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Can Artificial Intelligence Outperform Humans in ETF Management?

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ABSTRACT

'Exchange Traded Funds' (ETFs) are basket/bundle funds consisting of a portfolio of stock assets from multiple companies and organizations, traded similar to normal stocks. ETFs help with diversification of the investment, risk management and potentially gaining higher returns. Typically, ETFs are either passively managed with little human intervention and yielding performance that track market indices or actively managed by fund managers targeting to outperform market indices. With the recent Artificial Intelligence (AI) boom, there's been an increased interest in leveraging AI to manage ETFs, with the goal of maximizing returns and cost efficiency. The application of AI in managing ETFs represents a nascent yet promising area in the financial sector. This research paper endeavors to study the potential of AI in ETF management through a comparative analysis of data from analogous ETFs.

Background

Stock Market & Exchange-Traded Funds (ETFs)

Stock Market

The stock market is where individuals or groups can sell/buy shares of publicly traded companies. Stocks constitute ownership in a company and investors can profit from the increase in the value of these stocks. Companies authorize stocks through an initial public offering (IPO) to raise capital for expansion or other purposes. Investors can take part in the stock market through stock exchanges, with examples being the New York Stock Exchange (NYSE) or NASDAQ. Stock prices are based on 'supply and demand', which are influenced by company performance, economic conditions, and investor sentiment. Investors can make money in the market through capital appreciation (selling stocks at a greater price than purchased at) and dividends (share of company profits distributed to shareholders). Stock market investing involves risks, including the potential for loss of capital, and requires careful research and analysis. Various investment strategies exist, including long-term investing, day trading, and value investing, each with its own advantages and risks. Market indexes like the S&P 500 or Dow Jones Industrial Average aim to track the performance of stocks and serve as benchmarks for the market. The market plays a crucial role in the economy by enabling companies to raise funds and providing opportunities for individuals to grow their wealth.

Exchange Traded Funds (ETF)

ETFs contain a portfolio of stock assets from multiple companies and organizations. They are traded the same way normal stocks are. ETFs are good for stock diversification and can decrease risks of market fluctuation impacting a single company's stock. ETFs have recently become one of the most popular products in the investment industry. Assets in ETFs and other ETPs have amassed to more than $6.5 trillion.

There are several types of ETFs in the market: Equity ETFs, Bond ETFs, and Fixed Income ETFs. Equity ETFs are the most common and popular among these. Equity ETFs combine a bunch of stocks into a 'basket of stocks' to provide diversification, even if it's just tracking a specific stock sector. They track the performances of indices such as the S&P 500 or NASDAQ. Bond ETFs are ETFs that invest in fixed income securities like Treasuries or corporate bonds. They hold a portfolio of bonds with different particular strategies from U.S. Treasuries to high-yields, and holding periods between long-term and short-term. Fixed income ETFs are one of the most low-risk ETFs to invest in. They are the same as normal 'basket funds', however, you get a consistent flow of investments and it serves as a stable income source.[1]

Management of ETFs

ETF management is a critical aspect that determines the fund's ability to match or exceed the performance of the index it tracks. Below is an overview of ETF management.

Passively Managed ETFs

Passive ETFs aim to mimic/benchmark different market indices such as the Dow or S&P 500. They hold all or a representative sample of the securities in the index they track. This allows the ETF to match the performance of the index as closely as possible. These are not managed by fund managers, therefore the management cost is low. Passively managed ETFs are best for investors who want broad market exposure with lower fees.

Actively Managed ETFs

Actively managed ETFs on the other hand are constantly monitored by a fund manager. Investors in these ETFs optimize different investments or allocation to various indices in an attempt to outperform the general market. Because of this, actively managed ETFs may be more likely to generate high returns depending on the skill of the portfolio manager. Fees for actively managed ETFs are higher than passive ETFs, as there are portfolio/fund managers working on finding the best possible investment mix and potential for a large return on investment. This puts pressure on individuals or a group of ETF managers to deliver results that outperform their passive ETF counterparts. (2)

