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EMPIRICAL STUDY ON EQUITY INVESTMENT IN BET AND EXCHANGE-TRADED FUND

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Abstract
Stock exchange indices provide a general view on the performance and outlook of financial markets. This paper presents a comparative empirical study on the performance of BET Index and ETF Patria TradeVille, the objective of our analysis is to test the qualities of the ETF that tracks the composition and performance of the BET index, by examining the long-term relationship between the price of the TVBETETF on BSE and the underlying BET index, determining whether there is a semi-figurative link between the two, according to the ASF regulations for trading as an Exchange-traded-fund on BSE.

Keywords: *Bucharest Stock Exchange (BSE), Bucharest Exchange Trading Index (BET), Exchange Traded Fund Patria TradeVille (TVBETETF), modern portfolio theory, multiple linear regression model.*

JEL Classification: C12, M21, M48

INTRODUCTION

The management of any company seeks to attract new sources of financing, and one of the most effective ways to engage savings in investments is through the launch of a share offering for listing on the Bucharest Stock Exchange (BSE) on the Regulated Market. In this way, companies can access the financial resources necessary to achieve their development and expansion objectives. The Financial Supervisory Authority (ASF) (asfromania.ro) has supported efforts to regulate the capital market and improve its performance, even when the micro and macroeconomic conditions are not favorable.

The comparative empirical study conducted regarding the performance recorded by the Bucharest Exchange Trading Index (BET) and the Patria TradeVille Exchange Traded Fund (TVBETETF) was based on the annual reports published on the Bucharest Stock Exchange (BVB) (bvb.ro) and submitted to the relevant ministries, following the listing and trading of this instrument on the stock exchange. The purpose of the study is thus to present scientific perspectives on the performance of the Patria TradeVille ETF, as well as the influencing factors.

The importance of the topic addressed lies in the need of every individual to secure a certain amount of money in the form of savings, which they can later invest in one of the branches of the capital market in order to obtain returns that preserve the value of their monetary assets. It is crucial to understand the risks associated with investments on the capital market, such as volatility and the risk of capital loss.

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I. REVIEW OF THE SPECIALIZED LITERATURE ON THE ETFS MARKET

Investments in ETFs are often compared in the specialized literature to equity mutual funds, traded on a stock exchange. The main difference between the two is the management approach. Mutual funds, in general, are actively managed. ETFs, on the other hand, belong to the category of passive investments, as they typically track a stock index or an underlying asset portfolio. Investing in ETFs is seen as a way of replicating a stock index. An investor allocating money to the SPDR S&P500 ETF (symbol SPY) expects to achieve a performance similar to that of the S&P500 index. In Romania's case, TVBET-ETF tracks the performance and evolution of the BET index (Popa, 2017). This instrument has been in use for over two decades. The first such fund was used in Canada in 1990 by institutional investors to create sophisticated trading strategies, continuing the Modern Portfolio Theory (MPT) introduced by Harry Markowitz in 1952. This theory asserts that, at a given level of acceptable risk, an investor can optimize their expected return through portfolio diversification (Markowitz, 1991).

In the financial industry, investment management became an important undertaking during the 20th century, both in theory and in practice (Nisani and Amit, 2021), with a series of studies in the specialized literature focusing on optimizing financial decisions and maximizing returns on investors' securities investments (Marinciuc, (2020). Based on portfolio theory, the optimal combination (risk-return) of investments in securities can be chosen (Anuwoje and Victor, 2019). The concepts and financial instruments available to investors have evolved over time (Mangram, 2013), with investors always having to strike a balance between risk and return (Trichilli, Boujelbène Abbes & Masmoudi, 2020). Markowitz's market model, later developed by Sharpe, provides an empirical formula showing that the return on a security is due, on the one hand, to market returns and, on the other hand, to the specific characteristics of those securities (Lee, Cheng & Chong, 2016).

The main objective of investors is to optimize their portfolio in order to maximize returns and minimize the risk associated with a portfolio (Ivanova and Dospatliev, 2017). In this regard, we note that it is not possible to identify an optimal portfolio in terms of risk and return, as this is influenced by the preferences of each investor (Limnios et al., 2014).

Viewed as a complex system, financial markets exhibit different behavior (Setyantho and Hadi Wibowo, 2019). Thus, their behavior is sometimes difficult to understand, with investments in financial assets often being made on the capital market (Garas and Argyrakis, 2007). Furthermore, a relevant study (Grosu et al., 2024) has shown that, during periods of crisis, the behavior of the financial market differs from that observed during normal periods.

