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The Response of ETF Markets to Global Uncertainty Shocks: Evidence from Newly Industrialized Countries

Küresel Belirsizlik Şoklarına ETF Piyasalarının Tepkisi: Yeni Sanayileşen Ülkeler Üzerine Bir Uygulama

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ÖZ

Bu çalışmada, yeni sanayileşen ülkelerdeki iShares MSCI ETF fonları ile küresel risk ve belirsizlik göstergeleri olan VIX endeksi, altın (ONS) ve Brent petrol volatilitesi arasındaki kısa ve uzun vadeli ilişkileri incelemektedir. 2012 Şubat-2025 Nisan dönemine ait yeni sanayileşen ülkelere ilişkin aylık veriler kullanılarak Johansen eşbütünleşme testi ve Vektör Hata Düzeltme Modeli (VECM) uygulanmıştır. Ampirik bulgular, uzun dönemde çoğu ülke için ETF ile VIX arasında anlamlı ve negatif yönlü uzun dönemli bir ilişki olduğunu ortaya koymaktadır. Altın volatilitesi bazı ülkelerde pozitif etkiler yaratırken, Brent petrol oynaklığının özellikle enerji ithalatçısı ülkelerde ETF fiyatlarını olumsuz etkilediği tespit edilmiştir. Kısa dönem analizleri Brezilya, Endonezya, Filipinler, Malezya, Tayland ve Türkiye'de ETF fiyatları üzerinde negatif etkileri belirlenmiştir. Buna karşılık VIX endeksi ile altın volatilitesine verilen kısa dönem tepkiler ülke bazında farklılık göstermektedir. Hata düzeltme katsayıları, bazı ülkelerde kısa vadeli sapmaların uzun vadede dengeye geldiğini göstermektedir. Sonuçlar, ETF piyasalarının küresel risk ve belirsizliklere karşı yüksek duyarlılığa sahip olduğunu, ancak bu etkinin ülke ekonomilerinin enerji bağılılığı finansal derinliği gibi ülkeye özgü faktörlere göre değiştiğini ortaya koymaktadır. Bulgular, yatırımcılar ve politika yapıcılar açısından ülkeye özgü risk yönetim stratejilerinin önemini vurgulamaktadır.

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ABSTRACT

This study investigates the short- and long-term relationships between iShares MSCI ETF funds in newly industrialized countries and the global risk and uncertainty indicators represented by the VIX index, gold (ONS), and Brent oil volatility. Using monthly data for the period from February 2012 to April 2025, the Johansen cointegration test and the Vector Error Correction Model (VECM) are applied. The empirical findings reveal a significant and negative long-run relationship between ETFs and the VIX index for most countries. While gold volatility generates positive effects in some markets, Brent oil volatility adversely affects ETF prices, particularly in energy-importing economies. The short-run analyses indicate that ETF prices in Brazil, Indonesia, the Philippines, Malaysia, Thailand, and Turkey are negatively influenced by volatility shocks. Conversely, short-run responses to VIX and gold volatility differ across countries. The error-correction coefficients demonstrate that short-term deviations from equilibrium tend to adjust in the long run-in certain markets. Overall, the results suggest that ETF markets in newly industrialized countries are highly sensitive to global risk and uncertainty; however, the magnitude of this sensitivity varies depending on country-specific factors such as energy dependence and financial depth. These findings emphasize the importance of designing country-specific risk management strategies for both investors and policymakers.

1. Introduction

Global financial markets have undergone significant structural changes over the past thirty years in line with technological developments, regulatory reforms, and shifts in investor preferences. One of the key components of this transformation is exchange-traded funds (ETFs). First introduced on the Toronto Stock Exchange in 1989 (Kuo and

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Mateus, 2006: 6), ETFs have emerged as a prominent investment vehicle, particularly since the mid-1990s, due to their low transaction costs and high liquidity advantages (Ben-David et al., 2017: 169). The number of ETFs, which are passive investment products, has grown from 276 worldwide in 2003 to 10,319 as of the end of 2023. The total size of ETFs has also grown significantly, exceeding $11.5 trillion by the end of 2023 (www.statista.com). Therefore, it can be said that ETFs are the most popular and fastest-growing class of financial assets in today's markets (JankovÃ and Doskočil, 2021: 1).

