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Do actively managed exchange-traded funds add value?

A comparative performance analysis with passively managed ETFs and actively managed mutual funds

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Abstract

This Master's thesis examines the added value of active exchange-traded funds (ETFs) by conducting a comparative analysis between passively managed ETFs and actively managed mutual funds. The research studies the relative performance of active ETFs listed in the United-States in terms of risk-adjusted returns between 2009 and 2018. This performance is compared to similar passive ETFs and mutual funds. The objective is to examine the added value of active ETFs for investors.

Our sample consists of ten groups, each composed of an active ETF, a passive ETF, a mutual fund and a common benchmark. The groups are consistent in terms of investment category and benchmark. Our research then examines the performance of active ETFs compared to their passive ETF and mutual fund counterparts in terms of fees, volatility, tracking error, excess return and risk adjusted return by using several ratios. In addition, we differentiated our results between active ETFs investing in equity and fixed-income categories.

The results show an outperformance of active ETFs in the fixed-income category in terms of risk-adjusted returns compared to both passive ETFs and mutual funds. The results are more mixed for the equity category but do not support an underperformance of active ETFs. Overall, our research found that US listed active ETFs add value for the investors in terms of risk-adjusted returns by providing them with cheap active strategies that create positive excess returns.

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Introduction

The asset management industry has significantly evolved in the last decade, particularly since the financial crisis. Investors' growing distrust for mutual funds' active managers is partly to blame for this evolution. Their skepticism is backed by abundant proofs provided by scientific research demonstrating that active mutual funds fail to create value for investors, fail to outperform their benchmark and do not outperform their corresponding passively managed index funds (Sharpe 1966, Jensen 1968, Blake et al. (1993), Malkiel (1995, 2003, and 2013), Gruber (1996), Carhart (1997), French (2008), and McMillan (2014)). The main reason often raised for this underperformance is the costs incurred by active mutual funds' investors. These findings fueled the investors' growing focus on fees. The increasingly popular Modern Portfolio Theory (MPT) (Markowitz, 1952), which promotes the benefits of diversification, and the emphasis on costs (mainly management fees), led to a massive growth of the exchange-traded funds (ETFs).

An ETF is an investment vehicle registered as an open-end fund that can be traded on the stock-exchange throughout the trading day. One interesting property of ETFs is that, unlike typical open-end funds, they do not create or redeem new shares individually but in blocks called "creation baskets" at net asset value (NAV). This process is done by third parties named authorized participants (APs), typically large financial institutions. Therefore, ETFs combine the advantages of open-end funds (creation and redemption of shares) and close-end funds (tradability throughout the day). The structure and advantages of ETFs will be developed later in this thesis. We can already highlight that the characteristics and advantages over mutual funds implied by their design are numerous: trading liquidity, efficient tax structure and lower operating expenses.

Originally, ETFs have exclusively been index-based ETFs, meaning funds that track the performance of a specified benchmark, providing a broad market exposure at low cost (hence the previously mentioned link with the Modern Portfolio Theory). This type of ETFs still

represents the overwhelming majority of the industry in terms of number of ETFs and of asset under management.

In March 2008, the SEC (Securities and Exchange Commission) approved the listing of a fully transparent actively managed ETF in the US, which led to another step of evolution in the asset management industry. The possibility to create active ETFs was first mentioned by the SEC in 2004 in a concept release requesting public comments on the issue. This SEC release raised questions such as the possibility that "any mutual fund could be transformed into an ETF" (SEC, 2004) demonstrating the revolutionary potential of active ETFs for the asset management industry. Active ETFs do not seek to track a particular index like their passively managed counterparts. Instead, the objective of the managers of active ETFs is to create alpha or, in other terms, to outperform the market, as actively managed mutual funds. Rompotis (2015) differentiates active and passive ETFs based on their objectives, which are tracking for passive ETFs and outperforming for active ETFs. According to the author, this difference in objectives also means that investors will have to endure higher fees when investing in active ETFs compared to passive ETFs.

Active ETFs have taken some time before meeting with success. The first active ETF was launched by Powershares in 2008 and was based on quantitative active management strategies (David J. Abner 2011). The success of active ETFs has been quite slow to materialize afterwards. This was mainly due to a short track-record (Schizas, 2014), as for example Morningstar only rates funds with a track record of at least 3 years. Furthermore, table 1 of the appendix shows that the death rate of active ETFs was quite high during their first phase of launch, in particular between 2008 and 2010 were around the 70% of active ETFs launched have now disappeared. However, table 1 also shows that the death rate gradually declines until now, to reach a survival rate of 77% over the 10 years period (from 2008 to 2018) under consideration.

Starting in 2012, the active ETF industry started to take off as we can see in figure 1. The number of active ETF launched doubled between 2011 and 2012 and rose steadily thereafter. There were 226 active ETFs listed in the US in May 2018, including 29 new launched in the first 5 months of the year alone. In the same time, assets under management of the US active ETF

industry rose exponentially over the period, as displayed by the blue line on figure 1, growing from zero in March 2008 to more than $56 billion in May 2018. The total assets of the industry in the US nearly tripled in the past 3 years. Additionally, figure 1 shows that the active ETF industry is still very young with an average age of 2.71 years and a median age of 1.96 years. The industry is also highly concentrated as attested by the significant difference between the average assets of $250 million and the median assets of $45 million. According to AdvisoryShares (2018), the top 5 active ETFs represent 40.7% of the total assets under management for the industry in the US as displayed in table 2 of the appendix.

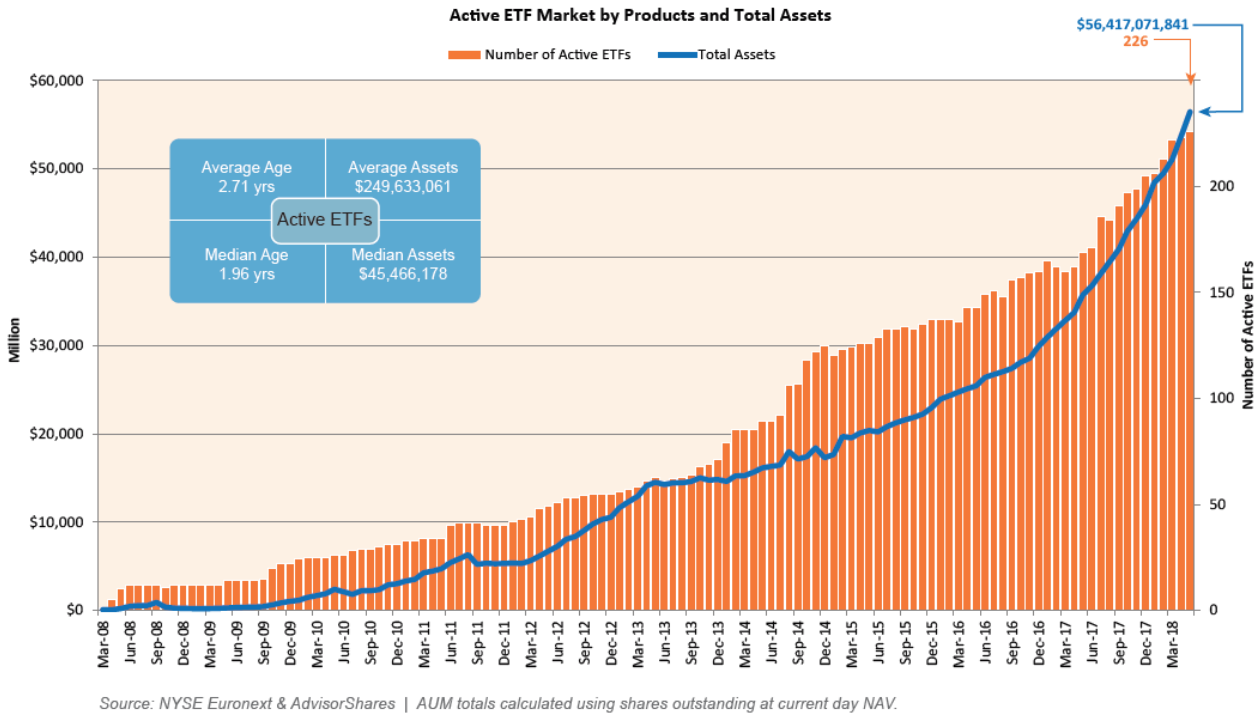

Figure 1: This figure shows the evolution of the active ETF market in the United-States by product and total assets under management from March 2008 to May 2018.[1]

Our motivations to conduct a research on active ETFs are that they have the potential to improve the competitiveness, the standards and the added value of the asset management industry as a whole. For example, according to Cremers and Curtis (2015), active ETFs could represent a solution for the consistent underperformance of closet index funds and the harm

[1] AdvisoryShares Investments LLc. (2018), *Active ETF Report 31-05-2018*. Unpublished material.

they do to investors. The rise of active ETFs represents an increase in competition for mutual funds, which are required to improve their offer and standards in terms of active management. An additional motivation is that the active ETF industry's future looks promising. Among other proofs, in its research on ETFs published in 2016, PWC expects the American regulator (SEC) to accept periodically disclosed active ETFs. The introduction of these types of active ETFs would likely contribute to asset growth in the industry according to the market surveys conducted by PWC (2016). Sherrill and Upton (2017) are similarly predicting a rising market share of active ETFs.

Given the growing importance of the sector in the asset management industry, researchers have started to take an interest in the active ETFs. Because of the youth of the sector and the insufficiency of data, existing literature is still scarce. Additionally, much of it has been conducted several years ago, when the availability of track record was very limited. Rompotis (2010, 2011a, 2011b, 2013, 2015), Kotro (2017), Schizas (2014) and Dolvin (2014) found no sign of outperformance of active ETFs compared to their benchmarks or their passive ETFs counterparts. Several authors found no market timing skills or stock picking ability from the active ETFs managers based on various regression models. When studying the volatility of active ETFs, Rompotis (2010, 2011a, 2011b, 2013), Kotro (2017), Schizas (2014) and Dolvin (2014) showed that active ETFs are more volatile than passive ones and demonstrate higher tracking errors, which is intuitive given their active management strategy. Rompotis (2015) established that active ETFs are slightly less risky than their indexed counterparts, which is a counterintuitive finding that contradicts the results previously mentioned. In contrast to each research that has been conducted, Garyn-Tal (2013) showed that active ETFs applying a specific strategy (based on R^2) are able to generate risk-adjusted excess returns. Therefore, based on past research comparing active and passive ETFs, we would expect to find an underperformance of active ETFs compare to both their benchmark and their passive counterparts. Additionally, we expect to find a lack of skills on the account of active managers translated in an inability to create excess-returns. It is less unanimous for the volatility and therefore the riskiness of active and passive funds, as the majority of past research and intuition point toward higher levels of

volatility for active ETFs. We could also expect outperformance of active ETFs for a limited number of specific investment strategies but spotting them is not the objective of this thesis.

The existing literature comparing active mutual funds and active ETFs is particularly scarce. Sherrill and Upton (2017) studied the potential of active ETFs to be substitutes for active mutual funds. This addresses the questions raised by the SEC about active ETFs in their first mention of the investment vehicle in their publication in 2004. Sherrill and Upton (2017) describe active ETFs as low-cost active management options. According to the authors, the difference in structure between active ETFs and mutual funds actually gives an advantage to the former in terms of costs (price efficiency, lower overhead costs and tax efficiency). Their analysis found evidence of outperformance of actively managed ETFs compared to mutual funds, which is also proved by Schizas' work (2014). While evidence of such outperformance is obvious for the equity category, this is less clear for the fixed-income category. Sherrill and Upton (2017) conclude their analysis by predicting a rise of active ETFs in terms of market shares, as they would become substitutes for mutual funds and that their low costs would attract investors back into the active management universe.

The vast majority of existing literature on active ETFs has been conducted on a limited sample over a limited period of time. Furthermore, most of them have been conducted in the early days of active ETFs, when major investment managers had not joined the movement towards active ETFs yet. Additionally, according to Oey (2017), the robust demand of investors for funds with lower costs dragged the fees down across the asset management industry. According to the author, the investors paid a weighted average expense ratio of 0.65% in 2013, down to 0.57% in 2016. Therefore, the war on price that drove costs (and fees) down as described by Oey (2017) had not increased the competitiveness of exchange-traded products in the eyes of investors yet. As a result, the findings concerning the added value of active ETFs could be different today. The first active ETF has been launched a decade ago and the main active ETFs have a longer track record. Additionally, given the increasing attention of the investors, we believe that it is time to conduct a throughout analysis of the industry.

The objective of this thesis is to offer a better understanding of actively managed exchange-traded funds and to raise the question of their added value for investors. We compare the performance of active ETFs listed in the United-States, with passively managed ETFs and actively managed mutual funds. We will also differentiate our results for funds investing in equities and those investing in fixed-income. The analysis consists of a comparison between the risk-adjusted returns of these different investment vehicles to evaluate the added value of active ETFs.

Our analysis is based on daily price returns. We study the level of effective activity of the investment vehicles using their tracking error. Concerning the risk-adjusted returns, they are analyzed using several ratios. We compute the Sharpe ratio, Treynor ratio, Jensen's alpha, Information Ratio and Appraisal ratio for each fund. These different ratios allow us to see if active ETFs are outperforming their comparable passive ETFs and mutual funds in terms of risk-adjusted returns. They are also used to study the added value of the active ETFs' managers. Centralized database of active ETFs with historical prices do not exist yet. Most of the existing ones do not differentiate active from passive ETFs or only contain limited data. Therefore, given the time-consuming work to gather and process all the data, we have decided to focus our analysis on the 10 leading active ETFs and their comparison with passive ETFs and mutual funds having similar benchmarks.

Based on past research conducted on the subject, we expect to find an underperformance of active ETFs compared to passive ETFs and an outperformance compared to mutual funds. The tracking error of active ETFs should be higher than their passive counterparts and similar to active mutual funds. Therefore, the active ETFs could add value by providing an active management solution at lower costs to investors compared to mutual funds.