In recent years, the specialized literature has deepened the study of ETFs due to the growing popularity of this financial instrument among investors. Before making the decision to invest in an ETF, every investor is interested in its performance, management costs, and tracking error (TE) (Gastineau, 2004). Despite the long history of this financial instrument, it became popular among retail and institutional investors only after the Global Financial Crisis of 2007-2008 (Popa, 2017). Viewed as capital instruments with a relatively low risk class, Exchange-Traded Funds have experienced a substantial increase in assets under management (AUM). According to Vanguard (vanguard.ca), the most well-known passive investment manager, in 2009, the Global ETF AUM reached one trillion US dollars, driven by the shift from commission-based advisory services to fee-based ones. By 2018, the total assets under management by ETFs exceeded 6.5 trillion US dollars.

A specific characteristic of ETFs is that they tend to underperform relative to the underlying portfolio. This happens because ETFs attract the attention of investors due to their high liquidity and cost-efficiency features. As a hybrid instrument, the ETF benefits from variable capital funds that can be traded on stock exchanges, as well as fixed capital parts, allowing the creation and redemption of fund units by authorized dealers. This strategy helps keep the trading price on the exchange close to the net asset value, avoiding discounts or premiums due to excessive supply or demand (Tskhoidze and Lien, 2021). Studies show that the most important variables influencing the bid-ask spread are the option price, trading volume, and volatility of the underlying investment (Mayhew, 2002).

Boehmer and Boehmer argued in a 2003 study that the listing of an ETF on the New York Stock Exchange (NYSE) had a significant impact on trading at the American Stock Exchange (AMEX) in terms of both the quality and quantity of the volumes traded. Due to the popularity of this instrument, the NYSE attracted a considerable number of ETFs for listing. The increased number of these funds, both on the New York and American exchanges, led to greater competition between the two stock exchanges, followed by a narrowing of the bid-ask spread (Boehmer and Boehmer, 2003).

Joell Miffre, in 2007, questioned the ability of ETFs to truly reflect an investment strategy for portfolio diversification, considering the vastness of the capital market. His study on ETFs demonstrated that they can offer

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benefits for international portfolio diversification at a relatively low cost, with a small tracking error and composition, as well as higher tax efficiency. Investors can achieve an average to high return for a medium level of risk, or an average return for a low level of risk (Miffre, 2007).

The Pareto principle can be applied in the analysis of the BET index and the ETF that tracks its performance (Rineyskiy, 2014). According to this principle, it is possible that the majority of the performance recorded by the index is the result of the influence of only 20% of the constituent companies.

Stock market indices play a very important role in the functioning of the capital market, reflecting the economic and investment trends of a particular market and setting realistic expectations for investors. The origin of stock indices dates back to 1880, when the first stock indices were created: the Dow Jones Average in 1884, the Industrial Average in 1896, and in 1923, the first market capitalization-weighted index, the S&P. In 1964, Sharpe introduced the β variable to measure the volatility of an asset compared to the general market. It is used to measure the systematic risk of an asset (Sharpe, 1964). Kendall, in his 1953 work, laid the foundations for the Efficient Market Hypothesis, arguing that stock prices reflect all available information at a given time. There is no systematic advantage that would allow for the prediction of prices (Kendall, 1953). These researchers, along with others like Fama, who detailed the concept of efficient markets and argued that it is impossible to achieve abnormally high returns from public information (Fama, 1970), contributed to the expansion of indices worldwide and the promotion of passive investing, covering stock markets, bonds, commodities, real estate, and hedge funds.

II. Sample and Research Methodology

The objective of our analysis is to test the qualities of the ETF that tracks the composition and performance of the BET index. Thus, we will examine the long-term relationship between the price of TVBETETF on the BSE and the underlying BET index. We aim to determine whether there is a significant link between the two, in accordance with the ASF regulations for being traded as an Exchange-Traded Fund on the BSE.

Since the economic-financial indicator Price to Book Value (P/B ratio) is a key element in any analysis, we also wish to analyze the relationship between the ETF Price and the Net Asset Value (NAV) of the ETF. This relationship can indicate whether the open-end investment fund is undervalued or overvalued.

In conducting this comparative study between the BET index and TVETFBET, daily data was used over a five-year period, from January 1, 2018, to December 31, 2022. The data was collected from the annual reports published on the Bucharest Stock Exchange and from the TradeVille brokerage platform, the market maker for TVBETETF PatriaTradeVille. A total of 1,212 observations were collected, which include information on the ETF's market price, the volume of units traded per session, the BET index price, and the net asset value (NAV) of the ETF. The data was checked for consistency and aligned to the same date to avoid any anomalies. Additionally, no missing values were found that required removal.

