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Actively Managed ETFs: A Performance Evaluation

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Abstract: Research Question: The current study examines whether actively managed Exchange Traded Funds (ETFs) in the United States can beat the market. The market timing skills of ETF managers are evaluated too. **Motivation:** This study has been motivated by the recent increased interest of investors in actively managed ETFs. This interest has been answered by the creators of active ETFs via the launch of several of such products over the last couple of years. As a result, significant money has flown into active ETFs during the last two years, and especially in 2021. **Idea:** In other words, by examining the latest return data of active ETFs, we try to confirm whether the recent growth in the active ETF market has been driven by material performance records of these funds. **Data:** The performance of 50 U.S. equity actively managed ETFs is examined over the period 1/1/2018 - 31/12/2021. **Method/Tools:** Standard methodology including single-factor market model and the Fama-French-Carhart four- and six-factor models is used. **Findings:** The findings are in line with previous evidence in the literature. Active ETFs fail to achieve any material above market return. In addition, it is shown that the Fama-French-Carhart factors are material in explaining the performance of the examined ETFs. Finally, the managers of active ETFs do not seem to possess any superior market timing skills. **Contributions:** When it comes to the contribution of this study, we note that we use the most recent data than any other known study in the literature. Moreover, based on methodology found in the literature on traditional mutual funds, we consider several factors in assessing the performance of active ETFs than just the market index, which is frequently the case in similar studies. Finally, market timing skills are assessed via an enhanced set of regression models. All the above enhance our knowledge about the failure of active ETFs to beat the market and to compete their passive peers.

Keywords: ETFs, active management, performance, market timing.
JEL Classification: G11

1. Introduction

This study re-examines the long-lasting question about whether the active fund managers can create value for their investors by gaining above-market returns and beating their passively managed rivals. To do so, the study employs a sample of 50 actively managed equity Exchange Traded Funds (ETFs) listed in the United States.

Active ETFs were launched in the U.S. in February of 2008, even though the first appearance of such ETFs was made in Germany at the beginning of the new century. The first

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years of the active sector of the ETF market were not easy, as investors were reluctant to massively invest in such products. However, the long-awaited boom in the market of active ETFs seems to be closer than ever. After more than a decade of weak growth and frequent failures, active management is becoming a trend in the ETF market. Investors are flooding in at a record pace. Inflows into actively managed ETFs in the US during the first six months of 2021 amounted to $55 billion, when the inflows during the entire 2020 were $59 billion.[1] Nevertheless, the ETF market is still dominated by passive products. At the end of 2021, from the 2,793 ETFs listed in the U.S., 803 ETFs were active. At the same time, the total assets managed by these funds amounted to $287 billion, when the entire ETF market in the U.S. managed about $7 trillion.[2] These numbers indicate that the market share of active ETFs (4.1%) is still very low and, thus, there must be room for further growth.

Actively managed ETFs can be found in the following asset classes: i) equity, ii) asset allocation, iii) fixed income, iv) alternatives, v) currency, and vi) commodities. With respect to classes, fixed income is by far the largest segment of the active ETF marketplace, even though thematic and defensive strategies are gaining ground. The popularity of fixed income active ETFs is justified by their decent records of beating their passively managed rivals.

The performance of active equity ETFs in the U.S. is examined in this study over the period 1/1/2018 - 31/12/2021 with standard methodology found in the literature. In the first step, raw daily returns are computed. Then, the single-factor market model is used to assess whether active ETFs produce any significant alpha. Multifactor regression analysis of ETFs' performance is conducted too. Finally, the ability of active ETF managers to time the market is evaluated.

First, the empirical findings reveal that the ETFs in the sample achieved positive average raw returns during the period under study. However, these returns did not exceed the corresponding return of the S&P 500 Index, which is used as the market proxy. This inability of active ETFs to beat the market index is also verified by the insignificant alpha estimates obtained from the single- and multi-factor regression analysis of performance. Furthermore, the results indicate that the Fama and French (1992 and 2015) stock market factors and the momentum factor of Carhart (1997) are quite significant in explaining the performance of active ETFs in the U.S. Finally, the results accentuate that, overall, the managers of active ETFs do not possess any efficient market timing abilities, while some evidence is obtained on the opposite.

This study has been motivated by the recent increased interest of investors in actively managed ETFs, the significant growth in the number of such products and the significant money inflows into them during the last two years, and especially in 2021. In other words, by examining the latest return data of active ETFs, we try to confirm whether the recent growth in the active ETF market has been driven by material performance records of these funds. To the best of our knowledge, the most recent study on the subject is that of Rompotis (2020), which examines the performance of 37 pairs of equity active and passive ETF with data up to December 31, 2016. Obviously, the current study cannot capture the recent growth in the active ETF market as the current study does and that is why an expansion to our previous work is justified.

When it comes to the contribution of this study, we note that we use the most recent data than any other known study in the literature. Moreover, based on methodology found in the literature on traditional mutual funds, we consider several factors in assessing the performance of active ETFs than just the market index, which is frequently the case in similar

[1] The information reported in this paragraph has been found in: "Active ETFs: The Next Act", www.bnymellon.com/content/dam/bnymellon/documents/pdf/aerial-view/active-etfs-the-next-act.pdf.
[2] Refer to: "Active Management ETF Overview", www.etf.com/channels/active-management-etfs, and "NYSE Arca Q4 2021 Quarterly ETF Report", www.nyse.com/etf/exchange-traded-funds-quarterly-report.

studies. Finally, market timing skills are assessed via an enhanced set of regression models. All the above enhance our knowledge about the failure of active ETFs to beat the market and to compete their passive peers.

In addition, we deem that our empirical results can explain why, at least until recently, investors have been reluctant to embrace the actively managed ETFs. They can also contribute to the fierce debate about the merits and pitfalls of active management by demonstrating, once again, that the increased costs incurred by active managers cannot be compensated for by spectacular returns records. Finally, given that in our study we use equity active ETFs, their poor performance records relative to market returns could explain why fixed-income dominates the active ETF marketplace.

The remainder of this paper is structured as follows: Section 2 provides the literature review. Section 3 develops the research methodology applied in our study and describes the sample used. Empirical findings are discussed in Section 4 and conclusions are offered in Section 5.

2. Literature Review

In this section, we discuss the findings of the literature on the performance of actively managed ETFs. To the best of or knowledge, the studies discussed below concern the most significant studies on the matter.

First, on active vs passive ETFs, Rompotis (2011a) examines the performance of three pairs of comparable active and passive ETFs traded on the U.S. stock market. The results reveal that the active ETFs underperform both the corresponding passive ETFs and the market indexes. The study also found that both active and passive ETFs provide investors with no positive excess returns. Further regression analysis indicates that the managers of active ETFs do not possess the selectivity and market timing skills. Rompotis (2013) studies nine pairs of active and passive ETFs following common market benchmarks and found similar results. In addition, active ETFs were also found to be more expensive than the passive ETFs. However, this increased cost of active ETFs relative to the passive peers is not justified by their performance records. The paper also verifies the inability of active ETF managers to implement efficient market timing strategies.

More recently, Rompotis (2020) studies the performance and risk of a sample of 37 equity active and passive ETF pairs up to December 31, 2016. Several return metrics are computed, such as absolute, buy-and-hold and risk-adjusted returns. Moreover, cross-sectional regression analysis of the factors that may affect the performance of ETFs is applied. Finally, the ability of managers to time the market is examined. The findings are similar to those in most of the previous studies. Active ETFs underperform their passive peers being, at the same time, more volatile than them. In addition, they cannot achieve any material excess return, while their managers are found unable to time the market.

How active ETFs performs relative to other assets? Rompotis (2011b) has compared the performance of 14 U.S. equity active ETFs against the performance of the S&P 500 Index over a period spanning from the inception of each ETF up to June 30, 2010. The empirical findings indicate that active ETFs cannot beat the market. Furthermore, the managers of these ETFs are found to be lacking any material skills to time the market. Rompotis (2015) examines the performance of a sample of 22 active ETFs listed in the Canadian stock market. The ability of active ETFs to produce excess returns relative to the market is evaluated. The ability of the managers to time the market is assessed too. The empirical findings indicate that, similarly to their U.S. cousins, the Canadian active ETFs fail to beat the market. On the contrary, the majority of them deliver significantly negative alphas. In addition, the managers of these funds seem to be unable to time the market efficiently. More recently, Kumar (2021) examine the performance of active and smart beta equity ETFs listed in the U.S. since 2000.

Using a sample of 95 active ETFs and 376 smart beta ETFs, the author shows that, during a five-year period ending at October 30, 2020, only 20% of active ETFs and 15% of smart beta ETFs outperformed the S&P500 Index. Moreover, using the Fama-French-Carhart six-factor model, Kumar (2021) finds that more than 20% of smart beta equity ETFs and 10% of active equity ETFs have significant alphas.

Do active ETFs underperform? In this respect, Schizas (2014) presents empirical results on the first active ETFs based on risk and return. Using models for the returns and volatility of the underlying assets, the author compares the performance of these models with alternative investment solutions, such as passive ETFs, mutual funds and hedge funds. The results indicate that active ETFs are more volatile than the passive ones but the performance of the two groups is comparable to each other. The results is consistent with Dolvin (2014) who also finds that active funds are more volatile than their passive peers without, however, providing any return advantages. Therefore, active ETFs cannot be considered as good substitutes for the existing passively managed funds. However, contrary to previous studies, the author reveals that, in terms of relative risk, i.e. Information and Treynor ratios, active ETFs with highest average daily trading volumes seem to perform better than their passive peers.

Garyn-Tal (2013) examines whether the performance of ETFs is affected by active management in a positive way. Performance is assessed via the Fama-French-Carhart four-factor model. The author uses weekly return data on 10 active ETFs for the period 2008-2012 and finds an investment strategy in active ETFs that earns a positive risk-adjusted excess return, based on R2, as extracted from the regression of the ETFs' excess return on the four-factors' excess return. On the other hand, Meziani (2015) identifies the transparency issue and the relevant contention between the Securities and Exchange Commission (SEC) and fund sponsors seeking for approval of new active ETFs, as the main obstacle to the growth of active ETFs. He also reveals that only fixed-income active ETFs can contribute to enhancing the performance of an investment portfolio and reducing its overall risk. Therefore, it is not a surprise that fixed-income active ETFs possess by far the largest share of the U.S. active ETF market.

3. Methodology

In this section, we develop the methodology to be used in our analysis of active ETFs' performance. First, we compute the raw returns of ETFs. A single-factor regression analysis of ETFs' performance follows. The regression analysis of performance is expanded by using a four-factor and a six-factor model. Finally, the market timing skills of ETF managers are assessed. Overall, the methodology that we will use is common in the relevant literature on ETFs and traditional actively managed mutual funds.