In the next parts of this thesis, we first conduct a literature review to highlight the findings of past research. We then develop the methodology used to conduct this comparative performance analysis and evaluate the added value of active ETFs. Afterwards, we describe our sample and present the data used in this study. Subsequently, we present our findings and their limitations. Finally, we conclude with a summary of our results.

Section I: Literature review

Chapter I: Active versus passive management

Active management is an important characteristic of active ETFs, as their managers seek to enhance the return of their portfolio. Managers do so by conducting fundamental research, using technical analysis or other methods to select the future winners. This management is defined by Rompotis (2015) as active management. Therefore, it is essential to review the existing literature concerning this topic.

Much ink has been spilled about the eternal debate on the benefit of active management against passive management. The objective of our work is not to take a position on this contest, but the past research that tackles this dispute can help us in our comparative analysis between several products. Most of the studies actually show that active managers fail to beat their benchmarks (Sharpe, 1966 and Jensen, 1968) and even underperform their correspondent passive managers when costs are considered according to Blake et al. (1993), Malkiel (1995, 2003, and 2013), Gruber (1996), Carhart (1997), French (2008), and McMillan (2014). What can be derived from these readings is that active managers significantly require higher fees to conduct their active strategies, while they often fail to compensate investors with higher corresponding returns. The other side of the active versus passive debate actually provides evidence of the capacity of active managers to create above-average gross market returns. According to Ippolito (1989), Grinblatt and Titman (1989, 1993), Kacperczyk et al. (2005), and Cremers and Petajisto (2009), when fees and expenses are not taken into consideration, active management does create value. As active ETFs have lower fees than their actively managed mutual funds counterparts as we are going to develop later, it would be interesting to extend these studies of active management to active ETFs, as their lower fees would induce a lower drag on returns than for active mutual funds.

In this study, we would like to extend the active vs passive comparison to ETFs, and to analyze to what extent the choice of investment product in the active universe (ETF or mutual fund) affects the performance.

Chapter II: Exchange-traded funds

Exchange-traded funds (ETFs) are investment vehicle registered as open-end funds that can be traded on the stock-exchange throughout the trading day. ETFs are often linked to Index tracker. Index ETFs are the most popular ETFs and compose the majority of the ETFs' universe (PWC, 2016). They are described by Birdthistle (2008, p.69) as "the most dynamic and complex new investment vehicles on the market" and as "a security that provides the diversification of a mutual fund but trades on a securities exchanges like a stock". ETFs are therefore investment products that can be traded at any point during the trading day just like shares of a stock on stock exchanges. Additionally, there is no restriction concerning a minimum limit on sales and purchases by investors (Elton, Gruber, Comer, and Li (2002)).

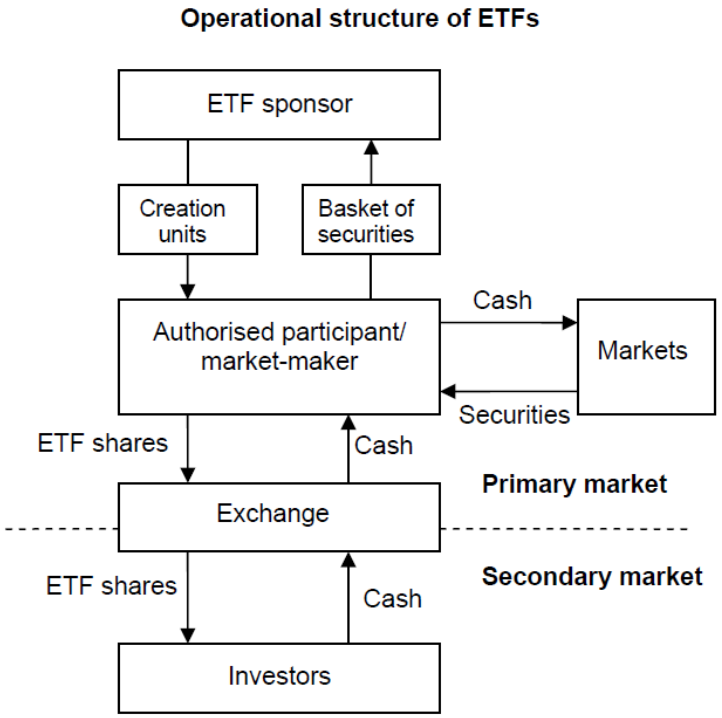

Figure 2: It represents the operational structure of ETFs to help the reader by having a visual representation of the inner working of these investment products[1]

[1] Farid, J. (2011). *Exchange Traded Funds (ETF): BIS paper on ETF market and systemic risks*. Retrieved from https://financetrainingcourse.com/education/2011/09/exchange-traded-funds-etf-bis-paper-on-etf-market-and-systemic-risks/

As we can see in figure 2 above, an ETF has a structure similar to an investment trust, but the creation/redemption process of new shares is done by an institutional investor, called "Authorized Participant" (AP) in that case. This AP gives the required basket of securities to the ETFs in exchange for the corresponding share of the ETF (Ackert and Tian, 2008). Index ETFs, on the contrary of active ETFs or mutual funds, always define clearly their investment objectives, which consists in tracking as close as possible their designated benchmark. The AP of the ETF plays a key role in the price efficiency of ETFs. By using the principle of arbitrage, the AP creates or redeems shares of the ETFs and operates the inverse transaction on the underlying basket of shares in the market. In this process, the AP tries to take advantage of each potential price discrepancies between the ETF fund prices and the price of its underlying basket. The ability of ETFs to arbitrage mispricing results in relative price efficiency. The price of ETFs indeed tends to be relatively close to the net asset value (NAV) of their portfolio according to previous research, particularly in the US, a relative liquid market (Ackert and Tian (2000), Ackert and Tian (2008) and Elton, Gruber, Comer, and Li (2002)). This creation/redemption process is part of the innovation of ETFs as it "facilitates arbitrage and promotes efficient pricing" (Ackert and Tian, 2008, p.332).

According to Ackert and Tian (2008), US ETFs are priced very closely to their NAV while country ETFs can be traded with a large premium or discount. These two authors state that the reason for this difference in the pricing efficiency of US funds compared to international funds is that the creation-redemption process that uses arbitrage opportunities created by market discrepancies is easier and less expensive in the US market than in the international markets. The hedging conducted in the creation-redemption process is realized in a more efficient way in the domestic market (Ackert and Tian, 2008). These results led us to focus our research on US funds, so that we can base our analysis on trading prices that are not biased by too significant premiums or discounts compared to the NAV.

Besides price deviations, another factor is used to explain the gap that can occur between ETFs and their benchmarks. The tracking error is often used to judge the quality of passive ETFs and the ability of their managers to track their benchmark. According to Elton, Gruber, Comer, and Li (2002), the primary reasons for underperformance of index funds, or passive ETFs, are the

management fees and the loss of income due to dividends received but not yet distributed nor reinvested. As the dividends received are often held in cash, they do not produce income and this creates an underperformance compared to the benchmark. Gastineau (2004) and Verdu (2014) explain the tracking error by expense ratio alone. Their findings highlight the importance of low expense ratio to the performance of portfolios and motivated us to select the biggest active ETFs in terms of asset under management. The leading ETFs are often the ones with the lowest expense ratio as this particularity bring inflows from investors who look at this criterion when comparing funds. Another reason for price deviations according to Blitz, Huij and Swinkels (2010) is dividend taxes that create a gap between the benchmark performance and the net returns of an investor investing in an ETF tracking that benchmark. Finally, one last factor explaining tracking error is low liquidity (Blitz and Huij, 2012). Based on this finding, we have decided to select popular funds among investors according to their asset under management to avert selecting funds with prices biased by low liquidity.

These past research led us to expect an underperformance of the funds studied compared to their benchmark, mainly due to dividend taxes, dividends held in cash and fees. We also tried to select US funds with sufficient liquidity to exclude as much as possible the tracking error caused by these factors. The objective is to focus our analysis on the management skills of the active ETFs' managers and the efficiency of this structure for an active strategy.

Some past research also tackle the difference in efficiency between foreign passive ETFs and country mutual funds. Harper, Madura and Schnusenberg (2006) compared the risk and return performance of ETFs and closed-end funds and found that ETFs have better mean returns and Sharpe ratio than closed-end funds. Additionally, they found that the latter generates negative alphas. According to the authors, passive ETFs may be superior to active mutual funds. The reason used by the authors to explain this superiority is the tax efficiency of ETFs. Harper, Madura and Schnusenberg (2006) and Bouchey, Brunel and Li (2016) assert that shares of ETFs are created and redeemed by in-kind share contributions and redemptions, meaning via the AP as explained earlier, which permit the ETF to avoid realizing taxable capital gains when it has to sell securities to meet redemptions from investors. The redemption of shares, when investors are getting out of the fund, is then performed without taxes for the ETF as the process is

"externalized". The findings of Harper, Madura and Schnusenberg (2006) concerning the performance of ETFs compared to mutual funds were based on historical performance dating from 1996 to 2001 and on the early types of index ETFs. We would like conduct a parallel analysis and extend this work to current US active ETFs and study their difference in efficiency with active US mutual funds.

Additionally, Kotro (2017) compared 9 pairs of actively managed European equity funds and European passively managed ETFs from 2012 to 2016. Based on their historical performance, volatility, costs and Sharpe ratio, Kotro (2017) found that actively managed funds have higher annual gross return than their corresponding passive ETFs, but that the inverse is true when managing costs are taken into account. Passive ETFs also exhibit higher risk-adjusted performance and lower overall volatility (Kotro, 2017). These results are quite intuitive and converge with the numerous research about active and passive investing already mentioned. We expect to find similar conclusion in our comparison analysis between these two investment vehicles in the US that would indicate a potential added value of the structure of active ETFs.

Finally, Blitz, Huij and Swinkels (2010) reached the conclusion that the comparison between the performances of active fund managers, which are subject to dividend withholding taxes, with benchmark indexes, which are not, is giving pessimistic results. To measure the added value of active managers, we typically base our analysis on the alpha of their fund. But according to the authors, the dividend taxation implies significant costs for the active funds. Therefore, Blitz, Huij and Swinkels (2010) recommend comparing performance of actively managed funds with the performance that passively managed funds are able to achieve. This would be more "even-handed" as passive funds are subject to dividend withholding taxes, like their active counterpart. The authors add that the fund expense ratios vary across listing, which is an additional reason for us to compare funds listed on the same exchange and in the same country. Based on these results, we have decided to include a comparison with passively managed ETFs in our performance analysis to judge active ETFs more fairly than by performing this analysis with their benchmark exclusively.

Chapter III: Actively managed exchange-traded funds

While the existing literature on passive ETFs is quite extended, the existing literature on active ETFs is relatively scarce, mainly due to the somewhat short history of this investment vehicle. Furthermore, the take-off of this type of funds has been even more recent.

3. 1 Difference between active and passive exchange-traded funds

An actively managed ETF is a form of Exchange-traded Fund which is actively managed by a manager that can deviate from its benchmark. Like their passive counterparts, active ETFs offer great benefits in terms of price, transparency, liquidity and tax efficiency. However, at the same time, the fund can adapt to different market conditions. Therefore, in comparison to mutual funds, actively managed ETFs have similar flexibility in terms of asset allocation that gives them the opportunity to beat their benchmark. Nonetheless, in the meanwhile actively managed ETFs show lower expense ratios and higher liquidity (ICI, 2014). In comparison to indexed ETFs, actively managed ones may be more interesting for investors when markets are more volatile as the manager can adapt its portfolio allocation to the market conditions.

According to Rompotis (2015, p.58), the main difference between active and passive ETFs is that passive ETFs are “structured to track a specific broad market, sector, or international index, whereas active ETFs seek to outperform a specific segment of a market or a particular sector through actively managing a portfolio of stocks, bonds, or other assets”. According to the author, the difference between the two is their objective: tracking for passive and over-performing for active. The logical corollary from these definitions is that active manager, while having to choose a benchmark, may hold in their portfolio securities that are not linked to their index of reference. Additionally, this often means that investors will have to endure higher fees when investing in active ETFs than passive ETFs, as demonstrated by Rompotis (2015). A second difference between active and passive ETFs in the US is the structure and requirements concerning each type of investment vehicles (Rompotis, 2015 and ICI, 2014):

- The number of authorized participants (AP): at least one for active ETFs, compared to a minimum of two for passive ETFs.
- Minimum size of investment: there is no requirement for passive ETFs but a minimum is required for active ETFs.
- Interactions with the AP: the manager of the active ETFs and the AP are part of the same company while they are not connected in the case of passive ETFs.
- Publishing requirements of the holdings: passive ETFs' holdings are known publicly throughout the trading day while active ETFs publish their holdings only at the closing of each trading day.

The last point has a significant impact on the efficiency of prices and on arbitrage opportunities. As the market maker (or authorized participant) does not know the exact composition of each basket of share of the ETF, he will not be able to take advantage of potential arbitrage opportunities emerging from a difference the price of one share of the ETF and the market price of its basket of securities. The reason why active ETFs do not publish their holdings throughout the trading day, unlike passive ETFs, is that doing so would increase the possibility of front-running. Investors could indeed let the active manager invest in research and select securities, while not paying fees and just replicate their trade throughout the trading day.

Mistry and Manooj (2012) explain that classifying ETFs as actively managed or non-actively managed may be challenging as there are many possibilities in the management of ETFs. ETFs use strategies that range on a scale between beta on one side and alpha on the other side, with a lot of different combinations between the 2 extremes. The ETF located on the beta extreme would typically be an ETF long-only with the objective of tracking an index weighted by market capitalization (Mistry Manooj, 2012). In the middle between pure-alpha and pure-beta, we could typically find ETFs that track indices using some factor-weighting factors, different from the classic market capitalization weighted models. Value, Growth, or even momentum are examples of such factors. This category of ETFs is often referred to as "beta-plus" investments. Further on the scale, closer to the Alpha extreme, we could find "active-beta", also called "smart-beta" ETFs, which have become very popular lately. These ETFs provide exposure to an

actively managed portfolio that implements asset allocation strategies using passive products based on systematic factors that try to replicate the performance of hedge fund strategies or active mutual funds.