ETFs are publicly traded, open-ended index tracking funds that can be bought and sold continuously during stock market trading hours. The primary objective of these funds is to track the returns of the underlying index as closely as possible. As passive investment vehicles, ETFs combine the advantages of traditional investment funds with the liquidity of stocks thanks to their low-cost structure and flexible trading features (Khan et al., 2015: 40). In this regard, ETFs are a type of hybrid financial asset that combines the common characteristics of stocks and investment funds (Verma and Dhirman, 2020: 121; Lakshmi, 2022: 2). ETFs are traded on organized markets and invest in portfolios composed of stocks, bonds, or other marketable investment instruments. However, unlike traditional mutual funds, ETFs are managed under a passive investment strategy, reflecting the structural advantages they provide (Lakshmi, 2022: 2).

Since the early 2000s, there has been a significant shift in the asset management sector from active investment strategies to passive strategies. Active strategies allow portfolio managers to make investment decisions aimed at outperforming the market index, while passive strategies are characterized by rule-based investment decisions that focus on tracking a specific index (Anadu et al., 2020: 23). In other words, passive investing is an investment fund that allows investors to invest in an entire index, such as the S&P 500. While the performance of active investments is typically measured in terms of absolute returns and index-adjusted returns, the performance of passive investments is measured by their ability to minimize tracking error relative to the selected index (Ben-David et al., 2017: 174).

Considering the development of ETF markets, the performance of exchange-traded funds during periods of financial uncertainty is important in terms of investor behavior. The rapid increase in exchange-traded funds has made ETFs not only an investment vehicle but also a channel for transferring systematic risks.

A review of the existing literature reveals studies on the performance of ETFs, their pricing mechanisms, and their relationship with macroeconomic indicators. The response of exchange-traded funds, particularly in emerging markets, to global risk and uncertainty factors has been relatively limited. In this context, the impact of commodity indicators such as oil and gold, which have significant effects on investor risk perception, and financial volatility measures such as the VIX index on ETF indices in emerging countries is an area that requires detailed examination.

The purpose of this study is to analyze the responses of iShares MSCI ETF indices in newly industrialized economies to global uncertainty indicators. The analysis covers countries such as Turkey, India, Brazil, China, and South Africa economies that are positioned between developed and emerging markets in terms of industrialization and income levels. The study also examines how investors' positioning in exchange-traded funds during periods of heightened uncertainty affects ETF price dynamics.

In this context, by analyzing how ETF markets react during periods of risk and uncertainty, the systematic risk level of these funds and their behavior within the portfolio will be revealed. The findings are expected to contribute to the literature with original insights specific to newly industrialized countries and to enable the development of practical recommendations for portfolio diversification and risk management strategies.

2. Literature Review

In this study, the literature review is presented through a chronological and thematic classification of previous research in the field. This approach allows for a clearer understanding of the historical development and methodological diversity of the literature, thereby highlighting the specific contribution of the present study. Literature studies generally fall under three main headings: the pricing and performance of ETFs, the role and importance of ETFs in financial markets, and their responses to macroeconomic variables. Consistent with the purpose of this study, the literature review primarily concentrates on examining the linkages between macroeconomic variables and exchange-traded funds (ETFs).

In his study, Ivanov (2011) examined the relationship between spot prices and ETF and futures prices for gold, silver, and oil commodities for the period from March 1, 2009, to August 31, 2009. The analysis results show that there is a significant cointegration relationship between the variables. The traditional advantage of the futures market in commodity price discovery has shifted to the ETF market for gold and silver. This means that gold and silver exchange-traded funds have become more important than the futures market in determining the price of gold and silver.

In their study, Yavas and Rezayat (2016) examined the links between ETF returns and volatility transmission in the stock markets of the US, Europe, and emerging countries. For this purpose, they looked at the period between February 3, 2012, and February 28, 2014. The research concluded that the returns of ETFs across all countries move significantly in tandem, and that there are still significant opportunities for diversification. U.S. and European investors can achieve significant diversification benefits by investing in ETFs from China, South Africa, and Turkey rather than investing in each other's markets. U.S. market volatility is transmitted to India, Russia, Mexico, and Turkey, while European volatility spreads to Mexico and South Korea.

In their study, Shank and Vianna (2016) examined the behavior of investors in currency-protected ETFs listed in the US between July 2011 and November 2015 in response to currency fluctuations using a panel VAR approach. The results of the study show that investors were able to predict future changes in exchange rates and invested in currency-protected ETFs before such changes occurred. The results of the Granger causality test also indicate that investors proactively invested before exchange rate changes.