3.1 Raw Returns

We compute the raw return of active ETFs in percentage terms over the period 2018-2021 with daily trade data found on www.nasdaq.com. Percentage return is calculated with formula (1):

$$Ri,t = \frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}} \quad (1)$$

where $R_{i,t}$ refers to the percentage daily return of the *ith* ETF on the trade day *t* and $P_{i,t}$ refers to the close trade price of the ETF on day *t*.[3] Formula (1) is also used for the calculation of

[3] We have also calculated the absolute returns with dividend-adjusted trade price data without returns differing significantly from the dividend-free returns. For simplicity purposes, we only report the returns which are not adjusted for dividends.

market performance. We use the S&P 500 Index as a proxy for the market. In addition, formula (1) is used for the calculation of total (or cumulative) return of ETFs and market over the entire period under study. Finally, the risk of ETFs and the market index is calculated as the standard deviation in daily returns.

3.2 Single-factor Performance Analysis

The first model used to examine the performance of ETFs is the following:

$$R_i - R_f = \alpha_i + \beta_i(R_m - R_f) + \varepsilon_i \quad (2)$$

where R_i denotes the daily return of ETFs, R_m represents the return of the S&P 500 Index and R_f is the risk-free rate expressed by the one-month U.S. Treasury bill rate. The model is applied with the regression method of the Least Squares and, when it is necessary, adjustments are made, for dealing with autocorrelation and heteroskedasticity issues.

Alpha represents the above-market return that can be achieved by an ETF. It is used to assess the selection skills of ETF managers. If ETFs can achieve above-market returns, alpha estimates will be positive and statistically significant. Beta measures the part of risk that cannot be mitigated by diversification techniques and indicates the systematic risk of active ETFs.

3.3 Four-Factor Performance Analysis

We evaluate the exposure of ETFs to certain market factors with the Fama and French (1992) three-factor model, to which we add the momentum factor of Carhart (1997). The model is shown in Equation (3):

$$R_i - R_f = \alpha_i + \beta_{1,i}(R_m - R_f) + \beta_{2,i}SMB + \beta_{3,i}HML + \beta_{4,i}MOM + \varepsilon_i \quad (3)$$

where R_i, R_m and R_f are defined as in Section 3.2. The model is applied with the regression method of the Least Squares and, when it is necessary, adjustments are made, for dealing with autocorrelation and heteroskedasticity issues.

SMB (Small Minus Big) is the average return on nine small-cap portfolios minus the average return on nine large-cap portfolios. HML (High Minus Low) is the average return on two value portfolios (in book-to-market equity terms) minus the average return on two growth portfolios.

In the Fama and French model, the size effect implies that small cap companies outperform large firms. The book-to-market equity ratio effect captured by the HML factor implies that the average returns on stocks with a high book-value to market-value equity ratio must be greater than the returns on stocks with a low book-value to market-value equity ratio.

Finally, the existence of a momentum in asset prices is considered to be an anomaly which is difficult to explain, because the efficient capital markets theory suggests that an increase in the price of an asset cannot indicate a further increase in future prices. An explanation to this anomaly offered by behavioralists is that investors are not rational and that they underreact to the release of new information. In doing so, they fail to reflect new information into stock prices.

3.4 Six-Factor Performance Analysis

We evaluate the exposure of ETFs to certain market factors with the Fama and French (2015) five-factor model, in which we add the momentum factor of Carhart (1997). The model is shown in Equation (4):

$$R_i-R_f=\alpha_i+\beta_{1,i}(R_m-R_f)+\beta_{2,i}SMB+\beta_{3,i}HML+\beta_{4,i}RMW+\beta_{5,i}CMA+\beta_{6,i}MOM+\varepsilon_i \quad (4)$$

where R_i, R_m and R_f, SMB, HML and MOM are defined as above. The model is applied with the regression method of the Least Squares and, when necessary, adjustments are made, for dealing with autocorrelation and heteroskedasticity issues.

Finally, the Robust Minus Weak and the Conservative Minus Aggressive factors correspond to the Fama and French (2015) operating profitability and investment factors. Based on the findings of Fama and French (2015), a negative loading is expected for the RMW factor, that is, the excess return of active ETFs must be affected by the profitability factor in a negative fashion. Furthermore, past investment is viewed as a proxy for the expected future investment. Fama and French (2015) suggest that CMA implies a negative relationship between the expected investment and the expected internal rate of return.[4]

3.5 Market Timing Analysis

The ability of active ETF managers to time the market is evaluated in this section. Market timing implies the efficient increase or decrease in a portfolio's exposure to equities prior to market accessions or decreases, respectively. In our analysis, we use two alternative models to assess the market timing skills of active ETF managers.

The first method is the Treynor and Mazuy (1966) model shown in Equation (5):

$$R_i-R_f=\alpha_i+\beta_i(R_m-R_f)+\gamma_i(R_m-R_f)^2+\varepsilon_i \quad (5)$$

where R_i, R_m, R_f, α_i and β_i are defined as above. γ_i measures the market timing skills. The model is applied with the method of the Least Squares and, when necessary, adjustments are made, for dealing with autocorrelation and heteroskedasticity issues.

If the manager increases (decreases) efficiently the portfolio's exposure to the market index prior to market accessions (recessions), γ_i will be positive and statistically significant, indicating that the manager can capture the bull and bear moments of the market.

The second model used is the higher moment model suggested by Jagannathan and Korajczyk (1986). This model is based on the Treynor and Mazuy (1966) model but additionally includes a cubic term of the market excess performance. The cubic term is used to evaluate the ability of managers to time the market volatility. The model is shown in Equation (6):

$$R_i-R_f=\alpha_i+\beta_i(R_m-R_f)+\gamma_i(R_m-R_f)^2+\delta_i(R_m-R_f)^3+\varepsilon_i \quad (6)$$

where R_i, R_m, R_f, α_i, β_i and γ_i are defined as above and δ_i measures the response of each ETF to market volatility. The model is applied with the regression method of the Least Squares and, when necessary, adjustments are made, for dealing with autocorrelation and heteroskedasticity issues.

3.5 The Sample

The sample includes 50 equity active ETFs traded on the U.S. market. If we consider the total number of active ETFs available in the U.S. today, this relatively small sample is due to the fact that the population of active ETFs surged over the last two years (2020 and 2021). However, we needed sufficient return data to apply substantive testing on performance. Thus, we decided that a period spanning from 1/1/2018 to 31/12/2021 serves the purposes of our

[4] The historical daily data of risk-free rate, the Fama and French three "traditional" factors, as well as the robust minus weak factor and the conservative minus aggressive factor, and the momentum factor are available on http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html.

analysis. No other selection criterion has been applied. As a result, our sample is limited to these 50 active ETFs.

Table 1 presents the profiles of active ETFs, which include their ticker, name, inception date, age as of 31/12/2021(in years), expense ratio, average daily volume over the period 1/1/2018-31/12/2021, average trading frequency, as the fraction of the days with no zero volume to the entire to total trade days over the period 1/1/2018-31/12/2021, average intraday volatility, computed as (Daily Highest Price-Daily Lowest Price)/Daily Close Price, and assets under management as of 31/12/2021.[5]

Table 1: Profiles of ETFs
This table presents the profiles of active ETFs, which include their ticker, name, inception date, age in years as of 31/12/2021, expense ratio, average daily volume over the period 1/1/2018-31/12/2021, average trading frequency, as the fraction of the days with no zero volume to the entire to total trade days over the period 1/1/2018-31/12/2021, average intraday volatility, computed as (Daily Highest Price-Daily Lowest Price)/Daily Close Price, and assets under management (AUM) as of 31/12/2021.

Ticker[1]	Name[1]	Inception[1]	Age	Exp. Ratio[1]	Volume[2]	Trade Freq.	Intr. Vol.	AUM ($ M)[1]
ARKK	ARK Innovation ETF	Oct 31, 2014	7.17	0.75%	2,952,830	100.00%	2.76	12,366.60
ARKG	ARK Genomic Revolution ETF	Oct 31, 2014	7.17	0.75%	1,210,900	100.00%	3.06	4,041.90
ARKW	ARK Next Generation Internet ETF	Sep 29, 2014	7.26	0.83%	530,375	100.00%	2.43	2,431.80
EMLP	First Trust North American Energy Infrastructure Fund	Jun 21, 2012	9.53	0.96%	559,641	100.00%	1.28	2,229.70
ARKQ	ARK Autonomous Technology & Robotics ETF	Sep 30, 2014	7.26	0.75%	248,857	100.00%	2.02	1,558.00
SECT	Northern Lights Fund Trust IV Main Sector Rotation ETF	Sep 05, 2017	4.32	0.78%	68,831	100.00%	1.13	1,025.30
SYLD	Cambria Shareholder Yield ETF	May 14, 2013	8.64	0.59%	23,823	100.00%	1.54	425.90
DUSA	Davis Select U.S. Equity ETF	Jan 11, 2017	4.97	0.62%	19,244	100.00%	1.09	377.10
PHDG	Invesco S&P 500® Downside Hedged ETF	Dec 06, 2012	9.07	0.40%	37,404	99.40%	0.92	362.10
DWLD	Davis Select Worldwide ETF	Jan 11, 2017	4.97	0.63%	38,845	100.00%	1.21	336.70
AMZA	InfraCap MLP ETF	Oct 01, 2014	7.25	2.01%	104,528	100.00%	3.12	312.60
CCOR	Core Alternative ETF	May 24, 2017	4.61	1.09%	23,557	99.80%	0.94	277.70
LRGE	ClearBridge Large Cap Growth ESG ETF	May 22, 2017	4.61	0.59%	18,960	88.59%	0.90	228.40
QVAL	Alpha Architect U.S. Quantitative Value ETF	Oct 22, 2014	7.20	0.49%	21,922	100.00%	1.33	214.00

[5] Tickers, names, inception dates, expense ratios and assets under management have been found on www.etfdb.com. Volumes have been found on www.nasdaq.com.

