Vanguard's Index Funds vs. Vanguard's Managed Funds: a Nine Style Box and Fama-French Multi-Variable Regression Approach

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Abstract

Many investors struggle to determine whether they want to invest in managed funds or indexed funds when they build portfolio. Vanguard, founded by John Bogle, a strong advocate for indexed investing has seen his company grow to over $3.9 trillion in funds. In the last three years $1 trillion of new money has come into their passive funds as investors are moving towards saving on cheaper expense ratios. However, many people like Vanguard's former CIO Gus Sauter believe that managed funds can deliver additional value to their investors by keeping expense ratios low and hiring the world's best managers. This study looks at Vanguard indexed and managed funds in three different market capitalizations organized nine style boxes to see whether Vanguard's strategy of low management expense ratios provides additional value to their own benchmarks. This study uses two comparison methods to analyze market returns of these funds from 2006-2016. First, indexed and managed Vanguard funds will be compared using a Morningstar nine-style box to directly see differences in return rates and estimate riskiness of these assets through standard deviations. Second, the Fama-French three-factor model will be used to create a regression explaining where the fund returns may be coming from. This method will determine the SMB and HML of the funds telling us the size of the equities in the fund along with their value premium over book value. Also, a market coefficient will be determined to see how close these funds are relative to a market benchmark. Overall, it is determined that Vanguard indexed funds in small-cap and mid-caps are slightly better investments based on returns and exposure to risk along with their equity composition. Based on the same criteria, large-cap funds perform slightly better than their indexed counterparts.

JEL classification: C55, G10, G11, G12

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1. Introduction

The recent bull market after the 2008 recession has led to many investors wondering why they would invest their money with high cost money managers when such managers are unable to consistently outperform market benchmarks. In the last three years, over one trillion dollars has flowed into index funds, a troubling fact for active managers (Reid 2016). However, the debate between managed and index funds is heavily discussed between the public up to heads of investing firms. John Bogle argues that there is not much of a difference between managed and index funds if expense ratios stay low. A strong advocate for indexing, he identifies three main reasons as to way indexing provides the best returns: no sales commissions, low expense ratios, and a low portfolio turnover (Merriman 2006). Even though John Bogle considers index funds to be a better way to invest, his company has many actively managed funds as well.

Former Vanguard CIO, Gus Sauter in a 2016 Bogleheads conference stated that Vanguard's managed funds were better than its indexed funds based on two main reasons: keeping active manager fees very low and hiring the best managers around the world who do their own independent analysis.

"We have looked at our active funds. The argument for indexing does not rule out active management. But in fact the argument … does allow that there some investors that do outperform. If you think of a normal distribution, let's say before costs you have a normal distribution of performance about the market rate of return. After costs that distribution shifts below the market rate of return (the center of that distribution below the market rate of return). But there still are people in the tail that beat the market rate of return. … But the tail is just too fat relative to being just pure luck. And so that means there are some managers out there who do have skills... Our theory doesn't rule out some active managers being smart enough to be able to add value over time… So it turns out that if you look at Vanguard's active funds on average they have outperformed the indexes or the benchmarks that they are designed to perform in line with by I hesitate to say a number, because but I'm not exactly sure what it is, but I think it is on Vanguard's web site." (Gus Sauter, quoted in the Philadelphia Boglehead Conference Interview 74th minute, 2016)

Also, Dan Wiener, editor of the *FFSA Independent Guide to the Vanguard Funds* writes how indexing is a way for Vanguard to put money in passive funds and not have to worry about clients getting antsy. "These funds have underperformed and builds a great business not an investment." (Wiener 2007).

However, over time Dan Weiner seems to have softened his approach towards index funds as his February 2017 growth portfolio is 38% in two ETFs which are index funds (Weiner 2017). With current market trends moving towards more passive management there is still a large market for investors who are still trying to outperform the market. Vanguard has followed John Bogle's advice and has active managed funds at a much lower expense than the industry average. Bill McNabb, Vanguard's CEO, said that "active management can survive and even succeed if it is offered at a much lower expense" and has offered managed funds that are well below 1.00% in expenses (Wadhwa 2017).

Also, regulatory oversight aimed at transparency is adding fee pressures. The DOL Department of Labor fiduciary rule may be implemented in April 2017 and aims to stop advisors from working for their own interests by keeping them from earning high commissions that run contrary to client interests. This paper looks into whether current market trends and pressures have made these recent low cost managed funds a viable investment strategy. Are these newer low cost managed funds able to provide extra value to investors who are trying to beat benchmarks? Similar to how Bogle (1998) compared the returns of US managed funds with the returns of comparable indexes using the Morningstar style box, which divides mutual funds into 9 style boxes: value, blend, growth for each cap: large cap, mid cap, small cap. Here we will compare the recent performance of Vanguard's managed to index funds in a similar style box. Also, the Fama-French three factor model is used to help describe the returns of these nine funds. This model can help explain over 90% of the diversified funds returns compared to only 70% in the CAPM model. Through this analysis we can see if certain factor loads explain the composition of returns in the passive or managed funds. In other words, we control for factor loads.