We can see with this simplified scale that the ETF industry started based on the Efficient Market Hypothesis. This hypothesis states that active managers can't beat consistently the market over time, and that investors would be better of owning the whole market (Fama, 1991). So the first ETFs were index trackers, providing a cheap solution for a broad exposition to the market as a whole. But they have gradually evolved to come ever closer to active management. They started with beta investing and evolved to alpha investing.

3.2 Performance comparison between active and passive exchange-traded funds

According to Dolvin (2014), actively managed ETFs have higher volatility and higher tracking error than passive ETFs, while the returns are quite similar between the two types of ETFs. His results show that in terms of risk-adjusted returns, active ETFs do not outperform their passively managed counterparts. Interestingly, the author also found an outperformance of active ETFs with higher trading volumes compared to active ETFs with lower trading volumes". It is important to note that Dolvin's research was conducted over a short time frame and over a limited number of funds. The author realized his analysis on 20 actively managed ETFs over a period of 3 years, with some of the funds with a performance history as brief as 6 months due to the novelty of active ETFs at that time. Our research aims at providing a similar analysis of performance of actively managed ETFs, now that these funds have a longer track record. We would also like to extend this comparison with mutual funds as we would get different structures but the same kind of investment strategies. While when we compare with passive ETFs, we would compare 2 funds with similar structure but different investment strategies.

Rompotis (2011a, 2011b, 2013) reached similar results than Dolvin (2014) on the US ETF market. Rompotis (2013) compared nine pairs of active and passive ETFs over a trading history of 2 to 3

years. The results showed that active ETFs underperform their passive peers in terms of risk-adjusted returns while being more volatile. The author also found that active ETFs fail to create any alpha by using several regression analyses of performance. When assessing the market timing skills of active ETFs managers, Rompotis (2013) concluded that there are no such material skills in his sample. We are going to conduct a similar study in this performance analysis, extending the work of Rompotis (2011a, 2012b, 2013) and Dolvin (2014), to an extended track record and over a more diversified sample in terms of strategy and investment universe in order to have a broader view of the current active ETF universe.

Gerasimos G. Rompotis (2015) made an analysis of the performance of 22 actively managed ETFs traded on the Toronto Stock Exchange by using a range of single and multifactor models. His study found no evidence that active ETFs could add value in terms of risk-adjusted returns. According to its regression model, part of this underperformance is due to a lack of timing and selection skills from the active managers. Interestingly, he found that active ETFs are slightly less risky than the indexes, which is a counterintuitive finding that contradicts the results of Rompotis (2010, 2011a, 2011b, 2013). The reason advanced by Rompotis (2015) is that his research was conducted during a period following the unprecedented financial crisis of 2008, which effect was to diminish the aggressiveness of active managers. The limitations of these results are that Rompotis (2015) based its analysis on a restricted sample of ETFs, which were traded only in Canada and relatively small in terms of asset under management (average sample funds were 72.7 million CAD). Most importantly, the ETFs were managed by the same asset management company: Horizons. Additionally, the period under review has only been for 4 years (from January 2010 to December 2014), which is quite limited as it does not represent a full economic cycle. This last limitation is common to the majority, to not say the entirety, of the existing literature on active ETFs. Our study aims at tackling these limitations by conducting a similar performance analysis on a longer period in order to take more differentiation into consideration. To do so, we plan to consider active ETFs that are world leaders in terms of asset under management and asset managers that are distributed among several different asset management companies.

Rompotis (2010) conducted a bid-ask spread analysis of German passive and active ETFs. His analysis established that the tracking error and the volatility of passive ETFs are lower than their active counterparts, which is consistent with their corresponding investment objectives. The author also showed that both types of ETF demonstrate similar average daily raw returns but that active ETFs tend to underperform passive ETFs in terms of risk-adjusted returns measured by Sharpe and Treynor ratios. These results are consistent with the majority of research already mentioned. As Rompotis (2010) conducted his study over a limited period of time, from 2003 to 2005, on a limited number of active ETFs (17) and on a limited geographic area (German ETFs), we would like to deepen his analyses and reassess these results over a longer period for more mature active ETFs.

Schizas (2014) examined active ETFs in a pretty thorough way. According to the author, active ETFs were not as active as expected at the time the analysis was conducted, based on a low tracking error from their passive counterparts. The findings of Schizas (2014) also pointed out that active ETFs appear to be less profitable and more volatile than passive ETFs. However, the author mitigates his results, as the popularity (and thus asset under management) of active ETFs were still low at the time the analysis was conducted. Furthermore, the increase in popularity, the longer track record, and the involvement of well-established asset managers could improve the performance significantly according him. This conclusion highlights the added value of our analysis given the current state of the industry which is more mature.

Finally, in a similar way to the active versus passive debate, some authors found results being at variance with the conclusion of the majority of papers we just described. Garyn-Tal (2013) showed that active ETFs applying a strategy based on R^2 create a risk-adjusted excess return. To reach this conclusion, the author used a four-factor model applied to this particular strategy. Even if we will not differentiate our results for the various strategies applied by active ETFs' managers in our sample, the results of Garyn-Tal (2013) show that we could find outperformance of active ETFs despite the consensus view of the majority of past research.

3.3 Comparison between active exchange-traded funds and mutual funds

The main difference between active ETFs and mutual funds lies mainly in their structure. This different structure implies generally lower fees, higher transparency and liquidity for active ETFs compared to mutual funds. According to Kotro (2017), mutual funds are indeed less liquid than ETFs because they can be traded only once a day at the closing of the market whereas ETFs can be bought or sold anytime throughout the trading day. There are also numerous differences as the minimum investment requirement, redemption process and taxes, short selling and options, dividends, and so on.

Treynor and Mazuy [1966], Henriksson and Merton [1981], Chang and Lewellen [1984], Henriksson [1984], and Graham and Harvey [1996] conducted research on the timing abilities of active mutual fund managers and all of them reported limited or nonexistent market timing ability. The common feature of these studies is that returns are considered on a monthly or an annual basis. On the contrary, Bollen and Busse [2001, 2004] applied daily tests on the market timing efficiency of mutual funds and revealed that managers do possess material market timing skills. In our study, we decided to consider the daily price returns to compare the performance of the different investment vehicles consider. But given the numerous studies cited above that demonstrate the inability of active managers, we expect to find similar results when comparing active ETFs and mutual funds to passive ETFs.

More recently, Sherrill and Upton (2017) studied the potential of active ETFs to be substitutes for active mutual funds. The authors were interested in this topic as actively managed ETFs are a low cost active management option. Specifically, the authors assert that active ETFs provide a very similar product to investors as active mutual funds, but at lower costs and with a tax advantage on the capital gains coming from the creation/redemption process (as already discussed earlier). Their analysis found evidence of an outperformance of actively managed ETFs compared to mutual funds, which is also proved by the work of Schizas (2014). According to Sherrill and Upton (2017), equity and mixed category of active ETFs are substitutes of mutual funds. The evidence of substitution was less clear for fixed income products. They also conclude that a more in-depth performance comparison should be performed particularly when larger

data-sets are available and when the industry is more mature. Finally, Sherrill and Upton (2017) assert that active ETFs were major competitors and would most likely gain market shares in the active management universe, while their low cost and tax efficiency could well persuade investors to stay in that active universe. These findings motivated us to conduct a performance comparison analysis between these two investment vehicles as Sherrill and Upton (2017) based their analysis mainly on fund flows while we would like to base ours on trading prices. As the authors make a distinction between equity and fixed-income products in some of their conclusions, we would like to conduct our performance analysis by making a distinction between active ETFs in these 2 investment categories in order to highlight any potential difference in our findings. Given their results, we expect to find an over-performance of active ETFs over active mutual funds, mainly explained by their lower costs and tax efficiency.

Section II: Methodology and data

Chapter I: Methodology

The objective of this thesis is to assess the added value of actively managed ETFs. This analysis is based on a comparison between actively managed ETFs, passively managed ETFs and actively managed mutual funds. The research has been performed by selecting active ETFs, passive ETFs and mutual funds with similar investment universe and properties. Additionally, our sample consists of investment vehicles listed in the United-States. We formed 10 groups of 3 related investment vehicles and their common benchmark to compare them together. This thesis considers the performance of active ETFs in terms of risk and return relatively to their benchmark, their passive counterpart and a similar actively managed mutual fund. The analysis is focused on US traded investment vehicles. We conduct this comparison across two different asset classes (fixed-income and equities). The objective is to highlight any difference in findings across these two asset classes as it appeared to be the case in the results of Sherrill and Upton (2017). The time period considered for the analysis runs from November, 2009 to July 2018 with different time frame depending on the existing track record for each individual fund. Active ETFs are recent products and still have a limited history, with numerous leading funds launched during recent years, limiting the availability of data. The number of daily observations range from 569 for the fund “First Trust RiverFront Dynamic Developed International ETF” (RFID) to 2183 for the fund “PIMCO Enhanced Short Maturity Strategy Fund” (MINT).

The research has been conducted using quantitative methods. To perform a comparison of performance we used the daily trading prices of each investment vehicle and derived several performance indicators. As we use the trading price, it is important to note that each return computed in the thesis is net of management fees. Actually, management fees are already incorporated in the prices. The reason why we only study net of fees returns is because we want to evaluate the added value of active ETFs for investors. From the point of view of investors, the returns need to take fees into account. Each time “returns” are mentioned in this thesis, the reader has to understand “net of management fees returns”. Additionally, as it is a common

practice in the literature, the reader should note that the returns are computed with dividends reinvested. This means that eventual taxes on dividends will not be taken into consideration. This decision has been taken for the sake of simplicity and to have a fairer base of comparison. Concerning the benchmarks, we choose total price indices which use the same method concerning the reinvestment of dividends.

As already mentioned in the literature review, the price of ETFs tends to be close to their NAV (Verdu, 2014, Ackert and Tian, 2008, Elton, Gruber, Comer, and Li, 2002), which is an additional reason why we have based our analysis on daily trading prices to assess the ability of managers to create value. This pricing efficiency is less true for mutual funds, notably due to a quarterly disclosure of their holdings according to the same authors. Our study is focused on active ETFs and on investors' perspective. Their returns are directly impacted by the prices and not by the NAV of the mutual fund, so we have also taken daily trading prices when studying the mutual funds' performance. This gives us a similar base of comparison.

The historical daily trading prices of the investment vehicles and the risk-free rates have been extracted from Bloomberg, a leading provider of data and information for the finance industry. The characteristic of the funds (i.e their benchmark, strategy, investment types) have been extracted from Morningstar's database, Thomson Reuters' database, ETFdb.com's database and on the website of the asset manager of the fund. All the tables and computations in this research have been done using Microsoft Excel.

All the formula used and described in the methodology below are based on Professor Laurent Gheeraert's course materials "Alternative Investment and Advanced Portfolio Management" 2017-2018.

The added value of active ETFs will be studied via their relative performance in terms of overall returns, volatility, tracking error and risk adjusted returns.

1.1 Returns

The first step to study the performance is naturally to compute the daily average returns over the period under consideration. This data has been computed and compared between each type of investment vehicle. The main objective is to analyse the outperformance or underperformance of active ETFs relatively to their benchmark, their passive peers and a similar mutual fund. As the fund manager of the active ETF has for objective to outperform its benchmark, analyzing the excess-returns of the funds is a very important step. The formula used to compute daily returns is as follow:

$$r(i+1) = \frac{P(i+1) - Pi}{Pi}$$

Where $r_{(i+1)}$ represents the return during day (i+1), $P_{(i+1)}$ represents the closing price at day (i+1) and P_i stands for the price at day i.

Based on the existing literature as exposed in the literature review, we expect passive ETFs to outperform active investment vehicles in term of annualized daily returns.

1.2 Volatility

The second factor we consider to assess the added value of active ETFs is their volatility compared to their benchmark and the other investment vehicles. The measure we use for volatility is the variance of the daily returns of the fund, which is computed based on the standard deviation of those performance. The standard deviation measures how widely the daily performances are dispersed around the daily average performance. The volatility is computed as follow:

$$\sigma = \sum_{i=1}^{N} \frac{(ri - R)}{N - 1}$$

$$Variance = \sigma^2$$

Where r_i and R are the daily and average returns of the fund, N represents the number of daily price observation. σ is the standard deviation while "Variance" stands for the variance of the fund, also called its volatility.

The existing literature was more mixed concerning the volatility of active ETFs. Kotro (2017), Rompotis (2010, 2011a, 2011b, 2013), Dolvin (2014) and Schizas (2014) showed that passive ETFs have lower volatility than active ones while Rompotis (2015) found that active ETFs were slightly less risky.

1.3 Tracking error

We used the tracking error as an indicator of the activity of the investment vehicles. The tracking error is the average of absolute differences between the investment vehicle daily returns and its corresponding benchmark daily returns. We used the absolute value of excess returns because the tracking error appears when a performance deviation takes place, be it positive or negative does not matter. The formula of the average tracking error used is as follow:

$$\overline{TEp} = \frac{\sum|Rpi - Rbi|}{N - 1}$$

Where the numerator is the sum of the absolute values of the daily tracking error or daily excess returns. $\overline{TEp}$ is the average tracking error while $Rpi - Rbi$ is the daily tracking error. R_{pi} is the daily return of the fund at time i, R_{bi} is the daily return of the benchmark at time i, and the denominator N is the number of daily observations. If the fund perfectly replicates the performance of its benchmark, the average tracking error should be equal to zero. In practice, a perfect tracking hardly ever happens because the fund manager needs to hold a certain amount of cash to pay commission fees and managing costs, among other things (Kotro, 2017).