Ticker[1]	Name[1]	Inception[1]	Age	Exp. Ratio[1]	Volume[2]	Trade Freq.	Intr. Vol.	AUM ($ M)[1]
DFNL	Davis Select Financial ETF	Jan 11, 2017	4.97	0.64%	19,367	100.00%	1.24	205.80
CACG	ClearBridge All Cap Growth ESG ETF	May 03, 2017	4.67	0.53%	16,959	100.00%	1.14	189.40
RFDI	First Trust RiverFront Dynamic Developed International ETF	Apr 13, 2016	5.72	0.83%	31,510	100.00%	0.72	166.40
AIEQ	AI Powered Equity ETF	Oct 17, 2017	7.21	0.80%	44,579	100.00%	1.47	144.80
IVAL	Alpha Architect International Quantitative Value ETF	Dec 17, 2014	7.04	0.60%	18,004	100.00%	0.74	143.10
FLLV	Franklin Liberty U.S. Low Volatility ETF	Sep 20, 2016	5.28	0.29%	12,168	88.39%	0.73	139.50
HUSV	First Trust Horizon Managed Volatility Domestic ETF	Aug 24, 2016	5.36	0.70%	40,785	100.00%	0.86	127.90
GVAL	Cambria Global Value ETF	Mar 12, 2014	7.64	0.71%	26,812	100.00%	0.93	125.10
RFDA	RiverFront Dynamic US Dividend Advantage ETF	Jun 07, 2016	5.57	0.52%	14,326	100.00%	0.84	113.00
EYLD	Cambria Emerging Shareholder Yield ETF	Jul 14, 2016	5.47	0.65%	6,928	100.00%	1.18	95.30
DGRE	WisdomTree Emerging Markets Quality Dividend Growth Fund	Aug 01, 2013	8.42	0.32%	18,844	100.00%	0.95	90.30
QMOM	Alpha Architect U.S. Quantitative Momentum ETF	Dec 02, 2015	6.08	0.49%	12,646	99.90%	1.46	85.50
HDGE	AdvisorShares Ranger Equity Bear ETF	Jan 26, 2011	10.94	5.20%	61,121	100.00%	1.67	79.50
TTAI	FCF International Quality ETF	Jun 28, 2017	4.51	0.61%	3,174	91.57%	0.38	79.20
RESP	WisdomTree US ESG Fund	Feb 23, 2007	14.86	0.28%	10,791	99.90%	0.89	77.00
HDMV	First Trust Horizon Managed Volatility Developed Intl ETF	Aug 24, 2016	5.36	0.80%	21,180	100.00%	0.69	75.10
IMOM	Alpha Architect International Quantitative Momentum ETF	Dec 23, 2015	6.03	0.60%	12,991	99.70%	0.69	68.20
AADR	AdvisorShares Dorsey Wright ADR ETF	Jul 20, 2010	11.46	1.10%	16,322	99.21%	1.20	66.70

Ticker[1]	Name[1]	Inception[1]	Age	Exp. Ratio[1]	Volume[2]	Trade Freq.	Intr. Vol.	AUM ($ M)[1]
FYLD	Cambria Foreign Shareholder Yield ETF	Dec 03, 2013	8.08	0.59%	7,759	100.00%	0.85	52.90
DBLV	AdvisorShares DoubleLine Value Equity ETF	Oct 04, 2011	10.25	0.91%	2,351	99.80%	0.73	48.20
FTHI	First Trust BuyWrite Income ETF	Jan 06, 2014	7.99	0.85%	15,024	99.80%	1.03	47.90
WBIF	WBI BullBear Value 3000 ETF	Aug 27, 2014	7.35	1.25%	9,210	100.00%	0.59	47.50
RFEM	First Trust RiverFront Dynamic Emerging Markets ETF	Jun 14, 2016	5.55	0.95%	10,187	99.31%	0.75	46.80
WBIG	WBI BullBear Yield 3000 ETF	Aug 27, 2014	7.35	1.14%	14,903	100.00%	0.63	44.40
VMOT	Alpha Architect Value Momentum Trend ETF	May 03, 2017	4.67	1.75%	14,117	100.00%	0.65	43.60
WBIL	WBI BullBear Quality 3000 ETF	Aug 25, 2014	7.36	1.25%	11,187	100.00%	0.59	42.60
UTES	Virtus Reaves Utilities ETF	Sep 23, 2015	6.28	0.49%	3,748	90.18%	0.85	40.60
RFFC	RiverFront Dynamic US Flex-Cap ETF	Jun 07, 2016	5.57	0.52%	14,916	100.00%	0.91	33.30
CWS	AdvisorShares Focused Equity ETF	Sep 20, 2016	5.28	0.66%	2,302	97.72%	0.95	31.90
RESE	WisdomTree Emerging Markets ESG Fund	Apr 07, 2016	5.74	0.32%	7,027	100.00%	0.73	27.60
SMCP	AlphaMark Actively Managed Small Cap ETF	Apr 21, 2015	6.70	1.18%	1,318	67.66%	0.38	23.70
RFEU	First Trust RiverFront Dynamic Europe ETF	Apr 14, 2016	5.72	0.83%	8,385	90.28%	0.51	21.90
YLDE	ClearBridge Dividend Strategy ESG ETF	May 22, 2017	4.61	0.60%	1,813	64.09%	0.30	19.00
FTLB	First Trust Hedged BuyWrite Income ETF	Jan 06, 2014	7.99	0.85%	3,739	90.58%	0.45	10.90
RESD	WisdomTree International ESG Fund	Nov 03, 2016	5.16	0.30%	5,827	95.34%	0.33	8.90
VWID	Virtus WMC International Dividend ETF	Oct 10, 2017	4.23	0.49%	210	44.25%	0.07	7.10
Average			**6.73**	**0.84%**	**127,645**	**96.11%**	**1.06**	**577.17**
Median			**6.18**	**0.68%**	**15,673**	**100.00%**	**0.91**	**87.90**
Min			**4.23**	**0.28%**	**210**	**44.25%**	**0.07**	**7.10**
Max			**14.86**	**5.20%**	**2,952,830**	**100.00%**	**3.12**	**12,366.60**

Notes: [1] Source: www.etfdb.com. [2] Source: www.nasdaq.com.

The average age of active ETFs approximates seven years while the oldest ETF in the sample is about 15 years old. Overall, age indicates that this section of the ETF market is relatively young. This fact might have implications for the management and performance of these funds.

The average expense ratio of active ETFs is equal to 84 basis points (bps). The minimum expense ratio is 28 bps, which is comparable to the expense ratios of several passively managed ETFs. However, the maximum expense record in the sample is 520 bps. This percentage stands as an outlier in the sample.

When it comes to trading activity, the average daily volume in Table 1 amounts to 128th. shares. It is notable that the range between the minimum and maximum volume in the sample is huge. Overall, if we focus on the median term of volumes, we can see that the daily trading activity for most of active ETFs in the sample does not exceed 16th. shares per day. This is a rather weak trading activity relative to the popular passive ETF products.

The average trading frequency is quite high at 96%. This indicates that, on average, active ETFs present only a few days of zero trading activity. However, we should note that the minimum trading frequency in the sample just exceeds 44%. Therefore, there are active ETFs whose trading activity is quite poor. This element might imply liquidity issues for the corresponding active ETFs.

With respect to intraday volatility, the respective average term in Table 1 is 1.06. The median term is even lower at 0.91. These low measures indicate that the period under study has been a rather smooth era for the active ETF market.

Finally, in regard to assets, Table 1 shows that the average active ETF in the sample managed about $577 million at the end of 2021. The largest actively managed equity ETF is the ARK Innovation ETF (ARKK), with assets exceeding $12 billion. On the other hand, the bottom record of assets in the sample is just $7 million. Overall, the rather small figure of assets, compared to the hundreds of billions managed by several successful passive ETFs, verify the long-lasting reluctance of investors to embrace actively managed ETFs.

4. Empirical Results

4.1. Raw Returns

The descriptive statistics of returns are provided in Table 2. The table presents the average and median daily returns, the standard deviation of returns, and the minimum and maximum returns. The cumulative return of each ETF over the entire study period is also presented along with the average daily and the cumulative excess return of each ETF against the S&P 500 Index, as well as the excess risk relative to the market index.

Table 2: Descriptive Statistics of Returns

This table presents the descriptive statistics of each ETF's return, namely the average daily return, the median daily return, the standard deviation of returns, and the minimum and maximum returns. In addition, the cumulative return of each ETF is presented along with the average daily and the cumulative excess return of each ETF against the S&P 500 Index, as well as the excess risk relative to the market index. The study period spans from 1/1/2018 to 31/12/2021.

Ticker	Average	Median	StDev	Min	Max	Cumulative	Daily Exc. Ret.	Cum. Exc. Ret	Excess Risk
ARKK	0.12	0.26	2.35	-15.57	10.42	145.18	0.05	68.38	1.02
ARKG	0.12	0.25	2.49	-13.76	11.16	141.39	0.05	64.59	1.15
ARKW	0.12	0.28	2.20	-15.11	9.73	149.59	0.05	72.79	0.86
EMLP	0.01	0.08	1.40	-14.05	9.28	0.85	-0.05	-75.95	0.06
ARKQ	0.10	0.22	1.89	-10.44	9.20	128.25	0.03	51.45	0.55
SECT	0.06	0.10	1.42	-13.36	16.03	62.28	-0.01	-14.52	0.08
SYLD	0.07	0.11	1.78	-10.96	12.16	67.48	0.00	-9.32	0.45

Ticker	Average	Median	StDev	Min	Max	Cumulative	Daily Exc. Ret.	Cum. Exc. Ret	Excess Risk
DUSA	0.05	0.12	1.41	-9.69	10.02	45.55	-0.02	-31.25	0.07
PHDG	0.04	0.04	0.88	-7.37	11.50	38.13	-0.03	-38.66	-0.46
DWLD	0.02	0.09	1.46	-11.23	9.36	9.14	-0.05	-67.66	0.12
AMZA	-0.07	0.00	3.22	-42.38	24.10	-70.84	-0.13	-147.64	1.88
CCOR	0.02	0.00	0.67	-5.33	5.17	21.08	-0.04	-55.72	-0.66
LRGE	0.08	0.02	1.33	-9.13	8.24	106.14	0.02	29.34	-0.01
QVAL	0.03	0.03	1.67	-11.92	10.58	19.26	-0.03	-57.54	0.33
DFNL	0.04	0.09	1.74	-13.57	12.19	28.35	-0.03	-48.45	0.40
CACG	0.07	0.13	1.38	-12.08	9.01	80.23	0.00	3.43	0.04
RFDI	0.02	0.09	1.19	-10.98	7.44	13.15	-0.05	-63.65	-0.15
AIEQ	0.06	0.17	1.46	-12.00	8.09	60.73	-0.01	-16.07	0.12
IVAL	-0.01	0.06	1.36	-11.27	10.03	-21.04	-0.08	-97.84	0.02
FLLV	0.06	0.02	1.23	-11.45	9.42	69.86	-0.01	-6.94	-0.11
HUSV	0.05	0.11	1.14	-11.08	9.56	56.72	-0.01	-20.08	-0.20
GVAL	0.00	0.09	1.31	-11.67	6.41	-11.92	-0.07	-88.72	-0.03
RFDA	0.05	0.09	1.24	-9.15	8.26	48.99	-0.02	-27.81	-0.10
EYLD	0.01	0.06	1.27	-9.43	6.60	2.31	-0.06	-74.49	-0.06
DGRE	0.01	0.11	1.39	-12.12	6.76	2.60	-0.05	-74.20	0.05
QMOM	0.08	0.22	2.02	-14.81	11.16	75.60	0.01	-1.20	0.68
HDGE	-0.10	-0.15	1.57	-11.96	11.77	-68.18	-0.17	-144.98	0.23
TTAI	0.04	0.00	1.35	-11.60	14.55	33.95	-0.03	-42.85	0.01
RESP	0.06	0.12	1.32	-9.54	8.81	59.54	-0.01	-17.26	-0.02
HDMV	0.00	0.07	0.97	-10.15	6.35	-7.97	-0.07	-84.77	-0.37
IMOM	0.02	0.04	1.41	-10.48	9.48	10.78	-0.05	-66.02	0.07
AADR	0.02	0.11	1.53	-15.35	8.96	6.55	-0.05	-70.25	0.19
FYLD	0.01	0.06	1.33	-11.18	8.91	3.07	-0.05	-73.72	-0.01
DBLV	0.04	0.07	1.24	-8.34	7.17	37.02	-0.03	-39.78	-0.10
FTHI	0.00	0.07	1.02	-7.31	7.52	-6.07	-0.07	-82.87	-0.31
WBIF	0.01	0.04	0.82	-6.12	3.59	6.45	-0.06	-70.35	-0.52
RFEM	0.00	0.06	1.44	-11.67	7.41	-6.24	-0.06	-83.04	0.10
WBIG	0.01	0.05	0.78	-6.08	2.91	2.20	-0.06	-74.60	-0.56
VMOT	0.00	0.05	0.93	-4.31	3.72	-8.19	-0.07	-84.98	-0.41
WBIL	0.02	0.05	0.81	-5.71	3.15	12.99	-0.05	-63.81	-0.53
UTES	0.05	0.03	1.34	-10.36	9.88	47.50	-0.02	-29.30	0.00
RFFC	0.05	0.11	1.35	-11.68	8.02	44.65	-0.02	-32.15	0.01
CWS	0.06	0.08	1.23	-6.98	7.71	70.20	-0.01	-6.60	-0.11
RESE	0.01	0.08	1.41	-16.49	7.74	4.23	-0.05	-72.57	0.08
SMCP	0.03	0.00	1.36	-10.04	7.65	17.95	-0.04	-58.85	0.02
RFEU	0.03	0.01	1.25	-10.98	7.35	19.02	-0.04	-57.77	-0.09
YLDE	0.05	0.00	1.16	-13.05	7.92	56.70	-0.01	-20.10	-0.17
FTLB	0.00	0.00	0.69	-4.01	5.11	-6.35	-0.07	-83.15	-0.65
RESD	0.03	0.03	1.14	-9.05	6.02	25.59	-0.04	-51.21	-0.20
VWID	0.01	0.00	1.18	-9.72	16.29	4.32	-0.05	-72.48	-0.16
Average	**0.03**	**0.08**	**1.39**	**-11.24**	**9.00**	**32.58**	**-0.03**	**-44.22**	**0.05**
Median	**0.03**	**0.07**	**1.34**	**-11.03**	**8.86**	**20.17**	**-0.04**	**-56.63**	**0.00**
Min	**-0.10**	**-0.15**	**0.67**	**-42.38**	**2.91**	**-70.84**	**-0.17**	**-147.64**	**-0.66**
Max	**0.12**	**0.28**	**3.22**	**-4.01**	**24.10**	**149.59**	**0.05**	**72.79**	**1.88**