2. Data Sources

The data used is from Wharton Research Data Services and their Center for Research in Security Prices (CRSP) which has quarterly updates on the monthly returns of mutual funds. To investigate this question Vanguard domestic equity funds (2017) listed on their website were selected. The webpage lists all the Admiral share class funds along with the Investor share class funds. Data to select funds was also based of on information received from queries in the Vanguard website. Whenever there is an Admiral class fund it is used in this analysis, but when there is no Admiral class fund the Investor class fund is chosen. Admiral shares provide the same investments, portfolio manager, and strategy as the Investors shares at a lower cost because higher balances are less expensive to maintain, benefitting those who invest more money.

3. Vanguard Index Funds vs. Managed Funds using the Morningstar Nine Style box Method

The Morningstar nine style box method is a quick and easy way to compare market returns of the nine main broad types of mutual funds, similar to how John Bogle organized his data in his 1998 study. Bogle (1998) determined that in all nine Morningstar categories, indexes delivered the highest risk-adjusted return. In this analysis, we did not consider tax managed funds, international funds, or sector funds and included all the remaining Vanguard funds in each of the nine categories. Exhibit 1 indicates the tickers for the funds used and Exhibit 2 includes the number of Admiral and Investor funds in each category. It is easy to see that most of the Admiral shares are indexed helping cut down costs whereas the Investor class is mainly composed of managed funds.

Exhibit 1. Funds comprising portfolio by ticker

		Value	Blend	Growth
large cap	managed	VEIPX	VDEQX	VMRGX
		VUVLX	VDIGX	VPMAX
		VWNDX	VPCCX	VWUSX
		VWNFX	VQNPX	
	index	VHDYX	VDADX	VFTSX
		VIVAX	VFIAX	VIGAX
			VLCAX	
			VTSAX	
mid cap	managed	VASVX	VSEQX	VHCAX
		VCVLX		VMGRX
	index	VMVAX	VEXAX	VMGMX
			VIMAX	
small cap	managed	VEVFX	VSTCX	VEXPX
	index	VSIAX	VSMAX	VSGAX

Exhibit 2. # of funds in each class

	Admiral	Investor
Index	11	2
Managed	4	17

To create a portfolio for each of the style boxes an equally constructed weighted portfolio was used that was rebalanced monthly. Some funds were introduced at later dates so once they became available they were introduced in the portfolio with the other funds of its class and the new correct proportion for each fund was allocated. The entire ten-year period from 2007-2017 is a good time frame to consider because it captures performance during the 2008 recession and the recovery after. An entire business

cycle is studied along with one of the more volatile time period for equities in the United States. Exhibits 3-5 indicate continually compounded annual real rates of return for the portfolios.

Continuous compounded returns are studied because the average arithmetic mean does not tell you how fast a portfolio has grown in given time frame. For example, if two portfolios have the same return over the same time frame the arithmetic mean is greater in the more volatile fund. But when looking at the geometric mean for both funds will be the same. When looking at varying positive and negative returns geometric returns can replicate the movement regardless of direction or magnitude (Tower 2009).

Exhibit 3: Average 10 year returns from Vanguard Stock Funds 2007-2016 (% per year)

		Value	Blend	Growth
Large Cap	Managed	6.45	7.27	7.97
	Index	6.47	7.11	7.14
	idx-mgd	**0.02**	**-0.16**	**-0.83**
Mid cap	Managed	7.46	7.26	7.36
	Index	n.a.	7.59	n.a.
	idx-mgd		**0.33**	
Small cap	Managed	n.a.	7.35	7.02
	Index	n.a.	8.10	n.a.
	idx-mgd		**0.75**	

Exhibit 3 shows the ten year returns of each of the style boxes but leaves out Value and Growth portfolios for mid-cap and small-cap stocks because these funds were unavailable in this time frame. Of the five style boxes that are left, three times indexed funds beats managed. Also, the average excess return of index funds considering all five style boxes is .02%. It is important to note that when looking at just large cap stocks the managed funds perform slightly better. The ten-year returns take into account the volatility and uncertainty of the 2008 recession. Kacpercztk (2014) finds evidence that fund managers out return index funds during market recessions by displaying persistence and greater successes in market timing. It seems like these findings are magnified with larger cap equities.

Exhibit 4: Average 5 year returns from Vanguard Stock Funds 2012-2016 (% per year)		Value	Blend	Growth
Large Cap	Managed	13.71	13.95	14.27
	Index	14.10	13.96	14.29
	idx-mgd	**0.39**	**0.01**	**0.01**
Mid Cap	managed	13.98	16.05	10.64
	Index	14.90	13.59	12.08
	idx-mgd	**0.92**	**-2.46**	**1.44**
Small Cap	managed	13.84	15.00	12.23
	Index	14.98	13.64	11.85
	idx-mgd	**1.14**	**-1.36**	**-0.38**

Exhibit 4 shows the average five year returns of the same portfolio of stocks. By 2012 all the different types of funds existed so a full analysis can be completed. In six out of nine boxes the indexed portfolio performs better than that of the corresponding managed fund portfolio. Contrary to indexed relative performance in large cap stocks in the ten-year time frame, large cap indexed funds perform better, although the extra value added in Blend and Growth is negligible. Overall, in the past five years the managed funds perform better on average by .03%. This is mainly due to managed funds performing well in the Blend category.