In their study, Lau et al. (2017) examined the relationships between silver, platinum, and palladium, referred to as white metals, and gold, oil, and global stock ETFs using a new variance decomposition methodology. The study period covered the years 2006–2016. The cointegration test between the variables revealed that cointegration relationships existed between all variable pairs. A positive and significant relationship was identified between the average returns in the gold market and the average returns in the silver, platinum, and palladium markets. This indicates that gold is the primary source of return spillovers in the white metal ETF markets.

In their study, Mallika and Sulphey (2018) examined the price discovery process and performance of two gold ETFs (Goldman Sachs ETF and SBI ETF) between 2009 and 2016. Johansen cointegration and Vector Error Correction Model (VECM) were used for price discovery. According to VECM results, spot gold prices lead gold ETFs. The analysis results reveal that although price formations occur in the spot market, gold ETFs perform as well as physical gold.

In his 2020 study, Gazel examined the effect of exchange rates and CDS premiums on the prices of Turkish ETFs traded on US stock exchanges for the period 2008:03-2018:9. The study shows that there is an asymmetric and cointegrated relationship between the variables in the short and long term. NARDL's long-term results show that increases or decreases in the exchange rate have a negative effect on ETF prices, and similar results are also valid in the short-term relationship. Additionally, a negative relationship was found between the CDS premium and exchange-traded funds.

Verma and Dhirman (2020) investigated the causal relationship between the spot price of gold, the BSE SENSEX index, and 10 gold exchange-traded funds (ETFs) traded on the Bombay Stock Exchange between April 1, 2015, and March 31, 2018. The cointegration analysis revealed a long-term cointegration relationship among all variables. No Granger causality was detected between spot gold prices and the BSE SENSEX index. Granger causality was detected between spot gold prices and six of the ten gold ETFs. Granger causality was determined between only two of the ten gold ETFs and the BSE SENSEX index.

Kaur and Singh (2020) investigated the long-term cointegration relationship between gold ETFs and spot gold prices and futures gold prices on the Indian stock exchange for the period 2007-2016. The research results show the existence of a long-term cointegration relationship between gold ETFs and spot gold and futures gold markets. Therefore, it has been stated that investors wishing to invest in gold can eliminate the storage, purity, and security issues associated with physical gold by purchasing gold ETFs instead of physical gold. Additionally, it has been determined that movements in spot gold prices and futures prices lead the prices of gold ETFs.

In their study, Naeem and Ahmed (2022) tested the hedging effectiveness of ten currency ETFs against crude oil price fluctuations using symmetric and asymmetric dependency structures. The study found that the Invesco DB US Dollar Index Bullish fund (UUP) provided strong protection against crude oil price volatility in both average and extreme dependency scenarios. The WisdomTree Bloomberg US Dollar Bullish Fund (USDU) and the Invesco Currency Shares Japanese Yen Trust (FXY) funds were found to serve as safe havens against crude oil prices during downturns.

Aypek et al. (2025) examined the responses of the iShares MSCI ETF indices of the so-called fragile five countries—Indonesia, India, Brazil, Turkey, and South Africa—to daily fluctuations in CDS premiums. The study period was set as January 1, 2016, to December 31, 2023, and the case study model was used for analysis. The results revealed that investors took short positions in iShares MSCI ETF indices during periods of significant fluctuations in CDS spreads. Additionally, it was determined that investors in Turkey and Brazil reacted more strongly to fluctuations in CDS spreads.

Literature evidence indicates that ETFs are more effective in financial markets and have become decisive in pricing behavior. ETFs not only serve portfolio diversification but also play important roles in helping investors understand market behavior, price determination, and protection against macroeconomic risks.

3. Methodology

3.1. Data Set

The main objective of this study is to determine the relationship between global risk and uncertainty indicators and MSCI ETF investment funds in newly industrialized countries. In this regard, the iShares MSCI ETF indices of the countries in question were taken as the dependent variable. The explanatory variables consist of risk and uncertainty indices, namely the Chicago Board Options The explanatory variables include the global risk and uncertainty indicators, namely the Chicago Board Options Exchange Volatility Index (VIX), volatility of gold (ounce) prices (ONS), and volatility of Brent crude oil futures prices (Brent).