We expect our results to show lower tracking error for passive ETFs compared to their benchmark as their objective is to track their index of reference as closely as possible. On the contrary, we expect to see higher tracking error for active ETFs and mutual funds as their

managers will try to deviate from their benchmark allocation in order to generate alpha. We will then compare the average tracking error of active ETFs with their passive counterparts and active mutual funds in order to study the effective level of activity of the actively managed funds.

1.4 Risk-adjusted returns

Sharpe ratio

The first criterion we use to evaluate the risk-adjusted performance of the funds is the Sharpe ratio. This indicator adjusts the performance to the total risk taken and gives a ranking of the different funds. The Sharpe ratio is computed as follow:

$$Sp = \frac{Rp - Rf}{\sigma p}$$

Where R_p is the average daily price return of the fund, R_f is the average daily risk-free return, measured in this study by the 3-months Treasury bill. σp is the standard deviation of the fund's daily returns, which represents the risk of the fund. And S_p is the Sharpe ratio of the fund which is computed by dividing the fund's excess return by its risk. We can understand the Sharpe ratio as a measure to assess how the fund's investors are compensated for each additional level of risk they take. A high Sharpe ratio would mean a good performance of the fund while a low Sharpe ratio would indicate a bad performance of the fund.

Treynor Ratio

Additionally to the Sharpe ratio, we use the Treynor ratio as a criterion of analysis to measure the performance of the funds in relation to the market's performance. The Treynor Ratio is computed as follow:

$$Tp = \frac{Rp - Rf}{\beta p}$$

Where R_p and R_f are defined as above for the Sharpe ratio. βp represents the market risk, also called the systematic risk of the fund, which represents the sensitivity of the fund to a movement in the market portfolio. β can be computed as follow:

$$\beta = \frac{\sigma fund, market}{\sigma^2 market}$$

Where $\sigma_{fund,market}$ represents the covariance between the fund daily performances and the market daily performances. In this study, as we are analyzing funds investing in specific asset classes or in specific thematic, the market will be represented by the benchmark of the funds. We took the assumption that investors are choosing the active ETFs based on a specific need. For example, investors are looking to invest in cash proxies for MINT or NEAR that are in the ultrashort bond category. Therefore, to analyse the added value of these active ETFs, we should compare their performance with the ultrashort bond universe. σ^2_{market} represents the variance of the market, also called market volatility. A β higher than zero would mean that the fund has a positive correlation with the market and moves in the same direction. A β of zero would mean that the fund is not correlated with the market while a negative β would mean a negative correlation and that the fund moves in reverse direction to the market.

The Treynor ratio adjusts the excess return of the fund to its market risk while the Sharpe ratio takes the overall risk into account. Similarly, a high Treynor ratio would indicate good performance while a low Treynor ratio would indicate bad performance.

Jensen's alpha

Additionally, when assessing the added value of active ETFs, it is important to analyse the ability of their manager to achieve superior returns by applying strategies or selecting stocks that would allow their portfolio to outperform their benchmark and their passive counterpart. We use the Jensen's alpha to study these managerial skills. Jensen's alpha is computed as follow:

$$\alpha p = Rp - [Rf + \beta p(Rm - Rf)]$$

Where R_p is the average daily price return of the fund over the studied period, R_f is the average daily risk-free return and R_m is the average daily market return. As mentioned before, the market is represented by the benchmark of the fund as it represents its market universe. The coefficient βp represents the systematic risk of the fund. αp is Jensen's alpha which represents the abnormal returns of the fund and which is the object of our analysis.

A positive and significant alpha would indicate that the manager adds value while a negative and significant alpha would indicate a failure from the manager to create value. Jensen's alpha is useful for the comparison between active ETFs and active mutual funds as it allows us to judge the added value of active managers. While measuring Jensens' alpha for passive ETFs is less relevant as their managers tries to replicate their benchmark and do not perform active management but track their index.

Information Ratio

The Information Ratio (IR) is a measure of the excess returns of a fund compared to its benchmark, adjusted by the tracking error of its performances with the latter. The IR measure the fund's manager added value by adjusting the excess returns to the volatility of its performance relatively to its benchmark. This is an indicator often used to select ETFs or mutual funds because the IR standardizes the difference in performance by the difference in volatility. The IR is computed as follow:

$$Information\ Ratio = \frac{(\mathrm{Rp} - \mathrm{Rb})}{\mathrm{TEp} - \mathrm{b}}$$

Where R_p is the return of the portfolio over the considered period, R_b is the return of the benchmark and $TE_{p\text{-}b}$ is the tracking error of the portfolio compared to its benchmark (as defined above).

A higher IR would indicate that the fund manager has demonstrated better risk adjusted returns and an added value by deviating from its benchmark, while the opposite would indicate lower risk adjusted returns and a lack of added value.

Appraisal Ratio

Finally, the Appraisal Ratio (AR) is a risk-adjusted measure for the fund manager's ability to deliver alpha. The AR adjusts the fund's alpha (as defined above) to the unsystematic risk of the fund. We use the AR as an indicator of the returns that find their source in the fund managers' skills. The ratio gives the active return produced by the manager for each unit of risk he is taking. We can compute the AR as follow:

$$Appraisal\ Ratio = \frac{\alpha}{\sigma e}$$

Where α is the Jensen's alpha which represents the abnormal returns of the fund as developed above. σ_e is the fund's unsystematic risk, also called idiosyncratic risk or the residual standard deviation.

To compute the idiosyncratic risk, we will use the formula:

$$Unsystematic\ Risk = \sqrt{(Total\ Variance - Systematic\ Variance)}$$

with the Total Variance equivalent to the volatility as defined above and Systematic Variance computed as follow :

$$Systematic\ Variance = (\beta . \sigma market)^2$$

Where the coefficient β represents the systematic risk of the fund (as defined above) and σ_{market} represents the standard deviation of the market portfolio, which is represented by the respective benchmark of the fund (as already explained earlier).

Chapter II: Dataset

The core sample of this thesis contains 10 different active ETFs listed in the US. The ETFs have different investment universe to study their performance across different asset classes and asset category to have a scope as broad as possible. Morningstar's categories included in the sample are Ultrashort Bond, Intermediate-Term Bond, Bank Loan, Energy Limited Partnership, Technology, World Large Stock and Foreign Large Blend. These categories can be regrouped in two principal groups according to their main asset classes: Fixed-Income and Equities. Each group contains an even number of constituents: 5 different active ETFs. Therefore, this sample includes a sizeable scope of investment opportunities for the investors, which is, in our view, essential to assess the added value of active ETFs.

2.1 Active exchange-traded funds

The selection process of our core sample of 10 active ETFs has been conducted to focus on leading active ETFs. We have chosen the biggest active ETFs in terms of assets under management to consider the most successful ETFs based on their popularity among investors. We assume that investors are rational, implying that the ETFs with the most assets under management should be the best in class ETFs in their category. Additionally, the industry of active ETFs is highly concentrated. According to AdvisoryShares (2018), as demonstrated in Table 2 in the appendix, the top 5 active ETFs represented 40.70% of total assets under management of the industry in the US. Therefore, as our sample includes the 5 biggest ETFs of the industry (4 in the fixed-income category and one in the equity category), our research covers at least more than 40% of the active ETF universe in the US.

We focused our study on US active ETFs because the North American ETF market is the leading growth driver for the ETF industry. According to PWC (2016, p.17), it accounts for more than two thirds of the worldwide ETF assets. In their study, they add that there were only 30 active ETF issuers as of February 5, 2016 but 75 asset managers had already the SEC (US Securities and Exchange Commission) approval to launch such funds. A survey, conducted by PWC (2016, P.17) at that time, shows that professionals of the asset management industry expected the asset

under management of active ETFs in the US to grow from $20 billion in 2016 to more than $100 billion in 2019. According to Blackrock (2018), in June 2018 the asset under management of the ETFs in the US amounted to $3.5 trillion (or 71% of global asset under management of ETFs). This growth between 2016 and 2018 can partly be explained by the outperformance of US markets in 2017 which has led to both capital appreciation and strong inflows for the ETFs. The growth potential and leading place of the US active ETF industry motivated us to focus our analysis on this market.

To select the actively managed ETFs, we used several sources to cross-check our data. The first source is the data base of ETFdb, a well-known ETF platform. ETFdb is a provider of information for professional investors and financial advisors specialized in Exchange-Traded-Funds.

According to this database, as of July 19th, 2018, there were 228 active ETFs listed around the world. Among them, 83 were Bonds focus ETFs and 85 were Equity focus ETFs. We selected the 5 biggest active ETFs in terms of assets under management listed in the US investing in fixed-income and equity markets.

We then reviewed all the prospectus of the funds to check if their investment strategy and objectives are truly active. We made the assumption that this is a sufficient proof of active management, as the regulator (SEC) made it mandatory for funds to state in their prospectus that they are actively managed if it is the case.

Ticker	Asset Class	Morningstar Category	Total Assets ($MM)	Inception Date	Annualized returns	Benchmark	Expense ratio (%)
MINT	Bond	Ultrashort Bond	$ 9.340,35	17-11-09	1,23%	Morningtar	0,35
NEAR	Bond	Ultrashort Bond	$ 3.746,82	26-09-13	1,15%	Self-selected	0,25
TOTL	Bond	Intermediate-Term Bond	$ 3.200,19	24-02-15	1,39%	Self-selected	0,55
SRLN	Bond	Bank Loan	$ 3.106,41	04-04-13	2,34%	Self-selected	0,7
BOND	Bond	Intermediate-Term Bond	$ 2.066,79	01-03-12	3,60%	Self-selected	0,55
EMLP	Equity	Energy Limited Partnership	$ 2.222,25	21-06-12	7,43%	Self-selected	0,95
ARKK	Equity	Technology	$ 974,61	31-10-14	29,53%	Self-selected	0,75
RFDI	Equity	Foreign Large Blend	$ 680,41	14-04-16	12,56%	Self-selected	0,83
AMZA	Equity	Energy Limited Partnership	$ 644,88	02-10-14	-10,06%	Self-selected	0,95
ARKW	Equity	Technology	$ 597,90	30-09-14	36,34%	Self-selected	0,75

Table 3: This table shows the main characteristics of the active ETFs used in the dataset. These specifications include the ticker, the asset class, the Morningstar category, the total assets under management (AuM) in millions of US Dollars as of June 6, 2018, the inception date, the annualized average daily returns over the period extending from the inception date to the 19th of July 2018, the benchmark we used as reference in this thesis and the published fees (or expense ratio) in percentage points.

As described in table 3, the track record of equity active ETFs is still quite limited as four of them have a track record lower than 4 years and their size is still small compared to fixed-income ETFs (average of approximately $1 billion of assets under management for equity active ETFs compared to $4.3 billion for fixed-income ones). The inception date of the youngest active ETF

(RFDI) is particularly close as its track record is a little bit above 2 years. But compared to past research, including Rompotis (2010) and Rompotis (2015) for example, our sample as a more extended track record and should be sufficient to draw conclusion about the evolution of the industry. Particularly with active ETFs as mature as MINT and BOND, which have a track record of more than 8 and 6 years. This is longer than most of past studies. We can also see in table X that equity active ETFs have higher expense ratio than their fixed-income counterparts.

Most of active ETFs in our sample have positive annualized average daily returns. The only exception is AMZA, with a significantly negative performance. Additionally, AMZA has the highest expense ratio of our sample, approaching 1%.

MINT and NEAR are the leading active ETFs of the industry. The short term bond category (which includes the ultrashort term bond) has the biggest market share of the active ETF market. Table 4 in the appendix shows that this category represents 35.60% of market share, which is equivalent to slightly more than $20 billion in assets under management. Among the 19 active ETFs in this category, MINT and NEAR, the two ultrashort term bond of our sample, represent alone more than half of assets under management of this category. Additionally, as demonstrated in table 2 in the appendix, MINT alone, which is the biggest ETF, represented 16.56% of assets under management of all active ETFs in the US as of May, 2018. We can also see in table 5 in the appendix that all off the active ETFs of our sample are among the top 20 active ETFs by assets under management.

Interestingly, Pimco Total Return ETF (Ticker: BOND) is a well-known active ETF that was launched in March 2012 by the famous bond guru Bill Gross (Mistry, Manooj, 2012). This launch highlighted the growing popularity of active ETFs as star asset managers started to launch active ETFs in addition to their main traditional ETF to chase inflows.

2.2 Benchmarks

The next step has been the selections of the benchmarks. There are 2 different types of benchmarks that we use for each group as already mentioned above. The first benchmark is the one designated by the fund manager in the prospectus of the active ETF. The second one is the Benchmark designated by Morningstar. We selected total return indexes for benchmarks as it

takes into account capital appreciation and reinvested dividends. Therefore, it represents the returns investors could expect without dividends taxes and no cash holdings. We compare each time the active ETF with the 2 benchmarks in terms of correlation, and we select the one with the highest correlation. The results of this comparison of correlation are displayed in table 6 in the appendix. The objective is to base our analysis on the benchmark which best represents the investment universe of the active ETF. We included the benchmark of Morningstar in our sample to take a broader and more standardized benchmark. This also gives a more objective view than by taking the benchmark designated by the fund manager.

The correlation coefficients between the active ETFs and their two possible benchmarks (table 6 in the appendix) show that active ETFs tend to give a more representative benchmark in their prospectus than the general one assigned by Morningstar. On the 8 active ETFs analyzed that indicate an index of reference in their prospectus, 7 actually had higher correlation coefficient with their declared benchmarks than with Morningstar's benchmarks. Only the PIMCO Enhanced Short Maturity Strategy Fund (MINT) had a lower correlation coefficient with the Morningstar benchmark, but by a very slight margin and the correlation was very low in both cases.

2.3 Mutual funds

Afterwards, we selected a corresponding and similar mutual fund for each active ETF. We used the Morningstar's database once again and their fund screener tool. Morningstar is an investment research and investment management firm that is one of the leading providers of market data about mutual funds and ETFs. We took the Morningstar category of the active ETF and selected the biggest actively managed mutual fund active in the same category. We also compared the strategies and exposures to be sure that the mutual fund is effectively actively managed and is truly focus on the same market area. This selection process has been conducted to select a mutual fund counterpart for each active ETF that would be as similar as possible. As such, we can make a consistent comparison by comparing similar strategies and similar offers for investors. This would provide consistence for our comparative analysis of performance.

