear definition, making the identification somewhat arbitrary. Invesco (2019) defines bull and bear markets for each month since 1956, based upon the S&P500's rise or fall of the previous low or high of 20%. The data goes up to February 2018. The remaining dates are assumed to be bullish, since virtually every major source, such as the Financial Times (2019) and CNBC (2019), write that the bull market reached it 10-year anniversary in March 2019. Figure 1 shows an overview of both indicators. In total, there are 199 bull months and 41 bear months. In comparison, there are 214 expansionary- and 26 recessionary months. The indicators are

[1] Retrieved from https://wrds-web.wharton.upenn.edu/wrds/ds/compd/index/ixprice.cfm?navId=83

[2] NBER based Recession Indicators for the United States from the Period following the Peak through the Trough. Retrieved from https://fred.stlouisfed.org/series/USREC, June 10, 2019.

nuanced in the months where recession classification is doubtful, there are two recessionary periods whilst there are four bear periods. However, as Kole and van Dijk (2010) suggested, the choice of indicator does not affect the results greatly.

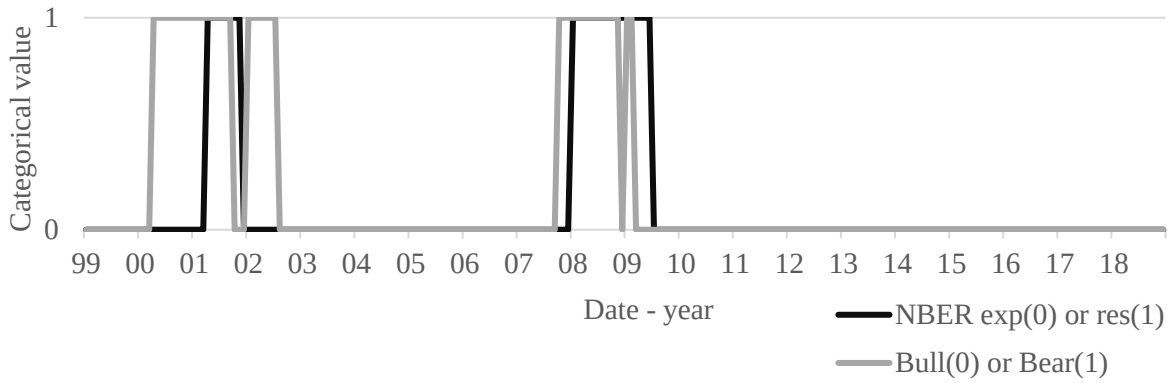

Figure 1. Market condition indicators, dictating which month is classified as either an expansion (0) or regression (1), or either bull (0) or bear (1) between 1999 and 2019. NBER data is from the Federal Reserve Bank of St. Louis database and the bull and bear indicators are from Invesco (2019).

The factor returns and risk-free data required for the four-factor model will be collected from Kenneth French's database on his website. These variables include the market return (*Rm*), risk-free rate (*Rf*), small minus big market cap portfolio return (*SML*), high minus low book-to-market portfolio return (*HML*) and the momentum factor (*MOM*). How each variable is defined is described in the methodology section. Further construction details of all variables can be read in Fama and French (1993) "Common Risk Factors in the Returns on Stocks and Bonds,", Carhart (1997) "On Persistence in Mutual Fund Performance" and on Kenneth French's website[3].

[3] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Research

4. Methodology

Factor models will be used to measure the risk adjust performance. It is worth beginning with the CAPM model. First introduced by the likes of Treynor, Sharpe and Litner in the 1960s. The model captures an assets exposure to systematic risk, also known as beta. The model is described as follows:

$$R_{it} - Rf_t = \alpha_i + \beta_i (Rm_t - Rf_t) + \varepsilon_{it} \quad (1)$$

Where R_{it} stands for return of asset i on time t, Rf_t stands for the return on a risk-free asset on time t, Rm_t for the return on a market portfolio on time t and ε_{it} for the error term. The market return is constructed as the value weighted return of all firms found in the CRSP database and listed on the NYSE, NASDAQ or AMEX. The risk-free rate is defined as the one-month Treasury bill rate. Beta stands for the exposure to the market factor and α_i represents the Jensen's alpha. Alpha is commonly interpreted as a measure of under- or outperformance of an asset relative to the market proxy. While still widely used, the CAPM model is unable to explain certain anomalies.