Artificial Intelligence and ETF Management

Artificial Intelligence or AI is the simulation of human intelligence done by machines or computers. Examples of AI include natural language processing, speech recognition, machine vision and so on. In general, AI systems work by ingesting large amounts of data, analyzing the data for patterns, and then making predictions about future actions. In this way, an AI chatbot on a website that is fed examples of human text interactions with customers can learn to generate lifelike exchanges with people, or an image recognition AI tool can figure out how to identify and describe objects in images by reviewing millions of examples. New, rapidly improving generative AI techniques can create realistic text, images, music and other media. In any application, typically AI programming focuses on learning, reasoning, self-correction and estimation to predict the right next step. Artificial intelligence has emerged as a prominent trend in recent times. Naturally, investors are seeking to leverage AI technology to gain a competitive advantage in their investment strategies.

Applying AI to Actively Managed ETFs

AI-powered ETFs leverage machine learning and natural language processing to create investment portfolios with superior performance and risk-management capabilities, substituting human fund managers in the process. AI can absorb a large volume of information at once, making it easier to evaluate the performance of companies and even interpret risk factors and predict potential problems. AI learns with vast amounts of historical financial data, allowing for more quick and accurate data analysis without much human intervention. They can adjust their investment strategies based on market data. AI-powered ETFs can utilize natural language understanding to process news articles and social media data to find stocks with high probabilities of market appreciation (increased asset value).They can leverage risk management techniques like portfolio optimization and diversification to decrease overall risk factors and manage allocation of indices appropriately. While actively managed ETFs require you to pay larger sums of money, AI managed ETFs may be able to do exactly the same for a smaller cost. Along with that, they may be able to outperform the market as well, as they identify patterns in the market and have strong data analyzing capabilities.

While AI for ETF management has several benefits, currently it also has some shortcomings. AI hasn't been around for a long time, so unfortunately their track record is quite limited. AI may not be able to handle situations that are unprecedented, where there is no significant prior data, like the case of COVID pandemic. In addition, even though AI could in future possibly do "more for less", currently AI managed ETFs are still quite expensive. Lastly, most AI managed ETFs currently have low assets, so they're not very popular. (3)

Performance Evaluation of AI Managed ETFs

The focus of the study is to assess the performance of AI-managed ETFs in relation to their passive counterparts and those managed by human fund managers. AI managed ETFs are few in number. In order to evaluate the performance, we focus on the 3 primary AI managed ETFs:

AIEQ: AIEQ is an AI-Powered Equity ETF that tracks an index that holds US companies of any market cap selected using a proprietary, quantitative model based on artificial intelligence. It uses IBM's Watson supercomputer to select portfolio holdings and has become one of the most popular funds, raising over $70 million within a few weeks of its launch in 2017. AIEQ leverages machine learning, overall analysis, and language processing to select stocks in its portfolio.The portfolio analyzes companies through financial analysis, news, management, etc.AIEQ has performed well, returning over 14% in the year to January 27, consistently outperforming the S&P 500.

AIVI: AIVI uses AI to search for mid and large-cap value-stocks, specifically from outside of the U.S. and Canada. (international value stocks). It changed its strategy in January 2022 to take advantage of AI and machine learning.

AMOM: This fund is supervised by humans, however it still utilizes AI in order to pick out the most optimal stocks . Beginning in 2019, this ETF uses AI to look for large capitalization stocks, which are usually performing well and are looking to keep doing so.

AI Managed ETF vs Passive ETFs

In this section we compare the performance of AI managed ETF against comparable passively managed ETFs. We have chosen passive ETFs with portfolio distribution comparable to the specific AI managed ETF that it is compared against. We use the 1 year returns to compare the performance. Additionally we also compare the expense ratios. Expense ratio is an indicator of the cost to yield the return. Ideally investors would like lower expense ratios. Passively managed ETFs typically incur very low costs and therefore low expense ratios.

The table below lists the AI managed ETFs and the chosen passive counterparts for comparison.