2.4 Passive exchange-traded funds

Finally, the last step was to select the appropriate corresponding passively managed ETF for each active ETF. To do so, we used the ETF screener of Morningstar and selected once again the biggest passive ETF in the same Morningstar category than the active ETF. We have chosen to select the largest passive ETF in terms of assets under management for the reason described above during our selection process for the active ETFs. When possible, we selected passive ETFs tracking the exact benchmarks of the actively managed ETFs. In a similar manner to the selection process of active ETFs described above, we also checked the prospectus of passive ETFs to make sure they were tracking ETFs.

Table 7 in the appendix describes the 10 groups of funds which are the result of the selection method described above. Each group is composed of one active ETF, 2 benchmarks, one passive ETF and one mutual fund. The groups 3 and 5 only have one benchmark because their fund's managers do not designate any benchmark in its prospectus so we use solely the benchmark designated by Morningstar. The benchmark of the group 6 is a blended benchmark, constructed as described in the prospectus of the active ETF "First Trust North American Energy Infrastructure Fund". It is a combination of two different benchmarks equally weighted: 50% of the Philadelphia Stock Exchange Utility Index and 50% of the Alerian MLP Total Return Index.

Finally, Table 8 in the appendix presents the descriptive statistics of each fund and benchmark. This table shows the group number and asset class, the ticker, the annualized average daily returns, the annualized average daily excess returns over the selected benchmark, the annualized standard deviation of the daily returns, the volatility and the number of observation for each fund.

Section III: Empirical results

In this section, we investigate the return and added value differentials between active ETFs, passive ETFs and mutual funds based on the methodology and data described in the previous chapter. All the results displayed and mentioned are annualized data. We also develop the limitations of our analysis.

Chapter I: Findings

1.1 Fees

Firstly, we would like to analyse the difference in fees among the studied investment vehicle.

Mean Fees (in percent)		
	Management Fees	**Expense Ratio**
Active ETFs	0,67	0,66
Fixed-Income	*0,50*	*0,48*
Equity	*0,85*	*0,85*
Passive ETFs	0,32	0,33
Fixed-Income	*0,21*	*0,46*
Equity	*0,42*	*0,21*
Mutual Funds	0,61	0,99
Fixed-Income	*0,44*	*0,85*
Equity	*0,78*	*1,13*

Table 9: this table shows the average management fees and expense ratios by investment vehicle type and by asset class in percentage points for the sample studied.

A negative differential between expense ratio and management fees should theoretically not happen as expense ratio is broader and include management fees. However, in reality, as we can see in table 9, it could happen in case of any eventual waiver or reimbursement. These one-off items can explain the difference, displayed in table 9, between the expense ratios and management fees of TOTL and EFA, an active and a passive ETF respectively.

Investors are charged with operating fees to support all the operating expenses of a fund, including the transaction costs, marketing, legal, auditing, and other administrative costs. The management fees are linked to the expenses related to the management of the portfolio, including the hiring and the salary of the portfolio managers and the investment team. The operating fees and the management fees make up the fund's expense ratio (Zucchi, 2018). As we want to study the added value of active ETFs on the investor's perspective, the main area of concerns for costs is the total costs incurred by the investors, or the expense ratio.

The results presented in table 9 above show a clear difference in costs between the 3 studied investment vehicle types. Overall, mutual funds are 50% more expensive than active ETFs, while passive ETFs are 50% less expensive than active ETFs. These results were expected and are in line with past research. When looking at the difference between asset classes, the results are consistent with the overall expense ratios. If we look at the individual investment vehicle in table 10 in the appendix, we can see that only one group does not hold the relation described above in terms of fees. The group 8 shows that the active ETF RFDI has higher fees (0.83%) in comparison to the similar mutual fund and passive ETF. This is the only exception and we think that this should not be considered as significant given the consistency of the results in the other groups. Coming back to table 9 above, we can also see that the difference in expense ratio between active and passive ETFs is explained by high management fees. This was expected given the difference in strategy between the two investment vehicles. Active managers need more resources to conduct research and select promising investments to try to outperform their benchmark, while passive ETFs only try to replicate their benchmarks. We can also see in table 9 that the management fees of active ETFs and mutual funds are quite similar, even slightly lower for mutual funds. The higher expense ratios of mutual funds are then explained by higher operating fees compared to active mutual funds. These results were also expected given the

difference in structures between these two investment vehicles. It confirms the higher structural efficiency of ETFs compared to mutual funds. Our results concerning fees are in line with past research.

1.2 Excess returns

Afterwards, we have analyzed the realized returns for each fund using the annualized daily returns on the period considered. We looked at the individual group composed of each investment vehicle. We also compared the mean and median annualized daily returns for active ETFs, passive ETFs and mutual funds. The median is incorporated in this analysis to diminish the effect of extreme data points. We should also add that even if the annualized daily returns of each investment vehicle of the same group is computed over the same period, this is not the case when comparing different group together. The median and mean data for each investment vehicle type are therefore aggregated over different time periods. All the periods under consideration start at the inception date of the active ETF and end the 20th of July 2018. This is the case in all of our analyses as we wanted to have the longer period of observation possible.

Excess returns (in percent)		
	Mean	**median**
Active ETFs	5,38%	1,71%
Fixed-Income	*-0,05%*	*0,07%*
Equity	*10,81%*	*4,88%*
Passive ETFs	1,08%	-0,67%
Fixed-Income	*-1,90%*	*-2,47%*
Equity	*4,06%*	*7,44%*
Mutual Funds	0,17%	-0,53%
Fixed-Income	*-2,33%*	*-2,56%*
Equity	*2,68%*	*1,20%*

Table 11: this table shows the average and median excess returns of each type of investment vehicles under consideration considered by asset class compared to their benchmarks.

The results displayed in table 11 are not what we expected based on the findings of past research. Overall, the mean excess returns of active ETFs (5.38%) are significantly higher than mean excess returns of passive ETFs (1.08%), while mutual funds hardly create positive excess returns (0.17%). We expected an outperformance of passive ETFs but there is clearly an outperformance of active ETFs according to our data. The results concerning actively managed mutual funds are more in line with past studies, as they underperform their ETFs counterparts. When we look at the median excess returns, the findings are quite different, but still surprising: active ETFs still clearly outperform with a median excess return of 1.71%, but they are followed by mutual funds with an underperformance of -0.53% compared to the index and finally, passive ETFs with -0.67%.

When we look at the excess returns in each asset class (equity and fixed-income), the results of table 11 show a clear underperformance of mutual funds investing in fixed-income products. Both the mean and the median of their excess returns are significantly negative and below ETFs' excess returns, showing that the underperformance happens across the majority of the fixed-

income mutual funds. The underperformance of mutual funds is also very clear in the equity asset class, as once again, both mean and median excess returns are below their ETFs counterparts, either active or passive. The results of an analysis on excess returns only tends to indicate an outperformance of ETFs products, and therefore, of the structure of these investment vehicles.

When comparing more particularly active and passive ETFs, we can see, in table 11, a clear outperformance of active ETFs in fixed-income products. These results indicate that active ETFs create value for investors, not only because of their structure, but also because of their active manager's skills. This comparison shows a clear relative outperformance of fixed-income active ETFs over passive ETFs.

For ETFs investing in equities, both active and passive ETFs realized positive excess returns compared to their common benchmark. While the mean shows a significant outperformance of active ETFs, (10.81% compared to 4.06% for passive ETFs), the median excess returns are indicating higher excess returns for passive ETFs. These results indicate that some active equity ETFs realized very high excess returns as we will see later. On the contrary, the average excess returns for equity passive ETFs has been dragged down by at least one low performing passive ETF.

When we look at table 10 in the appendix, which shows individual excess return for each fund, the excess returns support strongly the outperformance of fixed-income active ETFs over the two other types of funds as all the active ETFs systematically outperform by far. Additionally, the mean and median excess returns of fixed-income active ETFs are dragged down mainly by MINT negative excess returns. However, the underperformance of MINT, compared to its index of reference, comes mainly from the fact that the benchmark selected (chosen based on its higher correlation) contains higher duration bonds, meaning higher returns. Actually, this was the only time benchmark designated by Morningstar had a higher correlation than the benchmark designated by the fund's manager. Furthermore, the absolute value of excess returns should not be taken too preponderantly in our analysis as explained in the literature review and according to Blitz, Huij and Swinkels (2010). According to the authors, the funds

indeed have to hold some of their assets in cash and are subject to withholding taxes and other costs while indexes are not. Therefore, it is more relevant to compare active ETFs with passive ETFs than solely with their benchmarks.

The main origin of the high mean excess returns of ETFs compared to passive ETFs and mutual funds comes from the very high outperformance of the technology active ETFs. As we can see in table 10 in the appendix, the outperformance of ARKK and ARKW is huge in terms of excess returns (19.34% and 25.68% of annualized average daily excess returns over their benchmarks respectively). The selection of the corresponding passive ETFs, mutual funds and benchmarks could play an important role in the relative outperformance of active ETFs. These high excess returns could indeed be explained by a different investment universe or at least a narrower investment universe for active ETFs. Additionally, the technology sector has highly outperformed the majority of other equity sectors since 2014 (year of inception of ARKK and ARKW), so we are analyzing a short period where the particular strategy of both active ETFs has paid awesomely. Over a longer period, the results may diverge quite significantly. However, given the youth of the industry, we only have historical prices over one market cycle. Concerning the equity universe, only one active ETF has not outperformed its passive ETFs and mutual funds counterparts (table 10 in the appendix). It is the AMZA, in the Energy Limited Partnership category. All the other equity active ETFs have outperform significantly the other investment vehicle types studied over the studied period in terms of excess returns.

Overall, the results of the funds' excess returns compared to their benchmarks show an outperformance of active ETFs. Only one active ETF of the sample under consideration does not outperform its counterparts. When comparing to both passive ETFs and active mutual funds, we could think that this outperformance comes from the ETF structure as well as from the active management of active ETFs. The outperformance and the value added for investors are particularly clear for fixed-income active ETFs but less clear for equity active ETFs compared to equity passive ETFs given the scattering of excess returns among this asset class. The clearest outperformance overall is the added value of active ETFs over active mutual funds based on excess returns. To deepen our findings, we are now going to conduct several analyses adjusting the returns to the risks taken by the funds.

1.3 Volatility

Before computing the risk-adjusted returns of the funds, we have first analyzed the volatility of the different investment vehicles by using their variance, as explained earlier in the methodology. Our results are exposed in table 12.

Volatility		
	Mean variance	**median variance**
Active ETFs	2,69%	1,69%
Fixed-Income	*0,06%*	*0,07%*
Equity	*4,56%*	*2,08%*
Passive ETFs	1,95%	0,91%
Fixed-Income	*0,06%*	*0,10%*
Equity	*3,83%*	*2,49%*
Mutual Funds	1,92%	1,16%
Fixed-Income	*0,04%*	*0,02%*
Equity	*3,79%*	*3,35%*

Table 12: this table shows the average and median annualized variance of each investment type's daily returns used in our dataset by asset class.

Table 12 shows that active ETFs are riskier than both mutual funds and passive ETFs based on their variance. Both the average and the median volatility confirm this. However, we can see that fixed-income active ETFs are slightly less volatile than passive ETFs, while more volatile than mutual funds. These results are unexpected as we would suppose the opposite relation given the different strategies of the funds. When we look closer at the individual volatility in table 10 in the appendix, we can see that if we take out active ETFs with particularly high variance (as the AMZA) the results concerning volatility are mixed. This is confirmed by the median variance differentiated by asset classes. In fact, both fixed income active ETFs and equity active ETFs show lower volatility than passive ETFs based on their median. This is surprising and unexpected based on past studies and the different strategies of the funds. Results are also mixed when we

look at the median variance between active ETFs and mutual funds, which gives different conclusion than when looking at the average.

Nevertheless, in table 10 in the appendix, based on the standard deviation that is a measure of volatility similar to the variance (as demonstrated in the chapter concerning the methodology), we can see that ultrashort bond active ETFs (MINT and NEAR) are riskier than their passive counterparts while less risky than their corresponding mutual funds. Additionally, table 10 in the appendix demonstrates than technology active ETFs (ARKK and ARKW) have higher volatility than both corresponding passive ETFs and mutual funds. However, given the small sample, we are not able to extrapolate these findings.

These mixed results about volatility do not give usable insight about the comparative volatility of active ETFs. This volatility may depend on the strategy applied by the ETF's managers. These mixed results are also found in the existing literature as Rompotis (2015) shows that active ETFs are less risky than their passive counterparts, while Rompotis (2010, 2011a, 2011b, 2013), Kotro (2017), Schizas (2014) and Dolvin (2014) showed that active ETFs are more volatile.

1.4 Tracking Error

We are going to analyse the tracking error for each investment vehicle in order to study the effective level of activity of active ETFs. The aggregated results are displayed in table 13.

Tracking Error		
	Mean	**median**
Active ETFs	7,05%	3,64%
Fixed-Income	*2,30%*	*2,55%*
Equity	*11,79%*	*12,43%*
Passive ETFs	4,62%	4,11%
Fixed-Income	*2,29%*	*2,52%*
Equity	*6,94%*	*5,55%*
Mutual Funds	9,93%	5,22%
Fixed-Income	*2,11%*	*2,58%*
Equity	*17,75%*	*7,87%*

Table 13: This table shows the average and median tracking error of each investment type used in our dataset compared to their benchmarks by asset class.

