Smart Beta investing: Does the Smart Investor go Smart Beta?

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Abstract

This research aims to analyze the performance of smart beta funds around the globe. It concludes that smart beta funds in the United States and in emerging markets seem to outperform their respective passive cap-weighted index funds benchmarks on a risk adjusted basis. The only smart strategy that seems to outperform their benchmark on a risk adjusted basis is the value strategy. Multifactor strategies seem to offer worse risk adjusted results than their benchmark. Lastly, bigger funds seem to have better Sharpe ratios.

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1 Introduction

In recent years there has been a shift from active to passive portfolio management (Anadu & Kenechukwu, 2019). As of 2019 37% of the US market consists of passive funds, in comparison this used to be 3% in 1995. Active strategies consist of stocks that are handpicked by management. These stocks are thought to outperform a benchmark previously identified. The passive fund consists of a portfolio that holds all or a representation of all stocks in a certain index.

However, in recent years there has been a new development in portfolio selection: smart beta (SB) funds. This can be seen as a semi-active portfolio. The stocks aren't handpicked, neither are they a representation of the whole market. With a smart beta fund, the stocks are chosen on certain fundamental characteristics, for instance the E/P ratio's, B/M ratio's and size factor from the Fama and French 3-factor model (1993). Smart beta funds try to keep the benefits of passive investing: low turnover, low expense fees and lower risk. This while also trying to activate the benefits of active strategies: stock picking. The smart beta funds promise high returns with a relatively higher expense ratio of on average 0.41% higher than the passive funds (Gluskov, 2016).

In this research we find evidence that smart beta funds in the United States and in emerging markets seem to outperform their respective passive cap-weighted index funds benchmarks on a risk adjusted basis. The only smart strategy that seems to outperform their benchmark on a risk adjusted basis is the value strategy. Multifactor strategies seem to offer worse risk adjusted results than their benchmark. Lastly, bigger funds seem to have better Sharpe ratios.

FTSE Russel (2018) researched the growth of smart beta strategies and found that between 2012 and the end of 2017 the assets under management by SB strategies grew form 280 billion to 999 billion in 2017. Secondly the adoption rates seem to grow each year too, reaching an all-time high of 48% in 2019. According to this research SB ETFs take up the majority of smart beta strategies. The launch of these ETFs have grown exponentially too from 66 in 2013 to 302 in 2017. One of the goals of this paper is to see if this exponential growth in these smart beta strategies can be substantiated by better risk adjusted performance.

Gluskov (2016) has researched the performance of smart beta portfolio's in comparison to U.S. exchange traded cap-weigthed index funds. He had found no conclusive evidence that the smart beta funds outperformed their index fund benchmarks on a risk-adjusted basis. This research will elaborate on the research of Gluskov by looking at 4 different investing regions and benchmark these SB funds against a passive cap-weighted index fund within that same region. This will give investors a better understanding of the performance of multi-factor smart beta funds around the globe. Secondly, multifactor strategies will be benchmarked against single factor strategies to see whether there are significant differences between the

two. The goal of this is to see if returns and risk can be improved by adding more factors to the fund. Multi-factor ETFs are weighted on several factors (such as value and size factor). Furthermore, we will look at how these smart beta funds perform when adjusted for risk. Lastly, we will look how assets under management influence the risk adjusted returns of the funds.

research questions:

Do smart beta exchange traded funds outperform international cap-weighted index funds when adjusted for risk?

Sub-research questions:

Do multi-factor smart beta ETFs create significantly different returns from single factor strategies?

Does the investing region affect the return and risk in smart beta funds?

Does the size of a smart beta fund tell something about the performance?