Exhibit 5: Average 3 year returns from Vanguard Stock Funds 2014-2016 (% per year)		Value	Blend	Growth
Large Cap	Managed	22.21	19.10	15.77
	Index	21.87	19.64	18.39
	idx-mgd	-0.34	0.54	2.61
Mid cap	managed	8.24	10.99	5.66
	Index	10.60	9.58	8.37
	idx-mgd	2.36	-1.41	2.71
Small cap	managed	8.60	9.83	5.68
	Index	10.85	8.31	5.29
	idx-mgd	2.25	-1.52	-0.39

Exhibit 5 shows the average three year returns of the same nine style portfolios. In five out of nine style boxes index beats managed with an average extra return of .76% in the indexed funds. Again, it is significant to note that in the mid cap blend and small cap blend managed beats the indexed portfolio. Over all three style boxes the average excess return per year of indexed is .16% even with the fairly lower Vanguard managed expense ratios.

Do the excess returns from the indexed funds come from higher risk associated with the portfolio? Exhibit 6 includes the standard deviation of the portfolio returns also, continuously compounded.

Exhibit 6: Monthly standard deviation of portfolio return. (% per month)

		Value	Blend	Growth
Large Cap	Managed	4.09	4.76	4.50
	Index	4.53	4.56	4.56
	idx-mgd	**0.44**	**-0.20**	**0.06**
Mid cap	managed	3.37	3.68	3.58
	Index	3.19	3.30	3.53
	idx-mgd	**-0.18**	**-0.37**	**-0.05**
Small cap	managed	3.81	3.96	4.01
	Index	3.77	3.77	3.90
	idx-mgd	**-0.04**	**-0.18**	**-0.11**

This table has the standard deviations of monthly returns of the portfolios. For the funds in existence for the full ten years the figures come from that whole-time frame, otherwise they are only from the past five years. In seven out of nine style boxes, the index has a lower standard deviation meaning it was less of a risky asset. Overall the average excess standard deviation of the managed funds is .07% per month. This paper was written because of recent comments by Gus Sauter and Dan Wiener telling investors in indexed funds were missing out on excess returns. However, this seems unlikely. When taking a mix of Vanguard funds and creating a portfolio indexed investors in small-cap and mid-cap seem to getting a slightly higher overall return with generally a lower risk profile. In large-cap funds we see some advantages that would only become significant in the long run.

4. Using Fama-French Three Factor Model Regressions Including Tax Managed Funds

The prior two comparison methods were able to say that Vanguard's managed funds did not perform as well as their indexed counterparts. However, there are now better tools to evaluate management performance.

The Fama-French three-factor model was employed to discover that small-cap and value stocks have typically outperformed the overall markets on a regular basis. These three additional factors Mkt, SMB, and HML are included into the model to help identify where the excess returns amongst the indexed funds are coming from. The Mkt variable is the ratio by which how closely the fund follows the market index. A fund that holds all the equities in the stock market would have a value of one. The SMB variable stands for 'Small Minus Big' accounting for the spread in returns between small and large sized firms. The HML variable stands for 'High Minus Low' representing the returns between value and growth stocks by looking at book-to-market ratios of equities. These variables effect the expected return of a fund through the small firm effect and the value premium. For example, a portfolio with a larger number of small-cap or value stocks would be expected to have a lower return than what the CAPM model would come up with. The model adjusts for this overperformance. This could be because small cap stocks face higher startup costs with higher levels of debt and more uncertainties with their business. Also, it is harder for the market to price these equities as they are newer and their role in industry is not as clearly defined.

The model used in this analysis considers the Fama-French Factors to analyze the Vanguard returns and see if there are any factor loads the different types of funds are taking advantage of. Also, we should be able to see if there is a value add when a fund is being managed or tax managed. This method makes it possible to identify if higher returns are from the makeup of smaller and value type equities or from manager expertise. The model created relies on the usage of continuously compounded monthly

returns from January 2006- December 2016 if the fund is available for the whole-period. There are a few funds that have an inception that are a little later and are analyzed from that date onward.

Exhibit 7: Tickers of Funds Used in the Regression Model w/ Expense Ratios			
	Small-Cap	**Mid-Cap**	**Large-Cap**
Managed Value	VEVFX (0.63)	VASVX (0.39%)	VEIPX (.26%)
Managed Blend	VSTCX (0.34%)	VSEQX (0.21%)	VDEQX (0.40%)
Managed Growth	VEXPX (0.49%)	VMGRX (0.43%)	VPAMX (0.34%)
Indexed Value	VSIAX (.08%)	VMVAX (0.8%)	VVIAX (0.08%)
Indexed Blend	VSMAX (.08%)	VIMAX (0.8%)	VTSAX (.05%)
Indexed Growth	VSGAX (.08%)	VMGMX (0.8%)	VIGAX (0.08%)
Tax Managed	VTMSX (0.11%)	VTMFX (0.11%)	VTCLX (0.11%)