Table 13 above shows that the average tracking error is higher for active ETFs compared to passive ETFs and lower compared to mutual funds. These findings would tend to prove that mutual funds are more active than active ETFs which are more active than passive ETFs. This would be coherent with our expectations based on the strategies of the funds. Nevertheless, the averages of tracking error displayed in table 13 show that we need to differentiate equity funds from fixed-income funds. Equity mutual funds actually appear to be significantly more active than active ETFs which are significantly more active than passive ETFs. However, fixed-income passive and active ETFs appear to have a similar tracking error, slightly higher than mutual funds. The medians of the tracking errors tell a different story, showing a lower median tracking error for active ETFs compared to both passive ETFs and mutual funds. When we look at the individual asset classes, we can see more precisely that average and median tracking

error are higher for equity active ETFs compared to passive ETFs, while very slightly higher for fixed-income active ETFs compared to passive ETFs. The results are less clear when comparing active ETFs to mutual funds.

To better understand the results of the analysis of tracking error, we need to look at the individual groups in table 10 in the appendix. For equity active ETFs, only one fund (EMLP) exhibits (significantly) lower tracking error than its passive ETF counterpart. Aside from this data point that we can ignore given the specificity of the fund, equity active ETFs show all a significantly higher tracking error than their passive counterparts. The results compared to mutual funds do not allow us to draw conclusions. Concerning fixed-income products, ultrashort bond active ETFs have a higher or slightly higher tracking error than passive ones. It is less clear for other categories and compared to mutual funds.

Overall, we can conclude that while active ETFs investing in equities appear to be more active than their corresponding passive ETFs, it is less clear for funds investing in fixed-income. The results are mixed as well, compared to mutual funds. It does not contradict past research as they demonstrated higher tracking error for active ETFs compared to passive ETFs. We can assume that these unclear results come from the methodology we have used. We based our computation on daily prices and on daily performances. Therefore, the tracking error are low, particularly on fixed-income products which are less volatile, and outcomes do not appear clearly. Other studies could conduct this kind of analysis on weekly or monthly performance to highlight the tracking error and have more reliable results.

1.5 Risk-adjusted returns

In this section we conduct the core of our analysis by comparing the risk-adjusted return of the different investment vehicles to active ETFs using several ratios.

Sharpe Ratio

The first ratio under consideration is the Sharpe ratio which adjusts the returns of the fund to the overall risk it is taking. The results appear in Table 15.

Sharpe Ratio		
	Mean	**median**
Active ETFs	0,806	0,836
Fixed-Income	*0,792*	*0,835*
Equity	*0,820*	*0,837*
Passive ETFs	-0,035	-0,063
Fixed-Income	*-0,607*	*-0,595*
Equity	*0,537*	*0,529*
Mutual Funds	-0,025	-0,101
Fixed-Income	*-0,422*	*-0,388*
Equity	*0,372*	*0,525*

Table 15: This table shows the average and median Sharpe ratio by asset class for each type of investment vehicle considered in our study.

The results displayed in table 15 are unambiguous. The active ETFs are clearly outperforming both passive ETFs and mutual funds in terms of "overall" risk adjusted returns, in each asset class. Only one active ETF of the sample does not beat its counterparts based on Sharpe ratios as we can see in table 14 in the appendix. This fund is AMZA and its Sharpe ratio is only slightly lower than the corresponding passive ETF and mutual fund. The lower Sharpe ratio of AMZA is mainly explained by a very high volatility. Overall, results from table 15 above prove the added value of active ETFs as their managers create more return for each additional unit of risk they are taking compared to passive ETFs and mutual funds. This conflicts with several past research conducted by Rompotis (2010, 2011a, 2011b, 2013, 2015), Kotro (2017), Schizas (2014) and Dolvin (2014), but results are in accordance with the conclusions of Garyn-Tal (2013).

Let's also note that the Sharpe ratios of active ETFs are particularly elevated compared to the comparing funds for the fixed income asset class. This is especially the case for the utrashort bond active ETFs (MINT and NEAR), which indicates a clear added value of active ETFs of this category.

A possible explanation for the outperformance of active ETFs compared to passive ETFs, mutual funds and their benchmark could be coming from the studied period. Since 2009 (earliest date of inception of the active ETFs under consideration), managers have only met one bull market with a dominant theme: technology. There is also a bias in the methodology used to select our sample. We selected only the leading active ETFs of the market in terms of asset management. This factor biased our selection for choosing the best performing funds as investors choose their investment based on past performance among other things. The best performing funds will then draw more inflows. There is also the survival bias taking place as we have only selected funds still active, which eliminate from the sample all funds that have been terminated including those that performed too poorly. However, we believe we applied the exact same methodology when selecting passive ETFs and mutual funds, so the same biases should apply to them. Additionally, if we have selected the best in class ETFs because of this methodology, we have also selected the best in class mutual funds and passive ETFs.

Treynor Ratio

The second ratio used to evaluate the comparative performance of active ETFs in terms of risk adjusted return is the Treynor ratio. This time, the results show the returns created for each additional unit of market risk taken by the manager of the fund.

Treynor Ratio		
	Mean	**median**
Active ETFs	0,813	0,230
Fixed-Income	*1,832*	*0,619*
Equity	*-0,002*	*0,076*
Passive ETFs	0,070	0,036
Fixed-Income	*-0,029*	*-0,139*
Equity	*0,150*	*0,161*
Mutual Funds	0,021	-0,027
Fixed-Income	*-0,393*	*-0,329*
Equity	*0,353*	*0,081*

Table 16: This table shows the average and median Treynor ratios by type of investment vehicle considered and by asset class. Please, note that the average and median Treynor ratios that appear in table G are computed excluding the group 2. The β of the investment vehicles of the group 2 were close to zero, and as this is the denominator of the Treynor ratio equation, the results were extremely high. We had to exclude them to compute usable average and median Treynor ratios that would not be biased by this data point. To check results for group 2 in terms of Treynor ratio and β, please refer to table 14 in the appendix.

The results displayed in table 16 above show a clear outperformance of fixed-income active ETFs over passive ETFs and mutual funds as they have higher average and median Treynor ratio in this asset class. Concerning active ETFs investing in equities, they demonstrate lower Treynor ratio than both passive ETFs and mutual funds in terms of average and median. However, the difference is quite slight. These results are less useful to assess the added value of active ETFs as

the Treynor ratio adjusts the returns per unit of market risks, while active ETFs try to outperform the market by deviating from it.

As the Sharpe ratio, the Treynor ratio highlights the added value of active ETFs investing in fixed-income products. Active ETFs, when investing in this asset class, are able to create higher returns for each additional unit of market risk taken.

Jensen's alpha

The third measure of risk adjusted return we are using is the Jensen's alpha which represents the ability of active managers to achieve higher returns by creating alpha (also called abnormal returns). This is a critical measure of the added value of active management. Results are displayed in table 17.

Jensen's alpha		
	Mean	**median**
Active ETFs	8,31%	2,75%
Fixed-Income	*1,35%*	*0,91%*
Equity	*15,27%*	*12,12%*
Passive ETFs	1,84%	0,16%
Fixed-Income	*-0,58%*	*-0,45%*
Equity	*4,26%*	*6,14%*
Mutual Funds	1,28%	-0,37%
Fixed-Income	*-0,93%*	*-0,40%*
Equity	*3,50%*	*6,05%*

Table 17: This table shows the average and median Jensen's alpha by type of investment vehicle considered and by asset class.

The results displayed in table 17 are clearly indicating an outperformance of active ETFs in terms of alpha generation capabilities. The outperformance is significant, highlighting the added value

of the active strategies of active ETFs, both for the equity and fixed-income category, compared to passive ETFs and mutual funds. These results are especially useful for our comparison with active mutual funds as Jensen's alpha is used to measure the performance of active managers. Active ETFs' managers of our sample are "beating the market" by a wide margin.

When we look at the individual Jensen's alpha in table 14 in the appendix, we can see that the results are very strong for fixed-income active ETFs in particular as all of them create positive alpha and beat their passive ETFs and mutual funds counterparts. In the equity asset class, the results are less one-sided. On the five active ETFs, three have higher Jensen's alpha than similar passive ETFs and mutual funds. EMLP and AMZA have lower alpha than their corresponding mutual fund or both mutual fund and passive ETF respectively. Importantly, all the active ETFs have positive alpha. Therefore, each active manager was able to beat the market during the period under consideration.

Jensen's alpha results add to the previous findings concerning the clear outperformance of active ETFs investing in the fixed-income asset class. Results are more mixed for equities, even if average and median Jensen's alpha of active ETFs are still higher than their peers.

Information Ratio

The Information ratio adjusts the excess return of a fund by its tracking error. This gives a measure of returns adjusted by the level of activity of a fund manager compared to its benchmark. This indicator is especially important to analyse the added value of active ETFs as it is often used by investors when comparing ETFs or mutual funds. The average and median Information ratios of our sample by investment vehicle and asset class are displayed in table 18.

Information Ratio		
	Mean	**median**
Active ETFs	0,426	0,424
Fixed-Income	*0,074*	*0,024*
Equity	*0,778*	*0,484*
Passive ETFs	-0,212	-0,357
Fixed-Income	*-1,286*	*-0,798*
Equity	*0,862*	*1,339*
Mutual Funds	-0,509	-0,382
Fixed-Income	*-1,301*	*-1,025*
Equity	*0,282*	*0,039*

Table 18: This table shows the average and median Information ratios by type of investment vehicle considered and by asset class.

Table 18 shows that active ETFs overall have higher Information ratios than both passive ETFs and mutual funds. This is particularly true for the active ETFs active in the fixed-income asset class, as they have significantly higher Information ratio. For the equity asset class, the average and median Information ratios are slightly lower for active ETFs compared to passive ETFs, while they are still higher compared to mutual funds. Inside individual groups, when we look at table 14 in the appendix, we can see that each individual fixed-income active ETF systematically has a higher information ratio than its passive ETF and mutual fund peers. For the equity universe, the results are more mitigated as only two active ETFs (EMLP and RFDI) beat their counterparts. The others have lower information ratios than passive ETFs or both.

The results of our analysis of Information ratios are consistent with the results of other risk-adjusted returns conducted above. They show an outperformance of fixed-income active ETFs that is demonstrated by higher information ratios, meaning that their active managers are able to add value by creating higher excess returns for each deviation in their portfolio from their benchmarks' portfolio. As investors often use Information ratios when comparing different

funds, these results could support inflows in these active ETFs as it appears that they add value for investors. The results are not conclusive for equity active ETFs as there is dispersion in the results and we are not able to conclude an outperformance of active ETFs.

Appraisal Ratio

The Appraisal ratio is the final indicator of risk-adjusted returns of active ETFs. This ratio is focused on the ability of the fund managers to deliver alpha, adjusted to the unsystematic risk taken. The objective is to evaluate if the unnecessary or diversifiable risk the manager of the fund is taking is creating value or destroying it. Average and median results by investment vehicle and asset class are displayed in table 19.

Appraisal Ratio		
	Mean	**median**
Active ETFs	0,805	0,844
Fixed-Income	*0,733*	*0,832*
Equity	*0,876*	*0,876*
Passive ETFs	-0,041	-0,032
Fixed-Income	*-0,671*	*-0,609*
Equity	*0,589*	*0,671*
Mutual Funds	-0,142	-0,221
Fixed-Income	*-0,534*	*-0,388*
Equity	*0,250*	*0,295*

Table 19: This table shows the average and median Appraisal ratios by type of investment vehicle considered and by asset class.

The results of table 19 are clearly highlighting the ability of active ETFs to create positive active returns. Average and median Appraisal ratios of active ETFs are positive and significantly higher than passive ETFs and mutual funds. This ratio is especially useful when comparing the two types of actively managed investment vehicles. We can see that active ETFs are able to create

positive active returns in both equity and fixed-income asset classes while mutual funds have negative active returns overall and low but positive Appraisal ratio in the equity asset class. We can see the individual Appraisal ratio for each fund in table 14 in the appendix, which shows that only one active ETF (AMZA) does not beat its passive ETF and mutual fund counterparts, while still having a positive Appraisal ratio. The other 9 active funds of our sample significantly outperform their comparable peers in terms of Appraisal ratios.

The Appraisal ratio highlights the added value of the managers of active ETFs and of the investment vehicle as a whole given their positive and comparatively higher level in regard to passive ETFs and mutual funds.

Overall, the results provide corroborating evidence of the added value of active ETFs, especially for fixed-income products. It is interesting to note that active ETFs in the bond asset class of our sample were older compared to equity active ETFs. This may be a reason of their higher relative outperformance as the age of funds has been used as a factor influencing price efficiency by Verdu (2014).

Chapter II: Limitations

The results presented in this thesis involve several limitations.

Firstly, the literature about active ETFs in still scarce. Besides, most studies end by indicating significant limitations of the limited number of active ETFs in their sample or the short track record available. Furthermore, most of these studies analyse active ETFs in specific locations or with specific strategies. This explains the numerous contradictions between the findings of the different authors. Additionally, a significant part of past research has been conducted by the same author, Rompotis (2010, 2011a, 2011b, 2013, 2015). Therefore, the conclusions of the existing literature should be used with caution.

Concerning the methodology, the limitations include the use of daily performances only, which may give a narrow view to the funds' performances. Differences may be higher when

considering longer period. Additionally, we have focus our study mainly on ratios to evaluate the performance of the funds. In order to have more powerful findings, we should have performed statistical analysis (using for example regression models) to assess the significances of our results. Unfortunately, given our limited resources and the significant amount of data to analyse, we have not been able to include this in our study.

Additional limitations exist about the data. These limitations may be the more significant ones. Even if the industry is now more mature than during past research, most of the active ETFs are still quite young. The oldest have a track record of approximately 9 years, but it still represents only one market cycle. Since 2009, the financial markets have only known a long bull market and results during this period may not be representative of all market conditions. Additionally, we analysed a sample of 10 active ETFs, which does not represent the whole industry despite our assumptions. However, databases regrouping active ETFs and their price history do not exist yet, making it very time-consuming to create a database representing the industry. Finally, the price history extracted from Bloomberg had flaws in some occasions as prices were not available for some specific days. This limitation may have a slight impact on the computed volatility and returns, but it does not change our overall findings.