2 literature review

2.1 Expected Returns and Anomalies

Asset pricing and the calculation of expected returns have always been part of the core of finance theories. Two fundamental theories are the capital asset pricing model (CAPM) and the arbitrage pricing theory (APT). CAPM theory (Sharpe, 1964) draws a link between expected return and systematic risk. Investors will demand higher returns for riskier assets. This theory is highly linked to the efficient market hypothesis, which states that all possible information is known by the market. This means that only systematic risk affects your stock price (Fama, Malkiel, 1970). These theories are in stark contrast with APT by Ross (2013). This states that there are certain risk factors that influence the return, these will be different for each stock. Financial researchers have found several anomalies that influence historical returns. These anomalies create stock performance with higher returns and lower volatility.

In this research we will focus on several factors related to these anomalies. It is important to mention that there are several more smart beta strategies (such as liquidity, growth). The factors used in this research are the most frequently applied in smart beta strategies and have acquired the most capital.

Indro, Jiang et. al (1999) found that fund size affects the performance of the mutual fund. Firstly, they concluded that a fund needs a minimum fund size in order to achieve sufficient returns to justify their costs of acquiring and trading information. Secondly, there are diminishing marginal returns to information acquisition and trading. However, after the

optimal funds size point these diminishing marginal returns become negative. This points to the possibility that funds can be too small or too big.

Carhart (1997) researched the performance of actively managed mutual funds. He found that the common factors in stock returns and investment expenses almost completely explain persistence in returns. The size, value and momentum factors seem to explain a big part of the funds performance. Secondly, there seems to be a negative correlation between turnover and return as well as expense ratios and performance. All these results point to the inexistence of managerial skill with regard to producing above average mutual fund performance.

Fama and French (2010) concluded that the aggregate return of actively managed firms produce an alpha close to the one of the market portfolio. However, the high costs of actively managed funds result in lower returns for investors. When looking at individual funds the results suggest that only a few funds seem to produce benchmark adjusted expected returns that are sufficient to cover their expense ratios.

Berk and Binsbergen (2015) researched if managerial skill exists in mutual funds. They did this by using the value added to a fund by a manager as a proxy for skill. They found that there exists a cross-sectional difference in managerial skill. Furthermore, they found that investors are able to recognize this skill and invest more in these funds. There exists a strong correlation between current compensation and future performance.

French (2008) found that investors spend 0,67% of the aggregate value of the market each year searching for superior returns using active strategies. He concluded that the average investor could increase his average annual return by 0,67% if he switches to a passive strategy.

Fama and French (1993) found three distinct factors influencing historical returns, these are: the market risk, size and book-to-market ratios. The size factor refers to the finding that lower capitalization firms, that is firms with a lower than $10 billion capitalization, generally outperform high capitalization firms.

In general, stocks with lower book-to-market ratios offer higher returns. A low book-to-market ratio is connected to value stocks. These stocks have a relatively cheap price in comparison to their value measures, such as B/M or P/E.

Jegadeesh and Titman (2001), found that stocks that have performed well in the past will keep on winning. This is in a time-frame of 3- to 12 months. This anomaly tells us to buy past winners and sell your losers.

Fama and French (1988) found a relation between higher dividend yields and higher returns. They concluded that future price increases implied by higher expected returns are offset by the decline in the current price because of the high dividend yield. This is corrected by the market; the price will revert to the mean. This will cause higher returns.

Ang, Hodrick, Xing and Zang (2006) find that stocks with high idiosyncratic risk and stocks with high exposure to systematic risk have, on average, lower returns.

Lastly, the quality factor is a representation of an equal weighted average of nineteen normalized and standardized firm characteristics meant to capture each firm's overall quality. These characteristics are along ten different dimensions (Kalesnik and Kose, 2014).

Multifactor strategies use a combination of two or more factors to try and acquire above average returns or lower volatility.

2.2 Smart Beta Research

The goal of smart beta is to obtain alpha, decrease risk or increase the diversification at a lower cost than active portfolio management. The management fee is slightly higher than a passive cap-weighted index fund, but SB alternatives try to compensate for this by trying to obtain higher returns with lower risk. This is seeked through optimally diversifying portfolio's weighted on several anomalies and factors that historically have offered higher returns and lower risk.