The data covers the period from February 2012 (2012M2) to

April 2025 (2025M4) on a monthly basis. Within this framework, a data set consisting of a total of 158 observations has been created. All data was obtained from the www.investing.com website. To reduce scale effects and perform more robust stationarity analyses, logarithmic transformations of the series were used. The countries analyzed in the study, along with their iShares ETF index codes and explanatory variables, are presented in Table 1.

Table 1. Variables Table

Variables	Code	Variable Description
Dependent Variable: iShares MSCI ETF		
Indonesia	EIDO	Indonesia iShares MSCI ETF index value
Philippines	EPHE	Philippines iShares MSCI ETF index value
Malaysia	EWM	Malaysia iShares MSCI ETF index value
Mexico	EWW	Mexico iShares MSCI ETF index value
Brazil	EWZ	Brazil iShares MSCI ETF index value
South Africa	EZA	South Africa iShares MSCI ETF index value
India	INDA	India iShares MSCI ETF index value
China	MCHI	China iShares MSCI ETF index value
Thailand	THD	Thailand iShares MSCI ETF index value
Türkiye	TUR	Türkiye iShares MSCI ETF index value
Explanatory Variable: Risk and Uncertainty Indicators		
Oil price	Brent	Brent crude oil futures market volatility
Gold price	ONS	Gold price volatility (ONS)
Fear index	VIX	An index calculated based on the S&P 500 index value that measures investor risk perception in the markets.

All variables used in the study are at a monthly frequency, and a logarithmic transformation was applied to the series. The analysis was primarily conducted using these logarithmic values in order to eliminate scale differences and stabilize variance. In addition, for the financial uncertainty indicators—gold (ONS) and Brent crude oil—volatility values derived from the logarithmic returns of the respective price series were employed instead of their raw price levels. This approach ensured that these variables were incorporated into the model in a manner consistent with the VIX index, representing uncertainty dynamics. Based on 158 monthly observations, the descriptive statistics of the logarithmic variables are presented in Table 2.

Table 2. Descriptive Statistics

Variable	Mean	Median	Maximum	Minimum	Standard Deviation	Kurtosis	Skewness	Jarque-Bera	Probability	Obs.
EIDO	1.379847	1.37602	1.551084	1.168203	0.068743	-0.36129	3.553260	5.486947	0.064346	158
EPHE	1.499030	1.50879	1.622007	1.343999	0.067376	-0.24723	2.069010	7.361958	0.025198	158
EWM	1.523631	1.47798	1.807535	1.301247	0.161823	0.606778	1.941259	17.18292	0.000186	158
EWW	1.717763	1.71096	1.872681	1.450711	0.084576	-0.58092	3.434599	10.19444	0.006114	158
EWZ	1.553201	1.54617	1.839981	1.297323	0.108908	0.090256	2.611107	4.217823	0.054394	158
EZA	1.695880	1.69390	1.823018	1.453012	0.076017	-0.37886	2.663096	4.555645	0.082507	158
INDA	1.532748	1.52309	1.767379	1.308991	0.110136	0.204509	2.177585	5.589258	0.061138	158
MCHI	1.716183	1.69460	1.937418	1.548021	0.086394	0.604579	2.623708	10.62424	0.004931	158
THD	1.870783	1.87511	2.002339	1.714162	0.062376	-0.18721	2.658004	1.703699	0.042662	158
TUR	1.544115	1.56086	1.864570	1.248954	0.154928	-0.06069	2.057354	5.984475	0.050175	158
Brent	8.962219	8.410988	19.21260	3.376463	4.224882	1.332140	3.948432	52.65294	0.000000	158
ONS	4.028471	4.032174	5.240866	2.130096	0.788470	-0.440909	2.575317	6.306562	0.042712	158
VIX	1.231933	1.21218	1.728678	0.978181	0.133794	0.856802	3.723468	22.92149	0.000011	158

According to Table 2, the EWM, TUR, BRENT, and VIX variables are volatile and carry high risk. No extreme values were found in the other variables. It has also been determined that the standard deviation values are low and the series volatility is low. The skewness values indicate that all series are positively right-skewed. The kurtosis values are 3 and below. This indicates that these series show a normal distribution. The Jargue-Bera and p probability values indicate that the series generally conform to a normal distribution.