The average daily return of active ETFs is 3 (basic points) bps, with the majority of them presenting slightly positive average daily returns. Moreover, the average cumulative return in the sample is 33%, with 80% of the funds presenting positive cumulative returns. These returns seem to be quite satisfactory. However, the majority of active ETFs fall short in the comparison with the passive market index. The average cumulative excess raw return of active ETFs relative to the S&P 500 Index is negative at -44%, whereas only six out of 50 funds present positive above-market raw returns.

The average risk estimate of active ETFs is 1.39, which is rather low. Moreover, Table 2 reports an average excess risk relative to the risk of the market of 5 bps. In addition, 25 ETFs

present risk that is higher than that of the market and 25 ETFs present the opposite. Overall, the measures of excess risk indicate that, actually, the risk of active ETFs is quite aligned to market risk.

The main conclusion that can be reached by analyzing raw returns and risks is that, on average, active ETFs cannot beat the market, even though there are limited cases in which active ETFs do outperform the market index. On the other hand, the total risk of these ETFs seems to be quite low and to be going hand-in-hand with market risk.

4.2 Single-factor Performance Analysis

The results of the single-factor performance regression analysis are reported in Table 3. The table includes the alpha and beta estimates along with t-tests on the statistical significance of estimates and R-squared on the explanatory power of the model.

Table 3: Single-Factor Performance Regression Results

This table presents the results of the single-factor performance regression model via which the daily excess return (return minus risk free rate) of each ETF is regressed on the excess return of the S&P 500 Index. Alpha reflects the above-market return that can be achieved by an ETF. Beta counts for the systematic risk of ETFs. The study period spans from 1/1/2018 to 31/12/2021.

Ticker	alpha	T-test	beta	T-test	R^2
ARKK	0.04	0.76	1.26[a]	32.80	0.52
ARKG	0.05	0.77	1.17[a]	25.81	0.40
ARKW	0.04	0.88	1.19[a]	33.44	0.53
EMLP	-0.04	-1.42	0.82[a]	39.56	0.61
ARKQ	0.03	0.86	1.12[a]	41.90	0.64
SECT	0.00	0.03	0.94[a]	59.84	0.78
SYLD	0.00	-0.01	1.10[a]	46.30	0.68
DUSA	-0.01	-0.60	0.96[a]	67.55	0.82
PHDG	0.03	1.00	0.14[a]	7.16	0.05
DWLD	-0.04[c]	-1.62	0.94[a]	53.44	0.74
AMZA	-0.15[c]	-1.75	1.33[a]	21.13	0.31
CCOR	0.01	0.62	0.14[a]	9.20	0.08
LRGE	0.03	1.33	0.86[a]	54.24	0.75
QVAL	-0.03	-1.15	1.05[a]	49.19	0.71
DFNL	-0.03	-0.84	1.07[a]	46.54	0.68
CACG	0.01	0.59	0.97[a]	92.24	0.89
RFDI	-0.03	-1.52	0.78[a]	56.20	0.76
AIEQ	0.00	-0.03	0.96[a]	57.67	0.77
IVAL	-0.07[b]	-2.67	0.83[a]	45.58	0.67
FLLV	0.01	0.56	0.83[a]	68.33	0.82
HUSV	0.00	0.23	0.78[a]	72.27	0.84
GVAL	-0.05[c]	-2.10	0.79[a]	42.49	0.64
RFDA	-0.01	-0.76	0.90[a]	119.11	0.93
EYLD	-0.02	-0.65	0.52[a]	20.86	0.30
DGRE	-0.04	-1.36	0.81[a]	39.42	0.61
QMOM	0.01	0.16	1.14[a]	36.40	0.57
HDGE	-0.04	-1.47	0.92[a]	40.82	0.62
TTAI	-0.01	-0.25	0.74[a]	34.40	0.54
RESP	0.00	-0.34	0.96[a]	124.75	0.94
HDMV	-0.04[b]	-2.53	0.61[a]	50.58	0.72
IMOM	-0.03	-0.96	0.79[a]	35.93	0.56
AADR	-0.04	-1.20	0.89[a]	39.14	0.60
FYLD	-0.04	-1.31	0.77[a]	38.43	0.60
DBLV	-0.01	-0.62	0.82[a]	60.25	0.78
FTHI	-0.04[b]	-2.22	0.64[a]	47.37	0.69
WBIF	-0.01	-0.53	0.34[a]	21.29	0.31
RFEM	-0.05[c]	-1.61	0.83[a]	38.25	0.59
WBIG	-0.01	-0.71	0.32[a]	21.03	0.31
VMOT	-0.03	-1.54	0.47[a]	29.36	0.46
WBIL	-0.01	-0.28	0.35[a]	22.21	0.33

Ticker	alpha	T-test	beta	T-test	R^2
UTES	0.01	0.28	0.63[a]	25.57	0.39
RFFC	-0.01	-1.33	0.98[a]	123.83	0.94
CWS	0.01	0.64	0.75[a]	44.82	0.67
RESE	-0.04	-1.43	0.85[a]	42.96	0.65
SMCP	-0.01	-0.24	0.56[a]	21.02	0.31
RFEU	-0.02	-0.83	0.74[a]	40.94	0.63
YLDE	0.01	0.49	0.64[a]	34.83	0.55
FTLB	-0.02	-1.28	0.30[a]	22.75	0.34
RESD	-0.02	-0.81	0.72[a]	51.49	0.73
VWID	-0.01	-0.34	0.37[a]	14.62	0.18
Average	**-0.01**	**-0.58**	**0.79**	**45.31**	**0.59**
Median	**-0.01**	**-0.63**	**0.82**	**40.88**	**0.62**
Min	**-0.15**	**-2.67**	**0.14**	**7.16**	**0.05**
Max	**0.05**	**1.33**	**1.33**	**124.75**	**0.94**

Notes: [a] indicates statistical significance at 1% level; [b] indicates statistical significance at 5% level; [c] indicates statistical significance at 10% level.

The average alpha estimate of active ETFs is slightly negative amounting to -1 bps. The majority of individual alphas are statistically insignificant, while there are only seven significant alphas, which are all negative. Overall, these results show that active ETFs in the U.S. cannot outperform the market, while there are some cases in which active ETFs actually underperform the market. This finding is in line with the findings of the raw return analysis in the previous section.

In regard to the systematic risk of active ETFs, Table 3 reports an average beta of 0.79. Furthermore, about 80% of beta coefficients are lower than unity. These results may indicate a conservatism of active ETFs relative to the market index, implying that, actually, active ETFs are not that active. However, these results might be viewed as if the active ETFs in the sample invest in stocks and markets which are not absolutely comparable to the S&P 500 Index.

4.3 Four-Factor Performance Analysis

The results of the four-factor performance regression Model (3) are provided in Table 4. The table includes the alpha coefficients along with the estimates of the explanatory variables of the model. T-tests on the statistical significance of estimates are offered too along with R-squared on the sufficiency of the model to explain the performance of active ETFs in the sample.

Table 4: Four-Factor Performance Regression Results

This table presents the results of a four-factor performance regression model via which the daily excess return of each ETF is regressed on the excess return of S&P 500 Index, the Fama & French (1992) SMB (small minus big) factor, HML (high minus low book-to-price ratio) factor, and the Carhart (1997) MOM (momentum) factor. The study period spans from 1/1/2018 to 31/12/2021.