Glushkov (2016) analyzed whether smart beta funds outperform their respected benchmarks in the United States. The smart beta funds were classed into thirteen different groups and compared to their benchmark, a risk-adjusted version and to a blended benchmark consisting of existing cap-weighted funds that provide passive exposure to the market, size and value factors. He found no evidence that the SB funds outperform their benchmarks on a risk adjusted basis. Secondly, he found evidence for unintended factor tilts offsetting the return advantage from intended factor tilts.

Malkiel (2014) came to a similar conclusion and found no conclusive evidence that SB funds consistently outperform passive funds, and when they do outperform their respective benchmarks it is because of a higher risk. He concludes that the performance of SB funds is dependent on market valuations existing at the time the strategy is implemented. For instance, value strategies worked really well during the internet bubble. However, when these stocks become richly priced, because of the growing popularity of SB funds, the results will be likely disappointing. So, the more people invest in these SB funds, the less likely positive returns will be produced.

3 Data

In this research there will be a sample of 83 US traded multi-factor SB ETFs and 148 Nasdaq traded single-factor ETFs. The ETFs will be categorized by Morningstar smart-beta categories. Table 1 shows the different factors included in this research and the amount of observations.

Table 1: Smart Beta factor categories

Smart Beta Factors	Observations
Multifactor	83
Volatility	5
Momentum	15
Value	38
Quality	8
Dividend	76
Total	225

The sample is divided in 4 different regions to see the difference in performance and risk between markets. The sample funds will be obtained from Morningstar. Only ETFs with a minimum of 36 months returns will be included in the sample. For all ETFs monthly return data is retrieved from the CRSP database. The SB ETFs will be benchmarked against different passive cap-weighted index funds, based on investing region. Monthly return data for these passive funds are also retrieved from CRSP.

Table 2:Passive Cap-weighted index funds benchmarks

Region	Benchmark Index Fund
US	SPDR S&P 500 ETF Trust
Global	Vanguard Total World Stock ETF
Global Ex. US	Vanguard FTSE All-World Ex-US ETF
Emerging markets	Vanguard FTSE Emerging Markets ETF

For the risk-free rate, the 3-month US treasury bill rate returns are used. The sample is subjected to survivorship-bias, only ETFs that are still active on the 31st of December 2019 are added.

3.1 Descriptive Statistics

Using the sample of 241 ETFs I analyze the trends and growth of smart beta funds. In figures 1, 2 and 3 you can see the growth in assets under management per investing region and per smart beta strategy. Overall it is evident that smart beta strategies have grown substantially from the start of the decade. This growth is mostly contributed to growth in smart beta ETFs in the United States. It is important to point out that in this research there has been a focus on American traded funds, the majority of international funds are not being traded on one of the United States stock markets. However, even in the other investing regions there is a clear growth in AUM, often doubling or even tripling its initial AUM in 2010. In figure 3 it can be seen that the two biggest SB strategies are value and dividend. However, multifactor strategies are clearly growing in popularity with AUM growing rapidly in the last 4 years.

