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Do active ETFs gain value over their passive counterparts

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ABSTRACT:

The purpose of this study is to examine if active ETFs can outperform traditional passive ETFs. This research is using a unique data set of five different ETF pairs from different time periods depending on the ETF pair. The ETF pairs are constructed of two different active and passive ETFs which are investing in the same industry. The key motivation for the study is to find out whether active ETF managers have found a way to take advantage of the active investment style combined with the structure of ETF.

ETFs have gained much attention since their release in 1993 and their AUM has risen significantly every year after that. Their structure is tax-efficient for investors and they offer a basket of securities as one unit. This method offers an easy diversification to the investors that lower the risk compared to owning a single stock of a company. The variety of ETFs is wide and investment strategies are versatile. Active ETFs were developed in 2008 and investors' interest in them has risen. The market of active ETFs has still been considerably smaller relative to other ETF markets. They are still new to the investors and understating the benefits of using an active investment style and ETF structure is still developed.

The empirical part of this thesis generates answers for investors considering active and passive ETFs. Inside the pairs, active ETFs tend to outperform their passive counterpart in risk-adjusted metrics and annualized returns. However, in some pairs, the time periods are relatively short, and the ETFs are investing in a niche market. The ETFs in the pairs are compared to each other also by the significance of the alpha. This study finds that an active ETF can find statistically significant alpha higher than its passive counterpart. This assumes that active ETFs in a specific environment can outperform their passive counterpart and generate excess returns from the market.

This thesis provides new evidence of active ETFs and their performance compared to passive ETFs which are investing in the same industry or niche market. Previous academic literature suggests that in its entirety passive ETFs perform better than active ETFs. In this study, the results are not unanimous with earlier studies since results on some occasions are the opposite.

KEY WORDS: Exchange-traded funds (ETFs), performance, active, passive, management

Table of Contents

List of Figures

List of Tables

Abbreviations

AP	Authorized participant
AUM	Assets under management
ETF	Exchange-traded fund
NAV	Net asset value
CAPM	Capital asset pricing model

1 Introduction

In the financial sector, ETFs are relatively new products in the market. Almost every type of investor can find their preferrable ETF from the market. Their AUM has risen significantly every year after its introduction to the market in 1993. The main advantages that ETFs have are related to the structure of the ETF. Even when owning one share of an ETF, investors have a well-diversified portfolio compared to a single share of an individual company (Ferri, 2009).

ETFs are a so-called basket of securities that usually tries to replicate an underlying index. ETFs are simply thought to be a passive investment approach that combines an opportunity to invest in listed or unlisted companies having a mechanism to track an underlying index. Their appearance can resemble mutual funds, but ETFs are listed on stock exchanges just like ordinary shares and their trading is similar (Ferri, 2009).

Active ETFs, on the other hand, have been even newer products in the market and they have not gained so much attention from investors since they were approved by the Securities and Exchange Commission in 2008 (Schizas, 2014). Active ETFs offer the structure of a so-called normal ETF and combine it with an active management style.

When passive ETFs try to track an underlying index, active ETFs try to outperform it. Active ETFs fund managers try to perform better than the index using their developed skills and knowledge of the market. Investors usually must pay a premium for active management styles because fund managers must take a view of the market and in changing environments make reallocations to the fund. The fund manager's objective is to generate high risk-adjusted returns which are referred to as alpha (Peterson, 2012).

This research begins with a detailed overview of ETF history. This is followed by the mechanisms of the ETFs and information about how they are priced, kept in accurate value and created. The second chapter lastly introduces different types of ETFs and investments styles related to them. The third chapter introduces earlier studies concerning ETF performances with different investment styles and compares the results.

The fourth chapter reviews extensively portfolio theory and market efficiency and then overviews various models to calculate returns and performance measures. These calculations and measures are used in the thesis to receive the most beneficial empirical results and answers.

The fifth chapter presents the data used in the research and why this specific data has been chosen. This is continued with the introduction of the methodology and how the empirical results are gained. The chapter introduces also new performance measures and a regression model in addition to the models expressed in the fourth chapter.

Then, the sixth chapter explains the results from the different ETF performance calculations and regression models. Finally, the last chapter has a debate on the results and suggestions for further research.

1.1 Purpose of the study

The purpose of the study is to examine how ETFs with different management styles perform compared to each other. The findings from Rompotis (2013), Schizas (2014) and Meziani (2015) suggest that passive ETFs in general outperform their active counterparts. New results may rise the interest in active ETFs and are therefore justified to be researched.

Active ETFs have been in the market for a short period and it is important to examine their performance in the market frequently compared to other financial products. In addition, since the market is young, new products can be developed, and their performance is important to investigate. This study uses a variety of ETF performance measures and regression models to gain the most accurate results for further research.

1.2 Hypotheses

This study is motivated to investigate a total of two different hypotheses. The first hypothesis is motivated by the earlier research results delivered by Rompotis (2013) and Schizas (2014), which suggest that in general actively managed ETFs do not deliver higher alpha than passively managed ETFs. Since the studies have not been followed by new research it is necessary to investigate if this same pattern has continued. The market for active ETF is rather recent so it is essential to provide new information. This hypothesis provides insight into the significance of the alpha. The first hypothesis is the following:

H1: Passive ETFs generate statistically significant higher alpha than active ETFs

The second hypothesis is motivated by Rompotis (2013), Schizas (2014) and Meziani (2015). The findings suggest that passive ETFs outperform active ETFs. The following hypothesis provides insight into riks-adjusted metrics. Since the previous study is over six years old it is reasonable to examine if active ETFs still can not yield excess returns compared to passive ETFs. The second hypothesis is stated as follows:

H2: Passively managed ETFs outperform actively managed ETFs by risk-adjusted ratios

2 Exchange-traded funds

Exchange-traded funds and mutual funds differ from each other since ETFs can be purchased and sold in the stock exchange like normal company stock when the market is open (Gerber, 2017, p. 224-225). Investors and the rest market participants are allowed to trade index portfolios just like normal individual investors would trade with stocks in the exchange. Since new ETF shares are continuously created, and already existing shares are redeemed the total shares outstanding can differ on a daily basis. ETF companies have the ability to redeem and issue shares to keep the ETFs market price in line with the underlying assets in the portfolio (Kearney, et. al., 2014, p. 86-87).

ETFs arbitrage mechanism is a process that will make sure that the value of the ETF that the investor is buying is near the real net asset value of the underlying securities that complete the fund (Ferri, 2009, p. 23). Net asset value is overviewed further in the research.

In today's market, ETFs are one of the most rapid and popular ways to invest in securities. They can invest in various industry sectors and exploit many types of strategies. ETFs can contain different variety of investments like commodities, bonds, equities, currencies, or a mixture of these investments. The average costs of ETFs are considered to be lower for normal investors since it would be more expensive to buy the securities which are in the ETF individually from the market. The idea behind this is that investors only need to do one transaction when buying the ETF and one transaction when selling which decreases the broker fees. One of the reasons for ETFs' great demand is that they are promoted to be more tax-efficient than classical mutual funds. Public-finance researchers have taken an interest in ETFs because they have been called prototypes for future development of the mutual-funds industry and therefore it is important to understand their taxation (Poterba & Shoven, 2002, p. 422).

The whole ETF market's estimated NAV was 531 billion US dollars in 2011 and a growth rate annually of approximately 6% after its introduction in 1993. Since the significance has risen in these instruments, academic studies have also seen an increase in numbers, and there are various types of topics related to ETF markets (Chau, et. al., 2011, p. 293).

2.1 History

The stock crash in 1987 created the idea of "stock baskets", which could be traded like a basket of securities in a single trade. New regulations were considered around securities and that was a way to make room for a new type of exchange-traded vehicle in the U.S market (Ferri, 2009, p. 12-13).

American Stock Exchange ("AMEX") capitalized on the new regulations around the securities and introduced SPDR Trust, Series 1 in January 1993. The fund is better known as SPDRs S&P 500 which is following the S&P 500 index, which consists of 500 of the largest U.S stocks. There was security called "SuperTrust" which was made by Leland, O'Brien and Rubinstein ("LOR") but it did not receive much attention since the product was complex to understand and the minimum investment size was large compared to the SPDRs S&P 500 (Ferri, 2009, p. 13).

SPDRs S&P 500 succeeded well in the market. The fund brought broadly 500 million dollars in assets in the first year of its existence. SPDR was structured well enough, and the price was not overly large. Therefore, individual investors could afford the new asset and the pricing structure was simple for anyone to understand (Ferri, 2009, p. 14). SPDRs S&P 500 is still listed in NYSE Arca and it is the oldest and largest ETF in the market. Fund's AUM is 340 billion dollars.

Figure 1 shows that there is an enormous spike in the AUM of ETFs in the past 10 years. AUM has risen slightly to over US$4 trillion in May 2017. Equity ETFs represent approximately 80% of the global AUM. After that comes fixed income ETFs with a total AUM of 17% and lastly ETFs which include commodities and other investments (Ord Minnet, 2019).

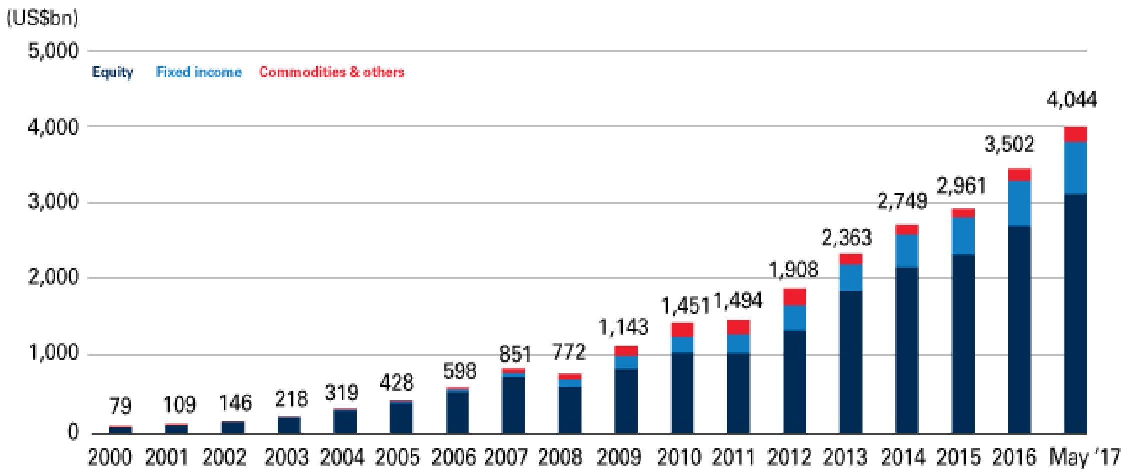

Figure 1. Global AUM of ETFs ($USbn) (Ord Minnet, 2019).

ETFs were created in North America and the continent manages approximately 74% of the global AUM, which makes it the largest ETF market in the world. This can be seen in Figure 2. Their growth has been dramatic in the industry for the last two decades, not only in size but also in the diversification of products offered to investors. In 2017 there were close to 2000 ETFs listed in the US market, and those held over US$3.01 trillion in assets. Investors started to use ETFs as hedging tools as the importance of ETFs in the US market increased, they turned out to be a leading way to manage risk (Ord Minnet, 2019)

The second greatest market is EMEA (Europe, the Middle East and Africa), which holds roughly 17% of the global AUM. There are over 3400 listed ETFs in Europe, but the same ETFs are commonly listed in multiple countries to entice retail investor cash flows because usually European investors can only trade in their national market. Since the ETFs are listed in many different stock exchanges it has led to spallation of liquidity for many European ETFs because of the disperse of market maker quotes and investor flow (Ord Minnet, 2019).

Markets in the Asia-Pacific region are smaller than in Europe and US. At this time there are more than 1200 listed ETFs managing over US$353 billion in assets. The listed ETFs includes also cross-listings from other regions as in the EMEA market (Ord Minnet, 2019).

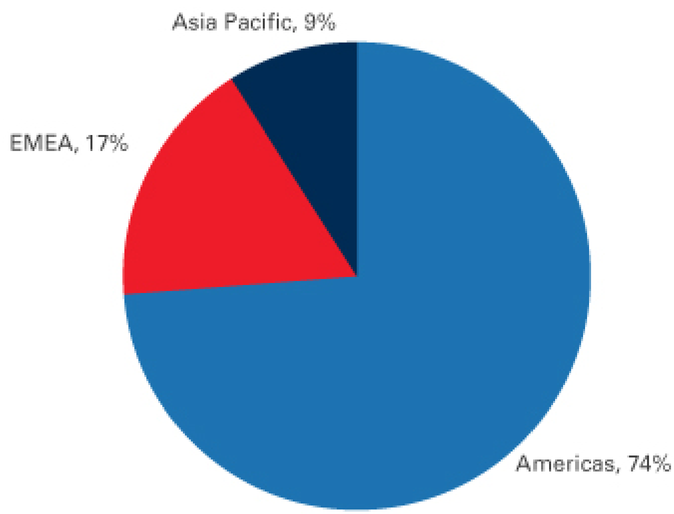

Figure 2. Global ETF market by region (Ord Minnet, 2019).

2.2 Features and concepts

ETFs are publicly-traded securities where each ETF share is a claim on a trust which holds a certain pool of assets. ETF shares are created when an authorized financial institute deposits a security portfolio with the fund trustee and receives ETF shares in return. After the process ETF shares can be sold to independent investors (Poterba & Shoven, 2002, p. 422).

The ETFs full activity begins after the fund provider receives all the necessary permissions from financial regulators and the ETF fund fills the requirements for listing to the exchange. The fund's trustee and one or more APs will enter agreements which each other since APs will take part in the redemption and creation of the ETF shares. Initial public offering (IPO) is the way to the issuance of ETF funds shares to the primary market. APs will buy these shares to spread them to the secondary market (Marszk & Lechman, 2019, p. 13).

In contrast with equities or bonds, this mechanism is continuous and new shares of ETFs may be created whenever after the full launch of the fund under the agreements between APs and the fund provider. The redemption of the fund's shares is another difference between the ETF market and the primary equity market. It is somewhat like the buyback of company shares but much more common and frequent. APs gain their profits from transactions between other participators in the secondary market since they are not compensated by the fund's provider. As matter of fact, APs are required to pay the redemption and creation compensation to the provider (Marszk & Lechman, 2019, p. 13).

The ETF market functions the same way as the common stock market. Investors have the right to sell or buy ETF shares as they like at any point during the day when the exchange is open. If ETF share prices differ from the underlying NAV of the securities in the portfolio will differences be adjusted by creating and redeeming ETF shares (Poterba & Shoven, 2002, p. 422-423).

If the price of an ETF share would rise above the NAV of the underlying assets in the portfolio, the financial institution, that created the fund would buy the associated securities and deposit them in the trust and establish new ETF shares. On the other hand, if the ETF share price would drop under the NAV of the underlying assets, the financial institution starts to buy the ETF shares and redeem them for the underlying securities (Poterba & Shoven, 2002, p. 423).

ETF shares are purchased through a brokerage firm on the stock market. The ETF shares are not made for the investor by the mutual fund company since they already are in someone else's portfolio. It is similar to purchasing normal individual stocks which already are in the public domain (Ferri, 2009, p. 24).

ETFs can be bought on margin, be sold short or trade normally during the day. These attributes separate ETFs from classical equity mutual funds. Investors can only purchase or sell mutual funds at their closing NAV for the day. Mutual funds are usually bought by commission directly from a company that is offering the fund to the market (Poterba & Shoven, 2002, p. 423).