Conclusion

In this thesis we have investigated whether active ETFs listed in the United-States are adding value for investors, by conducting a comparison analysis between active ETFs, passive ETFs and mutual funds.

We started by comparing the expense ratios and management fees of each investment vehicle. The findings were clear and expected. According to our data, the fees of active ETFs come exclusively from the management fees, just like the passive ETFs, while mutual funds have around two third of their expense ratio explained by management fees and one third by operating fees. The average expense ratio for active ETFs is 0.66%, higher than passive ETFs with 0.33% and lower than mutual funds with 0.99%. The management fees are similar between active ETFs and mutual funds, meaning that active managers are compensated equivalently by the two investment vehicles but that the lower costs of active ETFs come from their efficient structure.

The next analysis we have conducted is about excess returns, by looking at the annualized realized daily excess returns of each investment vehicle compared to their benchmark. The results show an outperformance of active ETFs over passive ETFs and mutual funds. Furthermore, the active ETFs outperform their benchmarks overall, with positive excess returns on average.

We have also analyzed the volatility of the different investment vehicles, but the results were inconclusive as the volatility of individual funds was very scattered and particularly low. The volatility is highly dependent of the strategy and the category of the fund. Nevertheless, active ETFs appeared slightly less risky than their passive ETFs counterparts. Additionally, active fixed-income ETFs appeared to be slightly riskier than their mutual funds counterparts. Average variance shows the same results. These findings were not expected, but the divergence in the results of past research comforts us in our mixed and unexpected results. In order to evaluate how active the managers of active ETFs are, we analysed their tracking error. In a similar manner to our findings about volatility, the tracking error actually changes significantly across

the different groups studied, varying with the different strategies and investment categories. According to our result, active ETFs appear to have higher tracking errors than their passive counterparts. While the difference is significant in the equity category, the tracking errors are only slightly higher in the fixed-income category. Results of the comparison with mutual funds are not conclusive.

The next step has been to compare the risk-adjusted returns of the three types of investment vehicles to study the added value of active ETFs. The insights given from a comparison of the Sharpe ratios, Treynor ratios, Jensen's alpha, Information Ratios and Appraisal ratios are unanimously indicating an added value of active ETFs investing in the fixed-income asset class. According to these ratios, fixed-income active ETFs outperform both passive ETFs and mutual funds in terms of risk- adjusted returns. This is true when adjusting returns for total risk, market risk, unsystematic risk, and active risk. The results for active ETFs investing in equity are less unanimous. The Sharpe ratio, Jensen's alpha and Appraisal ratio indicate an outperformance of equity active ETFs compared to the two other types of funds which indicate the added value of active managers. However, the Treynor ratio and Information ratio are inconclusive because of a significant variability of results between the different categories of funds. The added value of active ETFs is especially clear for the ultrashort bond category as all the ratios are demonstrating their outperformance. This may explain the leading position of this category of active ETFs in the industry.

To deepen our study, future research should conduct their analysis on a broader sample of funds, with more active ETFs in each investment category. The funds we have studied are distributed among different categories and have different strategies. This leads to some difficulties when analyzing their aggregated volatility, tracking error or risk-adjusted return. Using more furnished and refined categories of funds could simplify the way to spot the differences across the different strategies since results are already divergent between equity and fixed-income products. Additionally, our inconclusive findings about equity funds may be explained by their limited track record (four of them have a track record lower than four years) and their size which is still small compared to fixed-income ETFs (average of approximately $1

billion of assets under management for equity active ETFs compared to $4.3 billion for fixed-income ones).

In the active ETF industry, the winner takes all, as demonstrated by the high concentration of asset under management among the leading funds. This is the main assumption behind our choice to focus on the leaders of the active ETFs industry based on their assets under management. We also focused on the US listed funds to have a similar base of comparison.

In general, our results show that leading US listed active ETFs add value for the investors in terms of risk-adjusted returns by providing them with cheap active strategies that create positive excess returns. According to our findings, the sources of their outperformance come from both their structure and their active management. The structure of exchange-traded funds allows them to have lower expense ratios compared to similar mutual funds while providing at least similar performance. Additionally, their active managers are able to create alpha and higher risk-adjusted returns compared to passive ETFs in the fixed-income category. Results for equity active ETFs are not sufficient to prove this statement, but they do not support an underperformance of active ETFs.

After this analysis, we can conclude that fixed-income active ETFs are undeniable alternatives to mutual funds. This is particularly true for the ultrashort bond category. The ongoing focus of investors on fees could accelerate the transition of assets from the mature mutual fund industry to the young and quickly growing active ETF industry. This new type of investment vehicles provides investors with a cheap actively managed product that is especially adding value in the fixed-income asset class. After our thorough readings and analyses on the asset management sector, we strongly believe that the growing evidence of the added value of active ETFs will gradually draw investors into the asset class and increase the industry standards. Active ETFs could be the solution for active managers who currently face outflows at the benefit of the passive solutions. We hope this study will increase the visibility of active ETFs and participate in the development of these types of funds that, according to our research, add value for the investors.

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Morningstar : https://www.morningstar.com/

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Appendix

Table 1: This table shows the number of active ETFs by launch year and the "death rate" by year defined as the percentage of ETF launched by year that are still trading as of 31 May, 2018. Source: AdvisoryShares Investments LLc, Active ETF Report 31-05-2018.

Number of Active ETFs by launch year and death rate			
Launch Year	Number Launched	Number still trading	Death Rate
2008	15	4	73,3%
2009	10	3	70,0%
2010	11	4	63,6%
2011	9	7	22,2%
2012	18	11	38,9%
2013	20	14	30,0%
2014	55	41	25,5%
2015	22	14	36,4%
2016	38	38	0,0%
2017	66	61	7,6%
2018	29	29	0,0%
Total	293	226	22,9%

Table 2: This table shows the percentage of the total asset under management of the US active ETF industry managed by the biggest active ETF, the top 3 active ETFs, the top 5 active ETFs and the top 10 active ETFs. For more details about the ETFs composing the top 20 ETFs, please refer to table 5 in the appendix below. Source: AdvisoryShares Investments LLc, Active ETF Report 31-05-2018.

Percentage of Total AUM in Space	
05.31.2018	
Biggest ETF	16.56%
Top 3 ETFs	29.47%
Top 5 ETFs	40.70%
Top 10 ETFs	57.91%

Table 4: This table shows the active ETF market share in the US by strategy in terms of percentage of assets under management and of number of ETFs as of 31st May, 2018. Source : AdvisoryShares Investments LLc, Active ETF Report 31-05-2018.

Active ETF Market Share by Strategy as of 05.31.2018

Asset Class	AUM	% of Mkt Share	# of ETFs
Short Term Bond	$20,081,511,222	35.59%	19
Global Bond	$7,181,419,195	12.73%	23
Alternative Income	$6,427,432,105	11.39%	10
Alternative	$4,934,985,518	8.75%	38
Bank Loan	$4,673,871,066	8.28%	3
Global Equity	$2,994,866,054	5.31%	14
US Bond	$2,204,592,359	3.91%	20
High Yield	$1,809,560,635	3.21%	4
Tactical	$1,804,641,656	3.20%	23
US Equity	$1,681,303,452	2.98%	38
Foreign Equity	$1,412,520,525	2.50%	10
Multi-Asset	$492,458,840	0.87%	8
Foreign Bond	$281,094,955	0.50%	4
Alternative Bond	$272,026,940	0.48%	5
Currency	$147,718,140	0.26%	4
Sustainable	$17,069,180	0.03%	3
Total	$56,417,071,841	100%	226

Table 5: This table shows the name, category and assets under management of the top 20 active ETFs by assets under management as of 31st May, 20018. Source : AdvisoryShares Investments LLc, Active ETF Report 31-05-2018.

Top 20 Active ETFs by AUM

Rank as of 04.30.2018	Rank as of 05.31.2018	Ticker	Name	Category	AUM
1	1	MINT	PIMCO Enhanced Short Duration ETF	Short Term Bond	$9,344,138,020
2	2	NEAR	iShares Short Maturity Bond ETF	Short Term Bond	$3,802,886,000
3	3	FPE	First Trust Preferred Securities and Income ETF	Alternative Income	$3,479,141,823
4	4	TOTL	SPDR DoubleLine Total Return Tactical ETF	Global Bond	$3,238,405,980
5	5	SRLN	SPDR Blackstone/GSO Senior Loan ETF	Bank Loan	$3,099,481,920
6	6	EMLP	First Trust North American Energy Infrastructure Fund	Alternative Income	$2,230,314,038
7	7	BOND	PIMCO Total Return ETF	Global Bond	$2,123,612,935
8	8	FTSM	First Trust Enhanced Short Maturity ETF	Short Term Bond	$2,105,983,440
10	9	PDBC	Invesco Optimum Yield Diversified Commodity Strategy No K-1 ETF	Alternative	$1,704,190,320
9	10	FTSL	First Trust Senior Loan ETF	Bank Loan	$1,544,987,946
11	11	LMBS	First Trust Low Duration Mortgage Opportunities ETF	Short Term Bond	$1,312,510,602
12	12	HYLS	First Trust High Yield Long/Short ETF	High Yield	$1,185,829,520
13	13	GSY	Invesco Ultra Short Duration ETF	Short Term Bond	$1,166,465,840
15	14	ARKK	ARK Innovation ETF	Global Equity	$882,737,380
19	15	JPST	JP Morgan Ultra-Short Income ETF	Short Term Bond	$766,201,050
14	16	GDVD	Principal Active Global Dividend Income ETF	Global Equity	$711,680,000
17	17	COMT	iShares Commodities Select Strategy ETF	Alternative	$695,079,000
16	18	RFDI	First Trust RiverFront Dynamic Developed International ETF	Foreign Equity	$669,067,477
18	19	AMZA	InfraCap MLP ETF	Alternative	$633,684,975
20	20	ARKW	ARK Web X.0 ETF	Global Equity	$531,648,400

Table 6: This table shows the correlation coefficients of each active ETF of the dataset compared to the benchmark selected by the fund manager and designated in the prospectus of the fund, as well as the correlation compared to the benchmark designated by Morningstar. Groups 3 and 5 have no benchmark designated in their prospectus, we used the Morningstar benchmark only in these cases. The last column indicates the benchmark that has the higher correlation with the active ETF (in bold in the table) and therefore the benchmark used in the computations of this thesis.

Group	Asset Class	ETF Name	Symbol	Self-selected Benchmark	Correlation with self-selected benchmark	Morningstar Benchmark	Correlation Morningstar Benchmark	Benchmark
1	Bond	PIMCO Enhanced Short Maturity Strategy Fund	MINT	SBMMTB3	0,006	**LBUSTRUU**	**0,041**	Morningtar
2	Bond	iShares Short Maturity Bond ETF	NEAR	**BSGVTRUU**	**0,000**	LBUSTRUU	-0,037	Self-selected
3	Bond	SPDR DoubleLine Total Return Tactical ETF	TOTL			**LBUSTRUU**	**0,038**	Morningtar
4	Bond	SPDR Blackstone/ GSO Senior Loan ETF	SRLN	**IBXXLLTR**	**0,181**	LBUSTRUU	-0,003	Self-selected
5	Bond	PIMCO Total Return ETF	BOND			**LBUSTRUU**	**0,139**	Morningtar
6	Equity	First Trust North American Energy Infrastructure Fund	EMLP	**UTY & AMZX**	**0,929**	NDUEACWF	-0,042	Self-selected
7	Equity	ARK Innovation ETF	ARKK	**SPX**	**0,235**	NDUEACWF	0,001	Self-selected
8	Equity	First Trust RiverFront Dynamic Developed International ETF	RFDI	**MXEA**	**-0,075**	NDUEACWZ	-0,077	Self-selected
9	Equity	InfraCap MLP ETF	AMZA	**AMZI**	**0,907**	NDUEACWF	0,021	Self-selected
10	Equity	ARK Web x.0 ETF	ARKW	**SPX**	**0,271**	NDUEACWF	0,048	Self-selected

Table 7: This table shows the 10 groups of funds which are used in the dataset. Table 7 describes the group, asset class, Morningstar category, type of investment vehicle, ticker and name of each fund used in our dataset.

Group, asset class and Morningstar category	Investment Vehicle Type	Ticker	Name
Group 1 Fixed-Income Ultrashort Bond	Active ETF	MINT	PIMCO Enhanced Short Maturity Strategy Fund
	Self-selected Benchmark	SBMMTB3	Citi 3-Month Treasury Bill Index
	Morningstar's Benchmark	LBUSTRUU	Bloomberg Barclays US Aggregate Bond TR USD
	Passive ETF	SHV	iShares Short Treasury Bond ETF
	Active Mutual Fund	PSHAX	PIMCO Short-Term A
Group 2 Fixed-Income Ultrashort Bond	Active ETF	NEAR	iShares Short Maturity Bond ETF
	Self-selected Benchmark	BSGVTRUU	Bloomberg Barclays Short-Term Government/Corporate Index
	Morningstar's Benchmark	LBUSTRUU	Bloomberg Barclays US Aggregate Bond TR USD
	Passive ETF	SHV	iShares Short Treasury Bond ETF
	Active Mutual Fund	PSHAX	PIMCO Short-Term A
Group 3 Fixed-Income Intermediate-Term Bond	Active ETF	TOTL	SPDR DoubleLine Total Return Tactical ETF
	Morningstar's Benchmark	LBUSTRUU	Bloomberg Barclays U.S. Aggregate Bond Index
	Passive ETF	AGG	iShares Core US Aggregate Bond ETF
	Active Mutual Fund	MWTNX	Metropolitan West Total Return Bond
Group 4 Fixed-Income Bank Loan	Active ETF	SRLN	SPDR Blackstone/ GSO Senior Loan ETF
	Self-selected Benchmark	IBXXLLTR	Markit iBoxx USD Liquid Leveraged Loan Index
	Morningstar's Benchmark	LBUSTRUU	Bloomberg Barclays US Aggregate Bond TR USD
	Passive ETF	BKLN	Invesco Senior Loan ETF
	Active Mutual Fund	OOSAX	Oppenheimer Senior Floating Rate Fund Class A
Group 5 Fixed-Income Intermediate-Term Bond	Active ETF	BOND	PIMCO Total Return ETF
	Morningstar's Benchmark	LBUSTRUU	Bloomberg Barclays U.S. Aggregate Index
	Passive ETF	AGG	iShares Core US Aggregate Bond ETF
	Active Mutual Fund	MWTNX	Metropolitan West Total Return Bond
Group 6 Equity Energy Limited Partnership	Active ETF	EMLP	First Trust North American Energy Infrastructure Fund
	Self-selected Benchmark	UTY & AMZX	Blended Benchmark
	Morningstar's Benchmark	NDUEACWF	MSCI ACWI NR USD
	Passive ETF	AMLP	Alerian MLP ETF
	Active Mutual Fund	TORTX	Tortoise MLP & Pipeline Fund Investor Class
Group 7 Equity Technology	Active ETF	ARKK	ARK Innovation ETF
	Self-selected Benchmark	SPX	S&P 500 Index
	Morningstar's Benchmark	NDUEACWF	MSCI ACWI NR USD
	Passive ETF	XLK	Technology Select Sector SPDR® ETF
	Active Mutual Fund	WSTAX	Ivy Science And Technology A

Table 7 (continuation): This is the continuation of table 7 of the previous page.