Figure 1: Assets Under Management in different global Smart Beta ETFs

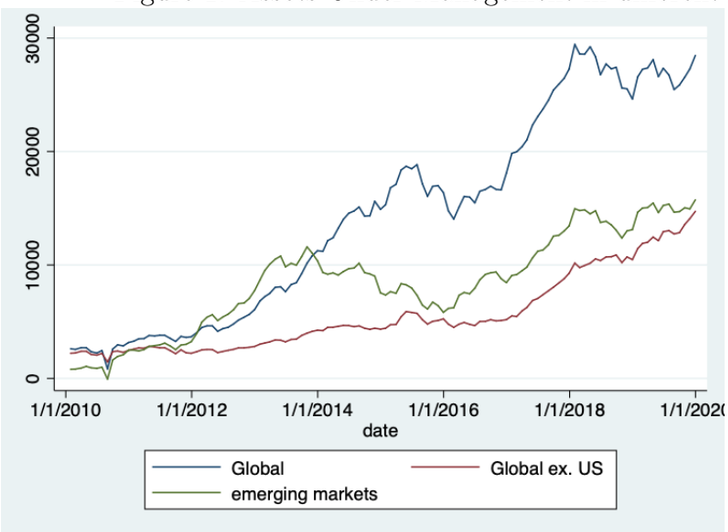

Figure 2: Assets Under Management in the US in Smart Beta ETFs

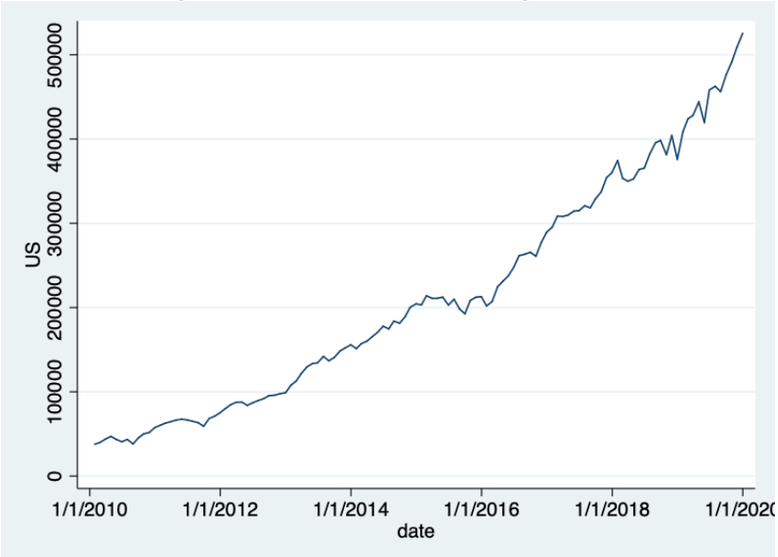

Figure 3: Assets Under Management in the different Smart Beta strategies

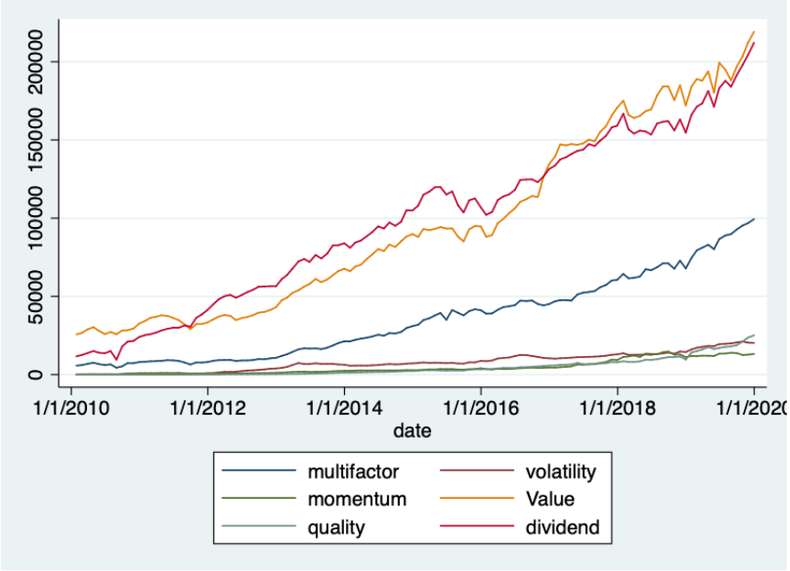

Table 3 shows the ten largest ETFs in the sample. This table shows us that the US based funds clearly dominate our sample. All the ten biggest ETFs are solely focused on the US market. Secondly, Value and Dividend strategies make up the bulk of the biggest ETFs, 8 of the ten ETFs are either of these strategies.