Table 1. AI managed vs Passively managed ETFs

AI-managed ETF	Passive ETF Counterpart
AEIQ: AI Powered Equity ETF	VTI: Vanguard Total Stock Market ETF passively managed fund that tracks the CRSP US Total Market Index. The fund measures the US equity market, and includes small and large cap companies.
AIVI: AI powered Equity ETF focused on value characteristics outside US and Canada	EFV: ETF seeks to track the investment results of an index made of developed market equities, excluding the U.S. and Canada, that exhibit value characteristics.
AMOM: AI powered large cap momentum stocks	MTUM: ETF seeks to track the investment results of an index made of U.S. large- and mid-capitalization stocks exhibiting relatively higher price momentum.

AIEQ vs VTI

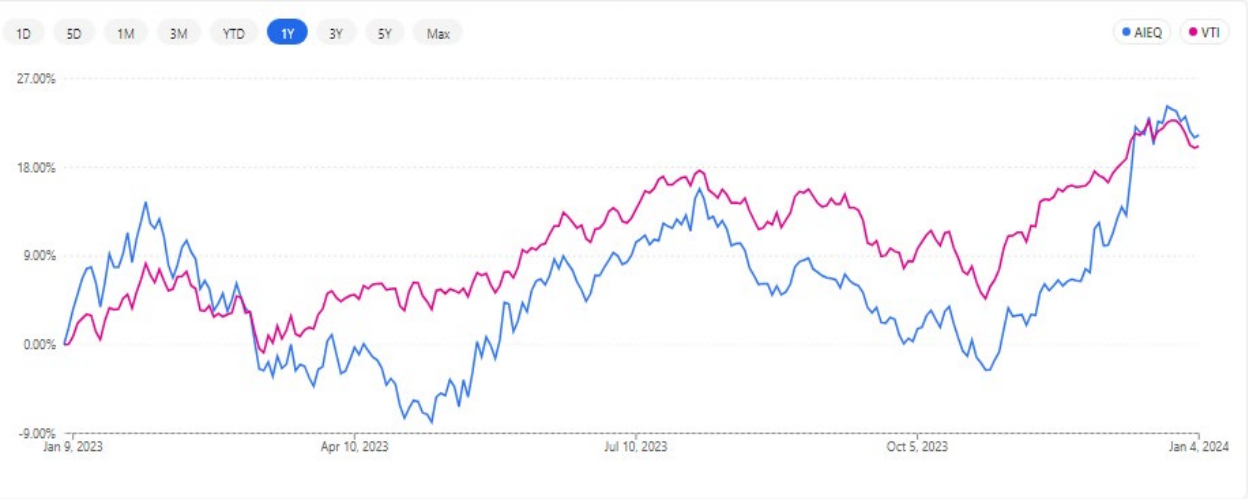

Figure 1 AIEQ vs VTI Comparison

Table 2. AIEQ vs VTI

	AIEQ	**VTI**
6 Month Return	11.89%	6.88%
1 Year Return	21.28%	20.10%
Expense Ratio	0.75%	0.03%

For the last year, AIEQ has had a higher return percentage than VTI. However, AIEQ has a higher expense ratio indicating that the cost of achieving higher returns is higher.