The three-factor model of Fama and French (1993) is, however, able to explain certain anomalies, because it enhances the CAPM model with two factors. Carhart (1997) further enhances this model with a momentum factor, which captures yet another anomaly. The resulting model is a market equilibrium model, meaning that the coefficients indicate the proportion of return that can be attributed to the corresponding factor. The following model is estimated:

$$R_{it} - Rf_t = \alpha_i + \beta_{0i} (Rm_t - Rf_t) + s_{1i}SMB_t + h_{2i}HML_t + m_{3i}MOM_t + \varepsilon_{it} \quad (2)$$

Where SMB_t stands for the difference in return between a small cap and large cap portfolio at time t and HML_t stands for the difference in return between a high and low book-to-market portfolio at time t. Finally, the return of a portfolio that longs the winners and shorts the losers from the previous 12 month at time t is represented by MOM_t. All other variables are defined

like they are in equation (1). Kenneth French[4] constructs SMB_t[5] as the average return of three small portfolios, minus the average return of three large portfolios formed on book-to market ratio. The HML_t[6] variable is constructed as the average return of two value portfolios, minus the average return of two growth portfolios formed on size. Finally, the MOM_t[7] variable is constructed as the average return of two portfolios of the high performers, minus the average return of two portfolios of the low performers from the previous 12 months. This leaves alpha, which indicates whether funds on average are able to under- or outperform the market after adjusting for risk. To give insight in the different states of the market the datasets will be split. One sample of a fund style will represent the boom or bull periods and the other the recession or bear periods. In the rest of this paper the return of a fund style is formulated as the average return of all mutual funds for each month, including both dead and alive funds.

[4] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Research
[5] SMB = 1/3(Small Value + Small Core + Small Growth) – 1/3(Big Value + Big Core + Big Growth)
[6] HML = 1/2(Small Value + Big Value) – 1/2(Small Growth + Small Value)
[7] MOM = 1/2(Small High + Big High) – 1/2(Small Low + Big Low)

5. Results & discussion

Hypothesis 1 on benchmark adjusted fund performance

The results of the benchmark adjusted performance measure are quite remarkable compared to results found in earlier studies. As is shown in Table 2, in five out of the nine style categories, mutual fund on average netted better returns than their benchmark index. All large cap and value mutual funds outperformed their benchmark, regardless of respective value-growth orientation or market cap. The biggest outperformance is that of the style large cap value, with an annualized return of an additional 231 basis points it outperformed the S&P500 value index. The mid cap growth fund style underperformed the most, with an annualized return of 244 basis points fewer than the S&P MidCap 400 growth index. Since these results are averages of thousands of mutual funds over a long period and because more than half of mutual fund styles outperform by a considerable amount, it is unlikely that these differences in returns are merely due to luck. There seems to be consistency with the small cap premium, returns increase as the market cap decreases. Large cap core funds had a total return of 156,50%, whereas small cap core funds netted 335,80%. The value premium seems to hold for average mutual funds, but the opposite effect is found for benchmarks; value orientation results in lower returns relative to core or growth orientation.

Gruber (1996) performed the same measure for the period 1985-1995 and found that the average mutual fund underperformed the market. However, a closer inspection reveals some questionable methodology. His sample only includes a total of 279 funds and it does not discriminate for different fund styles. Malkiel (2003) also found that mutual funds underperformed the market but used a better methodology. Malkiel did discriminate for different fund styles and measured performance with appropriate benchmarks. His sample, however, might also suffer from the fact that it only contains 582 funds from 1990 up to 2000. Hypothesis 1 reads:

Mutual fund of each style on average underperforms its appropriate benchmark.