Unlike mutual funds, ETF's pricing is continuing throughout the day whenever the stock market is open. ETF share price is the market price of those shares at the time of a sale. ETF shares NAV is still calculated only once a day, but a projection of the intraday value is calculated every 15 seconds. The exchange which is responsible for the trading must calculate the estimation of the intraday value and deliver the information to the market participants (Ferri, 2009, p. 26-27).

ETFs and open-end funds have a difference in their settlement period. When ETFs have a three-day settlement period, open-end funds have a one-day settlement period. After purchasing or selling open-end fund shares the account is settled for the next workday. When buying open-end shares, capital must be in the account the next day or the transaction is not able to go further (Ferri, 2009, p. 27).

The three-day settlement period occurs when purchasing ETFs. If the shares are bought on Monday, the money must be in the account on Thursday. In this case, there are two extra days to buy the ETF shares and when selling, it takes two days for the money to arrive in the account. This matter is useful to take into notice for example when selling ETF shares and purchasing open-end shares on the same day. There are differences in the settlement days, and it may leave the account short of capital for two days and lead to additional expenses (Ferri, 2009, p. 27).

2.2.1 Tax efficiency

Tax efficiency is one of the major characteristics of the ETF structure. The major tax advantages derive from the concept of in-kind creation and redemption process (Abner, 2016, p. 26). The creation and redemption process is covered afterwards.

When investors want to add assets to mutual funds, the manager of the portfolio takes money from the investor and purchases the underlying basket of assets. Exact the opposite happens when the investor wants to redeem shares of the mutual fund. On this occasion, the mutual fund manager needs to raise money to provide it back to the investor. Generally, managers need to sell assets that are in the fund. The selling of assets commonly causes a taxable circumstance for the mutual fund (ETF.com, 2021a).

Funds are holding some amount of capital in reserves to accommodate redemption, but this may lead to a performance lag. Some other minor management techniques may exist, but at its essence, when market participants leave and come into the fund, portfolio managers are selling and buying the underlying assets, which creates a taxable event inside the funds that will be divided among the rest of shareholders. Then in the future the mutual fund plan to make distributions of long- and short-term capital profits that will be taxable events for the shareholders (Abner, 2016, p. 26-27).

A typical ETF functions quite different when it takes in and disburses assets. The first part comes when the assets come in. An ETF operates on two different levels of the market, the secondary market, and the primary market. In the secondary market when an ETF is trading, the process of taking in new assets starts away from the ETF portfolio itself. When there is a large number of investors who want to buy the ETF, the liquidity provider will sell the ETF shares to those particular buyers. After that, they characteristically buy the shares in the underlying basket to hedge trading positions. As this goes on, over the trading day, the liquidity-providing communities are receiving larger short positions in the ETF and at the same time, they continuously grow long exposure to the underlying basket (Abner, 2016, p. 27).

When a trading day ends, the liquidity provider will value their portfolio and take action to clean up their balance sheets. If everything has been done properly liquidity provider has now two positions in their trading book: long a basket of stocks that stands for perfect creation units of the ETF portfolio and short of the ETF. They can then evoke a creation. The liquidity provider will deliver the basket of underlying assets to the ETF issuer's portfolio manager, and then there will be new ETF shares issued. This event is not considered a taxable event or a trade by the ETF portfolio since it is a primary market transaction. It is distinct from the secondary market trading activity that was taking place throughout the trading day (Abner, 2016, p. 27).

In a reverse situation, investors want to sell the shares of the ETF to liquidity providers, who are in turn selling shares across the underlying basket of ETF. Between the liquidity in the ETF and activity in the underlying baskets, this is the key transference. At the end of the trading day, the liquidity-providing community have a long position on the ETF and a short position on the underlying basket in perfect unit sizes. If done correctly, this represents a perfectly hedged position, and there is no market exposure, but there may be some financing fees in various short and long positions (Abner, 2016, p. 28).

To manage balance sheet exposures and costs the liquidity provider will provoke the redemption of ETF shares. On this occasion, the liquidity provider will be distributing ETF shares back to the issuer of the ETF, and the issuer will deliver perfect units of the underlying basket back to the liquidity-providing community. The outstanding shares of the ETF will decrease since the underlying shares that constituted those assets have been delivered out. This process is tax-efficient for the ETF (Abner, 2016, p. 28).

This primary market transaction is not creating a taxable event for the ETF because it is not considered to be a trade. The ETF's in-kind redemption and creation process allows the receipt and delivery of shares out and into of portfolio, but they are not considered to be trades for tax purposes (Gerber, 2017, p. 228-229).

2.2.2 The creation and redemption process

The creation and redemption process of the ETF happens in the primary market and this process facilities the accessing of underlying liquidity in an ETF. ETFs traded on an exchange are considered to be traded in the secondary market. The primary market is one of issuance (Abner, 2016, p. 40-41).

Shares are issued initially in the primary market via an initial public offering (IPO) and then shares begin trading in the secondary market. The case is similar to an ETF, except that an ETF has so-called “continuous issuance” via the daily creation and redemption process (Lettau & Madhavan, 2018).

As soon as an AP does a creation, the necessary shares matching the specific creation unit are delivered to the issuer, along with the essential cash component, and then the issuer delivers shares of the ETF to the AP. The ETF issuer does not uphold an inventory of shares that it delivers to the AP, but the issuer “issues” new shares of the ETF in part of the creation process. These new shares which have been made are reflected in the total amount of shares outstanding of the ETF and it is published day-to-day (Lettau & Madhavan, 2018).

The opposite situation occurs when the AP processes a redemption order. In this situation shares of the ETF are delivered to the ETF issuer and the issuer delivers the underlying basket to the AP. These transactions also include the required cash component amount. However, on this occasion, the ETF issuer does not put them in some inventory or hold onto those shares. The shares are theoretically “destroyed”. The meaning of this is that they are no longer outstanding in the marketplace, and the AUM of the ETF would decrease (Abner, 2016, p. 41).

Table 3 represents a basic diagram of the creation process. There AP is delivering a basket of shares to the ETF issuer and the issuer is then delivering the shares of the ETF. These transactions are not treated like official trades, they are in-kind transactions. The ETF issuer is not trading shares in the market since it is receiving them from the AP (ETF.com, 2021b).

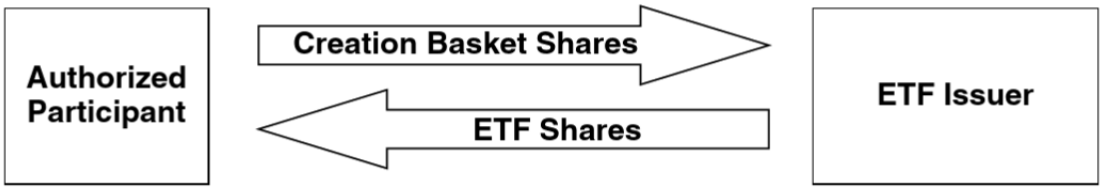

Figure 3. ETF creation process (Abner, 2016).

This process enables trading millions of shares of ETFs close to the price levels around NAV and portfolio managers can manage their portfolios tax-efficiently when many other product wrappers cannot. Figure 4 shows the redemption process. On this occasion, the issuer of the ETF is delivering the stocks in the underlying basket to the AP. The key to allowing ETF portfolio managers to manage their losses and gains is this in-kind delivery of the stocks from the ETF portfolio. This allows portfolio managers to lower any potential capital gains in the portfolio that might have appeared from corporate actions or rebalance trading (Abner, 2016, p. 42).

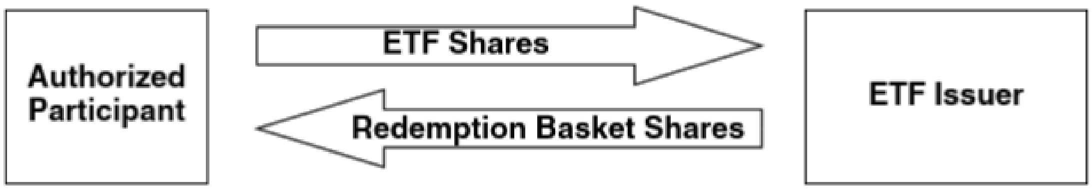

Figure 4. ETF redemption process (Abner, 2016).

Receiving and delivering in-kind shares is a procedure where the AP acts as an execution and trading representative of the underlying shares. AP's responsibility is to either buy the shares in the market or lend them to deliver to the ETF issuer (Abner, 2016, p. 42).

2.3 Net Asset Value

The NAV is representing the current market value of its underlying securities. Hypothetically any business company that is working with liabilities or assets can have a NAV. It is usually used to find possible investment opportunities within ETFs, indexes, or mutual funds. The term NAV is commonly used concerning fund valuation and pricing. The fund's NAV constitutes a "per-share" value of the fund which makes it simpler to be used for valuing the fund shares (Madhavan & Sobczyk, 2016).

The fund may hold assets, cash, and liabilities. The NAV of the ETF is calculated by subtracting the total value of assets from any liabilities, which then represents the underlying value of the fund. The sum is then divided by the number of shares outstanding. This calculation provides the NAV of the ETF (Madhavan & Sobczyk, 2016). The formula is presented as:

$$Net\ Asset\ Value\ (NAV) = \frac{Underlying\ value\ of\ the\ fund}{Number\ of\ shares\ outstanding}. \quad (1)$$

The official value of NAV is often shown as a value per share and the information is from the closing of the previous trading day. the calculation happens officially once a day on closing prices at 4:00 PM Eastern time by most of the US funds (Ferri, 2009, p. 38).

Mutual funds do not trade in real-time like normal stocks and ETFs. They are priced on the end of the day methodology based on their liabilities and assets. Liabilities often include money owed to the lending banks, a variety of fees and charges owed to several associated entities and pending payments. The liabilities of a fund additionally include accrued expenses, like operating expenses, utilities, staff salaries, distribution, marketing expenses and management expenses (Madhavan & Sobczyk, 2016).

A mutual fund's assets include the market value of the investments in the fund, cash and cash equivalents, accrued income, and receivables. Accrued income is money that has been earned by the fund but has not been yet received and receivables are items such as interest payments and dividends (Madhavan & Sobczyk, 2016).

Since closed-end funds and ETFs trade like normal stocks in the exchange, their shares prices can be above or below the actual NAV. This can create profitable opportunities for traders who actively trade ETFs. Like mutual funds, ETFs also calculate their NAV at the close of the market but they also disseminate and calculate intraday values multiple times per minute (Madhavan & Sobczyk, 2016).

2.4 Premiums and discounts

Usually, ETFs trade at a premium or a discount because their intraday values are only estimations from the NAV. The intraday values have valuable information for APs and investors as guidance for the price of an ETF share, but the intraday values are not absolute numbers, they are only estimations of the value (Staer, 2017). According to Ferri (2009), there are many theories about why premiums and discounts occur. There can be liquidity issues with the underlying securities, or the price of an ETF may provide a better picture of the NAV than the calculated intraday value. Nevertheless, the share pricing for the ETF is independent of their intraday value.

The premium or discount is calculated by subtracting the market price from the intraday value and then dividing the sum by the intraday value as the formula shows down below.

$$Premium\ or\ discount\ (ETF) = \frac{Market\ price - Intraday\ value}{Intraday\ value}. \tag{2}$$

2.4.1 Arbitrage

In theory, arbitrage occurs when the same asset is priced differently in different markets. The concept exists as a result of market efficiencies and it both resolves and exploits them. Arbitrage is a central principle in financial economics since it proposes that markets intend to price assets efficiently. Although, arbitrage is limited to the fact that impediments and market frictions to information diffusion are there (Ackert & Tian, 2008).

APs are the only ones who have the right to redeem and create ETF shares with the fund company and they are the ones who contract with the ETF. APs are managing the competitive market and they are trying to manage the spread between the NAV and the market price. APs try to make a profit when the ETF is trading at a premium or a discount (Staer, 2017).

When the shares of an ETF trade at a premium to their intraday value the AP will buy the underlying securities, which develop the fund and then add money according to the PCF and exchange the basket of securities for a creation unit. Then AP will sell the creation unit for a larger market price than the total value of the securities. This method is ongoing continuously until the ETF market price and its NAV are in an allowable measure. This constantly occurring process creates risk-free profits and stabilizes the price range (Petajisto, 2017).

When ETF shares are trading at a discount to their intraday value AP will purchase them from the market and sell securities that make up the fund. After AP have bought enough shares of an ETF to create up a creation unit, it will be exchanged for its underlying securities and cash. The redemption process of the units covers the AP for the stocks AP have already sold. This type of trading is repeated until the risk-free profits are removed from the market (Staer, 2017).

2.5 Tracking error

Tracking error was not usually used in fund evaluation and analysis until investors started to access a large number of ETFs tracking multiple indexes. There was a speech about index tracking and index mutual funds in same the discussion, but the total number of index mutual funds was small and the number of used indexes by mutual funds was even smaller. Interest in index-tracking has risen after the ETFs have entered the market (Gastineau, 2011, p. 155).

Tracking error has been defined sometimes differently in different circumstances. In many academic finance papers according to Gastineau (2011, p. 155) tracking error is described as “an unplanned divergence between the price behaviour of an underlying position or portfolio and the price behaviour of a hedging position or benchmark.” In these academic papers, the tracking error is generally indicated as the expected one standard deviation of a portfolio value from a benchmark index value. This definition is usually used to calculate an actively managed portfolio's deviation from the benchmark (Gastineau, 2011, p. 155).

Tracking comparisons between ETFs were analyzed when ETFs had been in operation for little more than a year. The purpose of these early investigations was simply to see how closely the ETF's return did follow the benchmark indexes' return. Since the usage and knowledge of standard deviation were low fund analysts only published the return of the fund minus the return of the index. This difference between the returns was normally indicated as basis points since the index tracking was close and the difference was small (Gastineau, 2011, p. 155).

When using standard deviation as the measure of tracking error, the value is expressed as a positive number since the test is calculating the absolute size of the variation in the results from an investment. Although, the difference between the fund’s benchmark indexes performance and funds performance can be negative or positive. Today when using tracking error in connection to ETFs the measure is positive when the fund’s NAV performs better than the index and negative when the fund underperforms the benchmark index (Gastineau, 2011, p. 155-156).

Some have measured tracking error as the difference between the return of the index and the market value return of the ETF, but the most common way is to compare the NAV return of the ETF to the return of the index (Gastineau, 2011, p. 156).

2.6 Different types of ETFs

Equity ETF or so-called stock ETF is a fund that tracks a particular set of equities, and it has the largest AUM of the different ETF asset classes. These funds can track stocks in a specific industry or an entire index of equities. Investors may gain exposure to a basket of equities and limited company-specific risk related to single stocks and diversify their portfolios in a cost-efficient way. Great diversification comes from a broad range of equities and indexes to which investors has access (Tse, 2015).

Fixed-income or so-called bond ETFs were introduced in the United States in 2002. Bond ETFs trade in exchange, unlike individual bonds which are sold over the counter by bond brokers. The market for bonds is undesirable for investors since the structure of bonds makes it difficult to find them at an attractive price. Bond ETFs try to avoid this issue by trading in large stock exchanges. Bond ETFs tend also to be more liquid than traditional individual bonds and even in times of distress, investors can trade their bond ETFs even if the underlying bond market is not operating well. Bond ETFs and normal bonds offer a regular coupon payment. In normal bonds, the fixed payments happen in a regular schedule usually every six months. In bond ETFs, the coupon is paid every month since they include bonds that may be due for coupon payment (Mahdavan, et. al., 2018).

Bond ETFs are an attractive way to gain exposure to the bond market, but there are also limits. An investor’s investment is at a larger risk in an ETF than on a bond. There is no assurance that the principal will be paid at full price since the bond ETF do not mature. In addition, when interest rates rise it usually harms the ETF price and since the ETF does not mature it is difficult to reduce the interest rate risk (Abner, 2016, p. 243-254).