A Quantile-Quantile (Q-Q) plot was created to obtain information about the distribution of the series. Kalaycı (2010) stated that a normal distribution is appropriate when the series values are clustered around the line. According to the Q-Q plots created to investigate whether the time series are randomly distributed (Figure 1), it can be seen that the observations in the center of all series are consistent with the line and are suitable for normal distribution. Deviations from normal distributions were detected at positive and negative extremes in some series. Despite the presence of outliers, it can be said that the majority of the series are consistent with normal distribution.

A correlation matrix was prepared to show the relationships between the variables used in the study. The correlation matrix shows the degree of positive or negative relationships between variables. The correlation matrix for the variables is given in Table 3.

Figure 1. Level Graphs of Series

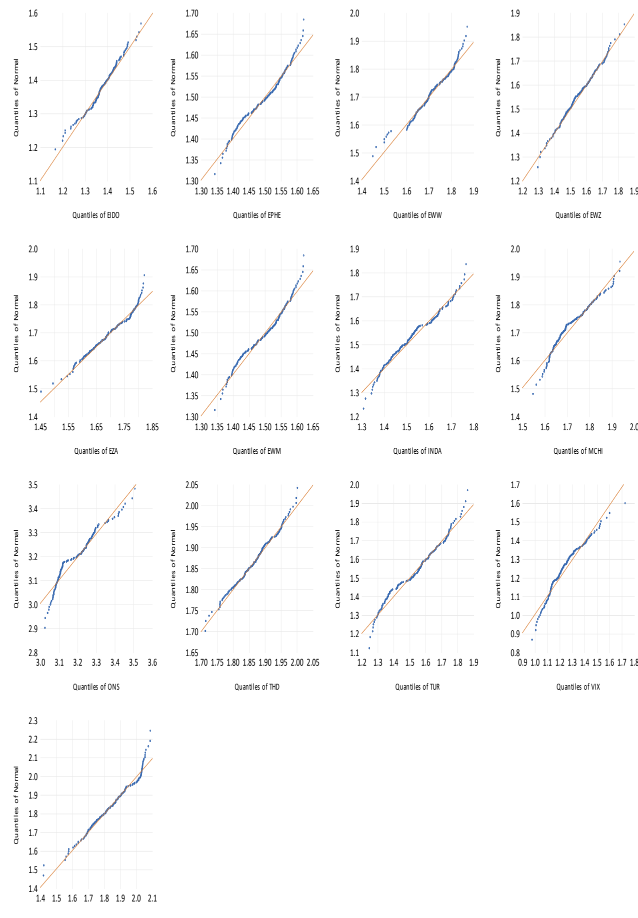


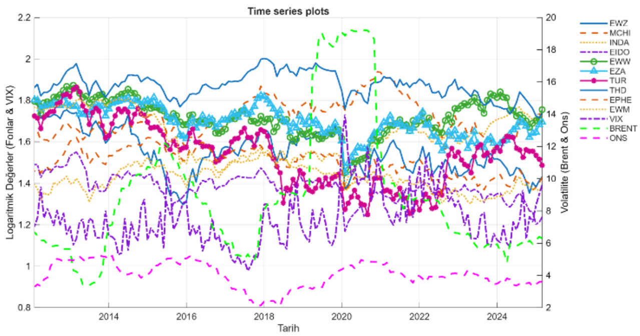
Table 3. Correlation Matrix

Variable	EIDO	EPHE	EWM	EWW	EWZ	EZA	INDA	MCHI	THD	TUR	BRENT	ONS	VIX
EIDO	1.00												
EPHE	0.65***	1.00											
EWM	0.62***	0.66***	1.00										
EWW	0.53***	0.26***	0.53***	1.00									
EWZ	0.77***	0.44***	0.62***	0.40***	1.00								
EZA	0.71***	0.74***	0.79***	0.55***	0.64***	1.00							
INDA	-0.44***	-0.52***	-0.75***	-0.11	-0.44***	-0.42***	1.00						
MCHI	-0.17**	0.08	-0.22***	-0.57***	0.01	-0.02	0.22***	1.00					
THD	0.66***	0.63***	0.31***	-0.020	0.61***	0.53***	-0.25***	0.46***	1.00				
TUR	0.58***	0.464***	0.75***	0.78***	0.45***	0.65***	-0.47***	-0.53***	0.05	1.00			
Brent	-0.34***	-0.002	-0.20**	-0.70***	-0.17**	-0.37***	-0.05	0.48***	0.10	-0.54***	1.00		
ONS	-0.06	0.09	0.34***	0.13	-0.06	-0.06	-0.42***	-0.24***	-0.31***	0.21**	0.12	1.00	
VIX	-0.45***	-0.46***	-0.29***	-0.52***	-0.34***	-0.48***	0.08	0.21**	-0.28***	-0.51***	0.44***	0.21***	1.00