Ticker	alpha	T-test	beta	T-test	SMB	T-test	HML	T-test	MOM	T-test	R^2
ARKK	0.01	0.28	1.28[a]	49.19	1.28[a]	26.29	-1.12[a]	-24.39	0.03	0.70	0.79
ARKG	0.01	0.29	1.19[a]	37.63	1.53[a]	25.81	-1.31[a]	-23.50	-0.03	-0.69	0.72
ARKW	0.02	0.46	1.22[a]	46.00	0.90[a]	18.07	-0.92[a]	-19.77	0.11[a]	3.09	0.75
EMLP	-0.03	-1.12	0.78[a]	42.00	0.14[a]	3.97	0.28[a]	8.71	-0.05[c]	-1.79	0.69
ARKQ	0.02	0.68	1.11[a]	51.73	0.88[a]	21.79	-0.53[a]	-13.89	0.03	0.92	0.77
SECT	0.00	0.22	0.93[a]	59.96	0.17[a]	5.96	0.07[b]	2.45	0.12[a]	5.38	0.79
SYLD	0.02	1.60	1.01[a]	87.61	0.66[a]	30.48	0.52[a]	25.77	0.01	0.75	0.93
DUSA	0.00	-0.16	0.93[a]	73.57	0.13[a]	5.53	0.21[a]	9.28	-0.01	-0.56	0.86
PHDG	0.02	0.93	0.15[a]	7.42	-0.07[c]	-1.95	-0.04	-1.15	-0.09[a]	-3.09	0.06
DWLD	-0.04[c]	-1.62	0.92[a]	53.91	0.27[a]	8.36	-0.03	-0.87	-0.02	-0.82	0.76
AMZA	-0.12[c]	-1.64	1.21[a]	21.85	1.01[a]	9.80	0.51[a]	5.23	-0.26[a]	-3.31	0.48
CCOR	0.02	0.89	0.13[a]	8.84	-0.10[a]	-3.71	0.16[a]	6.15	0.00	0.17	0.13

Ticker	alpha	T-test	beta	T-test	SMB	T-test	HML	T-test	MOM	T-test	R^2
LRGE	0.02	1.02	0.87[a]	57.35	0.06[b]	2.14	-0.22[a]	-8.22	-0.01	-0.68	0.77
QVAL	-0.02	-0.91	0.98[a]	65.47	0.52[a]	18.55	0.28[a]	10.52	-0.07[a]	-3.48	0.86
DFNL	0.00	0.09	1.00[a]	80.66	0.19[a]	8.04	0.71[a]	32.47	-0.01	-0.49	0.91
CACG	0.00	-0.01	0.99[a]	110.87	0.17[a]	9.98	-0.27[a]	-17.51	-0.03[b]	-2.25	0.93
RFDI	-0.03	-1.50	0.77[a]	55.91	0.16[a]	6.11	-0.01	-0.50	0.00	-0.05	0.77
AIEQ	-0.01	-0.40	0.96[a]	72.80	0.35[a]	14.10	-0.25[a]	-10.84	0.18[a]	9.89	0.86
IVAL	-0.06[c]	-2.61	0.81[a]	46.86	0.18[a]	5.66	0.11[a]	3.68	-0.07[a]	-2.97	0.72
FLLV	0.01	0.77	0.83[a]	68.28	-0.06[b]	-2.78	0.10[a]	4.83	0.00	0.11	0.83
HUSV	0.01	0.45	0.78[a]	74.39	-0.16[a]	-8.18	0.12[a]	6.43	0.05[a]	3.07	0.85
GVAL	-0.04[c]	-1.93	0.76[a]	44.06	0.17[a]	5.39	0.18[a]	6.02	-0.04[c]	-1.78	0.70
RFDA	-0.01	-0.79	0.89[a]	120.03	0.08[a]	5.85	-0.02[c]	-1.80	-0.03[a]	-3.02	0.94
EYLD	-0.02	-0.54	0.50[a]	20.18	0.19[a]	4.14	0.06	1.39	-0.01	-0.17	0.32
DGRE	-0.04	-1.36	0.80[a]	38.89	0.16[a]	4.21	-0.04	-1.00	-0.01	-0.49	0.61
QMOM	0.00	-0.01	1.13[a]	51.64	0.91[a]	22.18	-0.40[a]	-10.37	0.49[a]	15.98	0.80
HDGE	-0.04[b]	-2.27	0.89[a]	60.42	-0.67[a]	-24.37	0.18[a]	7.05	0.42[a]	20.72	0.85
TTAI	0.00	-0.12	0.73[a]	33.62	0.09[b]	2.22	0.08[b]	2.19	0.04	1.42	0.55
RESP	0.00	-0.18	0.95[a]	124.57	0.06[a]	4.34	0.03[b]	2.22	0.01	0.76	0.94
HDMV	-0.04[b]	-2.43	0.61[a]	49.76	0.07[a]	3.03	0.04[c]	1.78	0.02	0.94	0.72
IMOM	-0.03	-1.03	0.79[a]	36.58	0.22[a]	5.51	-0.08[b]	-2.01	0.14[a]	4.81	0.59
AADR	-0.03	-1.22	0.87[a]	42.52	0.38[a]	9.94	0.00	-0.01	0.33[a]	11.40	0.69
FYLD	-0.02	-1.02	0.73[a]	40.35	0.22[a]	6.55	0.24[a]	7.60	-0.02	-0.77	0.68
DBLV	0.00	-0.12	0.79[a]	69.50	0.19[a]	8.77	0.22[a]	10.90	-0.01	-0.78	0.85
FTHI	-0.03[c]	-1.87	0.61[a]	48.63	0.14[a]	5.92	0.21[a]	9.47	0.13[a]	7.15	0.74
WBIF	-0.01	-0.43	0.33[a]	20.63	0.17[a]	5.59	0.03	0.93	0.04[c]	1.82	0.34
RFEM	-0.05[c]	-1.64	0.82[a]	37.77	0.16[a]	3.86	-0.06	-1.46	0.00	-0.04	0.60
WBIG	-0.01	-0.59	0.31[a]	20.36	0.12[a]	4.35	0.04	1.51	0.06[b]	2.90	0.32
VMOT	-0.03[c]	-1.81	0.46[a]	32.40	0.36[a]	13.33	-0.12[a]	-4.63	0.16[a]	8.01	0.59
WBIL	-0.01	-0.26	0.34[a]	21.85	0.13[a]	4.38	-0.01	-0.53	0.06[b]	2.69	0.35
UTES	0.01	0.44	0.62[a]	25.24	-0.12[b]	-2.54	0.17[a]	3.89	0.00	0.12	0.41
RFFC	-0.01	-1.59	0.96[a]	142.00	0.24[a]	19.22	-0.07[a]	-5.53	-0.02[c]	-1.85	0.96
CWS	0.02	0.76	0.74[a]	43.99	0.08[b]	2.70	0.05	1.59	0.02	0.87	0.67
RESE	-0.04	-1.45	0.85[a]	42.41	0.13[a]	3.59	-0.04	-1.15	0.01	0.31	0.65
SMCP	0.00	-0.13	0.53[a]	20.80	0.42[a]	8.79	0.02	0.34	-0.09[b]	-2.42	0.38
RFEU	-0.02	-0.76	0.73[a]	40.29	0.09[b]	2.74	0.03	1.03	-0.02	-0.98	0.63
YLDE	0.02	0.80	0.62[a]	34.74	0.03	0.92	0.19[a]	5.88	-0.01	-0.49	0.58
FTLB	-0.02	-0.98	0.28[a]	22.16	0.16[a]	6.65	0.13[a]	5.86	0.12[a]	6.91	0.41
RESD	-0.01	-0.71	0.71[a]	51.26	0.13[a]	5.14	0.03	1.15	-0.02	-1.14	0.74
VWID	-0.01	-0.28	0.36[a]	14.10	0.10[b]	2.15	0.03	0.68	-0.02	-0.53	0.18
Average	**-0.01**	**-0.52**	**0.77**	**50.46**	**0.25**	**6.97**	**-0.01**	**0.76**	**0.03**	**1.52**	**0.66**
Median	**-0.01**	**-0.41**	**0.80**	**45.03**	**0.16**	**5.56**	**0.03**	**1.27**	**0.00**	**0.03**	**0.72**
Min	**-0.12**	**-2.61**	**0.13**	**7.42**	**-0.67**	**-24.37**	**-1.31**	**-24.39**	**-0.26**	**-3.48**	**0.06**
Max	**0.02**	**1.60**	**1.28**	**142.00**	**1.53**	**30.48**	**0.71**	**32.47**	**0.49**	**20.72**	**0.96**

Notes: a indicates statistical significance at 1% level; b indicates statistical significance at 5% level; c indicates statistical significance at 10% level.

The results on the above-market return of active ETFs are in line with those derived from the single-factor model. The average alpha is slightly negative at -0.01, with 41 out of 50 individual alphas being insignificant. In addition, there are nine cases in which alphas are significantly negative. These negative alphas indicate that the corresponding active ETFs underperform the market index.

The estimates of systematic risk are essentially equal to those obtained from the single-factor performance regression model. The average beta is equal to 0.77 (it was 0.79 in the single-factor market model above). In addition, the average difference in betas between the single- and the multi-factor models is 0.02 (not reported in Table 4). The estimates of systematic risk obtained via the four-factor model verify the conclusion reached through the single-factor regression analysis, that is, the examined active ETFs are either more

conservative that the S&P 500 index, or this index does not explain the performance of active ETFs in the best way.

The results on size factor reveal a positive relationship between the performance of active ETFs with this factor. There are only six SMB estimates which are significantly negative, while, with just one exception, all other estimates are positive and significant at 10% or better. The average SMB estimate of the sample is 0.25. This means that, on average terms, 25% of the performance of the average active ETF can be explained by the size factor suggested by Fama and French (1992).

This positive correlation between active ETFs' return and the size factor may be the result of active ETFs being small-cap portfolios themselves. Alternatively, it can indicate that the active ETFs choose to invest in companies with a small capitalization, which are supposed to perform better than the large-cap companies. As the size factor of Fama and French implies that small-cap entities beat the larger ones, our results seem to verify this assumption.

When it comes to the relationship between active ETFs' performance and the value factor, the average HML estimate offered by the four-factor model is not materially different from zero (being equal to -0.01). Based on this average term, we can claim that there is not a material relationship between the performance of actively managed ETFs and the Fama and French value factor.

At the fund level, there are 34 significant HML estimates, of which 22 are positive and 12 are negative. Significantly positive HML estimates mean that that the corresponding actively managed ETF portfolios have a positive relationship with the value premium suggested by Fama and French (1992). Alternatively, the positive estimates of the value factor indicate that the corresponding ETF portfolios are more exposed to value stocks. The opposite is the case for active ETFs with significantly negative HML estimates. However, the variation in significant estimates shows that there is not a consistent relationship between performance and the value factor. This relationship rather seems to be fund specific.

With respect to the impact of the market momentum factor on the performance of active ETFs, the empirical findings show that this relationship is not consistent either. At first, the average MOM estimate of the sample is equal to 0.03, that is just 3 basis points above zero. Based on this result, we can say that just 3% of the performance of the average active ETF can be explained by the momentum factor suggested by Carhart (1997).

In regard to individual momentum estimates, Table 4 includes 24 out of 50 MOM estimates which are statistically significant at 10% or better. 14 of them are positive and 10 are negative. As the MOM factor refers to winning and losing stocks based on their past performance, a positive MOM estimate indicates that the corresponding active ETF portfolios are heavier to equities with positive past returns that those ETF portfolios with negative MOM estimates. However, based on the variation in the individual MOM estimates we cannot reach a unique inference about the impact of market momentum on returns achieved by active ETFs. At best, the relationship between performance and the momentum factor is fund specific, as it was the relationship with the value factor.

4.4 Six-Factor Performance Analysis

The results of the six-factor performance regression Model (4) are provided in Table 5. The table includes the alpha coefficients along with the estimates of the explanatory variables of the model. T-tests on the statistical significance of estimates are offered too along with R-squared on the sufficiency of the model to explain the performance of active ETFs in the sample.

Table 5: Six-Factor Performance Regression Results

This table presents the results of a six-factor performance regression model via which the daily excess return of each ETF is regressed on the excess return of S&P 500 Index, the Fama & French (2015) SMB (small minus big) factor, HML (high minus low book-to-price ratio) factor, the RMW (robust minus weak) factor, the CMA (conservative minus aggressive) factor, and the Carhart (1997) MOM (momentum) factor. The study period spans from 1/1/2018 to 31/12/2021.