Commodity ETFs are investments that follow the performance of the underlying index of an asset or commodity. The first commodity ETFs traded different metals like gold and silver. Often, they are hard to access and they are an attractive option to stocks for further diversification in the portfolio. Commodity ETFs tend to be less transparent than stock or index ETFs since they do not often directly own the underlying asset, like oil, but use derivates instead. The underlying price of the commodity is tracked by derivates and it can carry more risk to the investor (Petrova, 2015).

Commodity ETF's numerous structures offer exposure to assets that have been difficult to access for many investors. ETFs provide broad or narrow exposure to a basket of commodities or single commodities. Some of the investment products are even attempting to manage actively based on various factors and strategic trading models (Abner, 2016, p. 275).

Commodity ETFs are usually separated into three different main categories of commodities which are agriculture, energy and metals. Within these three categories are many variations of ETFs providing various combinations of exposures. ETFs are using different techniques to provide exposure to commodities. The techniques include holding the physical commodity, futures tracking a single commodity, futures tracking a basket of commodities and equities with exposure to commodities in various forms (Abner, 2016, p. 276). Figure 5 down below presents the AUM of different asset classes.

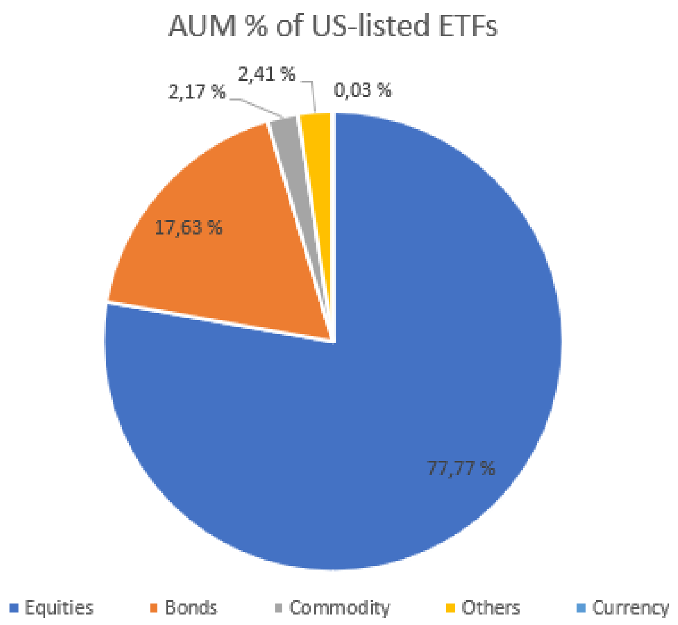

Figure 5. Total AUM of US-listed ETFs (ETF Database, 2021).

Figure 6. shows the total percentage of US-listed ETFs by asset class.

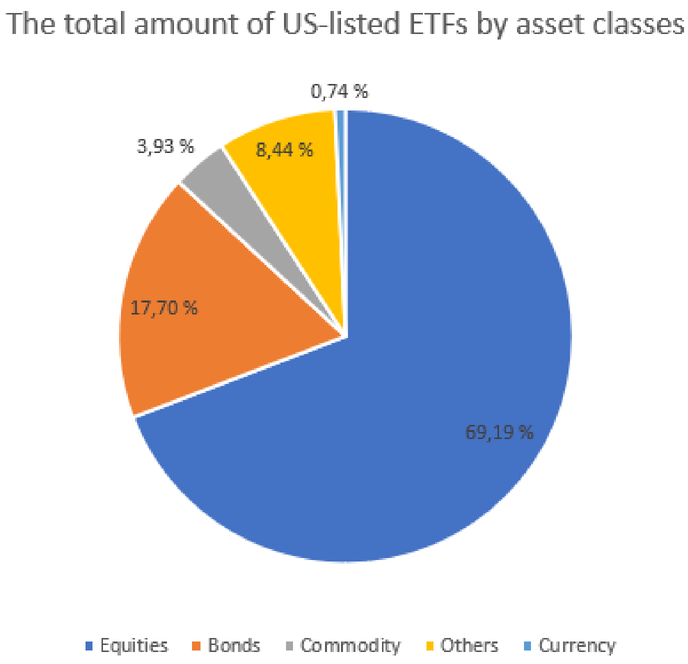

Figure 6. The total amount of US-listed ETFs by asset classes (ETF Database, 2021).

2.6.1 Leveraged and inverse ETFs

Regular ETFs function in a different way than leveraged ETFs do. Leveraged funds try to track daily returns instead of the value of the underlying index. These products use financial derivates such as future contracts and total return swaps and dept to gain greater returns of the underlying index. Leveraged ETFs can try to track the underlying index with ratios like 2:1 or even 3:1 when classic ETFs attempt to follow the underlying index hand to hand (Shum & Kang, 2013). Since the return can be twice or three times sizable as the return of an asset, investors must tolerate the higher risk. Therefore, these products are not suitable for every investor but only for those experienced in trading with these ETFs (Rompotis, 2014).

Leveraged ETFs can utilize option contracts to gain a boost to the exposure index. This option contract allows the investor to trade underlying security without the liability to sell or buy it. The fund costs consist of premium fees from option contracts and transaction and management payments to the issuer. Investors who want to benefit from short-term momentum, hedge their positions or speculate on the index are typically investing in these types of funds. These ETFs are seldom used as long-term investments since the risk is great and the fund's structure is expensive (Shum & Kang, 2013).

Rompotis (2014) states that the main risk to acknowledge in leveraged ETFs is market volatility. In general, these products are vulnerable to market volatility, and when equity markets have significant fluctuation, leveraged ETFs may not deliver their objective as expected returns of the fund. When investing environment is unstable and volatile, the longer investors hold the security, the further away can ETFs be apart from achieving their excepted returns.

Other risks are related to the variance in market prices and so-called counterparty risk. Leveraged ETF shares trade in the secondary market, therefore their market price will fluctuate when their NAV is changing, but they will also be influenced by the supply and demand. It is challenging to predict if the ETF is trading at a premium or a discount to its NAV. Counterparty risk may occur due to the usage of derivates, such as swap agreements to receive desired index exposure. Another party in this agreement makes payments based on the pre-agreed interest rate, which can be variable or fixed. The other side of the contract will make transactions based on the total return of the underlying index or asset. The risk relates to a possible financial loss if the ETF exposes to market difficulties and the counterparty cannot manage the obligations in the contract (Rompotis, 2014).

The inverse ETF strategy is to profit from a decrease in the value of the underlying index. It is like having many short positions. These ETFs also use derivates to bet against the market as if future contracts. If the market that the ETF is following falls, the value of the ETF would rise by the same percentage or more depending on the ratio that the fund has. This strategy is not a long-term investment since the derivative contracts are bought and sold daily by the fund manager. Furthermore, there is no guarantee that the ETF will correspond to the performance of the tracked index (Rompotis, 2014).

The inverse and leveraged ETF categories usually are combined since, like leveraged ETFs, inverse products use gearing to provide their expected returns. In a traditional inverse ETF, the gearing ratio will be -1, but with leveraged short ETF, the gearing could be -2 or even -3 times. The inverse ETFs have the same similarities as the leveraged ETFs in terms of rebalancing and compounding, but because of the low gearing in the products, those effects are composed. Primarily these funds hold swap contracts to achieve their objective like leveraged products. The funds will reset their holdings daily like leveraged products to obtain the daily return of the index. In theory, leveraged inverse products have no daily resets since the fund pays financing and management fees for hedging. Inverse ETFs produce an essential tool for investing in the form of long negative exposure (Abner, 2016, p. 273-274).

Inverse ETF investors do not have to have a margin account when holding a short position. The broker will lend the money to the margin account, and investors will borrow the securities that they do not own and then sell them to other market participants. After that, the idea is to purchase the ETF back at a decreased price and return the shares to the margin lender (Rompotis, 2014).

The leveraged inverse ETFs are trying to achieve the same objective as leveraged ETFs. When the market goes downwards, these funds try to use derivates to gain returns from the declining market (Trainor & Gregory, 2016).

2.6.2 Currency ETFs

Currency ETFs are pooled investments that provide investors with exposure to currencies or foreign exchange. These products allow investors to obtain exposure to variations in exchange rates in one or more currency pairs. Just like all other ETFs, currency ETFs can be bought on exchanges. These funds are commonly passively managed when underlying currencies are held in a basket of currencies or a single country. Purchasing currency ETFs offers investors an easy and cheap way to gain exposure to different currencies. They offer investors a structured investment exposure to the foreign exchange market with a managed currency portfolio (Padungsaksawasdi & Parhizgari, 2017).

A few of the simplest funds are assured by foreign currency bank deposits whereas others can be more complex. Particularly, currency trading is a speculative trade on spot exchange rates. Perhaps the most fundamental aspect to invest in currencies is the exposure to spot exchange rates. These ETFs fall and rise based on their positioning and exposure to either basket of currencies or a counter currency (Padungsaksawasdi & Parhizgari, 2017).

The fund managers can achieve the objective of their products using several different methods. Currency ETFs may hold short-term debt noticed in a currency, forex derivate contracts and currency or cash deposits. Before, these markets were only approachable to professional traders, but now the ETFs have opened the market for many investors, especially after the Great Recession (Padungsaksawasdi & Parhizgari, 2017).

Government Treasuries and currencies are somewhat related options as investments for investors who may look for safety. Typically, currencies may have little higher relative risk to other safe havens due to their trading mechanisms and volatility. Values of currencies are often driven by economic conditions, interest rates and government policies and, investors may use them for hedging, speculation, and safety (Padungsaksawasdi & Parhizgari, 2017).

2.7 Synthetic ETFs

Regular ETFs try to replicate an index physically while synthetic funds are trying to follow the underlying index with various derivates such as swap contracts. Reduced costs are the main objective for synthetic ETFs, and the costs decrease with the structure of the ETF. For the creation of the synthetic ETF, the provider of the funds does an agreement with the counterparty, which is often a bank. The counterparty will take care that the swap contract will return the value of the corresponding benchmark the fund is following. This agreement will provide profits if the counterparty can honour the contract which has been made by both entities. This agreement leads investors to counterparty risk. These products function the same way as regular ETFs and can be sold and bought as shares from the exchange (Naumenko & Chystiakova, 2015).

Synthetic ETFs efficiently track their underlying benchmark index and often has lower tracking errors than physical ETFs. Usually, physical ETFs have higher management fees and transaction costs than synthetic funds because of the portfolio rebalancing and tracking errors between the ETF and the underlying benchmark. Synthetic ETFs are advantageous to investors who want to gain exposure in markets that are otherwise difficult to reach. Investors may buy these funds if they are difficult to attain or the underlying asset is expensive to purchase, sell or hold (Naumenko & Chystiakova, 2015).

A total return swap is one way to create a synthetic ETF. The creation process starts when the authorized participant receives creation units from the synthetic ETF sponsor in trade for money. In the traditional ETF creation process, the transaction would include a portfolio of index securities. ETF sponsor enters a swap contract with the counterparty to receive returns according to the benchmark index. After that, the money is transferred to the counterparty and, the fund sponsor is receiving a basket of collateral assets in return. The counterparty is receiving the return of the collateral basket on the second side of the swap contract (Naumenko & Chystiakova, 2015). Figure 7 is showing the creation process.

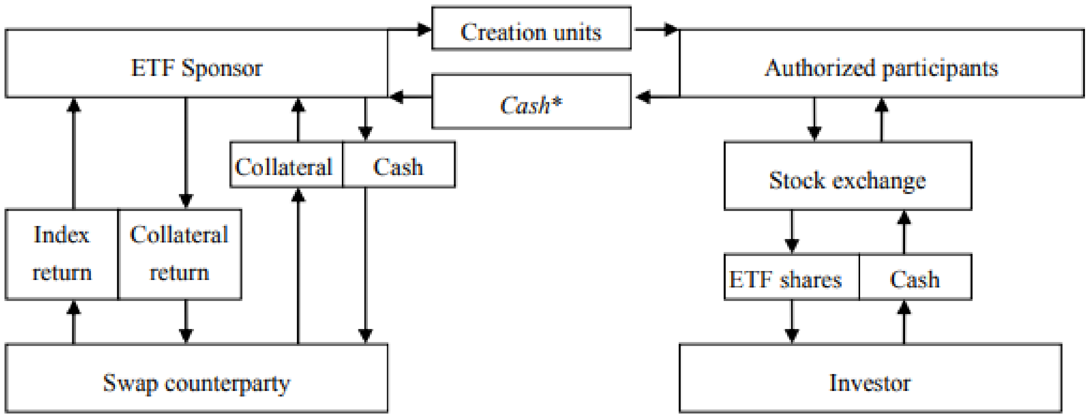

Figure 7. The creation of the synthetic ETF (Naumenko & Chystiakova, 2015).

2.8 Passive ETFs

When constructing a portfolio, the first step is to find out if the fund manages the assets in the fund passively or actively. The subject of passive investing is usually referring to traditional index funds. This investment approach is tempting since it is minimizing trading expenses and deletes most of the management fees while earning the return of the underlying index that the fund is following. The popularity of these index funds has increased geometrically (Peterson, 2012, p. 187).

Passive ETFs are a portfolio of securities pooled together to replicate the returns of a specific benchmark index. Similar to other passive investment products, these funds also have a relatively cost-efficient structure. Passive ETFs can include a wide range of securities like equities, fixed income, commodities, real estate, currencies and notable indexes (Pace, et. al., 2016).

The passive structure allows fund providers to charge investors less without having to mind the cost of employee salaries, research and brokerage fees. The passive strategy also benefits from lower turnover. Since the assets move in and out of the ETF at a slower speed, it concludes to lesser realized capital gains and transaction costs (Pace, et. al., 2016).

Passive investing tends to be an effective and simple portfolio management method, yet the strategy is challenging to maintain because of the self-discipline in the strategy and belief in it in the long term. In this investment style, the idea is to hold ETFs that mainly follow the low-cost benchmark indexes. These products are designed for investors with long-term objectives and therefore the investments are held for a long time. Investors' objectives are not to time the market by predicting charting prices or economical changes. They do not try to switch between various market sectors investing strategies to create returns above the market. The trading in the portfolio is only happening, when asset classes are rebalanced or when money is withdrawn or added to the fund (Ferri, 2009, p. 277).

The objective of passive investing is to produce the market returns of the underlying index. Successful passive investors understand that the natural returns from the bond markets and the global stocks are desirable. Furthermore, these investors acknowledge that it is challenging to outperform the market, and only a few investors can achieve it (Ferri, 2009, p. 277).

The method is straightforward. An investor chooses the desirable asset classes for the portfolio and tries to achieve the long-term target by selecting a low-cost ETF to represent the chosen asset classes. A buy, hold and rebalance strategy is obvious, creating a diversified portfolio that tracks the benchmark indexes and holds the fund for a long period. It includes trading annually to rebalance the portfolio back to the desired asset allocation (Ferri, 2009, p. 277). Figure 8 shows the market cap of passive and active ETFs in the whole market.