Table 3: Top 10 largest Smart Beta ETFs

Ticker	Inception Date	AUM	Investing Region	Smart Beta Category
VTV	26/01/2004	55909,1	US	Value
IWD	22/05/2000	42555,4	US	Value
VIG	21/04/2006	42121,2	US	Dividend
USMV	18/10/2011	37245	US	Multifactor
VYM	10/11/2006	30220,9	US	Dividend
SDY	08/11/2005	20027,3	US	Dividend
DVY	03/11/2003	18708,9	US	Dividend
IVE	22/05/2000	17873,2	US	Value
QUAL	18/07/2013	16307,9	US	Quality
VBR	26/01/2004	14808,3	US	Value

4 Methodology

ETF performance will be measured upon individual basis. The Fund's alpha and Sharpe ratio will be compared with the benchmark cap-weighted index ETF.

The Funds alpha is estimated using a time series regression of the monthly excess total returns on the monthly market excess return.

$$R_{fund} - R_{f,t} = \alpha + \beta_{mkt}(R_{mkt} - R_{f,t}) + \epsilon \tag{1}$$

A one-factor model will be used to estimate alpha.

alpha of the CAPM model is a performance measure. It is used to refer to the excess return produced by the fund. The beta is the measure of the fund's volatility in relation to the overall market. This beta is multiplied by the return of the market as a whole minus the risk-free return.

The alpha of the combined factor strategies and/or regions will be calculated in two different manners. Firstly, the alpha and Sharpe ratios of the factors and regions will be calculated based on the arithmetic mean of the corresponding ETF alphas and Sharpe ratios. Secondly, the alphas and Sharpe ratios of the individual ETFs will be weighted upon AUM. Thereafter the alpha and Sharpe ratios of the factor strategies and regions will be calculated based upon weight. This weighting will be done on assets under management, because as an investor the biggest chance is that you invest in one of the bigger funds.

The Sharpe ratio's will be compared to the benchmark Index fund in the corresponding time-period.

$$SharpeRatio = \frac{R_{fund,t} - R_{f,t}}{\sigma_{fund,t}} \tag{2}$$

The Sharpe ratio measures the excess return per unit of volatility. It shows the risk adjusted return.

To calculate the relation between fund size and risk adjusted performance, I calculated the average assets under management per fund and then regressed this with their Sharpe ratios. Secondly, the funds have been categorized by size into 5 groups. Thereafter the average Sharpe ratios of these groups has been calculated.

5 Results

Table 4 and 5 shows the yearly alphas and Sharpe ratios per region regardless of the smart beta strategy. Concerning the alpha, we see that the US smart beta funds produce an alpha that is only slightly negative. The US Emerging markets seem to offer slightly better risk adjusted returns. Most regions do not produce

The arithmetic average produces positive alphas for the global and emerging markets regions. This could point to smaller ETFs outperforming large AUM ETFs in these regions. However, the corresponding Sharpe ratios are lower, this points a higher risk being taken by these smaller ETFs.

The US funds producing better risk adjusted returns is in contrast to the research of Glushkov (2016), whom found that this was not the case. By calculating the arithmetic average and the weighted average it has become evident that larger ETFs in the US perform better on a risk adjusted basis than smaller ETFs. This is the case for almost all the investing regions except for global ex. US which produces an almost identical Sharpe ratio.

The Global ex. US and the Global strategies produce risk adjusted returns that are significantly lower than their benchmark as well as an alpha that is lower. These funds seem to be very unappealing for investors, offering lower returns with higher volatility and expense fees. The US funds seem to outperform the global funds on a risk adjusted basis.

Emerging markets offer an alpha that is slightly lower than the market return, however the Sharpe ratio of these funds are significantly better. The smart beta strategies seem to produce better risk adjusted returns than their cap weighted index benchmarks.