The correlation coefficients illustrate the contemporaneous comovements between the ETF indices and the global risk and uncertainty indicators. According to Table 3, most ETFs of newly industrialized countries exhibit negative correlations with the VIX index, oil, and gold volatility. This finding indicates capital outflows from these markets during periods of heightened global risk perception, suggesting that ETF indices are negatively affected by global uncertainty. However, the fact that the relationship is weak or reversed for certain ETFs implies that the dynamics of these markets—particularly gold-related movements—may be influenced not only by global risk factors but also by country-specific determinants. On the other hand, the relatively low or negative correlations provide portfolio diversification opportunities for investors.

To visualize the values of variables over time, time series graphs of the natural logarithmic values of each series were created. Time series graphs provide preliminary information about fluctuations, trend structures, breaks, and volatility levels in the series. Graphs related to the logarithmic series are given in Figure 2.

Figure 2. Logarithmic Value Graphs of Series



While some series show an increase during the study period, most series appear to be moving horizontally. There are periods of high volatility in the VIX and BRENT variables. In addition, high fluctuations are noticeable in the EWZ and EWM investment funds. Excessive volatility makes it difficult for the series to remain stable. The visual state of the series provides preliminary information about the presence of volatility and the non-stationarity of the series. Furthermore, jumps are observed in the series during the pandemic period. This indicates that the series are subject to structural breaks.

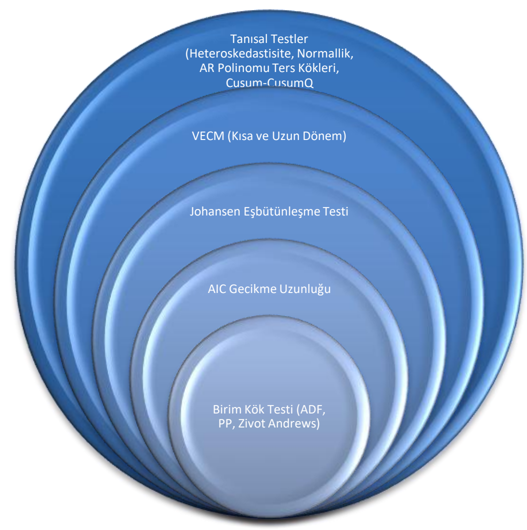
3.2. Method

Time series analysis was used to determine the effects of global risk and uncertainty on exchange-traded funds (ETFs). Descriptive statistics and Q-Q plots provided information on the normality of the series. The stationarity of the series was determined using traditional unit root test methods. Considering the study period, the Zivot-Andrews unit root test was used to identify possible structural breaks during the sample period.

To determine the lag length of models established with series with identified levels of stationarity, Vector Autoregression (VAR) models were created based on the Akaike Information Criterion (AIC) according to the number of lags. The LM autocorrelation test was performed to determine whether there was an autocorrelation problem in the models, and the inverse roots of the AR polynomial were examined for the model stability condition. As part of other diagnostic tests related to the robustness of the model, heteroscedasticity and normality tests were performed. In addition to the AR polynomial inverse roots used to determine the stability of the model, Cusum and CusumQ tests, which are stability tests, were performed to determine whether the model exhibited structural breaks over time.

The Johansen cointegration test was used to determine the long-term cointegration relationship. The Vector Error Correction Model (VECM) was used to evaluate both long-term and short-term relationships in the models where the cointegration relationship was determined, and long-term and short-term coefficients were determined. The Error Correction Coefficients (ECC) obtained from these models were used to evaluate the speed of return to the equilibrium point. All time series analyses conducted to reveal the short- and long-term relationship between investment funds and global risk and uncertainty indicators were carried out systematically. The methods used in the analysis process are shown in Figure 3.

Figure 3. Time Series Analysis Steps



Source: Author's own elaboration.