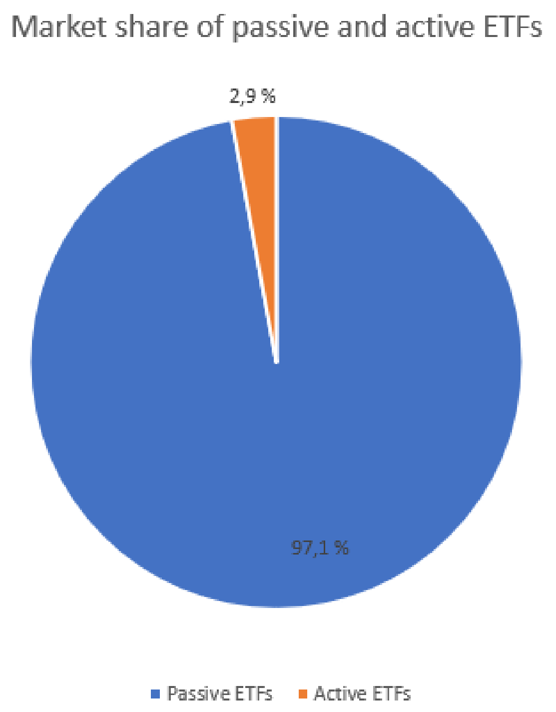

Figure 8. Market share of passive and active ETFs (Brown Brothers Harriman, 2021).

Passive ETFs tend to be exposed to total market risk since when the overall stock market or bond prices fall, so do also the funds track the index. Another down sight is the lack of flexibility in the funds. Fund providers cannot make changes to portfolios or adapt defensive strategies, such as reducing positions when a theoretical sell-off occurs. The hands-off approach can be harmful to the fund, particularly in a bear market. An active fund can rotate between market sectors to protect investors from large volatilities. A passive fund seldom adapts to changing market conditions which leads to negative returns (Peterson, 2012).

One other notable complexity with the passive ETFs is that several of the indexes the funds track are capitalization weighted. That means, the larger the stock's market capitalization, the larger its weight in a portfolio. This approach reduces funds diversification and leaves passive ETFs weighted toward large stocks in the market (Peterson, 2012).

2.9 Active ETFs

The active portfolio management style is a strategy where the fund manager tries to outperform the index and make more profits than the index itself. The higher profits are hypothetically generated from fund managers who have better information or skills about the market compared to the other market participators. Investors who want to bet against the index are employing active managers to generate risk-adjusted returns, which are higher than the index returns. This method makes investors pay commissions to active managers for their services (Peterson, 2012, p. 187).

The risk-adjusted returns refer to alpha, and they are earnings to stock selection, more extensive information about the market, skill, different models, and other events. These components are uncorrelated with the index return and consequently with the beta. Active portfolio management is like shorting the benchmark index and going long with the active portfolio (Peterson, 2012, p. 187).

In 2008 the Securities and Exchange Commission approved the first actively managed ETF. Active ETFs have gained attention in the fund management area since their introduction to the industry. Investors' interest in the funds has recently increased, and both assets in the funds and numbers of active ETFs have risen remarkably. At the end of the year 2012, there was $10 billion AUM in active ETFs, and the total number of funds was 45. In 2016 the number of active ETFs had increased to 148 with $28.8 billion AUM. The total amount of investment products has doubled from 2013 to 2014, the growth has been significant (Sherrill & Upton, 2018). There are 582 Active ETFs listed in the US, and they have $195.01 billion AUM in 2021.

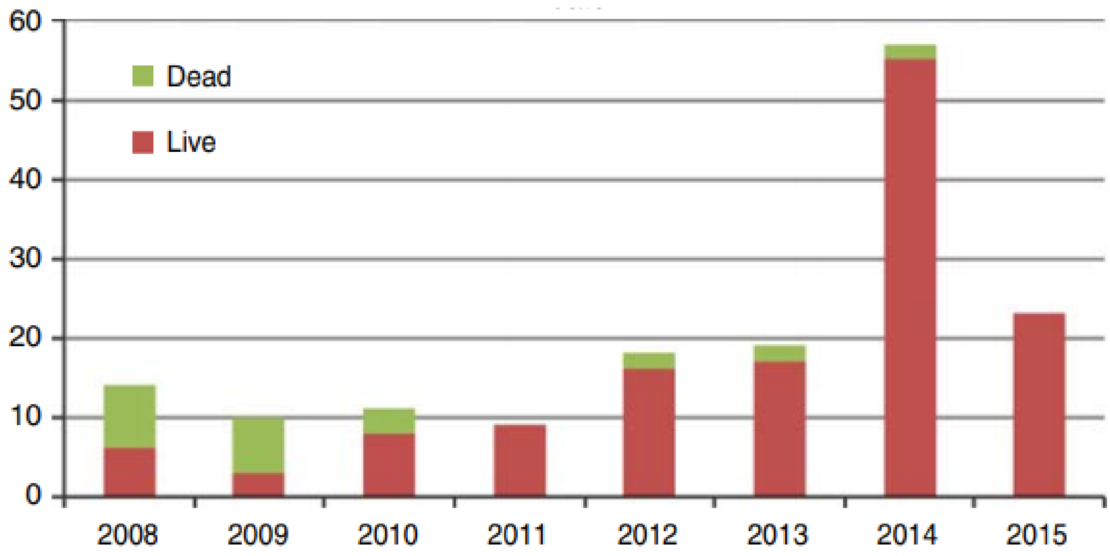

Figure 9. The number of actively managed ETFs by inception year from 2008 to 2015 (Sherrill & Upton, 2018).

However, the total AUM of active ETFs is low compared to the whole ETF and actively managed mutual fund markets, but still, they have had stable growth and gained constant AUM. Actively managed ETFs AUM passed exchange-traded notes AUM, which was $21.5 billion in December 2015 (Sherrill & Upton, 2018).

Actively managed ETF's purpose is to outperform the market when passive ETFs try to follow the specific underlying index. Even though active products are often assigned with a benchmark index, they are structured to follow fund managers' top picks of securities, try to accomplish a particular investment strategy or mirror existing mutual funds to generate above-average market returns for the investors (Rompotis, 2013).

There is a difference between passive and active ETFs concerning the minimum investment size, which is required in active ETF investing, but not in passive ETF investing. Some other characteristics are the number of market makers required by each type of investment fund and the connection between the fund manager of the ETF and the market maker. They are not connected in passive products but in active products, they, have a relationship since the manager of the ETF and the market maker are in the same company (Rompotis, 2013).

Active ETFs should bring above-market returns in theory, but it is not sure that they will underperform or outperform rival passive ETFs. Traditional ETFs tend to follow the index faithfully, which makes it easier for investors to forecast the future. The investor knows the risk profile and the holdings, which helps keep track of the portfolio (Rompotis, 2013).

Active ETFs fund managers have the liberty to trade outside of a benchmark index, which makes it more difficult for investors to foresee the future development of the portfolio. This strategy may work when the market conditions expect heavy volatility. The fund manager can allocate underperforming positions to more profitable asset classes or sectors (Rompotis, 2013).

Active ETFs have many same characteristics as traditional ETFs, and they tend to come at a premium. Many active funds have higher expense ratios than passive ETFs, and that pressures fund managers to outperform the market. Actively managed ETFs may not follow the basic investment principles like diversification. A typical fund manager changes allocations according to market conditions, which means the fund may be less diversified than a passive ETF (Rompotis, 2013).

3 Literature review

Active versus passive investing has typically been a debatable subject in academic articles and studies. This chapter is discussing studies and findings around these topics concerning performances and pricing, and the focus is on ETFs and mutual funds. In its entirety, the ETF market has grown rapidly but active ETFs are still not as common in the market as other products. After their appearance in 2008, they are experiencing significant growth despite investors having shifted more to passive investment products from active strategies.

3.1 Previous studies

Cremers & Petajisto (2009) paper introduces a new measure for active portfolio management. Active Share represents the share of portfolio possessions that vary from the benchmark index possessions. They find that this method can empirically determine various active management methods like concentrated stock picks, factor bets, pure indexing, closet indexing, and diversified stock picks. They argue that small funds are more active and a significant portion of the largest funds are closet indexers. This method significantly predicts fund performance relative to the benchmark, and funds with the largest Active Share are outperforming their benchmarks after and before expenses.

ETFs can have pricing errors in the market and therefore, they can be traded at a premium. Petajisto (2017) find that instead of comparing ETF prices with NAVs they can be measured relative to current market prices of a peer group of similar portfolios to detect mispricing in ETFs. This function eliminates the issue of stale NAVs.

Elton, et. al (2019) paper studies the performance of passive mutual funds and ETFs. They find that passive ETFs return pre-expenses slightly outperform their underlying index, while mutual funds slightly underperform. The second section examines the factors that explain the differences in the performance of ETFs and index funds relative to the underlying indexes. Cross-sectionally, the main factors impacting pre-expense return for mutual funds are the number of passive funds in the same category, turnover and the return from the security lending. The major determinant is the type of index followed by the index fund when calculating the standard deviation of return differences. The largest deviations are with foreign stock indexes and emerging market indexes. For ETFs, the major factors for the different returns across the funds following the same benchmark are security lending and the number of similar funds. For the standard deviation of return differences, they get the same results as earlier. Moreover, the results in cross-sectional returns post expenses are the same.

Finally, they examine the performance between the lowest cost ETF and the lowest cost index fund. In a strategy where investors select either the ETF or index fund each period, the institutional investor would gain 5 basis points higher returns when choosing the ETF while the returns would be the same for retail investors.

3.2 Active ETF research

Beck, et. al. (2017) find in their paper regarding active ETFs performances that Jensen's alpha in 50% of the funds included in the data underperformed their passive benchmark indexes. On the other hand, active fixed-income ETFs tend to present remarkable managerial performance and value within Sharpe ratios and Jensen's alpha. According to this research paper active ETFs, other than fixed-income ETFs, are not relevant as stand-alone investments.

Rompotis (2011) had an early study concerning active ETFs performances. The paper investigates equity ETFs because active ETF management was such a new product. The study period was relatively short, from April 2008 to June 2010 and it was followed by Rompotis (2013), who updates the sample period to December 2011. This study uses an assigned benchmark while the earlier study uses S&P 500 index. Each research investigates ETF performance with the Fama-French three-factor model, Jensen's alpha, and

Teynor and Sharpe ratios. The study finds that the passive counterparts perform better in the market than the active equity ETFs.

Dolvin (2014) includes both equity and debt active ETFs in the literature. The examination period is between January 2010 and December 2012. Dolvin finds that the active funds are more volatile than their passive counterparts and the active funds do not add a complete return advantage. The study finds that active ETFs do not tend to be great substitutes for passively managed funds, but high-volume active ETFs can outperform passive counterparts when measured by Treynor or information ratios.

Meziani (2015) examines active ETF's performance in different asset classes. There are 124 active ETFs under consideration including equity, fixed income, multi-asset, currency, commodities, and real estate. The author capitalizes on Jensen’s alpha, and Treynor, Sortino and Sharpe ratios and deduces that active fixed-income ETFs are capable to bring value to investment by boosting profits while reducing volatility.

Schizas (2014) and Garyn-Tal (2013) studies vary from the risk-adjusted performance approach that other studies above use. Garyn-Tal (2013) uses active ETFs in an investment strategy that makes positive risk-adjusted abnormal returns. This strategy is based on the Fama-French-Carhart four-factor model from where R^2 has been extracted. On the other hand, Schizas (2014) analyzes active ETFs with optional investment products such as mutual funds, passive ETFs, and hedge funds. The researcher states that active ETFs fail to time the market and active ETFs are not as active as the market participants excepted. On the positive side, active funds do outperform mutual funds relative to the average returns.

Rompotis (2020) follows earlier research with a study that employs a data sample of 37 pairs of passive and active ETFs, which are investing in common equity stocks. The paper includes several return metrics such as risk-adjusted returns and buy-and-hold returns. Cross-sectional regression analysis is included, which tries to identify the factors that might affect the performance of the ETFs. Moreover, the fund manager's ability to time the market is inspected.

Rompotis (2020) paper’s findings are in line with previous studies on actively versus passively managed ETFs. On most occasions, active ETFs cannot deliver better performance than their passive counterparts and they fail to overcome their benchmark indexes. Furthermore, most active ETFs are more volatile than passive counterparts in terms of total risk but on the other hand, active portfolios are less risky relative to passive ones when systematic risk is considered. In some cases, active ETFs are performing better than their passive peers and they are being less volatile. Investing in active ETFs is not a lost cause beforehand.

The multifactor performance regression analysis in Rompotis (2020) paper verifies that both fund types cannot generate any above-market returns and that active ETFs are less aggressive than their passive peers in terms of systematic risk. Additionally, the relation of performance of the active and passive fund groups with size elements is positive. Trading features and their possible impact on active and passive ETF performances are calculated with cross-sectional regression analysis and it provides a strong indication that performance is negatively related to volume and expenses but positively to the fund sizes. Results also ensure that fund managers are not able to time the market or market volatility. These findings are not surprising concerning passive ETFs but for active ETFs they are.

However, the findings are somewhat shattered in the earlier research. Some findings suggest that active ETFs can deliver higher risk-adjusted measures in the market but most of them do not. Active ETFs meaning is to find out new and superior investments from the market to outperform it, but earlier research is mainly against it. Likewise, studies find that active ETFs are not as active as they are thought to be and they are not relevant as stand-alone investments. In its entirety, passive ETFs tend to outperform active ETFs.

4 Market efficiency & portfolio theory

This chapter expresses the main concepts of market efficiency and portfolio theory. It is followed by different risk-adjusted performance measures and an overview of the capital asset pricing model.

4.1 Market efficiency

Efficiency as a term is central in finance. Commonly, this term is used to define markets where useful information is influencing the prices of financial assets. Some economists use the term operational efficiency, emphasizing the way resources are used to facilitate the functioning of the market. If capital markets are sufficiently competitive, investors should not be expected to achieve abnormal returns from their investment strategies (Dimson & Mussavian, 1998).

Furthermore, it has been emphasized that investors are not able to receive abnormal returns without experiencing a high degree of risk. Thus, it is clear that if traders want to obtain high profits, they have to acknowledge the high degree of challenge. Another aspect regarding the concept of market efficiency is that it is not adequate to observe previous information for future stock price prediction. However, the disclosures delivered by traders may impact the stock prices on a particular day. Nonetheless, several anomalies have occurred in the market even with the majority trust in the high efficiency of the stock market (Dimson & Mussavian, 1998).

Efficient markets are described to be as a market where many investors are trying to gain abnormal returns by predicting future values of investment products with information available to every participant. This implies that all the necessary information considering the securities is enough to reflect the security prices (Villalta, 2012, p. 53-62).

In a market of commodities, supply and demand establish the market price of the commodity. If the quantity demanded increases the price will fall and when the quantity supplied increases the price will rise. See figure 10. The fair market values are developed from the amount demanded at a specific price corresponding to the amount supplied at the same price. This theory has already been accepted in the commodity market and it became a tool for economists to characterize and understand the market of securities (Villalta, 2012, p. 53-62).

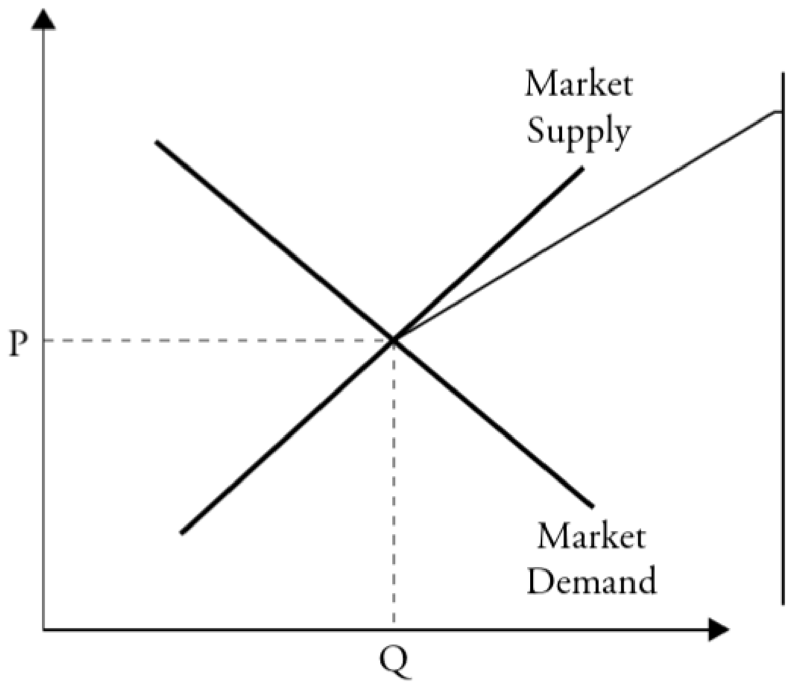

Figure 10. Market supply and demand (Villalta, 2012).