Since in over half the fund styles mutual funds performed better than their benchmark, the hypothesis is rejected. What these results suggest is that in the recent years some mutual fund styles were able to improve their performance. If one were to judge mutual fund performance only relative to a benchmark, then it would seem that certain mutual fund styles are able to add value.

Table 2

Benchmark adjusted performance of different fund styles. This table shows annualized- and total returns from of the average mutual fund and the benchmark of each style. The test period is from January 1999 up to January 2019.

Fund style	**Growth**		**Core**		**Value**	
	Ann. Return	Tot. Return	Ann. Return	Tot. Return	Ann. Return	Tot. Return
Large cap						
Fund	4,70%	151,00%	4,80%	156,50%	5,10%	169,60%
Benchmark	4,00%	118,70%	3,60%	103,90%	2,80%	73,00%
Mid cap						
Fund	6,50%	252,10%	7,40%	318,60%	7,40%	317,90%
Benchmark	8,90%	454,20%	7,50%	323,90%	6,00%	220,60%
Small cap						
Fund	7,00%	286,70%	7,60%	335,80%	8,00%	364,70%
Benchmark	9,00%	458,90%	8,10%	376,40%	7,10%	297,20%

Note. Mutual fund data is collected from the CRSP survivorship-bias free U.S. mutual fund database, while the index return data is from the Compustat database.

Hypothesis 2 on fund performance measured with the four-factor model

Table 3 provides summary statistics of all variables of the four-factor model and the excess return variables of each fund style. What stands out is that the mean excess return increases as portfolio size decreases. This is in accordance with the original findings of Fama and French (1993, 1996), who suggest that small cap firms are riskier and therefore investors require a higher risk premium. The risk explanation seems to hold for the data, as the standard deviation of small cap is larger than that of mid cap, which is consequently larger than that of large cap. Fama and French also suggested that there should be a premium on value stocks as they are also associated with higher risk. However, this is not evident in the data. Only in large and small cap funds do value funds provide marginally higher average returns of 0,01% per month. At the same time, value funds have lower standard deviation and thus lower risk than the core funds in each market cap. These findings therefore contradict the common conjecture made about the value premium proposed by Fama and French.

Table 3

Summary statistics of variables used in four-factor modeling. The mutual fund return variables are all in excess of the risk-free rate and all values are in percentages. The sample period is from January 1999 up to January 2019, thus there are 240 observations.

Variable	**Mean**	**Std. Dev.**	**Min**	**Max**
Rm-Rf	0,44	4,34	-17,23	11,35
SMB	0,30	3,38	-16,87	21,71
HML	0,14	3,19	-11,10	12,90
MOM	0,32	5,36	-34,39	18,36
Rf	0,14	0,16	0,00	0,56
Large cap core	0,34	0,27	-17,29	11,27
Large cap growth	0,35	0,30	-16,85	11,71
Large cap value	0,35	0,27	-17,37	11,45
Mid cap core	0,57	0,31	-21,10	13,68
Mid cap growth	0,54	0,37	-20,53	22,17
Mid cap value	0,56	0,29	-21,01	14,90
Small cap core	0,61	0,34	-20,92	15,87
Small cap growth	0,60	0,38	-20,93	22,89
Small cap value	0,62	0,32	-20,69	17,14

Note. The data from the first five variables is collected from Kenneth French's website[8] and mutual fund data is collected from the CRSP survivorship-bias free U.S. mutual fund database.