Vanguard has a large bundle of funds in each category. The funds that were chosen have similar expense ratios (shown in parenthesis in Exhibit 7) across all the different market caps. You can see that the managed Vanguard funds have an expense ratio between 0.26%-0.63% a large range that comes from the mix of Admiral and Investor funds. All the index funds have a very similar expense ratio of 0.5%-0.8% a much smaller range and similar rates among all their domestic equity funds. Out of curiosity a tax-managed fund for each market cap was introduced as well to see their specific design was beneficial. Tax-managed funds are designed with the intent of reducing an investor's tax burden. Many of these types of funds steer away from high dividend stocks and push for no short-term capital gains tax, holding positions for at least a year. All in all, 21 funds were selected that represented its strategy and market capitalization the best as advertised on the Vanguard Website.

The multi-variable regression created has the continuously compounded monthly returns for each fund regressed with individual variables for the three-French factors Mkt (Rm-Rf+Rf), SMB, and HML for each fund. Also, there is a dummy variable for managed funds and the tax managed fund. This means for each market capitalization there are a total of 23 individual variables. For each monthly return the corresponding Fama-French factor loads are inserted in the data table for the three variables specific to

its fund. When the monthly returns in the table represent a different fund other than the three variables representing it, a zero is inserted in the data set for the other 20 individual variables. For a managed fund a one is inserted in the data set and zero if it is indexed. Similarly, the tax managed funds have a one in both managed and taxed columns. Due to this large data set and high number of individual variables the regression was completed in Stata.

To complete the regression the coefficients of both Rm-Rf and Rf need to be added together so that they represent the market return denoted by "Mkt". This is because the model assumes that if you invest in a fund that perfectly mimics the overall market the Rm-Rf coefficient should equal one along with one for the Rf coefficient. This is because you are only exposed to systematic risk and are not generating any excess alpha. The total of the coefficients is two. Someone who invests solely in short-term treasury bonds would have a Rm-Rf coefficient of zero as they are not generating no excess returns from systematic market risk and have a Rf value of one as the returns are the same as a risk-free asset. The total of these coefficients is one. Lastly, if there is a highly leveraged investor who borrows and invests a dollar for each of his/her own capital, the Rm-Rf coefficient would be expected to be at a value of two. There is double the systematic risk the investor is exposed to. The Rf coefficient would be at negative one, so the sum of the coefficients is one as well. This means that every fund will have the Rm-Rf and the Rf coefficients that sum up between one and two. The model fits from the most conservative portfolio to portfolios that take on additional systematic risk to that of the market. For this reason, Rm-Rf and Rf are added together to represent the market movement (Mkt). The full regression results along with a further explanation of the model is included in the appendix. The coefficients of the regression are as follows:

Exhibit 8: Regression Coefficients	Small-Cap			Mid-Cap			Large-Cap		
	Mkt	SMB	HML	Mkt	SMB	HML	Mkt	SMB	HML
Managed Value	1.007	0.550	0.268	0.970	0.180	0.127	0.887	-0.275	0.203
Managed Blend	1.059	0.629	0.126	1.116	0.408	0.028	1.064	0.037	-0.082
Managed Growth	1.064	0.656	-0.108	1.046	0.328	-0.278	1.007	-0.024	-0.124
Indexed Value	1.023	0.502	0.260	0.984	0.126	0.067	0.975	-0.201	0.259
Indexed Blend	1.029	0.578	0.038	1.109	0.229	-0.093	1.023	-0.016	0.001
Indexed Growth	1.028	0.674	-0.219	1.024	0.245	-0.294	1.061	-0.032	-0.297
Tax Managed	0.957	0.764	0.196	0.509	-0.065	-0.074	1.036	-0.071	-0.036

Exhibit 9: SMB Averages Across Market Caps	Small-Cap		Mid-Cap		Large-Cap	
	Managed	**Indexed**	**Managed**	**Indexed**	**Managed**	**Indexed**
Average SMB	0.611605	0.585052	0.305097	0.200222	-0.0871	-0.08304

Exhibit 10: HML Averages Across Fund Styles	Managed Value	Managed Blend	Managed Growth	Indexed Value	Indexed Blend	Indexed Growth
Average HML	0.200	0.024	-0.170	0.195	-0.018	-0.270

Exhibit nine has the average of all the SMB coefficients for each of the managed and indexed funds in each market capitalization. This helps determine what size equities are generally in each of the managed and indexed funds Vanguard uses. Exhibit ten has the average HML coefficients for each strategy of funds across all market capitalizations. This helps determine the composition of how "valuey" each fund is in each strategy.

Also, the coefficients for the two dummy variables for Managed funds and Tax Managed funds. Exhibit eleven contains the value from the regression showing the monthly effect of the dummy variables. The

coefficients in exhibit twelve contains the dummy variable coefficients multiplied by twelve so that you can see the average yearly effect of management and tax management.