The theory of an efficient market is constructed in three several aspects. First, the market participants are considered to be rational individuals or entities that can make self-interested decisions. Secondly, if investors are not rational their errors are corrected by some who have an opposite view. It means that irrational behaviour is not correlated with other irrational behaviour. Finally, if correlated mistakes occur between investors the arbitrageurs will exploit the situation and make profits from the irrational behaviour. These participants will then move the security prices to the right level (Villalta, 2012, p. 53-62).

4.1.1 Efficient market hypothesis

According to Fama (1970), there are three different forms of market efficiency, and they are weak form, semi-strong form and strong form. The weak form of market efficiency suggests that the past price movements are not useful for predicting security's future values. When all information about the stocks is available, meaningful information about the stocks is already included in the prices and any important information from the past is already included in the current security prices. Hence, price transitions in the future can only be occurring if new information has become available in the market. In weak form, investing strategies like different techniques of technical analysis or momentum strategies are stated to be useless in investing decisions, since they are not expected to offer value to the investors. In this form market participants who are using fundamental analysis may gain excess returns from the market.

Economists have used different empirical tests in various countries to find out if the weak form is efficient or inefficient. Empirical studies have been done by runs tests, auto-correlation function tests and serial correlation coefficients tests. Many studies have revealed inefficiency in the market, but some earlier studies have found that markets have been efficient (Mustafa & Ahmed, 2020, p. 274-276).

In the semi-strong form of market efficiency, it is assumed that securities absorb quickly new public information introduced to the market, and investors can not generate abnormal returns by trading on that new information. Therefore, neither fundamental analysis nor technical analysis would be relevant strategies to gain excess returns from the market since any information received with fundamental analysis will already be accessible and therefore incorporated into current security prices. Only investors who have private information can gain an advantage in trading and only if they have the information before the rest of the market (Fama, 1970).

In the strong form, security prices reflect all the available private and public information and market participants can not take advantage of any type of information. Commonly, it is considered that semi-strong form and weak form hold but the strong form does not hold. Private and insider information will usually produce an arbitrary situation to investors profit wisely and this is viewed as illegal in our market (Fama, 1970).

4.2 Portfolio theory

Investors' first decision in investing is to find out the risk she or he is willing to take or handle. A common attitude is that investors want to obtain the highest return from the security with the lowest amount of possible risk in the security. Nonetheless, there commonly tends to be more risk involved with investment opportunities where the profits are larger. Because of this, the important matter for a portfolio manager is to determine how much risk the investor is willing to take. This is not typically easy to resolve since market participants have different attitudes towards risk. It can be hard to define and measure the concept of risk. However, portfolio managers have to think about what portfolios they are offering to their clients (Brentani, 2003).

When discussing fund or portfolio management the concept of risk is frequently included. When a portfolio is constructed, it will have certain risk constraints specified in the fund to cater for a particular type of investors who have a particular level of risk tolerance. Therefore, it is important to discuss the basic theories which determine the risk of an investment and attempt to explain the way how investments are priced in the market (Francis & Kim, 2013).

Risk versus return is the basic reason why market participants are investing in portfolios. The main idea in portfolio management is to construct an optimal portfolio, which is founded on the best risk-return opportunities when specific constraints are considered. To be able to make the decision, it must be possible to evaluate the degree of risk on particular occasions. The most popular approach is to use the standard deviation of the expected returns. This mechanism calculates spreads, and the possible returns of these spreads provide the measure of risk. The existence of risk means that there are different possible outcomes. It is expected that an investment produces diverse returns depending on the prevailing environment (Brentani, 2003). The formula for expected return is illustrated down below:

$$R_P = R_1P_1 + R_2P_2 \ldots R_nP_n, \tag{3}$$

where,

R = Return expectations in given scenario

P = Probability of the return being achieved in the scenario

n = Scenario number

The standard deviation is a measure of risk. It measures the dispersion of a dataset relative to its mean. It is calculated as the square root of variance by determining each data point's aberrance concerning the mean. There is a higher deviation in the data if the data points are further away from the mean. Therefore, the standard deviation is higher when the data is more spread out (Brentani, 2003).

The measurement reveals security's historical volatility when applied to the annual rate of return. When the standard deviation of securities is large, the variance between each price and the mean is also large which conclude to larger price ranges. For instance, stable security has a low standard deviation, while volatile security has a high standard deviation (Brentani, 2003). The formula is shown as:

$$Standard\ deviation = \sqrt{\frac{\sum_{i=1}^{n}(x_i - x)^2}{n-1}}, \tag{4}$$

where,

x_i = Value of the x-variable in the data

x = The mean value of the data

n = The number of the data points

A key point in portfolio theory is diversification. Most of the available securities are either high risk and high reward or low risk and low return. It is argued that investors could obtain the best returns with an optimal mixture of both risks based on their risk tolerance (Francis & Kim, 2013).

The theory suggests that an investment's return and risk characteristics should not be observed alone but rather be considered on how it influences the overall risk and return of the portfolio. That means that an investor could construct a portfolio of numerous securities which would result in greater earnings without greater risk. When the market participant has decided its risk level, it can build a portfolio with the lowest possible risk that can produce that return. Based on correlation and variance, the performance of a single stock is less important in portfolios profitability (Francis & Kim, 2013).

Portfolio theory is an effective tool for investors to create a diversified portfolio. The wide range of ETFs nowadays has made the theory more relevant by giving investors easier access to diverse assets. Stock investors can reduce risk by allocating a part of their portfolios to bond ETFs which will lower the variance of the portfolio because bonds have a negative correlation with stocks. In addition, this theory can be used to reduce the volatility of a treasury portfolio by investing in ETFs or small-cap value index funds. Even if small-cap value stocks obtain more risk than treasuries, they often perform well in a high inflation environment when bonds do not. This leads to lower portfolio volatility than it would be with only government bonds and the expected returns would be higher (Francis & Kim, 2013).

The most common criticism against portfolio theory is that it evaluates portfolios with variance and not with downside risk. Downside risk estimates a security's potential value loss if the market conditions anticipate a decline in that specific security's price. When two portfolios have the same variance levels, they are considered equally desirable in portfolio theory. The other portfolio could have that variance because of continual small losses. Another portfolio could have the same variance when experiencing rare but dramatic declines. Frequent small losses would be easier to tolerate, and investors would prefer that (Stewart, et. al., 2019).

The efficient frontier is argued to be the cornerstone of portfolio theory. It expresses a line that indicates the right combination of securities that will produce the highest profits with the lowest level of risk. When a portfolio is in the right corner of the efficient frontier, it has a sizable risk compared to its predicted profits. Therefore, when the portfolio falls below the slope of the efficient frontier, it provides lower profits relative to risk (Stewart, et. al., 2019).

4.2.1 Diversification

Many considerable aspects cause risks and variability in individual investments profits. Some of the most important factors that could influence the risk of security are exchange rates, tax rates, inflation, default risk, the state of the economy and liquidity risk which indicates the risk of not being able to sell the security. Moreover, the investor will estimate the risk of a specific investment through the other types of investments that may be in the portfolio such as life insurance, pension funds or properties (Brentani, 2003).

Investors may use a method called diversification to control the risk of their portfolio. In diversification, portfolios are including a wide variety of different asset classes to minimize the risk of any particular security. This theory is based on an old saying: do not put all your eggs in one basket. When an investor owns stocks from only one company the price of the stock will waver depending on the performance of that company. If that company goes bankrupt, there is an opportunity for an investor to lose all invested capital. In case the investor owns many stocks from several companies in different sectors the probability of all of them going bankrupt is greatly reduced. The same principle affects other aspects of risk as well not only bankruptcy risk (Brentani, 2003).

The objective is to form a portfolio from investments or securities to reduce the level of risk to such a point that it does not reduce the level of portfolio return. Covariance and correlation are used in this type of situation to measure the success of a diversified portfolio. Covariance illustrates how returns of two risky assets move in parallel. This statistical measure can be applied when analyzing how single stock price movements affect the other securities in the portfolio. A negative covariance indicates that securities returns move in inverse directions, whilst positive covariance indicates that they move together (Francis & Kim, 2013). The formula for covariance is presented as:

$$COV_{(x,y)} = \frac{\sum_{i=1}^{n}(x_i - x)(y_j - y)}{n-1}, \quad (5)$$

where,

x_i = Value of the x-variable of the data

y_j = Value of the y-variable in the data

x = The mean of the x-variable

y = The mean of the x-variable

n = The number of the data points

Covariances cannot be compared with each other since covariance is an absolute measure. The correlation coefficient is used for obtaining a relative measure (Brentani, 2003). The formula for it is down below:

$$r_{(x,y)} = \frac{COV_{(x,y)}}{\sigma_x \sigma_y}, \quad (6)$$

where,

$r_{(x,y)}$ = Correlation of the variables x and y

$COV_{(x,y)}$ = Covariance of the variables x and y

σ_x = Standard deviation of variable x

σ_y = Standard deviation of variable y

If two securities are perfectly correlated, they move up and down together and the correlation coefficient is +1. When the correlation coefficient is +1 the diversification effect would not occur. A perfect negative correlation occurs when the correlation coefficient is -1. This means that when another security's price moves up another one moves down. Bringing together these securities in a portfolio would rise the diversification effect. When the correlation coefficient is 0 securities will motion independently from each other. It is called the uncorrelated correlation coefficient and that means if one security goes up, the other may not move at all or it may go down. Therefore, this combination of securities in a portfolio may or may not generate a diversification effect. Although, it is still more desirable to be in this situation than have a perfect positive correlation in a portfolio (Brentani, 2003).

As specified earlier, diversification decreases the risk of the portfolio. The more assets and securities a portfolio holds the more the risk diminishes. Although, even extensive diversification cannot eliminate all risks from the investment. The risk that remains is named market risk and it is caused by general influences in the market. This risk is also called non-diversifiable risk or systematic risk. Individual assets risk is known as unique risk, unsystematic risk or diversifiable risk and it can be suppressed by diversification (Stewart, et. al., 2019).

Portfolio's total risk consists of systematic and unsystematic risks. Described in more detail systematic risk expresses security's potential variability in the returns caused by generic market factors, such as tax rates, state of the economy, inflation rate movements and interest rate changes. Unsystematic risk is related to factors concerning a specific company. The variability in the returns of a security or an asset depends on how well the company operates in the market environment. When the number of assets increases in the portfolio, the total risk might go down as a result of the decrease in the unsystematic risk (Stewart, et. al., 2019).

4.3 The capital asset pricing model

The CAPM is a model that characterizes the relationship between systematic risk and expected return for assets, especially shares of a company. CAPM is used widely in finance for pricing securities and to achieve excepted returns for assets providing the risk to those assets and the cost of the capital (Sharpe, 1964).

CAPM was developed by academic finance theorists in the early 1960s. Although, its weaknesses, the model may be the most popular tool for measuring and quantifying risk for equities in the industry of investments in the USA and academic circles. Because of the simplicity of its predictions the model receives the attention of investors. Anyhow, according to critics of CAPM, simplicity is attained without a realistic view of the financial markets (Brentani, 2003).

To derivate the model it needs certain simplifications and assumptions about investors and financial markets. These assumptions are listed as: Investors maximize utility, and they are risk-averse, investors select investments and portfolios based on their expected variance and mean of potential returns, all investors have the same single-period time horizon, unrestricted lending and borrowing at a risk-free rate, investors have similar expectations of asset's returns regarding variances, means and covariances and there are no transaction costs and no taxes included (Severini, 2017, p. 194-215). The conclusion of the CAPM is known as the security market line and the formula for CAPM is down below:

$$r_p = r_f + \beta(r_m - r_f), \tag{7}$$

where,

r_p = The expected return of the investment

r_f = Return of a risk-free asset

r_m = The expected return of the market

β = Beta reveals the sensitivity of the asset to the market

$r_m - r_f$ = The market risk premium

The CAPM creates the structure to resolve the relationship between expected returns and risk for particular investments as well as for portfolios. The security market line expresses that the expected return of an investment is the sum of the market risk premium and the risk-free profit adapted for the comparable volatility of the investment (Severini, 2017, p. 194-215).

One of the prognoses of the CAPM is that in equilibrium all portfolios and assets are located on the security market line. When an investment is generating a higher return than it is required for its level of risk the investment is located above the security market line and it would be acceptable for the investor. On the other hand, when an investment is under the security market line, the investor would reject it since its profit is low and it is undervalued (Severini, 2017, p. 194-215).

According to Brentani (2003) for the CAPM the beta coefficient is a key factor, and it can be written as:

$$\beta_p = \frac{COV_{(r_p, r_m)}}{VAR_{(r_m)}}, \tag{8}$$

where,

$COV(r_p, r_m)$ = The covariance of the return on specific portfolio with the return of the market

$VAR(r_m)$ = Market returns variance

The beta coefficient is a factor that can measure the volatility of a security compared to the systematic risk of the whole market. Beta expresses the slope of the line through a regression of data points. The data points show an individual security’s returns compared to the entire market (Brentani, 2003).

The beta coefficient describes effectively how the return of an investment responds to the markets changing environment. The measure helps investors understand if the security is moving along with the rest of the market or not. Beta also provides information about security's volatility and risk levels compared to the rest of the market. For useful insight, the market that is used as a benchmark should be related to security. For instance, using bond ETF's beta would not gain much helpful information to an investor if the benchmark index would be S&P 500 (Brentani, 2003).

The main aspect of using beta is to find how much risk an individual stock is adding to a portfolio. If a stock variates little from the market, it does not add a great number of risks to the portfolio, while it does not increase the chance to gain potential greater returns either (Pratt, et. al., 2014, p. 189-300).

In a situation where security has a beta of 1 that indicates a strong correlation with the market. Security has systematic risk when its beta is 1. Nonetheless, the calculation can not identify any unsystematic risk. When security with a beta of 1 is added to a portfolio the risk does not increase, however it does not increase the possibility for excess returns either (Pratt, et. al., 2014, p. 189-300).

If the beta value is less than 1 the security is theoretically less variable, than the market. The portfolio will be less risky if this security is included than if it's not. For example, if the beta is 0.5 the security's return will move half as much as the market and it will be less risky than investing in the market. In addition, utility stocks usually have low betas since they tend to move more slowly than the rest of the market (Pratt, et. al., 2014, p. 189-300).

When a stock's beta is over 1 its price is theoretically more volatile than the rest of the market. For instance, if a stock's beta is 1.3, it should be 30% more volatile than the market is. Small-cap stocks and technology stocks are in the habit of having higher betas than the market benchmark. Therefore, by adding this type of stock to the portfolio the risk will rise but the potential expected return may also increase (Pratt, et. al., 2014, p. 189-300).

In some cases, securities may have negative betas. A beta of -1 implies that the security is inversely correlated to the market. The security can be seen as a mirror image of the market benchmark. For example, inverse ETFs and put options are constructed to have negative betas. Some industry groups commonly have negative betas, like gold miners (Pratt, et. al., 2014, p. 189-300).