Table 4 presents results of applying equation (2) on each fund style. What stands out is that these models do a good job at explaining the excess return, as the regressions are highly significant and the R^2 does not go below 94%. Each fund style has a close relation to the market, with each beta being close to one. This is likely due to the fact the market proxy and the actual stocks held in the funds have a lot of overlap. The *SML* factor works as expected, the factor has more weight when the capitalization is smaller. For large cap core the *SML* coefficient equals -8,7%, whilst for small cap growth it equals 68,4%. This shows that the returns of smaller cap are due to the small size premium. The same holds for the *HML* factor; value fund styles have higher exposure to the *HML* factor. The momentum factor, however, has little weight and is in one third of the cases insignificant. These results suggest that the momentum factor in the core fund styles of each market cap could be omitted. Additional

[8] http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html#Research

factors might be able to explain returns better in other scenarios, but for these fund styles the three-factor model seems to be sufficient. Hypothesis 2 reads:

Mutual fund of each style on average are unable to outperform when adjusted for risk factors.

The only fund style with a significant alpha is that of large cap core at -7,2%. This means that the average large cap core fund underperformed the market over the 20-year period by 7,2% in terms of return on investment. Every other fund style retains insignificant alphas. This signifies that there is no evidence found of funds on average being able to generate alpha or in other words, outperform. These findings are in accordance with hypothesis 2 and it is therefore not rejected.

Table 4

Regression results of the four-factor model. Variable β_0 is for the market exposure, s_1 for the SML factor, h_2 for the HML factor and m_3 for the momentum factor. The sample period is from January 1999 up to January 2019, thus there are 240 observations.

Fund style	α	β_0	s_1	h_2	m_3	R^2	*F value*
Large cap core	-0,072*	0,968*	-0,087*	0,032*	-0,006	0,99	0,000
Large cap growth	-0,086	1,042*	-0,030	-0,238*	0,037*	0,97	0,000
Large cap value	-0,045	0,924*	-0,119*	0,274*	-0,046*	0,97	0,000
Mid cap core	0,001	1,01*	0,334*	0,117*	0,019	0,96	0,000
Mid cap growth	-0,081	1,114*	0,447*	-0,232*	0,085*	0,94	0,000
Mid cap value	0,043	0,943*	0,212*	0,344*	-0,051*	0,94	0,000
Small cap core	-0,055	0,997*	0,593*	0,285*	0,006	0,97	0,000
Small cap growth	-0,114	1,111*	0,684*	-0,096*	0,085*	0,96	0,000
Small cap value	0,000	0,921*	0,524*	0,499*	-0,044*	0,95	0,000

Note. *p<0,05.

Hypothesis 3 on fund performance during varying market conditions

For the market conditions two indicators are used, NBER and bull and bear. Results of both indicators were highly similar and therefore the bull and bear market indicators are highlighted for the remainder for this paper. Table 5 shows regression results with bull and bear market conditions and Appendix B shows regression results with NBER indicators. It is again worth pointing out that the regressions results are highly significant and the models do a good job at explaining the returns.

Firstly, looking at Table 5 shows that only the average large cap core and value funds were able to lower their beta coefficient in bear markets and increase it during bull markets significantly. Large cap core and value funds were able to have an increased beta during bull markets relative to both bull and bear markets of 1,1% and 2,8% respectively. Only these two funds were able to affect their beta meaningfully. All other funds styles increased their beta coefficients during bear markets and lower them during bull markets. Mid cap growth was the worst performer, which had an increased beta during bear markets of 18,7%. Since these coefficients are significant it is unlikely that these results are by chance. However, results using NBER indicators shows that no fund was able to increase their beta during expansions. In fact, each fund had an increased exposure to the market during recessions. These results overall suggest that funds are unable to alter their exposure to the market during varying market conditions meaningfully.