Table 4: Weighted average performance Smart Beta Funds per region

Region	Alpha Weighted average	Percentage significant P-values	Sharpe Ratio Weighted average	Sharpe Ratio Benchmark
US	-0,0001290	6,14%	0,3495107	0,346138321
Global ex. US	-0,007956433	50,96%	0,100084	0,189613621
Global	-0,0103656	0,05%	0,05498853	0,268078273
Emerging markets	0,0007667	10,60%	0,0,138153	0,050581767

Table 5: Arithmetic average performance Smart Beta Funds per region

Region	Alpha Arithmetic average	Percentage significant P-values	Sharpe Ratio Arithmetic average	Sharpe Ratio Benchmark
US	-0,0093462	10,07%	0,251567	0,346138321
Global ex. US	-0,0171521	27,66%	0,099024	0,189613621
Global	0,05493	5,88%	0,040896	0,268078273
Emerging markets	0,0010035	18,18%	0,0,115464	0,050581767

Table 6 and 7 shows the yearly alphas and Sharpe ratios per SB factor regardless of the investing region. The benchmark is a blend between the index funds weighted upon assets under management.

The volatility and Dividend strategies seem to produce positive alphas, on a weighted basis. However, on a risk adjusted basis all strategies seem to be outperformed by the blended passive index fund benchmark, except for the quality strategy.

The arithmetic average seems to offer worse alphas for all strategies, except for the dividend strategy. On a risk adjusted basis, once again no smart beta strategy outperforms the blended benchmark. The quality and multifactor strategy offer a better risk adjusted performance with the arithmetic average, all other strategies offer worse Sharpe ratios.

Table 6: Weighted Performance Smart Beta Funds per factor

Smart Beta Factor	Alpha Weighted average	Percentage significant P-values	Sharpe Ratio Weighted average	Sharpe Ratio Benchmark
Multifactor	-0,0085214	21,37%	0,17437231	0,327289582
Volatility	0,0301522	59,21%	0,15543401	0,327289582
Momemtum	-0,00852134	6,96%	0,2027858	0,327289582
Value	-0,0158739	3,46%	0,39101064	0,327289582
Quality	-0,0010367	0,00%	0,17437231	0,327289582
Dividend	0,0140129	5,70%	0,30594646	0,327289582

Table 7: Arithmetic Performance Smart Beta Funds per factor

Smart Beta Factor	Alpha arithmetic average	Percentage significant P-values	Sharpe Ratio arithmetic average	Sharpe Ratio Benchmark
Multifactor	-0,0091835	18,07%	0,18274	0,327289582
Volatility	0,0134527	20,00%	0,138153	0,327289582
Momemtum	-0,0097935	13,33%	0,148335	0,327289582
Value	-0,0217071	2,63%	0,250404	0,327289582
Quality	-0,015882	0,00%	0,317344	0,327289582
Dividend	0,0021167	14,47%	0,167369	0,327289582

The factors with the highest assets under management seem to produce the highest risk adjusted returns, and so justifying their high growth in assets. What stands out is the big difference between risk weighted performance of the quality and dividend strategies compared to their arithmetic averages. It seems that these two strategies seem to perform significantly better when there are more assets under management.

Table 8 shows the yearly alpha and risk adjusted performance of the 4 largest dividend and 4 largest value smart beta ETFs. See table 3 for their initiation dates. What is interesting to see is that 6 out of the 8 biggest value and dividend funds produce a Sharpe ratio that is higher than the weighted average Sharpe ratio, once again suggesting that the bigger funds seem to produce higher risk adjusted returns.

Table 8: Performance biggest Dividend and Value Funds						
Ticker	Factor	Alpha	P-value	Sharpe Ratio	Sharpe Ratio benchmark	Sharpe Ratio weighted average
VTV	value	-0,00274	0,622	0,51239641	0,346138321	0,391010641
IWD	value	-0,00123	0,14	0,458748529	0,346138321	0,391010641
VIG	dividend	0,00308	0,458	0,440694714	0,346138321	0,305946461
VYM	dividend	-0,00107	0,307	0,43063178	0,346138321	0,305946461
SDY	dividend	0,000926	0,225	0,317550154	0,346138321	0,305946461
DVY	dividend	0,00227	0,124	0,269354497	0,346138321	0,305946461
IVE	value	0,00162	0,14	0,435751802	0,346138321	0,391010641
VBR	value	0,00218	0,113	0,213609586	0,346138321	0,391010641

To further research the relationship between AUM and returns, I have regressed the Sharpe ratio's and the average assets under management per fund. Figure 4 shows the regression of the total sample. The regression shows a positive relationship between the Sharpe ratio and assets under management. The regression output is shown in table 9. This of course isn't a causal relationship, but it is interesting to see that the bigger funds seem to perform better.