Investors can gain some useful information from beta when evaluating a stock, but it does have some limitations. The usefulness come in handy when determining a stock's short-term risk and using CAPM to analyze volatility to receive the right equity costs. The measure becomes less meaningful for market participants looking to predict future security prices since beta is calculated with historical data (Pratt, et. al., 2014, p. 189-300).

On some occasions, CAPM can be used to build portfolios where the portfolio administrator has decided the risk level that the client is willing to take. An investor searching for a high profit would take more risk and therefore, the portfolio would be constructed using a higher beta coefficient. For instance, a new pension fund with a long-term horizon may utilize a strategy that invests in a portfolio with a greater beta than 1. This type of portfolio could produce higher returns than the normal market but similarly, have a higher risk level. A mature pension fund is more likely to invest in a safer portfolio and presumably prefers a portfolio with a lower beta than 1 (Brentani, 2003).

4.4 Measures of return

After portfolio establishment, the fund's performance is important to monitor. For portfolios performance measurement the achieved returns need to be calculated in the evaluation period. In the evaluation period, the performances can be calculated weekly, monthly, quarterly, or annually. There are many methods for calculating returns, and each one presents a different result. Those interested in calculating performances use standard and consistent techniques to present investment returns (Brentani, 2003).

For a performance evaluation, it is suitable to compare the performance of a fund against a reasonable benchmark which is usually a relevant index. That presents how the returns were achieved and with what risk. The results enable the investor to see that the agreed investment strategy has been followed and to evaluate the fund manager's skills in the investment process (Brentani, 2003).

Trustees of pension funds and unit trusts, managers of fund management departments, board of directors of investment trust companies and clients are some groups that are interested in the fund manager and analysts' capabilities to gain returns from their portfolio management. While in theory calculating returns may be simple, in practice it is more complex. Some methods used for calculating returns are money return, time-weighted return, and money-weighted return (Bacon, 2008).

The total return is the first element to calculate when evaluating the performance of a fund. First, the number of shares held in the portfolio is multiplied by the value of each share in the fund at the beginning of the evaluation period. This result indicates the market value of the portfolio at the beginning of the time period. This same method is used with market prices and holdings at the end of the evaluation period to calculate the portfolio value (Bacon, 2008). The total return is calculated as follows:

$$Total\ return\ r = \frac{V_{end} - V_{beginning}}{V_{beginning}}, \tag{9}$$

where,

$V_{beginning}$ = Market value in the beginning

V_{end} = Market value in the end of the period

In money-weighted return, the cash flows are discounted for each sub-period at an interest rate or in other words the internal rate of return. This makes the value of the portfolio and the sum of current values of the cash flows at the end identical to the fund value at the start of the evaluation period (Bacon, 2008). The result may be calculated as:

$$V_{beginning} = \frac{C1}{(1+v)} + \frac{C2}{(1+v)^2} + \cdots + \frac{Cn+V_{end}}{(1+v)^n}, \quad (10)$$

where,

V_{end} = The value of the portfolio at the end of the period

$V_{beginning}$ = The value of the portfolio at the beginning of the period

v = The money-weighted rate of return

Cn = The cash flow in period n

Occasionally, the calculation introduced above can deliver unexpected results. The performance may appear to be better than it indeed is if money is added to the fund whilst a time when the fund is performing well after a period of poor performance. There will be a performance bias in the period when the capital has been invested in the fund. The time-weighted return is not affected by cash outflows or cash inflows, which presents a much more accurate measure. This method measures the compound growth rate of the total portfolio value between any cash flow days (Bacon, 2008). The formula for the equation is:

$$V_{portfolio} = [(1 + v_1)(1 + v_2 \ldots (1 + v_n)] - 1, \quad (11)$$

where,

n = The total number of sub-periods

v_n = The achieved return in sub-period n

Generally, the money-weighted return provides a higher price than the time-weighted return since it is affected by a higher degree of cash inflows and cash outflows than the time-weighted return. The time-weighted return is usually more preferred measure for calculating portfolio returns (Bacon, 2008).

4.5 Performance evaluation

When absolute returns are essential and beneficial, the relative measurements are also. Interested parties value absolute returns achieved by fund managers but also the returns achieved relative to returns attained by market indices or by other portfolio managers. The investor often specifies a proper benchmark portfolio against the portfolio manager to evaluate the manager's performance. Depending on the investment this can be any index that is suitable to use as a benchmark index to examine the results properly (Brentani, 2003).

In a perfect market, outperforming the market is practically impossible and therefore it is a difficult task for a portfolio manager to accomplish. Transaction costs and expenses are included in the funds and fund managers have to perform better than the costs. Even experienced managers are likely to underperform the market and only a small percentage of them will outperform the market. Portfolio managers often prefer peer groups for comparisons, since they productively eliminate some variables and express the portfolio manager’s relative performance against the other competition (Brentani, 2003).

4.5.1 The Jensen’s alpha

Jensen’s alpha or Jensen’s measure was introduced in Jensen’s (1968) paper. It is a risk-adjusted measure for performance that presents the average return on an investment or a portfolio, below or above what CAPM has predicted when an investment’s beta and markets average return has been taken into consideration. This measure is also frequently called simply alpha (Bacon, 2008).

For an accurate analysis of an investment manager's performance, an investor must notice not only look at the overall return of the fund but also the total risk of the fund to recognize if the investment’s profit compensates for the risk it carries. If ETFs have the same return, a rational investor would prefer a less risky fund. Jensen’s alpha is one way to determine if an investment’s returns are in line with the total risk the fund holds. If the value of the measure is positive the portfolio is earning excess returns and if it is negative the market profits better (Bacon, 2008). The equation for the measure is introduced as:

$$Jensen's\ alpha = R_p - R_f + \beta_p(R_m - R_f), \quad (12)$$

where,

R_p = The excepted portfolio returns

R_f = The risk-free rate

β_p = Beta

R_m = The market fund return

4.5.2 The Sharpe ratio

According to Sharpe (1994), the Sharpe measure is used for helping investors to understand the risk of an investment compared to its returns. The ratio is the average earned return that exceeds the risk-free rate per unit of total risk or volatility. Volatility measures the price variations of a security or portfolio. The measure can be expressed as:

$$Sharpe\ ratio = \frac{R_p - R_f}{\sigma_p}, \quad (13)$$

where,

R_p = The expected portfolio returns

R_f = The risk-free rate

σ_p = The standard deviation of the portfolio's returns

When subtracting the risk-free rate from the mean return it is easier for the investor to isolate the returns associated with risk-taking activities. The risk-free rate of return means that the investment has zero risk involved, meaning that an investor will expect the return of the investment without taking any risk. U.S Treasury bonds yield is commonly used as the risk-free rate (Bacon, 2013, p. 43-67).

This ratio is the most widely used method for determining risk-adjusted returns for investments. Portfolio theory notes that including securities in a diversified portfolio that has little correlation can lower the total risk without sacrificing return. The Sharpe ratio should increase when more diversification is added to the portfolio, compared to similar portfolios. To make this true, the investor must accept the assumption that risk is equal to volatility, which can be hard to apply to all investments (Bacon, 2013, p. 43-67).

The Sharpe measure can be used to calculate the past performance of a portfolio where the existing returns are used in the equation. A market participant could also use the expected risk-free rate and portfolio performance to calculate and estimated the Sharpe measure. The Sharpe ratio can also assist the investor to find out whether the portfolio's abnormal returns are due to a result of overly much risk or smart investment decisions. Even if a portfolio or fund has higher returns than portfolios equal to it, it is only an acceptable investment if the higher returns do not come with an incontinence level of risk (Bacon, 2013, p. 43-67).

The larger a fund's or portfolio's Sharpe measure is, the better the risk-adjusted performance is. When the Sharpe ratio is negative it means that the portfolio's return is expected to be negative, or the risk-free rate is larger than the fund's return. Either way, a negative Sharpe measure does not provide the investor with any useful meaning (Bacon, 2013, p. 43-67).

The Sharpe measure uses the standard deviation of returns to calculate the total portfolio risk, and this is an assumption that the returns are normally distributed. Normally distributed data can be described as rolling a pair of dice. After many rolls, the most usual result from rolling the dice will be seven, and the least usual results will be twelve and two (Bacon, 2013, p. 43-67).

In the financial markets, the returns are skewed away from the average since the prices fluctuate much. In addition, the standard deviation presumes that if prices rise or decrease the risk is still equal. The Sharpe ratio can be managed to appear better by the fund managers to boost their risk-adjusted returns history. This is done by lengthening the measurement interval, which will lower the evaluation of volatility. Portfolio managers may cherry-pick the data and that will manipulate the risk-adjusted returns (Bacon, 2013, p. 43-67)

4.5.3 The Sortino ratio

The Sortino ratio is a modification of the Sharpe ratio that excludes not desired volatility from total overall volatility by using the investment's standard deviation of negative portfolio returns rather than the total standard deviation of portfolio returns (Sortino & Price, 1994). The first factor mentioned above is called downside deviation. The Sortino measure subtracts the risk-free rate from the portfolio's or asset's return and then divides the result by the investment's downside deviation (Longin, 2016). The Sortino ratio is calculated as:

$$Sortino\ ratio = \frac{R_p - R_f}{\sigma_d}, \tag{14}$$

where,

R_p = The expected portfolio returns

R_f = The risk-free rate

σ_d = The standard deviation of the downside

The Sortino measure is a reliable method for analysts, fund managers and investors to analyze an asset's return for a given level of poor risk. Since the Sortino ratio uses the downside deviation as a risk measure, it handles the problem of using total risk, which is essential because upside volatility is favourable to market participants and this factor is not worried by most investors (Longin, 2016).

The higher the Sortino ratio result is the better it is for the investor, just like in the Sharpe ratio. A rational investor would choose an investment with a higher Sortino ratio when measuring two similar investments. This means that the investment is generating more profit per unit of the poor risk it is influenced on (Longin, 2016).

The Sortino measure improves compared to the Sharpe measure by isolating negative volatility or downside from the total volatility by dividing excess profits by the downside deviation rather than with the total standard deviation of an asset or portfolio. It is considered that the Sharpe measure punishes the asset for positive risk, which generates positive returns for investors. Although, when choosing the ratio, the investor determines if the focus is on downside deviation or standard deviation (Longin, 2016).

4.5.4 The Treynor ratio

The Treynor measure, also noted as the reward to volatility measure, is a performance calculation to find out how much abnormal return was achieved for each unit of risk taken by an asset or a portfolio (Treynor, 1965, p. 63-75). Abnormal returns in this case mean returns that are higher than risk-free investment returns. However, there are no risk-free investments in the market, but treasury bills are often represented as the risk-free rate in the Treynor ratio. In the Treynor ratio, the risk is expressed as beta, also known as systematic risk. Beta measures an investment's market risk and total returns correlation to average market return (Haight, et. al., 2007). The formula is shown down below:

$$Treynor\ ratio = \frac{R_p - R_f}{\beta_p}, \tag{15}$$

where,

R_p = The excepted portfolio returns

R_f = The risk-free rate

β_p = Beta

Basically, the Treynor ratio is a risk-adjusted performance measure of return on beta. It demonstrates how much return an investment, such as a mutual fund, ETF, or portfolio of stocks, earns compared to the risk, the investment is holding. If the fund has a negative systematic risk the ratio result is not essential. If the ratio is high, it means that the investment is more desirable and more suitable for the investor. The Treynor measure is based on historical data, therefore it is important to remember that the results do not necessarily indicate future performance, and the ratio should not be the only factor for the investor when making an investment decision (Haight, et. al., 2007).

In essence, the measurement attempts to calculate how well an investment provides compensation to market participants for taking a risk in investment. The ratio is reliable on beta, which will judge the total risk. The assumption behind the measure is that investors must be rewarded for the risk included in the portfolio, since even diversification will not remove it (Haight, et. al., 2007).

A central weakness of the Treynor ratio is that it looks at historical data. Investments are more than likely to behave and perform differently in the future than they did in the past. The Treynor ratio's accuracy depends highly on the appropriate usage of benchmarks to measure beta. For instance, if the ratio is used to calculate the risk-adjusted return of a large-cap mutual fund, it would not be appropriate to calculate the fund's beta relative to a small stock index (Haight, et. al., 2007).

5 Data and methodology

This chapter is viewing the collected data and methodologies used to calculate the performances and attributes of the specific ETFs. The results are used to study the two research hypotheses introduced in chapter one. The general description of data and its properties are introduced further in this chapter. This section is also representing the motivation for the selection of a specific sample of ETFs and a brief introduction to the ETFs is presented.

Methodology for gathering information about ETF performances is introduced in earlier chapters, but new techniques are also expressed later in this chapter. Data including price development of the ETFs have been retrieved from Vaasa University databases and ETF database and explanatory variables for regression analysis are from the Kenneth R. French database. The sample period in this thesis for calculations varies depending on the inception of the ETFs to the market. Some ETFs are somewhat new in the market and the sample periods can vary from each other.

5.1 Data description

This paper focuses on the specific ETF performances and factor regressions. The ETFs are chosen from the US market since most of the ETFs are traded there and the data is more readily available. The total AUM, average volumes and the inception date of the active ETFs are preferred measures and information for choosing the fund. These characteristics are important for accurate performance measures since there are not as many active funds as passive funds.

This data package has been selected since the study is primarily focusing on niche market ETFs and earlier studies have not been focusing on similar ETFs or ETF pairs. The data sample is narrow because of the targeted niche market and the difficulty to find similar passive and active ETFs which have the same investment strategy.

The data consists of ETF pairs that are investing in the same industry or economy. There are 5 ETF pairs, and they are formed from a passive ETF and an active ETF. Some ETF pairs have the same benchmark index that they are following. ETF pairs and their benchmarks will be introduced, and their characteristics will be explained and presented in tables and text. All ETFs are equity ETFs. Table 1 underneath is showing descriptions of the chosen ETFs.

Table 1. ETF description (ETF database, 2022). *3 Month Avg. Daily Volume.

ETF Symbol	Sector	Niche	ETF Name	Avg. daily volume*	AUM
ARKK	Technology	Broad Thematic	ARK Innovation ETF	9,883,211	$14,403 M
VGT	Technology	Information Technology	Vanguard Information Technology ETF	590,927	$54,088 M
AVUV	Small Cap Value	Value	Avantis U.S. Small Cap Value ETF	306,697	$2,436 M
VTWV	Small Cap Value	Value	Vanguard Russell 2000 Value ETF	75,829	$1,082 M
BLOK	Technology	Blockchain	Amplify Transformational Data Sharing ETF	666,798	$1,089 M
BLCN	Technology	Blockchain	Siren ETF Trust Siren Nasdaq NexGen Econmy ETF	57,431	$249 M
EMLP	Energy	MLPs	First Trust North American Energy Infrastructure Fund	245,212	$2,198 M
MLPA	Energy	MLPs	Global X MLP ETF	296,703	$1,176 M
AVEM	Emerging Markets	Broad-based	Avantis Emerging Markets Equity ETF	95,040	$1,045 M
EEM	Emerging Markets	Broad-based	iShares MSCI Emerging Markets ETF	39,431,184	$28,983 M
				Median	Median
				270,958	$2,317 M

Table 1 expresses information about the selected ETFs in this paper. The table addresses specific ETF symbols, the sector, that the ETFs investments are focused on, niche investment strategy, whole ETF name, average daily trading volumes and AUM of the ETFs. There are 5 ETF pairs, which are compared to each other, and they are ARK Innovation ETF (ARKK) and Vanguard Information Technology ETF (VGT), Avantis U.S. Small Cap Value ETF (AVUV) and Vanguard Russell 2000 Value ETF (VTWV), Amplify Transformational Data Sharing ETF (BLOK) and Siren ETF Trust Siren Nasdaq NexGen Economy ETF (BLCN), First Trust North American Energy Infrastructure Funds (EMLP) and Global X MLP ETF (MLPA) and lastly in the table are Avantis Emerging Markets Equity ETF (AVEM) and iShares MSCI Emerging Markets ETF (EEM). The chosen pairs are focusing on the same market sector and if possible, they are also investing in the same niche market. The average daily volumes and AUM can vary significantly between the pairs since the active ETF market is still somewhat narrow and it is difficult to find a perfect counterpart from the market.