Second, large cap core and large cap value were the sole fund styles which were able to generate significant alpha, which was during bull markets. When NBER indicators are considered, only large cap core has a significant alpha of -7% during expansions. During bull markets large cap core and value both have a negative alpha of -10,5% and -12,5% respectively. The negative Jensen alphas suggest that these fund styles on average underperforms during bull markets. So even though these fund styles were able to increase their beta during bull markets, they were unable to outperform. All the other fund styles, during all market conditions, had insignificant alphas. Alphas found in these other funds styles during all market conditions are therefore likely to be by chance. It follows that funds are on average unlikely to generate alpha. Hypothesis 3 reads:

Mutual funds' performance of different styles is variant relative to market conditions, especially for small cap and growth funds.

Table 5

Regression results of the four-factor model during bull and bear markets. The bold fund styles are the same results as found in Table 4. Variable β_0 is for the market exposure, s_1 for the SML factor, h_2 for the HML factor and m_3 for the momentum factor. The sample period is from January 1999 up to January 2019, thus there are 240 observations.

Fund style	α	β_0	s_1	h_2	m_3	R^2	*F value*
Large cap core	-0,072*	0,968*	-0,087*	0,032*	-0,006	0,99	0,000
Bull	-0,105*	0,979*	-0,078*	0,005	-0,007	0,99	0,000
Bear	-0,006	0,967*	-0,130*	0,047*	-0,013	0,99	0,000
Large cap growth	-0,086	1,042*	-0,030	-0,238*	0,037*	0,97	0,000
Bull	-0,076	1,035*	-0,009	-0,238*	0,046*	0,97	0,000
Bear	0,005	1,069*	-0,113*	-0,239*	0,023	0,97	0,000
Large cap value	-0,045	0,924*	-0,119*	0,274*	-0,046*	0,97	0,000
Bull	-0,125*	0,952*	-0,110*	0,217*	-0,056*	0,98	0,000
Bear	0,030	0,901*	-0,167*	0,306*	-0,047*	0,96	0,000
Mid cap core	0,001	1,010*	0,334*	0,117*	0,019	0,96	0,000
Bull	-0,015	0,983*	0,377*	0,102*	0,006	0,97	0,000
Bear	0,524	1,130*	0,139	0,106	0,044	0,94	0,000
Mid cap growth	-0,081	1,114*	0,447*	-0,232*	0,085*	0,94	0,000
Bull	0,018	1,042*	0,510*	-0,220*	0,077*	0,95	0,000
Bear	0,355	1,301*	0,188*	-0,249*	0,114*	0,94	0,000
Mid cap value	0,043	0,943*	0,212*	0,344*	-0,051*	0,94	0,000
Bull	-0,064	0,957*	0,233*	0,292*	-0,068*	0,95	0,000
Bear	0,554	0,994*	0,091*	0,356*	-0,035	0,92	0,000
Small cap core	-0,055	0,997*	0,593*	0,285*	0,006	0,97	0,000
Bull	-0,090	0,985*	0,622*	0,256*	-0,006	0,98	0,000
Bear	0,371	1,082*	0,451*	0,291*	0,023	0,96	0,000
Small cap growth	-0,114	1,111*	0,684*	-0,096*	0,085*	0,96	0,000
Bull	-0,022	1,051*	0,733*	-0,109*	0,071*	0,97	0,000
Bear	0,131	1,259*	0,487*	-0,086	0,117*	0,95	0,000
Small cap value	0,000	0,921*	0,524*	0,499*	-0,044*	0,95	0,000
Bull	-0,116	0,939*	0,540*	0,444*	-0,060*	0,95	0,000
Bear	0,518	0,966*	0,422*	0,514*	-0,033	0,95	0,000

Note. Bull and bear markets are identified using the classifications from Invesco (2019). *p<0,05.

Only performance of large cap core and large cap value are variant to the market conditions. There is significant evidence that during bull markets these styles underperformed. While de Souza and Lynch (2012) found that small cap growth is very procyclical, there is no evidence found in this data. These results suggest that mutual funds of any style are in general unable to outperform, indifferent of bull or bear market conditions. Since performance of nearly all fund styles are invariant relative to market conditions the hypothesis is rejected.