The methodology used is based on data collection and interpretation methods, employing quantitative approaches to gather numerical and measurable data from theoretical documents.

The goal of this research is to test and examine the relationship between the ETF Price on the BVB and three independent variables: ETF Volume, BET Price, and NAV_ETF. Indices are of significant interest to investors, and through this study, we aim to determine whether TVBETETF can serve as an easier, passive alternative to manual active replication strategies.

The analysis was conducted using multiple linear regression, employing IBM SPSS Statistics software, and is built around two hypotheses:

H0/Null Hypothesis: The variables ETF Volume, BET Price, and NAV_ETF do not significantly influence the variable ETF Price.

H1/Alternative Hypothesis: The variables ETF Volume, BET Price, and NAV_ETF significantly influence the value of the ETF Price.

This methodology allows for testing whether the identified independent variables have a measurable impact on the ETF price, with a focus on understanding the strength and direction of these relationships.

III. Research Results

Macroeconomic variables such as inflation, socio-political conditions, and interest rates were not considered in this study, though they could significantly influence the results. Additionally, income from dividends received from companies held in the portfolio could affect the study's results at the level of ETF price and NAV. The fund does not distribute dividends to shareholders; instead, a portion of the earnings is reinvested in the fund or allocated as issuance premiums.

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The period analyzed, from January 1, 2018, to December 31, 2022, was not very favorable for global markets and the Romanian market. The health crisis, the energy crisis, global conflicts, and subsequently the recession period could significantly affect the results of the study.

To test the hypotheses of the study, H0 and H1, we chose to create an econometric model using multiple linear regression. Thus, we will test the impact of the independent variables ETF,Volume, BET,Price, and NAV.ETF on the dependent variable ETF,Price.

The estimated equation for the multiple linear regression of the analyzed variables and hypotheses is:

$$ETF.Price = \alpha + \beta \cdot ETF.Volume + \gamma \cdot BET.Price + \mu \cdot NAV.ETF + \varepsilon \quad (1)$$

where: α= constant, β = coefficient for the ETF.Volume, γ=coefficient for BET.Price, μ=coefficient for the NAV.ETF

Next, we will present the results of the analysis using the estimated equation of multiple linear regression in IBM SPSS Statistics.

As shown in Table 1, all the data centralized in the database were successfully inserted into the program, without any values being eliminated. The variables we considered for the empirical modeling are as follows: NAV.ETF, ETF.Volume, and BET.Price (independent variables), and ETF.Price (dependent variable).

Table 1 provides summary information about the recorded data. We have a total of 1,212 entries for each variable. The program provides essential indicators to understand how these variables interact. The standard deviation recorded high values for all variables, which means that during the analyzed period (January 1, 2018, to December 31, 2022), the values of the variables are spread over a wide range, indicating high volatility.

Table 1. Desctiptive Statistics

	Mean	Std.Deviation	N
ETF.Price	13.42415	3.154478	1212
ETF Volume	5983.24	7871.705	1212
BET Price	9974.1997	1781.3577	1212
ETF NAV	21853038.164480	22369438.416401	1212

Source: Own processing

Table 2 presents very important indicators for interpreting and validating the model. The R value, which is very close to 1 (specifically 0.99), indicates a very strong correlation between the analyzed variables using the multiple linear regression model. The R Square value of 0.98 indicates that the variation in the three independent variables—ETF.Volume, NAV.ETF, and BET.Price—explains 98% of the variation in the dependent variable, ETF.Price.

The Std. Error of Estimate represents the maximum estimated error for our multiple linear regression model, which is 0.435248. This value further strengthens the validity of the model.

Tabel 2. Model Summary

Model	R	Rsquare	Adjusted R-Square	Std.Error of the Estimate	Durbin-Watson
1	.990a	0.981	0.981	0.435248	0.158
a. Predictors: (Constant), NAV.ETF (RON), ETF.Volume, BET.Price					
b. Dependent Variable: ETF Price					

Source: Own processing

In Table 3, the Sum of Squares Regression is used to evaluate how well the applied regression explains the econometric model. In our case, this value is 11821.490, which indicates the variability explained by the regression model.

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Tabel 3. ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	11821.49	3	3940.497	20800.66	0.000b
	Residual	228.845	1208	0.189		
	Total	12050.34	1211			
a.Dependent Variable: PretETF						
b.Predictors:(Constant),NAV.ETF(RON),ETF.Volume, BET.Price						

Source: Own processing

In the ANOVA table, we find information about the estimated residual variation, Sum of Squares Residual, which in our case is 228.845. This indicates the variability that is not explained by the regression model. By summing the two components, we get the total estimated variation, which amounts to 12050.335.