Exhibit 11: Monthly Advantages Based on Style	Small-Cap	Mid-Cap	Large-Cap
Managed	-0.02546	-0.0369	0.059278
Tax Managed	0.205571	0.28479	-0.06602
Constant	-0.03171	-0.14141	-0.12455

Exhibit 12: Yearly Advantages Based on Style	Small-Cap	Mid-Cap	Large-Cap
Managed	-0.30553	-0.44274	0.711336
Tax Managed	2.466851	3.417485	-0.79228
Constant	-0.3805	-1.69697	-1.49459

Small-Cap Analysis:

Looking at exhibit twelve we can see that managed funds are generally underperforming by .31% every year. The previous comparison analysis also determines that small cap managed funds are generally a little risker than that of their indexed counterparts (Exhibit 6). While this may seem like a small yearly percentage many long-term investors in managed funds may be losing out on valuable returns while taking on extra risk. This may be because managers of small-cap funds like smaller equities in their fund as shown by the higher average SMB values (0.612 vs. 0.585). This spread is quite large compared to the other market cap funds. Smaller equities are generally harder to evaluate causing higher risk and uncertainty. The managers of these funds seem to be more risk loving. Also, across all types of funds, value, blend, and growth in the managed funds have a greater composition of value type equities (HML is bigger). Equities with high book to market ratios generally outperform those that have lower ratios. Managers in the small-cap funds can be seen trying to stock pick and generate higher value for their clients but it seems to not be working. Lastly, it is important to note that the expense ratios of the managed

small-cap funds are gene rally higher than that of the mid-cap and large-cap funds. Considering that it may take more experience and aptitude for equity analysis in smaller equities, managers may seem that they are more valuable. Regardless, you can tell that the high expense ratios seem to not be supported by the returns that are being generated.

Mid-Cap Analysis:

As shown in Exhibit twelve we can see that the managed mid-cap funds are underperforming their indexed counterparts by about .44%, a larger gap then what we see in small-cap funds. Similarly, to small-cap funds the managed mid-cap funds are riskier based on the standard deviations of monthly returns. Out of all the market capitalizations, managed mid-cap funds are the riskiest. It seems like a long-term investor is losing out on even bigger gains while taking on even greater risk. Again, we see managed mid-cap managed funds' higher composition of smaller equities (0.305 vs. .200), with a spread greater than that of the small-cap funds. Also, across all types of funds, value, blend, and growth in the managed funds have a greater composition of value type equities. Equities with high book to market ratios generally outperform those that have lower ratios. Considering that mid-cap managed funds have the lowest expense ratios than that of the other managed funds, through this analysis it can be determined that the value add of Vanguard mid-cap managers is the lowest. They take on the most amount of risk with small expense ratios and still underperform the greatest compared to the indexes.

Large-Cap Analysis:

The analysis shows a very different attitude towards large-cap funds then that of small-cap and mid-cap Vanguard funds. Exhibit twelve shows that managed large-cap funds are beating their indexed counterparts by about .71% a year. This is a significant amount of value add that the fund managers are able to bring especially for long run investors. Also, from the previous analysis managed large cap funds generally are less risky. Only the managed blend funds are a little riskier. The composition of the large-

cap managed and indexed funds seem to be very similar to each other (-0.087 vs. -0.083). These funds have a negative SMB values because of the highest number of large-sized firms. The managed funds do generally have smaller companies in them but this spread is not all that significant. Again, across all types of funds, value, blend, and growth in the managed funds have a greater composition of value type equities. Vanguard managers may see this as way to drive higher returns for their clients. The average expense ratio of the large-cap funds is between that of the small-cap and mid-cap funds. It seems like the large-cap managers can make up for their expense ratios and provide extra value for their clients. Managers are having more success in analyzing large-cap equities and picking equities that will outperform their indexes (Kacperczyk 2014). These higher returns in the large cap stocks are not driven by smaller companies or by choosing more value based equities. Vanguard managers in this area are succeeding in their goal.

Tax-Managed Analysis:

The story is flipped however in tax managed funds. The small-cap and mid-cap funds perform very well. These tax managed funds generate an extra yearly 2.47% and 3.42% respectively. The low expense ratios like the index funds seem to show that the tax burden cuts into returns in these types of market caps. Small-Cap and Mid-Cap funds may generally depend on growth that is based on dividends. Also, holding onto equities in this area in the longer term to avoid capital gains tax has a two-way benefit. It lets the smaller companies grow and develop into their industries while not having to be pushed down by extra taxes. Large-Cap tax managed stocks seem to not have similar positive returns. The value of picking Large-Cap stocks by reducing tax burdens seems to have a negative effect on returns. Large cap-growth is based on dividends and have less value equities and more equites in the growth category.

This model is very effective in introducing other factors into understanding stock returns that are otherwise left out in CAPM and other models. Using a regression set up this way directly lets us compare

fund performances with each other while controlling for its style. It tells us where returns are coming from and the strategy being used by the fund managers. Now we can tell that generally managers in the small and mid-caps are looking for more value based and smaller equities compared to the indexed portfolios. Strengths of this model come from having a deeper understanding of these funds outside of just analyzing risk. Various other factors play a role in the market and this helps us see those. However, this model is limited in only looking at one single portfolio in each strategy. Stronger claims can be made if each strategy was composed of a group of funds to get a more holistic picture of management value. Also, Fama-French (1993) loads do not always capture different patterns of return limiting the confidence of the results. For example, returns may be explained through a nonlinear function of size and value, so characterizing fund performance as a function of Fama-French loads may hide information that emerges from other Sharpe style-analysis approaches.