Ticker	alpha	T-test	beta	T-test	SMB	T-test	HML	T-test	RMW	T-test	CMA	T-test	MOM	T-test	R^2
ARKK	0.05	1.54	1.24[a]	53.69	0.96[a]	21.48	-0.71[a]	-14.95	-1.12[a]	-16.65	-0.63[a]	-7.13	-0.04	-1.28	0.84
ARKG	0.05	1.40	1.20[a]	42.34	1.14[a]	20.71	-1.02[a]	-17.36	-1.53[a]	-18.53	0.00	0.01	-0.18[a]	-4.49	0.79
ARKW	0.05	1.48	1.15[a]	46.74	0.66[a]	13.75	-0.48[a]	-9.47	-0.74[a]	-10.29	-0.99[a]	-10.60	0.11[a]	3.15	0.80
EMLP	-0.02	-0.92	0.80[a]	41.70	0.07[c]	1.96	0.28[a]	7.18	-0.30[a]	-5.36	0.19[b]	2.67	-0.09[a]	-3.29	0.70
ARKQ	0.03	1.24	1.09[a]	50.32	0.75[a]	17.87	-0.34[a]	-7.63	-0.43[a]	-6.80	-0.34[a]	-4.14	0.01	0.29	0.79
SECT	0.01	0.57	0.93[a]	58.66	0.10[a]	3.29	0.12[a]	3.61	-0.28[a]	-6.16	0.01	0.17	0.09[a]	3.98	0.80
SYLD	0.02	1.27	1.02[a]	86.26	0.70[a]	30.62	0.45[a]	18.30	0.14[a]	4.04	0.16[a]	3.66	0.01	0.88	0.93
DUSA	0.01	0.31	0.90[a]	71.34	0.08[a]	3.28	0.35[a]	13.62	-0.11[a]	-3.04	-0.42[a]	-8.70	0.01	0.39	0.87
PHDG	0.02	0.86	0.17[a]	7.95	-0.07[c]	-1.70	-0.10[b]	-2.41	-0.03	-0.48	0.23[a]	2.86	-0.11[a]	-3.57	0.07
DWLD	-0.03	-1.24	0.90[a]	51.48	0.20[a]	5.92	0.13[a]	3.68	-0.19[a]	-3.67	-0.41[a]	-6.13	-0.01	-0.45	0.77
AMZA	-0.09	-1.30	1.18[a]	20.79	0.78[a]	7.07	0.81[a]	6.87	-0.84[a]	-5.06	-0.45[b]	-2.09	-0.31[a]	-3.85	0.50
CCOR	0.01	0.60	0.17[a]	11.07	-0.07[b]	-2.51	0.01	0.47	0.02	0.47	0.47[a]	8.25	-0.03	-1.21	0.19
LRGE	0.02	1.11	0.86[a]	54.30	0.05[c]	1.74	-0.17[a]	-5.21	0.00	0.11	-0.17[b]	-2.79	0.00	-0.13	0.77
QVAL	-0.03	-1.38	0.99[a]	64.69	0.60[a]	20.45	0.19[a]	6.05	0.31[a]	6.93	0.10[c]	1.64	-0.05[b]	-2.32	0.86
DFNL	0.01	0.85	0.97[a]	81.07	0.10[a]	4.24	0.88[a]	35.91	-0.26[a]	-7.43	-0.42[a]	-9.32	-0.01	-0.33	0.92
CACG	0.00	0.36	0.97[a]	107.09	0.13[a]	7.69	-0.20[a]	-10.72	-0.08[a]	-3.10	-0.19[a]	-5.54	-0.02[c]	-1.83	0.93
RFDI	-0.02	-1.35	0.76[a]	53.43	0.13[a]	4.82	0.02	0.64	-0.08[c]	-1.96	-0.05	-0.93	-0.01	-0.28	0.77
AIEQ	0.00	0.17	0.97[a]	74.35	0.25[a]	9.74	-0.19[a]	-7.07	-0.42[a]	-10.99	0.06	1.18	0.14[a]	7.60	0.87
IVAL	-0.06[b]	-2.51	0.80[a]	44.53	0.17[a]	4.79	0.15[a]	3.99	-0.04	-0.81	-0.09	-1.38	-0.07[b]	-2.76	0.72
FLLV	0.01	0.67	0.83[a]	65.60	-0.05[b]	-2.00	0.08[a]	3.19	0.05	1.32	0.04	0.73	0.00	0.24	0.83
HUSV	0.00	0.05	0.80[a]	74.88	-0.12[a]	-5.89	0.02	1.07	0.10[a]	3.24	0.25[a]	6.20	0.04[b]	2.56	0.86
GVAL	-0.04[c]	-1.75	0.75[a]	42.20	0.13[a]	3.91	0.22[a]	6.05	-0.14[b]	-2.68	-0.05	-0.70	-0.05[b]	-2.12	0.70
RFDA	-0.01	-1.14	0.90[a]	117.35	0.11[a]	7.37	-0.07[a]	-4.26	0.09[a]	4.10	0.09[a]	2.98	-0.03[b]	-2.64	0.94
EYLD	-0.01	-0.34	0.49[a]	18.95	0.14[b]	2.75	0.15[a]	2.80	-0.18[b]	-2.38	-0.18[c]	-1.82	-0.01	-0.31	0.33
DGRE	-0.03	-1.16	0.79[a]	36.90	0.12[a]	2.80	0.04	0.96	-0.15[b]	-2.37	-0.17[b]	-2.05	-0.02	-0.58	0.62
QMOM	0.02	0.66	1.11[a]	51.24	0.74[a]	17.78	-0.18[a]	-4.16	-0.57[a]	-9.08	-0.35[a]	-4.21	0.45[a]	15.07	0.82
HDGE	-0.05[b]	-2.46	0.88[a]	57.69	-0.64[a]	-21.59	0.13[a]	4.24	0.10[b]	2.35	0.09[c]	1.64	0.43[a]	20.08	0.85
TTAI	0.00	0.09	0.72[a]	31.97	0.04	0.86	0.16[a]	3.40	-0.18[b]	-2.72	-0.13	-1.56	0.03	1.10	0.55
RESP	0.00	-0.28	0.95[a]	119.57	0.07[a]	4.58	0.02	1.00	0.03	1.21	0.03	0.87	0.01	0.81	0.94

Notes: [a] indicates statistical significance at 1% level; [b] indicates statistical significance at 5% level; [c] indicates statistical significance at 10% level.

Table 5: Six-Factor Performance Regression Results

Ticker	alpha	T-test	beta	T-test	SMB	T-test	HML	T-test	RMW	T-test	CMA	T-test	MOM	T-test	R^2
HDMV	-0.04[b]	-2.42	0.61[a]	48.34	0.06[b]	2.47	0.02	0.71	-0.05	-1.45	0.10[b]	2.04	0.00	0.25	0.72
IMOM	-0.02	-0.77	0.78[a]	35.03	0.16[a]	3.61	0.00	0.05	-0.24[a]	-3.67	-0.11	-1.28	0.13[a]	4.13	0.60
AADR	-0.02	-0.89	0.86[a]	40.98	0.29[a]	7.23	0.10[b]	2.29	-0.31[a]	-5.05	-0.13[c]	-1.69	0.30[a]	10.37	0.70
FYLD	-0.02	-0.79	0.72[a]	38.33	0.18[a]	4.88	0.31[a]	8.14	-0.14[b]	-2.63	-0.15[b]	-2.13	-0.02	-0.88	0.68
DBLV	0.00	-0.06	0.79[a]	67.16	0.17[a]	7.53	0.21[a]	8.61	-0.07[b]	-2.01	0.07	1.54	-0.02	-1.43	0.85
FTHI	-0.03[c]	-1.87	0.62[a]	47.18	0.13[a]	5.26	0.19[a]	7.02	-0.04	-1.13	0.09[c]	1.86	0.12[a]	6.29	0.74
WBIF	-0.01	-0.61	0.35[a]	20.98	0.19[a]	5.90	-0.05	-1.59	0.04	0.73	0.24[a]	3.86	0.03	1.20	0.35
RFEM	-0.04	-1.41	0.81[a]	35.79	0.10[b]	2.31	0.04	0.93	-0.18[b]	-2.70	-0.22[b]	-2.51	0.00	-0.13	0.61
WBIG	-0.02	-0.82	0.34[a]	21.44	0.15[a]	4.78	-0.07[b]	-2.01	0.01	0.22	0.34[a]	5.76	0.04[c]	1.83	0.35
VMOT	-0.03[c]	-1.65	0.47[a]	31.67	0.32[a]	11.16	-0.11[a]	-3.55	-0.16[a]	-3.66	0.07	1.30	0.14[a]	6.74	0.59
WBIL	-0.01	-0.49	0.36[a]	22.15	0.16[a]	5.13	-0.10[a]	-3.01	0.08[c]	1.66	0.23[a]	3.82	0.05[b]	2.25	0.36
UTES	0.01	0.32	0.64[a]	25.04	-0.10[c]	-1.95	0.08	1.54	0.02	0.31	0.27[a]	2.80	-0.01	-0.33	0.41
RFFC	-0.02[c]	-1.71	0.96[a]	136.05	0.26[a]	18.87	-0.06[a]	-4.41	0.06[a]	3.08	-0.05[c]	-1.72	-0.01	-0.85	0.96
CWS	0.02	0.74	0.74[a]	42.05	0.09[b]	2.64	0.05	1.27	0.02	0.41	-0.01	-0.14	0.02	0.94	0.67
RESE	-0.03	-1.23	0.84[a]	40.55	0.08[b]	2.06	0.02	0.55	-0.18[a]	-3.01	-0.10	-1.23	0.00	-0.09	0.66
SMCP	0.00	-0.01	0.54[a]	20.47	0.37[a]	7.16	0.02	0.31	-0.23[a]	-3.04	0.14	1.42	-0.12[a]	-3.19	0.39
RFEU	-0.01	-0.60	0.72[a]	38.32	0.06[c]	1.70	0.08[b]	2.10	-0.10[c]	-1.81	-0.10	-1.38	-0.03	-1.06	0.64
YLDE	0.02	0.69	0.63[a]	33.93	0.05	1.31	0.13[a]	3.46	0.03	0.60	0.15[b]	2.15	-0.02	-0.74	0.59
FTLB	-0.02	-0.96	0.29[a]	21.75	0.15[a]	5.79	0.12[a]	4.26	-0.05	-1.41	0.08[c]	1.65	0.11[a]	6.04	0.41
RESD	-0.01	-0.67	0.71[a]	48.85	0.13[a]	4.60	0.04	1.43	-0.01	-0.17	-0.04	-0.79	-0.02	-0.98	0.74
VWID	-0.01	-0.25	0.37[a]	13.85	0.08[c]	1.65	0.01	0.26	-0.09	-1.21	0.11	1.12	-0.04	-0.95	0.19
Average	**-0.01**	**-0.36**	**0.77**	**49.36**	**0.21**	**5.80**	**0.04**	**1.36**	**-0.17**	**-2.44**	**-0.05**	**-0.40**	**0.02**	**1.08**	**0.67**
Median	**-0.01**	**-0.41**	**0.80**	**43.43**	**0.13**	**4.69**	**0.04**	**1.04**	**-0.09**	**-1.99**	**0.00**	**-0.07**	**0.00**	**-0.20**	**0.72**
Min	**-0.09**	**-2.51**	**0.17**	**7.95**	**-0.64**	**-21.59**	**-1.02**	**-17.36**	**-1.53**	**-18.53**	**-0.99**	**-10.60**	**-0.31**	**-4.49**	**0.07**
Max	**0.05**	**1.54**	**1.24**	**136.05**	**1.14**	**30.62**	**0.88**	**35.91**	**0.31**	**6.93**	**0.47**	**8.25**	**0.45**	**20.08**	**0.96**

Notes: [a] indicates statistical significance at 1% level; [b] indicates statistical significance at 5% level; [c] indicates statistical significance at 10% level.