The sample size analyzed is 1212-N, and the total number of variables is 4-k. In the ANOVA table, the degrees of freedom can be found in column 3.

k-1=3

N-k=1208

N-1=1211

The most important coefficient in validating the econometric model is Sig. In our case, the Sig. value > 0.95, and we can say that the econometric model for the analyzed variables is explained by the multiple linear regression model in over 95%. The model explains the interdependence of the variables through multiple linear regression. Based on the Sig. value, the model is validated at a level of 95%. The Residual Statistics Table provides important information regarding the maximum and minimum values of the residuals. In our case, the smallest residual value presented in Table 4 was -1.291415, and the largest value was 1.194715. The residuals do not represent a systematic pattern, which may indicate that the relationship is linear. The standard deviation of the residuals is 0.436116, and the median is 0.00. The low value of the standard deviation confirms the strong fit of the model. Considering the very small values recorded for the residuals, we can conclude that TVBETETF follows a passive, safe investment strategy and closely tracks the underlying asset. The market for this ETF is stable, even during economic recession periods. The guiding principle for this fund is continuity.

Tabel 4. Residuals Statistics

	Minimum	Maximum	Mean	Std. Deviation	N
Predicted Value	8.53957	19.33431	13.4242	3.124381	1212
Std.Predicted Value	-1.563	1.892	0	1	1212
Standars Error of Predicted Value	0.014	0.136	0.023	0.01	1212
Adjusted Predicted Value	8.53332	19.34257	13.4242	3.124591	1212
Residual	-1.291415	1.194715	0	0.434709	1212
Std.Residual	-2.967	2.745	0	0.999	1212
Stud. Residual	-2.969	2.776	0	1	1212
Deleted Residual	-1.293352	1.221644	0.000044	0.436116	1212
Stud.Deleted Residual	-2.979	2.783	0	1.001	1212
Mahal. Distance	0.233	117.332	2.998	5.771	1212
Cook's Distance	0	0.062	0.001	0.003	1212
Centered Leverage Value	0	0.097	0.002	0.005	1212
a. Dependent Variable: ETF.Price					

Source: Own processing

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Table 4 provides quantitative information regarding the influence of the independent variables ETFVolume, BETPrice, and NAV.ETF on the dependent variable PriceETF. Here, the parameters of the chosen multiple linear regression model are determined. According to the Coefficients table, the model's equation should look as follows:

$$ETFPrice = -1.306 - (8.932 * 10^{-6}) * ETF.Volume + 0.001 * BET.Price + (3.370 * 10^{-8}) * VAN.ETF \quad (2)$$

Based on the estimated equation, we can make the following assumptions:

- If ETF.Volume increases by one unit, while the other variables remain unchanged, we conclude that ETF.Price will decrease on average by -(8.932×10^{-6}) units.
- If BET.Price increases by one unit, while the other variables remain unchanged, we conclude that ETF.Price will increase on average by 0.001 units.
- If NAV.ETF increases by one unit, while the other variables remain unchanged, we conclude that PriceETF will increase on average by 3.370×10^{-8}units.

These variables recorded relatively small coefficients, but as financial indicators, they exhibit unit changes with a higher frequency than other variables. The negative influence of the ETF.Volume variable, which refers to the number of fund units traded per session, may indicate a slight tendency of investors to sell assets rather than purchase them. This could be attributed to the market's sense of uncertainty caused by major negative events such as the COVID-19 pandemic, the recession, political conflicts, and inflation that marked the period from 2018 to 2022.

In Table 5. Coefficients, we find the t-value for the independent variable ETF.Volume is 4.507, and the Sig. value is <0.05. Therefore, the null hypothesis H0 is rejected, and the alternative hypothesis H1 is confirmed, meaning the regression coefficient β is significantly different from 0. The t-value for the variable PriceBET is 103.391, and the Sig. value is <0.05. The null hypothesis H0 is rejected, and the coefficient γ is considered significantly different from 0.

Thus, the variable that most influences the dependent variable ETF.Price is BET.Price, followed by ETF.Volume in terms of influence. The variable with the least influence on ETF.Price is NAV.ETF.