Overall, the results show that mutual funds on average are still unable to outperform. It also shows that mutual funds are unable to time market condition meaningfully by changing beta, whether it is defined as bull or bear, or as recession or expansion. The four-factor model of Carhart (1997) is able to explain a lot of the returns trough the risk factors. The funds are therefore unable to generate positive alpha. Positive alpha can only be generated by outperforming the market, which is often translated into stock picking skills. Anyone could earn higher returns by simply exposing his portfolio to risk factors associated with these higher returns, this does not require any stock picking skill.

These findings are mostly in accordance with what is commonly believed in literature. Jensen (1968) Malkiel (1995) and Carhart (1997) all pointed out that funds do not outperform and it is therefore better to buy low cost passive indexes. The benchmark adjusted results do, however, at first glance seems to contradict earlier findings. The benchmark adjusted performance shows that for a majority of fund styles a buy-hold strategy of a fund results in higher returns than that of an index. Could this mean that mutual funds have improved over the past 20 years or is there another explanation? A possible explanation from this phenomenon is similar to what Malkiel (2003) found. In his benchmark adjusted performance test he found that the same fund styles used in this research all underperformed, except for small cap growth. Upon closer inspection of the holdings of the 33 funds he discovered that most of them held stocks which were not akin to a small cap growth focused fund. During his test period, larger cap stocks tended to perform better and so he discovered that small cap growth funds held a larger average market cap then the benchmark did. Remember that also nearly a third of U.S. mutual funds have holdings which do not entirely match their prospectus (Sensoy, 2009). Since the returns are so well explained by the factor models, it is likely that the funds that did outperform their benchmark held stock that was not representative of that benchmark. Whilst this is the most reasonable explanation, it cannot be certain without knowing how the models which Lipper uses to classify styles operate. Considering the results of the risk adjusted performance, mutual funds are unable to

generate alpha or outperform. All results were found before considering expenses and fees of mutual funds, making the case even worse for mutual funds. These findings seem to support the idea of indexing being a better option than buying a mutual fund. However, the reader should be wary when a mutual fund outperforms the corresponding index; it is likely due to the fund holding stocks which do not represent its style.

6. Conclusion

The mutual fund industry has grown vastly in the last ten years alone. Due to an extensive amount of literature it is commonly believed that mutual funds underperform compared to low-cost passive indices (Carhart, 1997; Jensen, 1968; Malkiel, 1995). However, more recent research, like that of Moskowitz (2000), suggested that mutual funds could add value during down markets. An even more recent study opposed this, instead suggesting that some fund styles were procyclical while others were countercyclical (de Souza and Lynch, 2012). This paper therefore set out to investigate whether mutual funds of different styles were able to outperform during varying market conditions. It did so in three steps. First, it tested benchmark adjusted performance and found that more than half of the nine fund styles outperformed their benchmark. This surprising result has not been found before. A potential reason for this finding is that funds do not actually hold stocks which are truthfully representative of their benchmark's objectives. Second, it tested risk adjusted performance with the use of Carhart's (1997) four-factor model and found that no style managed to generate alpha, expect for large cap core, which underperformed. Third, it tested risk adjusted returns controlled for bull and bear markets and found results similar to the second step. Mutual funds on average, when adjust for common risk factors, are still unable to show signs of outperformance regardless of any market condition. The results also show that nearly all mutual fund styles increase their market exposure during down markets, which implies that they are not able to time markets successfully. The results also support the view that mutual funds managers on average do not possess stock picking ability. Kosowski et. Al. (2006) showed that some individual managers do possess skill; however, this is lost in the aggregate.