Table 2. ETF characteristics (ETF database, 2022).

ETF Symbol	ETF Name	Active ETF	Passive ETF	Expense Ratio (%)	Inception date	Age (Months)
ARKK	ARK Innovation ETF	Yes	No	0,75	31.10.2014	94
VGT	Vanguard Information Technology ETF	No	Yes	0,10	26.1.2004	216
AVUV	Avantis U.S. Small Cap Value ETF	Yes	No	0,25	24.9.2019	28
VTWV	Vanguard Russell 2000 Value ETF	No	Yes	0,15	20.9.2010	136
BLOK	Amplify Transformational Data Sharing ETF	Yes	No	0,71	16.1.2018	48
BLCN	Siren ETF Trust Siren Nasdaq NexGen Econmy ETF	No	Yes	0,68	17.1.2018	48
EMLP	First Trust North American Energy Infrastructure Fund	Yes	No	0,96	21.6.2012	115
MLPA	Global X MLP ETF	No	Yes	0,46	18.4.2012	117
AVEM	Avantis Emerging Markets Equity ETF	Yes	No	0,33	17.9.2019	28
EEM	iShares MSCI Emerging Markets ETF	No	Yes	0,70	7.4.2003	225
				Avgerage Passive		Average Passive
				0,42		148,4
				Average Active		Average Active
				0,60		62,6
				Average All		Average All
				0,51		104,5

Table 2 offers more knowledge about ETFs. The fund management strategies and expense ratios are introduced between ETF pairs. There are expense ratios from both active and passive ETFs and averages from both strategies. Almost every passive ETF have smaller expenses, which is expected, except for passive fund EEM. Inception dates vary a lot from each other in some ETF pairs, which is a result of the narrow option pool of active ETFs and since active ETFs are relatively new instruments in the market. The averages demonstrate the age gap.

In the first ETF pair, which includes ARKK and VGT, VGT is trying to track MSCI US IMI Information Technology 25/50 Index, but ARKK does not have a specific benchmark index. In the second pair active fund, AVUV uses Russell 2000 Value Index as the benchmark, but it does not seek to replicate the performance of the index. The passive counterpart VTWV's benchmark is the same. In blockchain ETFs, BLOK does not have a specific tracked index but BLCN tries to follow the Siren NASDAQ Blockchain Economy Index. From the MLPs, EMLP has no specific tracking index but MLPA is following Solactive MLP Infrastructure Index. AVEM and EEM are focusing on emerging markets, and they are both tracking MSCI Emerging Markets Index.

5.2 Research methodology

This paper is using all of the previous performance measures, which have been introduced earlier in this study to evaluate the ETFs. Jensen's alpha, Sharpe ratio, Sortino ratio, Treynor ratio, Calmar ratio and information ratio are preferable tools for calculating ETFs performances. The Calmar ratio and the information ratio will be introduced in this section. For accurate calculations, active funds that have no underlying index to follow, are using the same benchmark index as their passive counterpart.

Jensen's alpha measures if the average return of the investment or portfolio is higher than the predicted return level measured by the beta of the CAPM. Sharpe ratio on other hand helps an investor to understand the return of a portfolio or an investment compared to its risk. The Treynor ratio determines how much abnormal return is generated for each unit of risk taken by an investment or portfolio. Sortino ratio is a modification of the Sharpe ratio that differentiates adverse volatility from total volatility using the asset's standard deviation of negative portfolio profits.

This paper uses CAPM introduced by Sharpe (1964) to calculate the relationship between expected returns and systematic risk for ETFs. The model itself and beta have been explained in detail and described accurately earlier in this study. For another regression, this paper uses the Fama and French five-factor model to describe ETF returns (Fama & French, 2015). These regressions are chosen because of the potential to explain excess returns of the ETFs. CAPM and the Fama and French five-factor model are using the US market as a benchmark in the calculations. These factor models have been used in Rompotis (2013) and Schizas (2014) studies and they are considered to be useful factor models for research papers.

5.2.1 Information ratio

The information ratio presents portfolio returns beyond the returns of a benchmark relative to the volatility of those returns. The used benchmark is generally an index that represents the market or a particular industry or sector. This ratio is usually used to evaluate a portfolio manager's ability to generate excess returns compared to a benchmark, but it also tries to identify the coherence of the performance by adding a standard deviation or a tracking error to the calculation (Darbyshire & Hampton, 2012).

The tracking error notices the consistency level in how a portfolio tracks the performance of an index. If the tracking error is low, it means that the portfolio is outperforming the index consistently over time. Otherwise, a high tracking error indicates that the portfolio returns are more volatile and not as consistent to exceed the benchmark (Darbyshire & Hampton, 2012). The information ratio's formula is presented as:

$$IR = \frac{Portfolio\ return - Benchmark\ return}{Tracking\ error}, \tag{16}$$

where,

IR = Information ratio

5.2.2 The Calmar ratio or Drawdown ratio

The Calmar ratio expresses the relationship between risk and return. It is a function of the portfolio's average compounded annual return relative to its maximum drawdown. It is used for assessing the success of portfolios and making investment decisions. The timeframe for the maximum drawdown is usually three years (Darbyshire & Hampton, 2012). The function is shown down below:

$$Calmar\ ratio = \frac{R_p - R_f}{Maximum\ drawdown}, \tag{17}$$

where,

R_p = Portfolio return

R_f = Risk-free rate

The maximum drawdown is presented as the portfolio's maximum loss from a specific investment period. It is calculated by subtracting the portfolio's lowest value from the highest value and then dividing the outcome by the portfolio's peak value (Darbyshire & Hampton, 2012).

This ratio calculates the efficiency of a portfolio on a risk-adjusted basis. A higher ratio indicates that the return of the portfolio or investment is not at risk of significant drawdowns. When the ratio is low it indicates a greater risk of drawdown. The ratio tries to demonstrate the amount of risk to obtain a certain return. Since investors have varying risk tolerances, the Calmar ratio helps them to balance the risk in their investment decisions (Darbyshire & Hampton, 2012).

5.2.3 Fama and French five-factor model

As mentioned earlier CAPM has been introduced earlier in this paper and it will not be overviewed in this chapter (Sharpe, 1964). Fama and French (1993) introduced the three-factor model, and the five-factor model by Fama and French (2015) is an expansion of the earlier model. While CAPM captures the systematic or market risk, the Fama and French five-factor model uses company characteristics as proxies.

When CAPM is a single factor model, the model from Fama and French has five factors and is empirically proven to have more explanatory power. The five-factor model has five different proxies that explain the expected return of an asset. They are a market risk factor, size risk factor, value risk factor, profitability factor and investment factor (Fama & French, 2015). This model is an upgrade from Fama and French three-factor model where market, size and value factors are proxies (Fama & French, 1993). The formula of the five-factor model is as follows:

$$R_{it} - R_{Ft} = \alpha_i + b_i(R_{Mt} - R_{Ft}) + s_i SMB_t + h_i HML_t + r_i RMW_t + c_i CMA_t + e_{it}, \quad (18)$$

where,

R_{it} = The portfolio return

R_{Ft} = The risk-free rate

α_i = The abnormal return

R_{Mt} = The market return

In the formula SMB is the spread of return between small-capitalization stocks and large-capitalization stocks, HML is the spread of return between high book-to-market value companies and low book-to-market value companies, RMW is the spread of return between companies that make a profit and companies that are unprofitable, CMA expresses the spread of return between companies that invests conservatively and companies that invests aggressively and finally b_i, s_i, h_i, r_i and c_i are the factor coefficients (Fama & French, 2015).

Rompotis (2013) paper studies ETF pairs and uses a three-factor model to explain the alpha, further Schizas (2014) also studies performance between ETF pairs and uses the four-factor model to define the alpha of the funds. This paper tries to explain the alpha by the five-factor model which has more proxies than its predecessors.

6 Empirical results

This chapter presents the results of the calculations presented earlier in this paper. The results are shown in tables. Firstly, the results from performance measures are expressed in tables and then discussed further. Secondly, the results from regression analysis are presented in tables and explained in the text.

6.1 ETF Performance

The tables in this section show the statistics from ETFs, starting from the inception date of the active ETFs to 31.12.2021. Since the inception date of active ETFs varies from passive ETFs, the period from where the calculations have been started is adjusted to the inception date of the active ETFs. Performance calculations are somewhat similar to Rompotis (2013), Schizas (2014) and Meziani (2015) papers.

Table 3. ETF statistics.

	Active	Passive	Active	Passive	Active	Passive	Active	Passive	Active	Passive
	ARKK	VGT	AVUV	VTWV	BLOK	BLCN	EMLP	MLPA	AVEM	EEM
Annualized standard deviation	30.42%	17.66%	35.49%	29.62%	35.04%	23.71%	15.34%	30.00%	21.04%	18.76%
Monthly standard deviation	8.78%	5.10%	10.24%	8.55%	10.11%	6.84%	3.10%	5.98%	4.23%	3.73%
Skewness	0.17	-0.16	-1.14	-1.18	0.63	0.32	-1.15	0.15	-1.37	-1.04
Excess kurtosis	0.12	-0.26	3.44	4.12	0.82	-0.26	6.98	17.04	4.06	2.24
Beta	1.34	1.00	1.18	1.00	1.34	1.16	0.43	1.00	1.11	1.00
Tacking error	20.46%	0.77%	8.33%	0.86%	27.14%	13.37%	19.02%	2.60%	3.69%	1.92%

Table 3 shows some basic statistics from the ETF pairs. For the first pair, Fidelity MSCI Information Technology Index ETF (FTEC) is used as a benchmark for the calculations. The second pair is using iShares Russel 2000 Value ETF (IWN) as the benchmark, the third pair is using SPDR S&P 500 ETF Trust (SPY), the fourth is using ALPS Alerian MLP ETF

(AMLP) and the last pair is using Vanguard Emerging Markets Stock Index Fund ETF (VWO). The reason for using these ETFs as benchmarks is that the information is better available for the ETFs than for the indexes. Moreover, some benchmark indexes are only followed by one fund which does not make the results transparent. The benchmark ETFs have been chosen to follow as well as possible the original benchmark index. Exceptionally, SPY, which follows S&P 500 index. It is the largest ETF in the market, and it is an advisable benchmark for performance evaluations. Further return and risk-adjusted calculations are using the same benchmarks for the pairs.

Annualized and monthly standard deviations are higher in almost all active ETFs, which is the expected result of an active management strategy. Global X MLP ETF (MLPA) is an exception with a higher annualized and monthly standard deviation relative to its active counterpart First Trust North American Energy Infrastructure Fund (EMLP). Beta is larger in every active ETF except between EMLP and MLPA which is also expected since active counterparts try to seek abnormal returns compared to the market. EMLP's low beta indicates that it is less volatile, and is considered less risky, which is exceptional since it is an active fund. Passive ETFs manage to follow their benchmarks relatively well according to tracking error, except Siren ETF Trust Siren Nasdaq NexGen Economy ETF (BLCN), whose benchmark in the calculation is SPY, which is not the real benchmark that it is trying to follow.

Skewness indicates an asymmetry or distortion that differs from the normal distribution in a data set. When the curve is shifted to the right or to left, it is skewed. The data in the curve may taper differently depending on is it on the right side or left side. These taperings are called tails. Positive skew points out a bolder or longer tail on the left and vice versa. If the data is positively skewed the mean of the data is greater than the median. On the other hand, if the data is negatively skewed the mean of the data will be less than the median (Chattamvelli & Shanmugam, 2015).

Likewise, skewness, kurtosis is used to figure distribution. When skewness excludes extreme values in one versus the other tail, kurtosis measures extreme values in both tails. If kurtosis is large in distribution the tails exceed the tails of normal distribution. Vice versa the data of tails is less extreme in low kurtosis than in normal distribution tails. High kurtosis of the return distributions suggests that market participants will occasionally experience extreme returns, both positive and negative (Chattamvelli & Shanmugam, 2015). In table 3 the skewness is nearly symmetrical in ARK Innovation ETF (ARKK) and Vanguard Information Technology ETF (VGT) and Amplify Transformational Data Sharing ETF (BLOK) and BLCN, also passive fund MLPA has low skewness. Other pairs and active fund EMLP are extremely skewed. Peers ARKK and VGT and BLOK and BLCN have relatively small excess kurtosis when other pairs have higher. Especially passive ETF MLPA has high excess kurtosis.

Table 4 demonstrates results from calculations concerning ETF returns. Returns are from different time periods for versatile outcomes. Some ETFs do not have results in every category since some of the active ETFs are established shortly. The results may not present the right picture of the funds since in some pairs the measurement period is short. Inflation is not included in the calculations.

Table 4. ETF returns.

	Active	Passive	Active	Passive	Active	Passive	Active	Passive	Active	Passive
	ARKK	VGT	AVUV	VTWV	BLOK	BLCN	EMLP	MLPA	AVEM	EEM
Annualized return	25.54%	24.90%	24.75%	17.85%	23.90%	16.14%	6.12%	-1.58%	14.49%	11.00%
Annualized 5 year return	38.28%	31.79%	n/a	n/a	n/a	n/a	3.97%	-4.35%	n/a	n/a
Annualized 3 year return	37.80%	41.46%	n/a	n/a	47.85%	31.14%	9.58%	1.16%	n/a	n/a
3 month return	-13.71%	14.39%	6.12%	4.21%	2.80%	-4.69%	6.28%	1.15%	0.05%	-1.57%
Year to date	-23.38%	30.45%	24.75%	17.85%	31.19%	4.86%	23.18%	29.56%	5.16%	-3.61%
Best year	152.82%	48.61%	42.23%	27.90%	90.15%	60.55%	29.92%	39.56%	14.38%	17.03%
Worst year	-23.38%	2.46%	6.39%	4.86%	-28.38%	-20.31%	-25.40%	-33.79%	5.16%	-3.61%
Positive periods	55/86	58/86	20/27	19/27	28/27	31/47	68/114	62/114	20/27	18/27

In every pair active ETF is performing better in annualized return which is calculated from the establishment of the active ETF. VGT is outperforming ARKK in 3-year return, 3 months return and year to date return. ARKK's best and worst year varies a lot from each other compared to its counterpart VGT which is the result of an aggressive investment strategy.

In most pairs, active ETF is performing better in every category than passive ETF which is in line with Schizas (2014) study. However, there are some exceptions for example MLPA's year to date and best year return is higher. Furthermore, iShares MSCI Emerging Markets ETF's (EEM) best year is slightly higher than Avantis Emerging Markets Equity ETF's (AVEM). When looking at pure returns active ETFs are outperforming passive counterparts. Fund managers have been able to perform in the market Rompotis (2013) study summarizes that active ETFs present lower returns than passive ETFs which is not the case in this study.

Table 5. Risk-adjusted metrics.