AIVI vs EFV

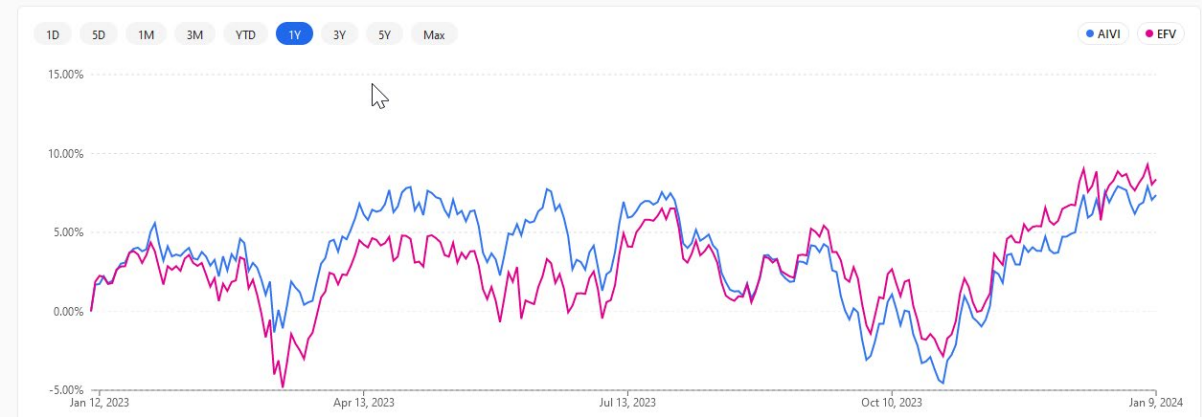

Figure 2 AIVI vs EFV Comparison

Table 3. AIVI vs EFV

	AIVI	**EFV**
6 Month Return	5.43 %	8.61 %
1 Year Return	8.42 %	10.30 %
Expense Ratio	0.59 %	0.34 %

In this case, it seems like the AI-managed ETF is not necessarily doing better than the passive managed ETFs. This could be a result of the AIVI funds only focusing on mid and large cap rather than including smaller companies.

AMOM vs MTUM

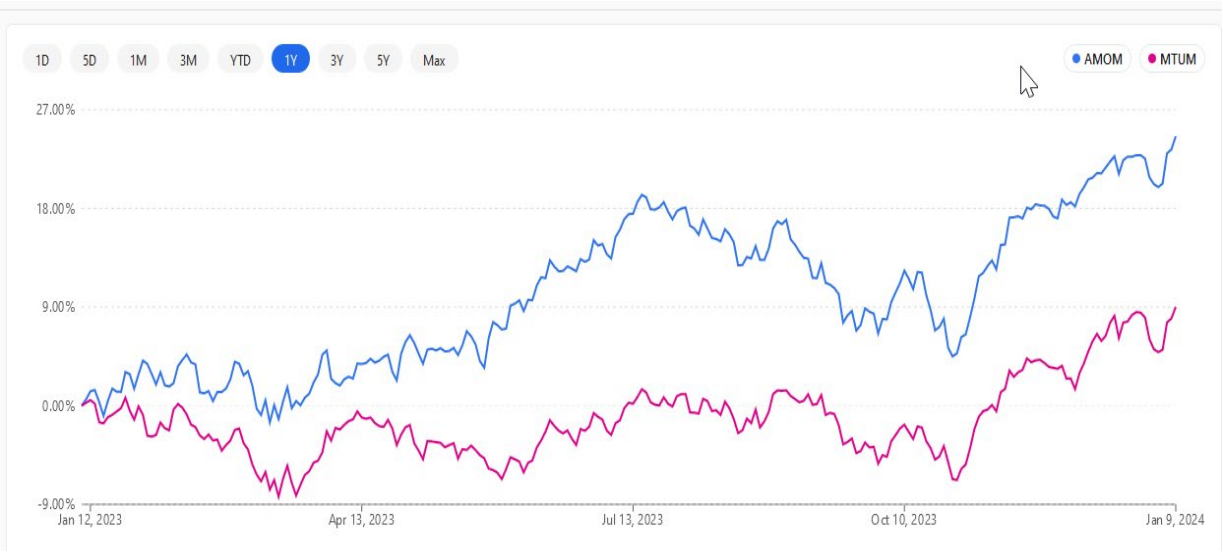

Figure 3. AMOM vs MTUM Comparison

Table 4. AMOM vs MTUM

	AMOM	**MTUM**
6 Month Return	8.44 %	10.51 %
1 Year Return	25.02 %	7.16 %
Expense Ratio	0.75 %	0.15 %

According to the data, AMOM consistently outperforms MTUM. In this case, it looks like AMOM is severely outperforming MTUM. Momentum investment strategy focuses on buying stock that are historically performing well and selling those that haven't been doing well. We believe that AMOM could be performing much better as AI can efficiently process vast data and make sound predictions

AI Managed ETF vs Actively Human Managed ETFs

In this section, we compare the performance of AI managed ETFs with the actively managed counterparts focusing on similar assets. Again, We use the 6 month and 1 year returns to compare the performance. Additionally, we have picked ETFs with comparable asset sizes so that expense ratios can be meaningfully compared.