The methodology of this study could be improved by moving from an unconditional- to a conditional model, since it utilizes information known to managers throughout the test period. This study is also bounded by only investigating a 20-year period, instead of using the entire database of CRSP starting from 1962. Such a period includes many more bull and bear markets and can therefore provide a more apprehensive picture of mutual fund performance during varying market conditions. Future research can focus on investigating why and how the surprising increase in benchmark adjusted performance of mutual funds occurred in the past 20 years. This paper has not only shown that the notion that mutual funds underperform still holds for different styles, but that it is also true during all market conditions. The puzzle as to why they have grown to become so large remains and is an important topic for future research.

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Appendix A

Description of the Lipper classification of the individual fund styles.

Fund style	Description
Large-Cap Core Funds	Funds that, by portfolio practice, invest at least 75% of their equity assets in companies with market capitalizations (on a three-year weighted basis) greater than 300% of the dollar-weighted median market capitalization of the middle 1,000 securities of the S&P SuperComposite 1500 Index. Large-cap core funds have more latitude in the companies in which they invest. These funds typically have an average price-to-earnings ratio, price-to-book ratio, and three-year sales-pershare growth value, compared to the S&P 500 Index
Large-Cap Growth Funds	Funds that, by portfolio practice, invest at least 75% of their equity assets in companies with market capitalizations (on a three-year weighted basis) greater than 300% of the dollar-weighted median market capitalization of the middle 1,000 securities of the S&P SuperComposite 1500 Index. Large-cap growth funds typically have an above-average price-to-earnings ratio, price-tobook ratio, and three-year sales-per-share growth value, compared to the S&P 500 Index.
Large-Cap Value Funds	Funds that, by portfolio practice, invest at least 75% of their equity assets in companies with market capitalizations (on a three-year weighted basis) greater than 300% of the dollar-weighted median market capitalization of the middle 1,000 securities of the S&P SuperComposite 1500 Index. Large-cap value funds typically have a below-average price-to-earnings ratio, price-to-book ratio, and three-year sales-per-share growth value, compared to the S&P 500 Index.
Mid-Cap Core Funds	Funds that, by portfolio practice, invest at least 75% of their equity assets in companies with market capitalizations (on a three-year weighted basis) less than 300% of the dollar-weighted median market capitalization of the middle 1,000 securities of the S&P SuperComposite 1500 Index. Mid-cap core funds have more latitude in the companies in which they invest. These funds typically have an average price-to-earnings ratio, price-to-book ratio, and three-year sales-pershare growth value, compared to the S&P MidCap 400 Index.
Mid-Cap Growth Funds	Funds that, by portfolio practice, invest at least 75% of their equity assets in companies with market capitalizations (on a three-year weighted basis) less than 300% of the dollar-weighted median market capitalization of the middle 1,000 securities of the S&P SuperComposite 1500 Index. Mid-cap growth funds typically have an above-average price-to-earnings ratio, price-tobook ratio, and three-year sales-per-share growth value, compared to the S&P MidCap 400 Index.
Mid-Cap Value Funds	Funds that, by portfolio practice, invest at least 75% of their equity assets in companies with market capitalizations (on a three-year weighted basis) less than 300% of the dollar-weighted median market capitalization of the middle 1,000 securities of the S&P SuperComposite 1500 Index. Mid-cap value funds typically have a below-average price-to-earnings ratio, price-to-book ratio, and three-year sales-per-share growth value, compared to the S&P MidCap 400 Index
Small-Cap Core Funds	Funds that, by portfolio practice, invest at least 75% of their equity assets in companies with market capitalizations (on a three-year weighted basis) less than 250% of the dollar-weighted median of the smallest 500 of the middle 1,000 securities of the S&P SuperComposite 1500 Index. Small-cap core funds have more latitude in the companies in which they invest. These funds typically have an average price-to-earnings ratio, price-to-book ratio, and three-year sales-pershare growth value, compared to the S&P SmallCap 600 Index.
Small-Cap Growth Funds	Funds that, by portfolio practice, invest at least 75% of their equity assets in companies with market capitalizations (on a three-year weighted basis) less than 250% of the dollar-weighted median of the smallest 500 of the middle 1,000 securities of the S&P SuperComposite 1500 Index. Small-cap growth funds typically have an above-average price-to-earnings ratio, price-to-book ratio, and three-year sales-per-share growth value, compared to the S&P SmallCap 600 Index.
Small-Cap Value Funds	Funds that, by portfolio practice, invest at least 75% of their equity assets in companies with market capitalizations (on a three-year weighted basis) less than 250% of the dollar-weighted median of the smallest 500 of the middle 1,000 securities of S&P SuperComposite 1500 Index. Small-cap value funds typically have a below-average price-to-earnings ratio, price-to-book ratio, and three-year sales-per-share growth value, compared to the S&P SmallCap 600 Index.

