ETF's tracking error determinants: a study of popular U.S. and European Indices

Exchange-Traded Funds (ETFs) have been growing since their inception in 1993 in the United States. Most follow a passive strategy, not trying to beat the market, instead miming the returns of a benchmark index/portfolio (Easley et al., 2021), such as the S&P-500. These funds, however, cannot track their respective benchmarks with 100% effectiveness due to the various market frictions that are not taken into account when looking at the "paper" portfolio of the index (Frino and Gallagher, 2001). The Tracking Error (TE), commonly measured as the standard deviation of the difference (TD) between the ETF's and benchmark's returns, serves as a tool to measure how well the fund accomplishes its mission. My dissertation aims to both measure the TE of a sample composed of ETFs that follow popular European and American indices, and find the determinants of TE, i.e., which variables impact tracking error the most.

The main restriction imposed on the sample was to only include funds that trade in the same exchange as the one from the securities of their underlying indices. This was done in order to avoid the TE noise that would result from discrepancies between the opening and closing hours of the markets. Added to that, I aimed to have a sample of developed markets only. This helped in streamlining the study, as the discrepancy between developed and emerging markets is avoided. With that in mind, using the justETF.com ETF Screener and the LSEG[1] Workspace platforms, I built a sample comprised of 59 ETFs following 19 indices, divided between European and American domicile. My sample period expands from 29/09/2000 to 30/09/2024, in order to have a high number of observations. All observations are made monthly, apart from the TD (daily frequency). In order to compute the tracking error, I follow the methodology proposed by Frino and Gallagher (2001). For the regressions that allow me to make conclusions about the determinants of TE, I follow a panel data format and control for individual, time and benchmark fixed effects. The standard errors are clustered by individuals and time. I regress TE against Index Volatility, number of Index Replacements, Market Illiquidity, Expense Ratio, Bull/Bear market state (binary variable), Size (log), Tenure (log), Net Creation/Redemption of shares (related to ETF flows) and Withholding Dividend Tax.

The descriptive statistics confirm that the sample is not able to accurately replicate the indices. However, most funds show good tracking efficiency when compared to the values of the overall sample, with American funds showing the best results. Evidence of tracking error being higher in periods of crises (.com bubble, global financial crises and covid-19 pandemic) is registered, being in line with studies like Buetow and Henderson (2012). Synthetic ETFs register worse TE than physical ETFs throughout the sample period. The regression results indicate that Index Volatility, Expense Ratio, Tenure and Net Creation/Redemption of shares impact tracking error, with Tenure being the most significant and Expense Ratio having the highest impact.

Keywords: Exchange-traded funds (ETFs); Tracking Error; Determinants.

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[1] Previously known as Refinitiv

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Appendix A. Tracking error measurements

$$TE_{1,i,m} = \frac{\sum_{t=1}^{n} \left| TD_{i,t} \right|}{n}$$

$$TE_{2,i,m} = \sqrt{\frac{1}{n-1} \sum_{t=1}^{n} (TD_{i,t} - \overline{TD}_i)^2}$$

where $TD_{i,t} = R_{i,t}^{ETF} - R_t^{Index}$ is the tracking difference of ETF_i at day t, with $R_{i,t}^{ETF}$ being the daily return of ETF_i at day t, and R_t^{Index} being the daily return of the corresponding underlying index at day t; n represents the number of periods (days) under each month with available data, and m an individual month.

Appendix B. Panel data regression

$$TE_{i,m} = \beta X_{i,m} + \alpha_i + \lambda_m + \Upsilon_b + \varepsilon_{i,m}$$

where $X_{i,m}$ represents the values of the set of explanatory variables that were presented, for ETF i for month m, α_i represents the control for individual time-invariant fixed effects, λ_m is the control for time-specific shocks, Υ_b represents the captured benchmark-related differences and $\varepsilon_{i,m}$ is the error term.