Group 8 Equity Foreign Large Blend	Active ETF	RFDI	First Trust RiverFront Dynamic Developed International ETF
	Self-selected Benchmark	MXEA	MSCI EAFE Index
	Morningstar's Benchmark	NDUEACWZ	MSCI ACWI Ex USA NR USD
	Passive ETF	EFA	iShares MSCI EAFE ETF
	Active Mutual Fund	DODFX	Dodge & Cox International Stock
Group 9 Equity Energy Limited Partnership	Active ETF	AMZA	InfraCap MLP ETF
	Self-selected Benchmark	AMZI	Alerian MLP Infrastructure Index
	Morningstar's Benchmark	NDUEACWF	MSCI ACWI NR USD
	Passive ETF	AMLP	Alerian MLP ETF
	Active Mutual Fund	TORTX	Tortoise MLP & Pipeline Fund Investor Class
Group10 Equity Technology	Active ETF	ARKW	ARK Web x.0 ETF
	Self-selected Benchmark	SPX	S&P 500 Index
	Morningstar's Benchmark	NDUEACWF	MSCI ACWI NR USD
	Passive ETF	XLK	Technology Select Sector SPDR® ETF
	Active Mutual Fund	WSTAX	Ivy Science And Technology A

Table 8: This table shows the group number and asset class, the ticker, the annualized average daily returns, the annualized average daily excess returns over the selected benchmark, the annualized standard deviation of the daily returns, the volatility and the number of observation for each fund used in the dataset.

	Ticker	Annualized returns	Excess Returns (annualized)	Annualized standard deviation	Volatility (Variance)	Number of Obs
Group 1 Fixed-income	MINT	1,23%	-1,91%	0,74%	0,01%	2183
	LBUSTRUU	3,14%		3,25%	0,11%	2183
	SHV	0,04%	-3,10%	0,25%	0,00%	2183
	PSHAX	0,04%	-3,10%	1,04%	0,01%	2183
Group 2 Fixed-income	NEAR	1,15%	0,48%	0,79%	0,01%	1213
	BSGVTRUU	0,67%		0,12%	0,00%	1213
	SHV	0,02%	-0,65%	0,27%	0,00%	1213
	PSHAX	0,07%	-0,60%	1,04%	0,01%	1213
Group 3 Fixed-income	TOTL	1,39%	0,07%	2,67%	0,07%	859
	LBUSTRUU	1,31%		3,20%	0,10%	859
	AGG	-1,28%	-2,59%	3,25%	0,11%	859
	MWTNX	-1,25%	-2,56%	3,07%	0,09%	859
Group 4 Fixed-income	SRLN	2,34%	-0,42%	2,59%	0,07%	1335
	IBXXLLTR	2,76%		1,63%	0,03%	1335
	BKLN	2,06%	-0,70%	3,23%	0,10%	1335
	OOSAX	-0,63%	-3,39%	1,42%	0,02%	1335
Group 5 Fixed-income	BOND	3,60%	1,54%	3,86%	0,15%	1608
	LBUSTRUU	2,05%		3,07%	0,09%	1608
	AGG	-0,41%	-2,47%	3,22%	0,10%	1608
	MWTNX	0,04%	-2,01%	2,93%	0,09%	1608
Group 6 Equity	EMLP	7,43%	1,88%	14,42%	2,08%	1530
	UTY & AMZX	5,55%		14,54%	2,11%	1530
	AMLP	2,05%	-3,50%	22,44%	5,04%	1530
	TORTX	6,76%	1,20%	20,53%	4,21%	1530
Group 7 Equity	ARKK	29,53%	19,34%	21,41%	4,58%	928
	SPX	10,19%		12,86%	1,65%	928
	XLK	18,47%	8,28%	15,68%	2,46%	928
	WSTAX	10,21%	0,02%	18,04%	3,25%	928
Group 8 Equity	RFDI	12,56%	4,88%	13,89%	1,93%	569
	MXEA	7,68%		13,90%	1,93%	569
	EFA	7,89%	0,21%	13,12%	1,72%	569
	DODFX	9,58%	1,90%	14,90%	2,22%	569
Group 9 Equity	AMZA	-10,06%	2,24%	39,38%	15,50%	957
	AMZI	-12,30%		28,60%	8,18%	957
	AMLP	-4,86%	7,44%	27,30%	7,45%	957
	TORTX	-1,55%	10,75%	24,32%	5,92%	957
Group10 Equity	ARKW	36,34%	25,68%	21,12%	4,46%	955
	SPX	10,66%		13,01%	1,69%	955
	XLK	18,56%	7,90%	15,77%	2,49%	955
	WSTAX	10,20%	-0,46%	18,30%	3,35%	955

Table 10: This table shows the group number and asset class, Morningstar category, ticker, management fees in percentage points, expense ratio in percentage points, annualized excess returns compared to the benchmark, standard deviation, number of observation, tracking error and correlation coefficient of each active ETF, passive ETF and mutual fund of the dataset. It is the first table showing the results of the analysis.

	Morningstar Category	Ticker	Management Fees (%)	Expense Ratio (%)	Excess Returns	Standard deviation	Number of Observetion	Tracking Error	Correlation Coefficient
Group 1 *Bond*	Ultrashort Bond	MINT	0,350	0,350	-1,91%	0,74%	2183	2,55%	0,041
		SHV	0,150	0,150	*-3,10%*	*0,25%*	*2183*	*2,52%*	*-0,022*
		PSHAX	0,450	0,780	*-3,10%*	*1,04%*	*2183*	*2,58%*	*0,075*
Group 2 *Bond*	Ultrashort Bond	NEAR	0,250	0,250	0,48%	0,79%	1213	0,55%	0,000
		SHV	0,150	0,150	*-0,65%*	*0,27%*	*1213*	*0,19%*	*-0,026*
		PSHAX	0,450	0,780	*-0,60%*	*1,04%*	*1213*	*0,59%*	*0,020*
Group 3 *Bond*	Intermediate-Term Bond	TOTL	0,650	0,550	0,07%	2,67%	859	3,15%	0,038
		AGG	0,050	0,050	*-2,59%*	*3,25%*	*859*	*3,42%*	*0,061*
		MWTNX	0,350	0,780	*-2,56%*	*3,07%*	*859*	*3,32%*	*0,036*
Group 4 *Bond*	Bank Loan	SRLN	0,700	0,700	-0,42%	2,59%	1335	1,87%	0,181
		BKLN	0,650	0,650	*-0,70%*	*3,23%*	*1335*	*2,22%*	*0,228*
		OOSAX	0,590	1,110	*-3,39%*	*1,42%*	*1335*	*1,21%*	*0,297*
Group 5 *Bond*	Intermediate-Term Bond	BOND	0,550	0,550	1,54%	3,86%	1608	3,39%	0,139
		AGG	0,050	0,050	*-2,47%*	*3,22%*	*1608*	*3,09%*	*0,178*
		MWTNX	0,350	0,780	*-2,01%*	*2,93%*	*1608*	*2,87%*	*0,130*
Group 6 *Equity*	Energy Limited Partnership	EMLP	0,950	0,950	1,88%	14,42%	1530	3,88%	0,929
		AMLP	0,850	0,850	*-3,50%*	*22,44%*	*1530*	*8,78%*	*0,814*
		TORTX	0,850	1,240	*1,20%*	*20,53%*	*1530*	*17,45%*	*0,043*
Group 7 *Equity*	Technology	ARKK	0,750	0,750	19,34 %	21,41%	928	16,57%	0,235
		XLK	0,040	0,130	*8,28%*	*15,68%*	*928*	*4,86%*	*0,912*
		WSTAX	0,810	1,260	*0,02%*	*18,04%*	*928*	*7,12%*	*0,848*
Group 8 *Equity*	Foreign Large Blend	RFDI	0,830	0,830	4,88%	13,89%	569	12,43%	-0,075
		EFA	0,330	0,320	*0,21%*	*13,12%*	*569*	*10,71%*	*0,155*
		DODFX	0,600	0,630	*1,90%*	*14,90%*	*569*	*49,10%*	*0,137*
Group 9 *Equity*	Energy Limited Partnership	AMZA	0,950	0,950	2,24%	39,38%	957	10,29%	0,907
		AMLP	0,850	0,850	*7,44%*	*27,30%*	*957*	*5,55%*	*0,942*
		TORTX	0,850	1,240	*10,75 %*	*24,32%*	*957*	*7,87%*	*0,927*
Group10 *Equity*	Technology	ARKW	0,750	0,750	25,68 %	21,12%	955	15,78%	0,271
		XLK	0,040	0,130	*7,90%*	*15,77%*	*955*	*4,80%*	*0,913*
		WSTAX	0,810	1,260	*-0,46%*	*18,30%*	*955*	*7,19%*	*0,850*

Table 14: This table shows the group number, asset class, Morningstar category, ticker, Beta (β), Jensen's alpha (α), Sharpe ratio, Treynor ratio, Information ratio and Appraisal ratio of each active ETF, passive ETF and mutual fund of the dataset used in this thesis. This table shows the second part of the results of our analysis.

	Morningstar Category	Ticker	Beta	Jensen's alpha	Sharpe Ratio	Treynor Ratio	Information Ratio	Appraisal Ratio
Group 1 *Bond*	Ultrashort Bond	MINT	0,009	0,91%	1,260	1,007	-0,750	1,226
		SHV	*-0,002*	*-0,25%*	*-1,035*	*1,533*	*-1,231*	*-1,016*
		PSHAX	*0,024*	*-0,32%*	*-0,244*	*-0,106*	*-1,202*	*-0,311*
Group 2 *Bond*	Ultrashort Bond	NEAR	0,000	0,67%	0,856	-1730,918	0,866	0,856
		SHV	*0,00*	*-0,45%*	*-1,667*	*56,611*	*-3,331*	-1,666
		PSHAX	*0,00*	*-0,40%*	*-0,388*	*-16,578*	*-1,025*	-0,388
Group 3 *Bond*	Intermediate-Term Bond	TOTL	0,032	0,71%	0,273	0,230	0,024	0,265
		AGG	*0,062*	*-1,97%*	*-0,595*	*-0,314*	*-0,758*	*-0,609*
		MWTNX	*0,035*	*-1,93%*	*-0,621*	*-0,552*	*-0,770*	*-0,629*
Group 4 *Bond*	Bank Loan	SRLN	0,288	1,24%	0,736	0,066	-0,225	0,485
		BKLN	*0,453*	*0,58%*	*0,504*	*0,036*	*-0,315*	*0,183*
		OOSAX	*0,260*	*-1,67%*	*-0,746*	*-0,041*	*-2,805*	*-1,226*
Group 5 *Bond*	Intermediate-Term Bond	BOND	0,005	3,21%	0,835	6,025	0,455	0,832
		AGG	*0,006*	*-0,80%*	*-0,245*	*-1,371*	*-0,798*	*-0,248*
		MWTNX	*0,004*	*-0,34%*	*-0,113*	*-0,872*	*-0,701*	*-0,115*
Group 6 *Equity*	Energy Limited Partnership	EMLP	0,922	2,28%	0,488	0,076	0,484	0,428
		AMLP	*1,256*	*-4,83%*	*0,074*	*0,013*	*-0,399*	*-0,370*
		TORTX	*0,061*	*6,05%*	*0,310*	*1,040*	*0,069*	*0,295*
Group 7 *Equity*	Technology	ARKK	0,391	25,18%	1,351	0,741	1,167	1,210
		XLK	*1,112*	*7,21%*	*1,140*	*0,161*	*1,706*	*1,123*
		WSTAX	*1,190*	*-1,80%*	*0,532*	*0,081*	*0,002*	*-0,189*
Group 8 *Equity*	Foreign Large Blend	RFDI	-0,075	12,12%	0,837	-1,554	0,393	0,876
		EFA	*0,146*	*5,96%*	*0,529*	*0,475*	*0,019*	*0,460*
		DODFX	*0,146*	*7,65%*	*0,580*	*0,590*	*0,039*	*0,519*
Group 9 *Equity*	Energy Limited Partnership	AMZA	1,248	5,44%	-0,270	-0,085	0,218	0,327
		AMLP	*0,899*	*6,14%*	*-0,200*	*-0,061*	*1,339*	*0,671*
		TORTX	*0,788*	*8,02%*	*-0,088*	*-0,027*	*1,366*	*0,877*
Group10 *Equity*	Technology	ARKW	0,440	31,32%	1,693	0,813	1,628	1,540
		XLK	*1,107*	*6,82%*	*1,139*	*0,162*	*1,644*	*1,062*
		WSTAX	*1,196*	*-2,43%*	*0,525*	*0,080*	*-0,064*	*-0,252*

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