The results on the above-market return of active ETFs are not different from those derived from the single-factor model and the four-factor model. The average alpha is slightly negative, with the majority of individual alpha estimates being insignificant. In addition, there are seven cases in which alphas are significantly negative showing that these funds underperform the market index.

The estimates of systematic risk are essentially equal to those obtained from the single-factor and the four-factor performance regression models. The average beta is equal to 0.77 (it was 0.79 in the single-factor model and 0.77 in the four-factor model in the previous two sections, respectively). In addition, the average difference in betas between the single- and the multi-factor models is 0.02 (not reported in Table 4). Based on these results, we re-confirm the conservatism of the examined active ETFs relative to the S&P 500 Index found via the single-factor and the four-factor regression analysis of performance.

The results on size factor reveal a positive relationship between the performance of active ETFs with this factor. There are only six SMB estimates which are significantly negative, while, with just one exception, all other estimates are positive and significant at 10% or better. The average SMB estimate is equal to 0.21 being slightly different from that obtained via the four-factor model which was equal to 0.25. Once again, this average estimates verifies that a significant portion of active ETFs' performance can be explained by the size factor of Fama and French (1992). The explanations offered to the corresponding positive relationship between performance and the size factor revealed by the four-factor model apply to the six-factor model too.

In regard to the relationship between active ETFs' performance and the value factor, 21 and 13 significantly positive and negative HML estimates, respectively are found in Table 5. We remind that similar results were obtained when we examined the four-factor model in the previous section. Therefore, the conclusion about a rather fund specific relationship between the performance of active ETFs and the value factor is verified by the results of the six-factor model.

On the impact on ETF performance by the Robust Minus Weak factor, the results reveal a negative such effect for 27 ETFs in the sample and a positive relationship in 7 cases. The rest RMW estimates are insignificant. The negative sign for the majority of the significant estimates in the sample is in line with our expectations about a negative relationship between the performance of ETFs and the RMW factor.

It should be noted that a positive value in RMW factor means that firms with higher profitability earn better results. Therefore, a negative sign for the RMW factor means that companies of lower profitability achieve lower returns too. In our case, the results indicate that more than half of the examined active ETFs are exposed to companies with poor profitability records.

When it comes to the Conservative Minus Aggressive (CMA) factor, the results indicate that there is not a monotonic relationship between the return of active ETFs and this factor. 16 significantly negative estimates of the CAM factor are obtained and 15 significantly positive. Based on these results, our assumption about a negative impact on the performance of active ETFs by the CMA factor is only partially verified.

Given that the CMA factor stands for the difference in returns between firms with low and high investment policies, the positive CMA estimates indicate that the corresponding ETFs are exposed to companies with significant investment plans. The opposite is the case for those active ETFs with significantly negative CMA coefficients.

With respect to the impact of the market momentum factor on the performance of active ETFs, the empirical findings show that this relationship is not consistent either. Specifically, 10 MOM estimates are negative and significant and 13 are significantly positive. Therefore, more than half of estimates are not statistically significant at any acceptable level. Similar

results offered the four-factor model in the previous section. Therefore, once again, we cannot make a solid inference about the relationship between the performance of actively managed ETFs and the momentum factor. As we have already pointed out, this relationship is rather fund specific.

4.5 Market Timing Analysis

This section discusses the regression results on the timing skills of active ETF managers. The results of the Treynor and Mazuy (1966) model are reported in Table 6. The alphas, betas and gammas of the model are presented along with t-tests on the significance of estimates and R-squared used to assess the ability of the model to explain the market timing ability of managers.

Table 6: Market Timing Regression Results - Treynor and Mazuy Model
This table presents the results of the Treynor and Mazuy (1966) Model on the timing ability of ETF managers. The daily excess return of each ETF is regressed on the excess return of the S&P 500 Index and the squared excess return of the index. The study period spans from 1/1/2018 to 31/12/2021.

Panel A: Active ETFs

Ticker	alpha	T-test	beta	T-test	gamma	T-test	R^2
ARKK	0.07	1.41	1.25[a]	32.21	-0.02[a]	-2.84	0.52
ARKG	0.08	1.28	1.16[a]	25.31	-0.02[b]	-2.28	0.40
ARKW	0.07	1.48	1.18[a]	32.86	-0.02[b]	-2.63	0.53
EMLP	0.00	0.07	0.80[a]	39.07	-0.02[a]	-6.29	0.62
ARKQ	0.04	1.17	1.12[a]	41.33	-0.01	-1.43	0.64
SECT	-0.01	-0.31	0.94[a]	59.50	0.00	1.43	0.78
SYLD	0.00	0.11	1.10[a]	45.78	0.00	-0.51	0.68
DUSA	0.00	-0.23	0.95[a]	66.75	0.00	-1.49	0.82
PHDG	-0.04	-1.41	0.17[a]	8.88	0.03[a]	10.38	0.14
DWLD	-0.02	-0.76	0.93[a]	52.76	-0.01[a]	-3.53	0.74
AMZA	0.00	0.06	1.27[a]	20.48	-0.08[a]	-7.72	0.35
CCOR	-0.04[c]	-1.84	0.16[a]	11.05	0.03[a]	10.56	0.17
LRGE	0.03	1.53	0.86[a]	53.59	0.00	-1.04	0.75
QVAL	-0.02	-0.71	1.04[a]	48.54	-0.01[c]	-1.72	0.71
DFNL	-0.02	-0.53	1.07[a]	45.95	0.00	-1.21	0.68
CACG	0.01	0.83	0.97[a]	91.23	0.00	-1.07	0.89
RFDI	0.00	-0.21	0.76[a]	55.72	-0.01[a]	-5.48	0.77
AIEQ	0.02	0.69	0.95[a]	56.94	-0.01[a]	-3.07	0.77
IVAL	-0.04[c]	-1.75	0.82[a]	44.93	-0.01[a]	-3.66	0.68
FLLV	0.01	0.67	0.83[a]	67.59	0.00	-0.51	0.82
HUSV	0.01	0.72	0.78[a]	71.42	0.00[b]	-2.11	0.84
GVAL	-0.01	-0.22	0.77[a]	42.30	-0.03[a]	-8.03	0.66
RFDA	-0.01	-0.90	0.90[a]	118.06	0.00	0.72	0.93
EYLD	0.02	0.59	0.51[a]	20.22	-0.02[a]	-5.21	0.32
DGRE	-0.01	-0.18	0.80[a]	38.83	-0.02[a]	-4.91	0.62
QMOM	0.02	0.52	1.13[a]	35.86	-0.01	-1.58	0.57
HDGE	-0.07[b]	-2.23	0.91[a]	40.18	0.01[a]	3.37	0.63
TTAI	0.02	0.60	0.73[a]	33.79	-0.01[a]	-3.63	0.55
RESP	0.00	-0.09	0.95[a]	123.44	0.00	-1.01	0.94
HDMV	-0.01	-0.86	0.60[a]	50.35	-0.01[a]	-7.09	0.73
IMOM	-0.01	-0.23	0.78[a]	35.33	-0.01[a]	-3.02	0.57
AADR	-0.02	-0.58	0.88[a]	38.54	-0.01[b]	-2.51	0.61
FYLD	0.00	0.16	0.75[a]	37.92	-0.02[a]	-6.22	0.61
DBLV	0.00	0.06	0.81[a]	59.50	-0.01[a]	-2.82	0.78
FTHI	-0.04[b]	-2.10	0.64[a]	46.87	0.00	-0.25	0.69
WBIF	-0.01	-0.28	0.34[a]	20.95	0.00	-1.01	0.31
RFEM	-0.02	-0.60	0.82[a]	37.62	-0.02[a]	-4.20	0.60
WBIG	-0.01	-0.37	0.32[a]	20.65	0.00	-1.36	0.31
VMOT	-0.02	-0.98	0.47[a]	28.84	-0.01[b]	-2.19	0.46
WBIL	0.00	-0.12	0.35[a]	21.90	0.00	-0.67	0.33
UTES	0.02	0.64	0.62[a]	25.13	-0.01	-1.59	0.40

Panel A: Active ETFs							
Ticker	**alpha**	**T-test**	**beta**	**T-test**	**gamma**	**T-test**	**R^2**
RFFC	0.00	-0.03	0.97[a]	123.67	-0.01[a]	-5.48	0.94
CWS	0.02	0.68	0.75[a]	44.34	0.00	-0.22	0.67
RESE	0.00	-0.02	0.83[a]	42.46	-0.02[a]	-5.94	0.66
SMCP	0.05	1.29	0.54[a]	20.36	-0.03[a]	-6.52	0.33
RFEU	0.01	0.40	0.73[a]	40.37	-0.02[a]	-5.19	0.63
YLDE	0.03	1.05	0.64[a]	34.25	-0.01[b]	-2.48	0.55
FTLB	-0.02	-0.84	0.30[a]	22.32	0.00[c]	-1.70	0.34
RESD	0.00	0.21	0.72[a]	50.86	-0.01[a]	-4.30	0.73
VWID	0.05[a]	1.61	0.34[a]	13.82	-0.04[a]	-8.34	0.23
Average	**0.00**	**-0.01**	**0.78**	**44.81**	**-0.01**	**-2.39**	**0.60**
Median	**0.00**	**-0.02**	**0.81**	**40.27**	**-0.01**	**-2.38**	**0.63**
Min	**-0.07**	**-2.23**	**0.16**	**8.88**	**-0.08**	**-8.34**	**0.14**
Max	**0.08**	**1.61**	**1.27**	**123.67**	**0.03**	**10.56**	**0.94**

Notes: [a] indicates statistical significance at 1% level; [b] indicates statistical significance at 5% level; [c] indicates statistical significance at 10% level.

In the case of active ETFs, the majority of alphas are not statistically significant. Only 5 alphas are significant, with just one of them being positive. Beta estimates are all significant and quite close to those obtained from the single-factor and the six-factor regression models of performance in the previous sections. When it comes to the ability of active ETF managers to time the market, 60% (30 out 50) of the gamma estimates in Table 5 are negative and significant. The average gamma in the sample is also negative. On the other hand, there are just 3 gammas that are positive and significant. Based on these findings, we may infer that the active ETF managers do not display any spectacular market timing skill.