5. Discussion Comparing Results with other Studies and Methodologies

There are many ways to tackle the question of whether managed or passive funds perform better. An average investor may just be interested in the returns of the funds and see which one performs better. However, these kinds of studies are necessary because there are many options to invest in and knowing the costs you are paying and the value you are getting from these fees is very important. Costs and performance are not always easily transparent in the financial services industry so it is worth taking some time to analyze the data available.

Reinker and Tower (2004) completed a study by constructing *synthetic portfolios* by weighting each fund by its proportion of assets. They also adjusted by risk by combining these assets with a risk-free portfolio. They concluded that there is comparable performance between the two types of funds with the managed funds being able to provide some protection against stock market bubbles. Sun and Wang (2009) consider whether managed funds outperform passive indexes in down markets. Down market performance shows that active funds have better counter-cyclical performance. Similar to these two studies when we restrict the Fama-French regression model between 2006-2010 during the trough of the 2008 recession we see that the spread between the managed and indexed fund spread wider favoring the managed funds. Managers seem to have the ability to identify bad equities that are going to perform worse than the bear market. It is hard to find value when all indices generally do well like in 2010-2016. This is why you see managers adjusting their fees up and down based on the cyclical nature of the market. Gus Sauter is right in believing that there will always be a role for fund managers as long as the market is cyclical. It is just harder to identify this role in a bull market.

This study is a continuation of Tower (2009) where returns of a wide variety of managed funds were regressed with their indexed counterparts. Patterns that came up in the regression results were able to determine management styles. The Fama-French three factor model does a good job of describing the patterns that are seen in the Tower (2009) and Tower (2008) studies. Deviances from the indexes can be

more clearly identified by managers selecting equities of a smaller cap and equities of high book to market ratios. These studies determine that in limited time frames managed fund indices may outperform their counterparts in certain timeframes but over the entire timeframe studied the average managed fund underperformed. From the analysis done in this study, considering the ten-year time frame, taking into account market capitalization as well would show that large-cap managers seem to provide a better value than small and mid-cap managers in the long run. Vanguard large-cap managers seem to be able to keep the composition of SMB and HML similar to their corresponding indexes while maintaining similar risk to outperform the benchmark.

A more recent study completed by Guercio and Reuter (2014) try to make sense of the underperformance of the average actively managed mutual funds by looking at more sector specific risk. Gruber (1996), and Fama and French (2010) determine the typical managed fund has a negative post fee alpha. They look at the question in more of a marketing viewpoint considering managed funds sold through brokers have weak incentives to generate alphas. However, this is not an issue through funds purchased through Vanguard. It appears that an average investor is more than happy to pay higher expense ratios for management to hedge against cyclical downturns in the market and just the general comfort that comes from the fiduciary duty in taking care of a client's money. This study within the small-cap and mid-cap segments did not find a huge outperformance in the indexed funds. These extra basis points may not be worth it to an investor who sees the post 2016 market as a bubble with a downturn more likely than it was five years ago. Lastly, this study shows that the managed funds do carry equities with a smaller cap and higher book to market ratio enticing investors of a market beat that could be significant. John Bogle, using a quote from Paul Samuelson, says indexed funds are as boring as, "watching paint dry." The premium paid or the opportunity for greater performance is a price many people are willing to pay.

6. Conclusion

This study considers the performance of indexed and managed Vanguard mutual funds after recent remarks by Gus Sauter claiming that indexed investors are missing out on extra returns by not turning to managed funds. This is something that is very different than the viewpoints of John Bogle who built the Vanguard company on the premise of low cost indexes. Gus Sauter's claims warrant relooking at this debate by looking at fresh data as well as using the Fama-French model to better understand fund returns. This study used two comparison methods: the Morningstar Nine Style direct comparison and a Fama-French regression model that incorporated factor loads to understand the fund composition. The direct comparison looks at the differences in return between both the managed and indexed funds while also analyzing risk through standard deviations. This methodology showed that there is very little difference in the indexed and managed funds in both the small-cap and mid-cap funds. When taking a mix of Vanguard funds and creating a portfolio indexed investors in these market capitalizations seem to getting a slightly higher overall return with generally a lower risk profile. In large-cap funds we see some advantages that would only become significant in the long run with similar risk profiles. One interesting note from this analysis is that in the ten year returns for the large-cap funds, which take into account fund performance during the 2008 recession, managers in these funds seem to have shown greater value in limiting risky exposure and trying to make less of a loss than the benchmarks.