The table below lists the AI Managed ETFs and chosen actively managed counterparts. SInce AIEQ is the only fully AI managed ETF, we have studied different factors that impact its performance relative to actively managed ones. We picked the ETFs from the list here [7]. We have used the asset sizes and target investment focus provided in the reference to narrow down appropriate comparators.

Table 5. AI managed ETF vs Actively Managed ETF Counterpart

AI-Managed ETF	Actively Managed ETF Counterpart
AIEQ: AI Powered Equity ETF	DWUS, SQEW, CACG: ETFs with similar focus, asset size
AIVI: AI powered Equity ETF focused on value characteristics outside US and Canada	OAIM, RFDI: Similar sized asset as AIVI and focused on foreign large cap
AMOM: AI powered large cap momentum stocks	GK, QPX: Similar sized asset, focused on large cap

AIEQ vs DWUS, SQEW, CACG

Figure 4 AIEQ vs DWUS, SQEW, CACG Comparison

Table 6. AIEQ vs DWUS, SQEW, CAGC

	AIEQ	DWUS	SQEW	CACG
6 Month Return	11.89	7.28	2.73	10.10
1 Year Return	21.28	14.35	6.15	37.26
Expense Ratio	0.75	0.98	0.75	0.53

Based on the compared ETFs, DWUS AIEQ outperformed DWUS and SQEW in 1 year returns while incurring similar or lower costs than counterparts. However, when we look at CACG, we see this ETF outperforms AIEQ at lower cost. We studied several other similar ETFs like LRGE, LCG and saw similar trends. We observed that the human managed ETFs that outperformed AIEQ had picked a distribution with a higher risk profile.

While there is no conclusive data, we think that AI algorithms were possibly tuned to keep risks low. If this parameter could be tuned, AI could possibly get comparable performance

AIVI vs OAIM, RFDI

Figure 5 AIVI vs OIAM, RFDI Comparison

Table 7. AIVI vs OAIM, RFDI

	AIVI	**OAIM**	**RFDI**
6 Month Return	4.45	-0.99	8.57
1 Year Return	7.75	7.99	12.44
Expense Ratio	0.59	0.95	0.83

Again there is no clear pattern. While performance of OAIM is almost the same as AIVI, RFDI significantly outperforms AIVI. RFDI seems to have picked a distribution with a very high risk profile. In this case, the actively managed ETFs also incur much higher costs than AIVI.

AMOM vs GK, QPX

Figure 6 AMOM vs GK, QPX Comparison

Table 8. AMOM vs GK , QPX

	AMOM	GK	QPX
6 Month Return	6.01	-0.24	5.41
1 Year Return	22.22	17.72	39.49
Expense Ratio	0.75	0.75	1.32

In this case the AI powered ETF outperforms human managed ETF with similar expense ratio. However, QPX out performs AMOM significantly. Based on expense ratio, it seems like the ETF has invested significant human effort in achieving the gains.

Discussion & Conclusion

From the comparisons of the ETFs, it does seem like the AI managed ETFs are either slightly beating their passive counterparts (AIEQ vs VTI), performing similarly (AIVI vs EFV), or handily beating them (AMOM vs MTUM). The short term results are especially good across the board, AI technology capabilities and solutions are likely to improve significantly in the near future, especially as they get trained with increased and more relevant data. Based on our analysis, we believe that AI managed ETFs have the promise to outperform many of their passive counterparts. Based on the data studies, it seems like AI managed ETFs also perform quite well in comparison to human managed ETFs. They help in achieving similar gains at lower costs in many scenarios. However, there are human managed ETFs that outperform AI managed ETFs. Our observation is that most of the high performing human managed ETFs invest in high risk portfolios to achieve high gains. It is likely that AI is still not mature to handle high risk, highly volatile investments.

In summary, although AI application in ETFs is still in early phase, it appears to be promising. As AI solutions evolve and more data becomes available, they can be improved to achieve results similar to or even better than their human managed counterparts in many cases. It is unlikely that AI will completely replace human management. We expect that AI tools will help human traders manage ETFs at lower cost and yield higher performance.

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