The results of the Jagannathan and Korajczyk (1986) model on the market timing skills of active ETF managers are exhibited in Table 7. We remind that the main difference of this model from the previous one is that this model also includes a cubic excess-market return component, seeking to capture the response of ETF managers to market volatility.

Table 7: Market Timing Regression Results – Jagannathan and Korajczyk Model
This table presents the results of the Jagannathan and Korajczyk (1986) Model on the timing ability of ETF managers. The daily excess return of each ETF is regressed on the excess return of the S&P 500 Index and the squared and cubic excess returns of the index. The study period spans from 1/1/2018 to 31/12/2021.

Ticker	**alpha**	**T-test**	**beta**	**T-test**	**gamma**	**T-test**	**delta**	**T-test**	**R^2**
ARKK	0.08	1.48	1.36[a]	27.76	-0.03[a]	-3.87	0.00[a]	-3.73	0.53
ARKG	0.08	1.32	1.25[a]	21.54	-0.02[a]	-2.97	0.00[b]	-2.60	0.41
ARKW	0.07	1.54	1.27[a]	28.02	-0.02[a]	-3.56	0.00[a]	-3.38	0.54
EMLP	0.00	-0.04	0.69[a]	27.18	-0.01[a]	-4.04	0.00[a]	6.69	0.64
ARKQ	0.05	1.32	1.27[a]	37.83	-0.02[a]	-3.66	0.00[a]	-7.34	0.66
SECT	-0.01	-0.30	0.95[a]	47.02	0.00	1.19	0.00	-0.55	0.78
SYLD	0.00	0.14	1.13[a]	37.06	0.00	-1.03	0.00[c]	-1.78	0.68
DUSA	0.00	-0.17	1.00[a]	55.08	-0.01[b]	-2.60	0.00[a]	-3.78	0.82
PHDG	-0.03	-1.36	0.45[a]	22.04	0.02[a]	5.23	-0.01[a]	-21.90	0.42
DWLD	-0.02	-0.70	0.99[a]	44.32	-0.01[a]	-4.67	0.00[a]	-4.16	0.75
AMZA	0.01	0.09	1.37[a]	17.35	-0.09[a]	-7.98	0.00[b]	-2.03	0.35
CCOR	-0.03[c]	-1.78	0.23[a]	12.82	0.02[a]	8.26	0.00[a]	-6.41	0.20
LRGE	0.03	1.58	0.89[a]	43.69	-0.01	-1.75	0.00[b]	-2.46	0.75
QVAL	-0.02	-0.69	1.07[a]	39.05	-0.01[b]	-2.10	0.00	-1.50	0.71
DFNL	-0.02	-0.57	1.02[a]	34.57	0.00	-0.36	0.00[b]	2.56	0.69
CACG	0.01	0.85	0.98[a]	72.33	0.00	-1.38	0.00	-1.16	0.89
RFDI	0.00	-0.18	0.79[a]	45.01	-0.01[a]	-5.83	0.00[c]	-1.96	0.77
AIEQ	0.02	0.72	0.98[a]	46.12	-0.01[a]	-3.60	0.00[b]	-2.18	0.77
IVAL	-0.04[c]	-1.78	0.80[a]	34.14	-0.01[a]	-2.90	0.00[c]	1.88	0.68
FLLV	0.01	0.57	0.76[a]	49.97	0.00	1.66	0.00[a]	6.99	0.83
HUSV	0.01	0.61	0.71[a]	52.86	0.00	0.36	0.00[a]	7.83	0.85

Ticker	alpha	T-test	beta	T-test	gamma	T-test	delta	T-test	R^2
GVAL	-0.01	-0.26	0.73[a]	31.90	-0.02[a]	-6.97	0.00[b]	2.20	0.67
RFDA	-0.01	-0.78	0.96[a]	104.78	0.00[b]	-2.66	0.00[a]	-10.95	0.94
EYLD	0.02	0.61	0.53[a]	16.77	-0.02[a]	-5.41	0.00	-1.44	0.32
DGRE	-0.01	-0.20	0.79[a]	30.01	-0.02[a]	-4.44	0.00	0.74	0.62
QMOM	0.02	0.56	1.18[a]	29.50	-0.01[b]	-2.15	0.00[b]	-2.10	0.57
HDGE	-0.07[b]	-2.29	0.97[a]	33.64	0.02[a]	4.19	0.00[a]	3.17	0.63
TTAI	0.02	0.55	0.67[a]	24.41	-0.01[b]	-2.35	0.00[a]	3.66	0.55
RESP	0.00	0.01	0.99[a]	102.73	0.00[a]	-2.95	0.00[a]	-6.39	0.94
HDMV	-0.01	-0.90	0.58[a]	38.14	-0.01[a]	-6.03	0.00[b]	2.37	0.73
IMOM	-0.01	-0.25	0.76[a]	26.94	-0.01[b]	-2.47	0.00	1.28	0.57
AADR	-0.02	-0.55	0.91[a]	31.32	-0.01[a]	-2.91	0.00[c]	-1.69	0.61
FYLD	0.00	0.12	0.71[a]	28.24	-0.02[a]	-5.13	0.00[b]	2.59	0.61
DBLV	0.00	0.18	0.89[a]	52.62	-0.01[a]	-5.08	0.00[a]	-7.51	0.80
FTHI	-0.04[b]	-2.06	0.67[a]	38.93	0.00	-1.22	0.00[a]	-3.19	0.69
WBIF	0.00	-0.03	0.54[a]	30.21	-0.02[a]	-6.72	-0.01[a]	-18.17	0.48
RFEM	-0.02	-0.61	0.80[a]	29.02	-0.01[a]	-3.74	0.00	0.81	0.60
WBIG	0.00	-0.14	0.51[a]	29.39	-0.02[a]	-6.90	-0.01[a]	-17.54	0.47
VMOT	-0.02	-0.85	0.63[a]	33.11	-0.02[a]	-6.50	0.00[a]	-13.67	0.55
WBIL	0.00	0.16	0.55[a]	31.32	-0.02[a]	-6.44	-0.01[a]	-18.45	0.50
UTES	0.02	0.57	0.53[a]	16.98	0.00	-0.06	0.00[a]	4.77	0.41
RFFC	0.00	0.08	1.01[a]	103.12	-0.01[a]	-7.34	0.00[a]	-6.55	0.94
CWS	0.02	0.73	0.79[a]	37.01	0.00	-1.23	0.00[a]	-3.29	0.67
RESE	0.00	-0.10	0.76[a]	30.68	-0.01[a]	-4.21	0.00[a]	4.86	0.67
SMCP	0.05	1.37	0.63[a]	18.95	-0.04[a]	-7.67	0.00[a]	-4.54	0.35
RFEU	0.01	0.36	0.69[a]	30.25	-0.01[a]	-4.19	0.00[b]	2.44	0.64
YLDE	0.02	0.97	0.53[a]	23.07	0.00	-0.17	0.00[a]	7.26	0.57
FTLB	-0.01	-0.75	0.37[a]	22.15	-0.01[a]	-3.77	0.00[a]	-6.83	0.37
RESD	0.00	0.22	0.72[a]	40.05	-0.01[a]	-4.16	0.00	-0.24	0.73
VWID	0.06[a]	1.65	0.38[a]	12.12	-0.04[a]	-8.57	0.00[b]	-2.03	0.23
Average	**0.00**	**0.02**	**0.81**	**37.46**	**-0.01**	**-3.06**	**0.00**	**-2.59**	**0.62**
Median	**0.00**	**0.04**	**0.79**	**31.61**	**-0.01**	**-3.58**	**0.00**	**-1.99**	**0.64**
Min	**-0.07**	**-2.29**	**0.23**	**12.12**	**-0.09**	**-8.57**	**-0.01**	**-21.90**	**0.20**
Max	**0.08**	**1.65**	**1.37**	**104.78**	**0.02**	**8.26**	**0.00**	**7.83**	**0.94**

Notes: [a] indicates statistical significance at 1% level; [b] indicates statistical significance at 5% level; [c] indicates statistical significance at 10% level.

Alphas, betas and gammas of active ETFs are similar to those derived from the Treynor and Mazuy (1966) model. The majority of alphas are insignificant, betas are lower than unity, and gammas, with just three exceptions, are either significantly negative or insignificant. When it comes to market volatility, the majority of deltas (28 out of 50 estimates) are negative and significant indicating that the managers of the corresponding ETFs fail to time the volatility of the market. However, there are 17 cases in which deltas are positive and significant, even though their magnitude is small. In these cases, we may conclude the managers can, in some degree, time the volatility of the market.

5. Conclusion

This study is an expansion to our previous work on actively managed ETFs. It offers new empirical insights on the question about whether active management can add value for investors. Standard research issues are examined for a sample of 50 active equity ETFs traded in the U.S. The issues investigated concern the performance of these funds and their ability to beat the market. The capability of fund managers to apply efficient market timing techniques is evaluated too.

The results obtained are in line with those in the previous studies on actively managed ETFs. In particular, in most of the cases, active ETFs cannot beat the S&P 500 Index. This inference is supported both a raw analysis of returns and a single-factor regression analysis of performance. However, their total risk, calculated as the standard deviation of returns, is

comparable to that of the market index. On the other hand, the market regression model showed that the systematic risk of active ETFs is considerably lower than that of the market index. The latter evidence shows that the active ETFs are more conservative that the market index. However, it might indicate that the S&P 500 Index cannot explain the performance of the examined actively managed ETFs in the most efficient way.

In a multifactor performance regression analysis (a four-factor and a six-factor model are applied in this respect), we re-confirm that the active ETFs cannot achieve any material above-market return and that they are less aggressive than the passive market index in terms of systematic risk. Furthermore, we find that the relationship of ETFs' performance with the size factor is positive. However, there is not a monotonic impact on performance by the value, robust minus weak, conservative minus aggressive and momentum factors, as a wide variation between negative and positive estimates for these variables is observed. Therefore, we the exception of the size factor, we concluded that the relationship of active ETFs' performance with the rest of the explanatory variables is rather fund specific.

Finally, as far as the market timing is concerned, the results verify the existing findings in the literature which show that the ETF managers fail to time the market. The ETF managers cannot time market volatility either. These findings do not surprise us because they resemble those in earlier studies on the topic. However, we expected that, after more than ten years in the business, the managers of active ETFs would be more able to respond to the ascending and descending trends in equity markets.

Overall, our results are in line with the results of the previous literature on the performance of actively managed ETFs. For instance, it is not new that the active ETFs cannot beat market proxies such as the S&P 500 Index. This pattern has already been accentuated by the studies of Rompotis (2011a, 2011b, 2015 and 2020). It is not new either that the managers of active ETFs do not possess any substantial market timing skills. This inability has been demonstrated by studies such as those of Rompotis (2013 and 2020).

Based on the results of the current study, we cannot confirm that the recent growth in the active ETF market has been driven by the performance records of the market relative to the S&P 500 Index or by the improved market timing skills of the managers of active ETFs. To our view, the need of ETF investors for diversifying their choices with ETFs and the prospect of enhanced future returns are the main driving forces for the rise in the assets managed by active ETFs and in the population of such products during 2020 and 2021.

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