Indro, Jiang et. Al. (1999) concluded that funds could grow too big for their liking, resulting in information costs that become too high, which affects the performance and the return of the fund. When a fund gets bigger than the optimal fund size, the marginal returns of information acquisition turns negative.

This does not seem to be the case with the smart beta funds. Because the nature of smart beta funds is semi-active, this information acquisition return does not seem to turn negative. Because the assets inside the SB fund are chosen on certain characteristics, in contrast to active strategies where the stocks are handpicked, so these diseconomies of scale that are associated with this information acquisition do not occur.

In table 10 all ETFs have been put into 5 groups based upon their size. The biggest funds are placed in group 1, the smallest in group 5. Once again, the bigger funds seem to offer better Sharpe Ratios.

Figure 4: Regression average AUM plot and Sharpe ratios

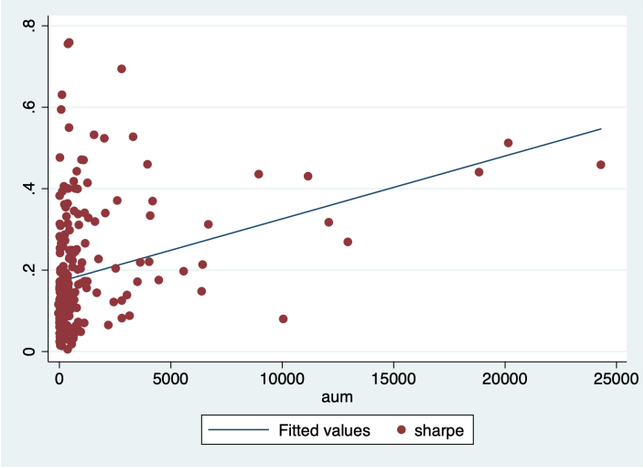

Table 9: Regression values	
Independent Variable	Value
Intercept	0,1716658
Beta	0,0000154
P-value	0,0000

Table 10: Sharpe ratios grouped by size	
Group	Sharpe ratio
1	0,28629715
2	0,20564096
3	0,17038126
4	0,15827394
5	0,12864971

6 Discussion & Conclusion

This paper looks at looks at the risk adjusted performance of smart beta funds benchmarked against international cap-weighted index funds.

Contrary to the research by Glushkov (2016), I find that US smart Beta funds do produce slightly better risk adjusted returns. Emerging markets seem to outperform their respective benchmark significantly. Global and global excluding US strategies seem to offer worse risk adjusted performances.

When looking at the different kinds of smart beta strategies, only value strategies seem to outperform their benchmark. Multi factor strategies offer worse risk adjusted returns than their benchmark.

An interesting finding of this research is that bigger smart beta ETFs seem to offer better risk adjusted returns. Bigger funds their Sharpe ratio are on average better. This was the case in all investing regions, and for all factors except multi factor and the quality factor.

One of the goals of smart-funds is to lower expense fees, which seems to succeed. With actively traded funds, when an ETF gets too big, the return can be negatively influenced. This is due to information costs producing diseconomies of scale. Because of the semi-passive nature of smart beta funds, this diseconomy of scale does not occur.

6.1 Limitations

The sample of this research is affected by the survivorship-bias. Secondly some of the factors do not have enough observations to get conclusive evidence that these strategies under perform with regard to their benchmark, namely the volatility, quality and momentum factors.

6.2 Further Research

In further research the performance of all factors could be researched per region to give investors a better view on the different performances of the factors per region. Secondly, the size effects of the fund could also be researched per region and per factor. The origin of better performance by higher AUM funds could also be further researched, to give investors a better understanding of its occurence.

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