Table 5. Coefficients

Model	Unstandardized .Coefficients		Standardized Coefficients			95.0%Confidence Interval for B	
	B	Std.Error	Beta	t	Sig.	Lower Bound	Upper Bound
(Constant)	-1.306	0.116		-11.25	0	-1.534	-1.078
ETF.Volume	-8.93E-06	0	-0.022	-4.507	0	0	0
BET.Price	0.001	0	0.795	103.391	0	0.001	0.001
NAV.ETF	3.37E-08	0	0.239	33.087	0	0	0
a. Dependent Variable: ETF.Price							

Source: Own processing

From the coefficient intervals of the variables, we can conclude that the chosen independent variables do not exhibit large fluctuations compared to ETF.Price. This could be due to the fact that the returns and performance of an ETF are measured based on its market value or net asset value (NAV).

A representation in Figures 1 and 2 is relevant to highlight the histogram of the model and model validation through Henry's right axis.

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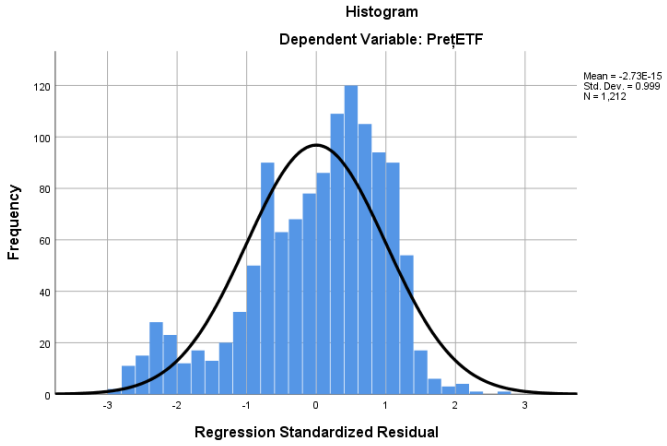

Figure 1. Histogram of the model

According to Fig.1, the distribution is asymmetric, skewed to the right, suggesting that the residuals are not normally distributed, and the independent variables have recorded higher values. This asymmetry can be explained by the fact that we did not include values regarding the overall market situation, such as indicators like the inflation rate, exchange rates, dividends not paid to shareholders but received by the fund.

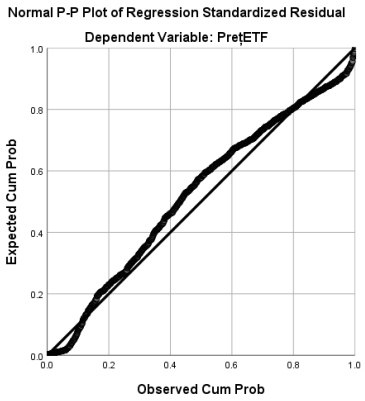

Figure 2. Model validation through Henry's right axis

We can observe in Figure no. 2 that the evolution of the residual value approaches Henry's line and intersects it at several points. Therefore, the econometric model complies with the assumptions of the analysis performed.

IV. CONCLUSIONS

The small values of the residuals suggest that the ETF closely tracks the underlying asset, indicating a passive and stable investment strategy. From the regression equation, the influence of the variables is as follows: BET.Price has the highest influence on ETF.Price, followed by ETF.Volume and NAV.ETF.

The negative trend of the VolumETF variable indicates a slight tendency of investors to sell assets, influenced by major events such as the COVID-19 pandemic, the recession, political conflicts, and inflation. The t-value and Sig. for the independent variables BET.Price, ETF.Volume, and NAV.ETF confirm the alternative hypothesis, with the regression coefficients significantly different from 0. The residuals approach Henry's line, validating the assumptions of the analysis and the econometric model. The fact that the econometric analysis showed a very strong correlation and a significance level below 5% for the independent variable NAV.ETF suggests that the ETF units are neither undervalued nor overvalued on the stock market.

We can conclude from the study conducted for the period from January 1, 2018, to December 31, 2022, that TVBETETF represents a very good strategy for replicating the BET index, closely following the price of the

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underlying BET index. It demonstrates an adaptable strategy, reacting effectively to both favorable and unfavorable market conditions in an ever-changing environment. As observed through econometric modeling, the price of the ETF unit is influenced by the variation in the price of the BET index unit by 95%. This strong correlation supports the use of TVBETETF as a method for Romanian investors—and beyond—to replicate the BET index.

In conclusion, investment products like ETFs have proven their efficiency over time, being among the preferred options for retail and individual investors. They are recommended for medium to long-term investment periods. The ETF BET Patria TradeVille fund has proven its efficiency and tracks the BET index, showing faster growth during the analyzed period of 2018-2022. Therefore, the ETF BET Patria TradeVille fund can be confidently used by investors as a strategy to replicate the most liquid index on the Romanian stock market, the Bucharest Exchange Trading Index.

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