	Active	Passive	Active	Passive	Active	Passive	Active	Passive	Active	Passive
	ARKK	VGT	AVUV	VTWV	BLOK	BLCN	EMLP	MLPA	AVEM	EEM
Alpha	-4.11%	0.43%	3.89%	-0.11%	5.04%	-1.49%	5.82%	0.04%	0.62%	-1.41%
Sharpe ratio	0.88	1.31	0.85	0.73	0.75	0.70	0.43	0.09	0.73	0.63
Sortino ratio	1.58	2.47	1.24	1.05	1.44	1.26	0.60	0.12	1.05	0.91
Treynor ratio	19.90%	23.20%	23.42%	19.92%	19.57%	14.38%	15.27%	2.56%	13.85%	11.84%
Calmar ratio	1.24	2.54	n/a	n/a	2.39	1.88	0.32	0.02	n/a	n/a
Information ratio	0.06	0.64	0.89	-0.19	0.28	-0.01	0.42	0.01	0.52	-0.82
Active return	1.13%	0.49%	6.75%	-0.15%	7.59%	-0.16%	7.72%	0.02%	1.92%	-1.57%

Table 5 exhibits result from risk-adjusted performance measures. Jensen's alpha is higher in every other active ETF except in ARKK. ARKK fails to deliver excess returns when VGT succeeds in it. Every other active ETF has positive alpha but only one passive ETF, MLPA manages to succeed in the market. When measuring Sharpe ratios only VGT is considered to perform well, while other ETFs have a Sharpe ratio value under 1.

Sortino ratio's results are higher in four active ETFs and only on passive ETF, VGT has a higher value than passive than its counterpart ARKK. Value over 1 is considered to be an acceptable measure. Only EMLP, MLPA and EEM fail to deliver these results. Treynor ratio follows the same pattern, since all active funds, except ARKK, outperforms their group member. Positive Calmar ratios over 1 are received from ARKK, VGT and BLOK. Some ETFs do not have any ratios since the calculations are done in 36 months span and some active ETFs have not been in the market for so long. VGT outperforms ARKK in this matter.

Information ratios are negative in some ETFs, which indicates that the fund is unable to produce any excess returns in the market. The largest cap is between AVEM and EEM, when active ETF AVEM receives the value of 0.52 and EEM only -0.82. Active return is higher in every active ETF within the group. Some passive ETFs fail to defeat their benchmarks. Active return represents the difference between the ETF and the benchmark. Positive values indicate that ETF has performed better than the benchmark and negative values mean the opposite.

Finally, the second hypothesis assumes that passive ETFs outperform their active counterparts by risk-adjusted metrics. This assumption can be rejected since only in pair ARKK and VGT, VGT's risk-adjusted performance measures are higher except for active return and annualized return. In the other pairs, the active ETF generate higher performance measures and overall returns than the passive ETF. These results can be affected by the smaller datasets of ETFs since they are new to the market or from the niche investment strategy.

6.2 Results from CAPM

Secondly, this thesis discusses the results from CAPM. The results are visible from all the ETF pairs. This regression is expressed somewhat similar to Rompotis (2013) study. Table

6 below suggests results from the CAPM. The alphas are not presented as percentages, but some annualized values are inspected. The stars following the numbers illustrate the significance level as follows: * significant at 10% level, ** significant at 5% level and *** significant at 1% level. In further tables, the significance levels will be visible similarly. The t-statistics are in the brackets under alpha and the factors. Observations are in months and the time period for the CAPM is from the inception of the active ETF to 30.11.2021. Newey-West estimator has been used in the regression to address autocorrelation and heteroscedasticity in the residuals.

Table 6. Regression results from the CAPM.

	Active	Passive	Active	Passive	Active	Passive	Active	Passive	Active	Passive
	ARKK	VGT	AVUV	VTWV	BLOK	BLCN	EMLP	MLPA	AVEM	EEM
Intercept	0.005	0.007***	-0.007	-0.009	0.009	0.002	-0.005	-0.018**	-0.006	-0.005
	(0.81)	(3.09)	(-0.61)	(-0.80)	(0.725)	(0.31)	(-1.28)	(-2.45)	(-0.83)	(-0.86)
Market	1.56***	1.07***	1.44***	1.22***	1.37***	1.15***	0.78***	1.57***	0.90***	0.76***
	(11.07)	(17.51)	(6.62)	(9.71)	(8.038)	(9.11)	(4.75)	(3.30)	(11.16)	(13.65)
R2	0.593	0.812	0.732	0.745	0.525	0.797	0.477	0.505	0.654	0.583
Observations (Months)	85		26		46		113		26	

As the results imply in the first pair Vanguard Information Technology ETF (VGT) has a statistically significant alpha at a 1% level while ARK Innovation ETF's (ARKK) alpha is not statistically significant. VGT's annualized alpha is 8.16% and ARKK's is 6.50%. Only one other ETF generates a statistically significant alpha at a 5% level, and it is Global X MLP ETF (MLPA). However, MLPA's annualized alpha is -22.08%. Active ETF Avantis U.S. Small Cap Value ETF (AVUV) outperforms passive ETF Vanguard Russel 2000 Value ETF (VTWV), yet both lose significance. This same scenario can be seen in pairs of Amplify Transformational Data Sharing ETF (BLOK) and Siren ETF Trust Siren Nasdaq NexGen Economy ETF (BLCN) and Avantis Emerging Markets Equity ETF (AVEM) and iShares MSCI Emerging Markets ETF (EEM). This means that these results from the groups are not statistically different from zero. In the pair of First Trust North American Energy Infrastructure Fund (EMLP) and MLPA, only MLPA is significant as mentioned before. These results are similar to Rompotis (2013) and Schizas (2014).

Most of the positive and negative alphas are not statistically significant, which can be the cause of a short data period or if the alpha simply just does not gain any excess return. The returns of the ETFs may also be explained by the market factor which is significant at a 1% level in every ETF. R2 or R-squared describes the proportion of the variance for a dependent variable that is explained by an independent variable in a regression.

The first hypothesis suggests that passively managed ETFs generate statistically significant higher alpha than active ETFs. This hypothesis can be rejected since only one of the passive ETFs gains positive significant alpha. Moreover, in the pair of EMLP and MLPA only MLPA gain statistically significant alpha but it is negative. The results from the first pair are in line with earlier studies. Moreover, MLPA generates negative alpha and the results from other ETFs can be considered statistically zero.

6.3 Results from the five-factor model

Thirdly, the thesis exhibits the alphas from the Fama and French five-factor model. Results from the regressions are visible for all the ETF pairs in Table 7 down below. The five-factor model is a modification of the three-factor and four-factor models that Rompotis (2013) and Schizas (2014) used in their earlier studies. Again, the stars illustrate the significance level as follows: * significant at 10 % level, ** significant at 5% level and *** significant a 1% level. The table presents all the market factors, and the t-statistics are in the brackets under alpha and the factors. Observations are in days and the calculations period is from the active ETF inception date to 30.11.2021. Newey-West estimator has been used in the regression to address autocorrelation and heteroscedasticity in the residuals.

Table 7. Regression results from the five-factor model.

	Active	Passive	Active	Passive	Active	Passive	Active	Passive	Active	Passive
	ARKK	VGT	AVUV	VTWV	BLOK	BLCN	EMLP	MLPA	AVEM	EEM
Intercept	0.0004**	0.0002**	0.0000	-0.0000	0.0007	0.0002	-0.0002	-0.0003	-0.0002	-0.0003
	(2.08)	(2.05)	(0.79)	(-1.52)	(1.45)	(0.91)	(-1.17)	(-1.14)	(-0.50)	(-0.86)
Market	1.17***	1.17***	1.01***	0.98***	1.03***	0.90***	0.78***	0.84***	0.78***	0.86***
	(44.50)	(100.44)	(47.49)	(59.48)	(21.37)	(19.63)	(15.62)	(7.57)	(24.56)	(18.23)
Size	0.70***	-0.09***	0.89***	0.82***	0.33***	0.23***	-0.01	0.35***	0.10**	0.06
	(11.90)	(-3.65)	(39.39)	(35.11)	(3.31)	(3.66)	(-1.19)	(2.66)	(2.03)	(1.09)
Value	-0.63***	-0.32***	0.53***	0.42***	-0.23***	-0.09**	0.30***	0.68***	0.03	0.03
	(-9.71)	(-13.42)	(19.97)	(20.61)	(-3.18)	(-2.22)	(3.92)	(3.72)	(0.70)	(0.69)
Profitability	-0.85***	0.10***	0.21***	0.05	-0.93***	-0.29***	-0.12**	-0.45***	-0.12	-0.18**
	(-10.51)	(3.66)	(4.92)	(1.53)	(-6.39)	(-3.54)	(-2.34)	(-4.25)	(-1.59)	(-2.12)
Investment	-0.51***	-0.20***	-0.10	0.01	0.10	-0.14*	0.27**	-0.07	-0.09	-0.14
	(-3.96)	(-2.83)	(-1.30)	(0.24)	(0.61)	(-1.89)	(2.50)	(-0.22)	(-1-10)	(-1.43)
R2	0.773	0.928	0.984	0.984	0.520	0.726	0.602	0.392	0.701	0.707
Observations (Days)	1783		550		970		2377		555	

Both ARK Innovation ETF (ARKK) and Vanguard Information Technology ETF (VGT) are significant at a 5% level, and they deliver excess returns. ARKK's annualized alpha is 10.32% and VGT's 4.49% as such the active counterpart ARKK outperforms the passive one. CAPM delivered different results from the regression when VGT outperformed ARKK. All other active ETFs outperform their passive group member, but they lack significance and are not statistically different from zero. These findings are in line with Rompotis (2013) and Schizas (2014) studies except for ARKK, which outperforms the passive ETF. This finding suggests that the active fund manager gains excess returns from the market and delivers its purpose in a successful active investment style.

In the pairs, Avantis U.S. Small Cap Value ETF (AVUV) and Vanguard Russell 2000 Value ETF (VTWV), Amplify Transformational Data Sharing ETF (BLOK) and Siren ETF Trust Siren Nasdaq NexGen Economy ETF (BLCN), First Trust North American Energy Infrastructure Fund (EMLP) and Global X MLP ETF (MLPA) and Avantis Emerging Markets Equity ETF

(AVEM) and iShares MSCI Emerging Markets ETF (EEM) active ETF outperform the passive counterpart, but all deliver an insignificant alpha. Many of the factors in the regressions are significant and they may explain the returns of the ETFs. AVUV lack insignificance only in investment factor and VTWV in profitability and investment factor. In BLOK and BLCN only BLOK lacks insignificance in investment factors. In the MLP pair, only MLPA is insignificant in the investment factor. AVEM only delivers significance in market and size factors and EEM only in market and profitability factors. The findings suggest that there may be a systematic relationship between the performance of passive and active ETFs and the factors.

The first hypothesis in this research presumes that passive ETFs generate statistically significant higher alpha than active ETFs. This hypothesis can be rejected since only in the pair ARKK and VGT both alphas are statistically significant at a level of 5%. In this pair, ARKK generates higher alpha than passive ETF VGT. This finding is not similar to Rompotis (2013) and Schizas (2014) studies. This suggests that the active management style can offer a better excess return than the passive counterpart. In all pairs, the active ETF performs better than its passive counterpart. However, all other pairs lack significance in alpha so the hypothesis can be rejected.

7 Conclusions

This thesis discusses the ETF history and characteristics thoroughly and includes an introduction to various ETF structures. The main objective of this paper is related to active and passive ETF investing. The objective is to find out if an active management style can outperform a passive management style. For results, the research uses various performance measures and two different regression models.

There has frequently been discussion between passive and active investing, and which one is the better option. This study uses a large variety of different types of performance measures for the interpretation of ETFs. The regression models suggest various findings from the ETFs.

The result of this study summarizes that with respect to pure annualized returns, the active ETFs present higher returns than the passive ETFs. These results are not in line with Rompotis (2013) study where passive counterparts are outperforming the active ones. Furthermore, every risk-adjusted performance measure gains larger values in active ETF, exceptionally for ARKK. Every active ETFs standard deviation and tracking error is higher than its counterpart, which is excepted since the active ETFs tend to be riskier than passive ones and they are not supposed to follow an underlying index but rather gain excess returns from the market. These findings may be due to the short time some of the active ETFs have been in the market. Another notable detail is the niche market of the ETFs.

The first regression CAPM gains significant alpha only in Vanguard Information Technology ETF (VGT) and Global X MLP ETF (MLPA). Other alphas are considered equal to zero due to insignificance and they do not differ statistically from each other. VGT outperforms active ETF ARK Innovation ETF (ARKK) in this matter. However, all ETFs gain significance in market factors which may explain the returns the funds generate. In this matter also the short calculation period and the chosen niche market of the ETFs may explain the insignificance of the alphas. These results mean that active ETF managers fail to outperform passive funds. However, all market factors gain significance when Rompotis (2013) and Schizas (2014) papers do not gain significance.

The Fama and French five-factor model gains significance in both ARKK and VGT at a 5% level. ARKK success to gain more abnormal returns than its passive counterpart VGT, which is a result of a successful active management strategy. Fund managers have succeeded to deliver abnormal returns higher than the passive counterpart VGT. This is a new outcome compared to Rompotis (2013) and Schizas (2014) studies where either active or passive ETFs does not gain significant alpha.

All other funds lack significance on alpha. Yet, many factors receive significant results. Although, active ETFs gain more alpha compared to passive ones, because of their insignificance they are considered statistically zero. The significance of the factors may explain the return of the ETFs. Again, due the short examination period and the specific niche market of the ETFs may explain the insignificance of the alphas.

Almost every active ETF fail to gain excess returns according to the two regressions. Only ARKK manages to gain positive alpha and outperform its passive counterpart VGT in the five-factor model. This is a new finding compared to earlier studies and it concludes that the active fund manager has performed in the market. Continuing, pure annualized returns are higher in every active ETF and risk-adjusted-performance measures are higher in every class except in ARKK. Otherwise, the results are in line with previous studies.

The first hypothesis suggests that passive ETFs generate statistically significant higher alpha than active ETFs. The results declare that in CAPM only VGT and MLPA deliver statistically significant alpha. VGT outperforms its counterpart ARKK but MLPA's alpha is negative. In the five-factor model only one pair gain statistically relevant results from the alpha. ARKK's and VGT's alphas are statistically significant and ARKK outperforms VGT as mentioned before. All other pairs lack statistical significance in alpha but active ETFs have higher returns. Due to these results, the hypothesis will be rejected. The majority of the ETFs do not generate statistical alpha in either regression. However, the regression factors may explain the differences in the returns.

The second hypothesis suggests that passive ETFs outperform active ETFs by risk-adjusted ratios. The findings from the performance measures suggest the opposite. Only in the pair ARKK and VGT, does passive ETF VGT have higher values in the risk-adjusted metrics. In every other pair, active ETFs have higher values or percentages in the ratios. Although, all ETFs can not calculate the Calmar ratio because of the active ETF pair's recent initiation. Due to these results, the hypothesis will be rejected. The majority of the active ETFs generate higher risk-adjusted performance ratios. This is a new result relative to earlier studies.

The results from the five-factor model indicate that active management can deliver statistically significant higher alpha, and investors can utilize that information in the market. Furthermore, the risk-adjusted measures between the ETF pairs present that active ETFs can outperform their passive peers. For investors, the results imply that an active management style can be profitable on some occasions. The funds are especially for investors seeking risk and different views from the market.

Further research could consider longer time periods in the calculations. Active ETFs are still relatively new to the market, and they are still trying to find their spot. However, this study motivates because of its positive results toward active ETFs. Furthermore, some of the ETFs are from a narrow niche market, and future studies could take more conservative ETFs into the study pool. Future studies could have more pairs of ETFs and more regression models to analyze the performance. Moreover, when the active ETFs become more known to the market, the AUMs and average daily volumes will increase, and the results from the calculations will become more transparent.

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