Appendix B

Regression results of the four-factor model during recessions and expansions. The bold fund styles are the same results as found in Table 4. Variable β_0 is for the market exposure, s_1 for the SML factor, h_2 for the HML factor and m_3 for the momentum factor. The sample period is from January 1999 up to January 2019, thus there are 240 observations.

Fund style	α	β_0	s_1	h_2	m_3	R^2	*F value*
Large cap core	-0,072*	0,968*	-0,087*	0,032*	-0,006	0,99	0,000
Expansion	-0,070*	0,965*	-0,086*	0,051*	-0,002	0,99	0,000
Recession	-0,090	1,003*	-0,077*	-0,050*	-0,001	1,00	0,000
Large cap growth	-0,086	1,042*	-0,030	-0,238*	0,037*	0,97	0,000
Expansion	-0,093	1,031*	-0,037*	-0,227*	0,061*	0,97	0,000
Recession	-0,068	1,073*	-0,056	-0,305*	0,000	0,98	0,000
Large cap value	-0,045	0,924*	-0,119*	0,274*	-0,046*	0,97	0,000
Expansion	-0,039	0,932*	-0,111*	0,312*	-0,057*	0,97	0,000
Recession	-0,164	0,948*	-0,077	0,142*	-0,014	0,99	0,000
Mid cap core	0,001	1,010*	0,334*	0,117*	0,019	0,96	0,000
Expansion	-0,007	0,997*	0,332*	0,167*	0,044*	0,96	0,000
Recession	-0,008	1,095*	0,311*	-0,102	-0,005	0,98	0,000
Mid cap growth	-0,081	1,114*	0,447*	-0,232*	0,085*	0,94	0,000
Expansion	-0,065	1,082*	0,445*	-0,207*	0,130*	0,94	0,000
Recession	-0,187	1,192*	0,283*	-0,397*	-0,006	0,98	0,000
Mid cap value	0,043	0,943*	0,212*	0,344*	-0,051*	0,94	0,000
Expansion	0,020	0,945*	0,208*	0,409*	-0,041*	0,94	0,000
Recession	0,090	1,024*	0,306*	0,102	-0,024	0,97	0,000
Small cap core	-0,055	0,997*	0,593*	0,285*	0,006	0,97	0,000
Expansion	-0,085	1,000*	0,584*	0,322*	0,022	0,97	0,000
Recession	0,022	1,030*	0,649*	0,152*	0,000	0,99	0,000
Small cap growth	-0,114	1,111*	0,684*	-0,096*	0,085*	0,96	0,000
Expansion	-0,125	1,096*	0,675*	-0,085*	0,121*	0,96	0,000
Recession	-0,098	1,142*	0,627*	-0,170*	0,021	0,99	0,000
Small cap value	0,000	0,921*	0,524*	0,499*	-0,044*	0,95	0,000
Expansion	-0,041	0,933*	0,516*	0,550*	-0,037	0,94	0,000
Recession	0,114	0,959*	0,640*	0,328*	-0,021	0,99	0,000

Note. Recessions and expansions are identified using NBER classifications from the Federal Reserve Bank of St. Louis database. *p<0,05.