The Fama-French model gave us a better understanding of these results. Mid-cap managers seem to be the worst at generating excess alpha for their clients. They charge the lowest fees while building funds with higher composition of smaller equities, with a spread greater than that of the small-cap funds. Also, across all types of funds, value, blend, and growth in the managed funds have a greater composition of value type equities. Equities with high book to market ratios generally outperform those that have lower ratios but mid-cap mangers seem unable to capture this extra return. It is good that mid-cap managed

funds have the lowest expense ratios than that of the other managed funds because otherwise the performance of these funds would look much worse. Managers in the small-cap funds can be seen trying to stock pick and generate higher value for their clients but it seems to not be working. Considering that it may take more experience and aptitude for equity analysis in smaller equities, managers see themselves as more valuable and charge the highest fees. Regardless, the high expense ratios seem to not be supported by the returns that are being generated. Large-cap managers can make up for their mid-level expense ratios and provide extra value for their clients. Managers are having more success in analyzing large-cap equities and picking equities that will outperform their indexes, these higher returns in the large cap stocks are not driven by smaller companies or by choosing more value based equities. Vanguard large-cap managers stick to a similar fund composition of the index and succeed in returns that make up for their expenses. However, this is a slight advantage where real returns will only be seen in the long run. Lastly, tax-managed funds perform very well in this analysis as the small-cap and mid-cap funds perform very well. These tax managed funds generate an extra yearly 2.47% and 3.42% respectively. The low expense ratios like the index funds seem to show that the tax burden cuts into returns in these types of market caps. But in the large-cap stocks trying to reduce tax burdens seem to have a negative effect on returns.

Looking into Gus Sauter's claim has given us interesting results. Even with Vanguard's low cost management fees, an average investor is not going to see a huge difference in going with fund managers. Only in some large-cap investments you see the extra benefit. The reason to go into managed funds continue to be if an investor is hoping for a large market beat, unlikely but a higher chance in these funds. Also, having the comfort that someone has the fiduciary duty to limit your losses in a bear market.

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8. Appendix

These regression results show how the monthly continuously compounded returns of each fund compare to their respective factor loads. Each market-cap has seven funds with three variables each for (Mkt, SMB, and HML) to see how these loads effect returns. Also, two other dummy variables are included; one for the value add for management and tax management. This regression has the monthly compounded returns as the y-variable and the 30 individual variables as the x. The constant returned is the amount of drag that the managed funds are facing compared to their indexed counterparts.

Full Small-Cap Regression Results:

Source	SS	df	MS	Number of obs =		434
				F(23, 410) =		563.27
Model	7133.496	23	310.152	Prob > F =		0
Residual	225.7567	410	.550626012	R-squared =		0.9693
				Adj R-squared =		0.9676
Total	7359.253	433	16.9959646	Root MSE =		0.74204
percentage	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
vexpxmkt	1.064168	.0291908	36.46	0.000	1.006786	1.121551
vexpxsmb	0.656368	.0445491	14.73	0.000	.5687947	0.743941
vexpxhml	-0.10803	.0450783	-2.40	0.017	-.1966439	-0.01942
vevfxmkt	1.006838	.0291908	34.49	0.000	.9494552	1.06422
vevfxsmb	0.549568	.0445491	12.34	0.000	.4619948	0.637141
vevfxhml	0.267583	.0450783	5.94	0.000	.1789699	0.356197
vstcxmkt	1.059453	.0291908	36.29	0.000	1.002071	1.116836
vstcxsmb	0.628881	.0445491	14.12	0.000	.5413073	0.716454
vstcxhml	0.1259	.0450783	2.79	0.005	.0372865	0.214514
vsgaxmkt	1.027545	.0291908	35.20	0.000	.9701621	1.084927
vsgaxsmb	0.674347	.0445491	15.14	0.000	.5867739	0.76192
vsgaxhml	-0.21924	.0450783	-4.86	0.000	-.3078536	-0.13063
vsmaxmkt	1.029451	.0291908	35.27	0.000	.9720683	1.086833
vsmaxsmb	0.578443	.0445491	12.98	0.000	.4908697	0.666016
vsmaxhml	0.037569	.0450783	0.83	0.405	-.051045	0.126182
vsiaxmkt	1.023447	.0291908	35.06	0.000	.9660647	1.080829
vsiaxsmb	0.502366	.0445491	11.28	0.000	.4147931	0.58994

vsiaxhml	0.259744	.0450783	5.76	0.000	.1711305	0.348358
vtmsxmkt	0.957296	.0306575	31.23	0.000	.8970306	1.017562
vtmsxsmb	0.763846	.0447501	17.07	0.000	.675878	0.851815
vtmsxhml	0.196423	.0452331	4.34	0.000	.1075057	0.285341
managed	-0.02546	.0834697	-0.31	0.761	-.1895426	0.138622
tax	0.205571	.118044	1.74	0.082	-.0264761	0.437618
_cons	-0.03171	.059022	-0.54	0.591	-.1477322	0.084315

Full Mid-Cap Regression Results:

Source	SS	df	MS	Number of obs =	726
			F(23, 702) =		571.07
Model	14253.52	23	619.718304	Prob > F =	0
Residual	761.8012	702	1.08518694	R-squared =	0.9493
			Adj R-squared =		0.9476
Total	15015.32	725	20.7107893	Root MSE =	1.0417

percentage	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
vasvxmkt	0.969598	0.023458	41.33	0.000	.9235417	1.015654
vasvxsmb	0.179696	0.045155	3.98	0.000	.0910405	0.268352
vasvxhml	0.127448	0.036597	3.48	0.001	.0555954	0.199301
vseqxmkt	1.116231	0.023458	47.58	0.000	1.070175	1.162286
vseqxsmb	0.407549	0.045155	9.03	0.000	.3188933	0.496204
vseqxhml	0.028226	0.036597	0.77	0.441	-.0436266	0.100079
vmgrxmkt	1.046281	0.023458	44.60	0.000	1.000225	1.092337
vmgrxsmb	0.328046	0.045155	7.26	0.000	.2393899	0.416701
vmgrxhml	-0.27815	0.036597	-7.60	0.000	-.3499983	-0.20629
vmvaxmkt	0.983806	0.039982	24.61	0.000	.9053076	1.062305
vmvaxsmb	0.126413	0.062584	2.02	0.044	.0035389	0.249287
vmvaxhml	0.066879	0.061173	1.09	0.275	-.0532249	0.186983
vimaxmkt	1.108543	0.023514	47.14	0.000	1.062376	1.154709
vimaxsmb	0.229191	0.045156	5.08	0.000	.1405346	0.317848
vimaxhml	-0.09324	0.03662	-2.55	0.011	-.1651366	-0.02134
vmgmxmkt	1.023909	0.039982	25.61	0.000	.9454103	1.102407
vmgmxsmb	0.245062	0.062584	3.92	0.000	.1221878	0.367936
vmgmxhml	-0.29433	0.061173	-4.81	0.000	-.4144364	-0.17423
vtmfxmkt	0.509257	0.023652	21.53	0.000	.4628202	0.555694
vtmfxsmb	-0.06473	0.045157	-1.43	0.152	-.1533881	0.02393
vtmfxhml	-0.07351	0.036676	-2.00	0.045	-.1455225	-0.00151
managed	-0.0369	0.089458	-0.41	0.680	-.212533	0.138742
tax	0.28479	0.111454	2.56	0.011	.0659665	0.503614
_cons	-0.14141	0.06998	-2.02	0.044	-.2788103	-0.00402

Full Large-Cap Regression Results:

Source	SS	df	MS	Number of obs =	833
			F(23, 809) =		1503.81
			727.50633	Prob > F =	0
Model	16732.6456	23	.48377593	R-squared =	0.9771
			Adj R-squared =		0.9765
Residual	391.374727	809	20.5817552	Root MSE =	0.69554
Total	17124.0203	832			

percentage	Coef.	Std. Err.	t	P>t	[95% Conf.	Interval]
veipxmkt	0.8874155	0.0156624	56.66	0.000	.8566717	0.9181592
veipxsmb	-0.2748424	0.0301494	-9.12	0.000	-.3340226	-0.2156622
veipxhml	0.203483	0.0244351	8.33	0.000	.1555192	0.2514467
vdeqxmkt	1.063523	0.0156624	67.90	0.000	1.032779	1.094266
vdeqxsmb	0.0371141	0.0301494	1.23	0.219	-.0220662	0.0962943
vdeqxhml	-0.0818199	0.0244351	-3.35	0.001	-.1297837	-0.0338562
vpmaxmkt	1.007052	0.0156624	64.30	0.000	.9763086	1.037796
vpmaxsmb	-0.023559	0.0301494	-0.78	0.435	-.0827392	0.0356212
vpmaxhml	-0.1242381	0.0244351	-5.08	0.000	-.1722019	-0.0762744
vviaxmkt	0.9752618	0.0156624	62.27	0.000	.944518	1.006005
vviaxsmb	-0.2014513	0.0301494	-6.68	0.000	-.2606315	-0.1422711
vviaxhml	0.2592728	0.0244351	10.61	0.000	.211309	0.3072365
vtsaxmkt	1.022555	0.0156624	65.29	0.000	.9918109	1.053298
vtsaxsmb	-0.0156368	0.0301494	-0.52	0.604	-.074817	0.0435434
vtsaxhml	0.0010307	0.0244351	0.04	0.966	-.046933	0.0489945
vigaxmkt	1.06122	0.0156624	67.76	0.000	1.030476	1.091963
vigaxsmb	-0.0320236	0.0301494	-1.06	0.288	-.0912038	0.0271566
vigaxhml	-0.297272	0.0244351	-12.17	0.000	-.3452358	-0.2493083
vtclxmkt	1.036042	0.0163666	63.30	0.000	1.003916	1.068168
vtclxsmb	-0.0709481	0.0305232	-2.32	0.020	-.1308622	-0.011034
vtclxhml	-0.0363486	0.0246412	-1.48	0.141	-.0847169	0.0120196
managed	0.059278	0.0526202	1.13	0.260	-.0440101	0.1625662
tax	-0.0660235	0.0763681	-0.86	0.388	-.2159264	0.0838795
_cons	-0.1245491	0.0372081	-3.35	0.001	-.1975849	-0.0515134