The flowchart below shows the time series analysis methods used in the study. The flowchart outlines the objectives and assumptions of the time series analysis methods and provides the calculation equations.

Prior to time series analysis, the Augment Dickey-Fuller (ADF) and Philips-Perron (PP) tests, which are traditional unit root tests, were performed to determine the stationarity of the series. The results of the unit root test performed at the beginning of the time series analysis will be decisive in the selection of the time series analysis method.

Dickey and Fuller (1979), states that the variable is non-stationary, contains a unit root, and that the effect of a shock becomes permanent in the event of a shock. The non-stationarity of a time series refers to the situation where the mean and variance do not change over time (Gujarati, 1999; 713). In this study, the ADF and PP tests were used to assess the stationarity of the series.

In the ADF unit root test, the null hypothesis is that there is a unit root (H_0: $\delta = 0$) or that the time series is non-stationary. The alternative hypothesis is that the time series is stationary (H_1: $\delta < 0$). If the obtained t-statistics are smaller than the critical value and statistically insignificant, the alternative hypothesis is rejected, and it is accepted that the series contains a unit root.

DF assumes that white noise error terms are independent and identically distributed in stationarity analysis. In the ADF test, DF analysis has been developed by adding lagged error terms to the dependent variable and taking into account the serial correlation in the error terms. In the Philips-Perron test, the ADF test was developed using nonparametric statistical methods instead of lagged difference values to account for the serial correlation in the error terms (Gujarati and Porter, 2012; 757). The following equations were developed in the PP stationarity test:

$$Y_t = \alpha_0 + \alpha_1 Y_{t-1} + u_t \quad (1)$$

$$Y_t = \alpha_0 + Y_{t-1} + \alpha_2\left(t - \frac{T}{2}\right) + u_t \quad (2)$$

Equations (1-2) show the distribution of the error terms u_t. T denotes the number of observations.

Many economists have stated that traditional unit root tests such as ADF and PP are inaccurate because they do not take into account structural breaks that occur during the research period (Shahbaz et al., 2013; Tiwari et al., 2013). In this study, Zivot-Andrews structural break unit root analysis was performed to account for regime changes that may occur after structural breaks in the time series and to determine its resilience to external shocks. The equations used for the Zivot-Andrews unit root test, which calculates a one-time break at the level (Equation-3), in the trend (Equation-4), and both at the level and in the trend (Equation-5), are as follows (Zivot and Andrews, 2002):

$$\Delta Y_t = \mu Y_{t-1} + \sum_{i=1}^{k} \delta_i \Delta Y_{t-i} + \varepsilon_t \quad (3)$$

$$\Delta Y_t = \alpha_0 + \mu Y_{t-1} + \sum_{i=1}^{k} \delta_i \Delta Y_{t-i} + \varepsilon_t \quad (4)$$

$$\Delta Y_t = \alpha_0 + \beta_0 + \mu Y_{t-1} + \sum_{i=1}^{k} \delta_i \Delta Y_{t-i} + \varepsilon_t \quad (5)$$

In the equations, Y represents the time series, while t represents the time sampling period. α_0 represents the intercept, β_0 represents the coefficient of the time trend, andμ represents the coefficient of the number of lags at the level.

The Akaike Information Criterion (AIC), developed by Akaike in 1974, was used to determine the appropriate lag length before determining the long-term cointegration relationship of the models created from the series subjected to stationarity testing. AIC calculates the model prediction accuracy by taking into account the variance of the error terms and the number of parameters.

The responses of ETFs to global risk and uncertainty indicators are shaped by different dynamics across short- and long-term horizons. In the short run, sudden changes in risk perception lead investors to quickly adjust their portfolio positions, resulting in temporary overreactions in prices (Baur and Lucey, 2010). In the long run, however, investors tend to optimize their risk exposure through portfolio diversification, rebalancing, and hedging strategies, which give rise to permanent cointegration relationships (Ambachtsheer, 1987; Booth and Fama, 1992; Horn and Oegler, 2020). To examine these two dynamics, the Johansen cointegration approach is employed. For financial assets, short-run disequilibria represent temporary deviations from portfolio equilibrium values, whereas long-run equilibrium reflects the stable relationship through which such deviations are corrected over time. In this context, long-term relationships capture investors' strategic positioning behavior, while short-term relationships reflect tactical responses and risk-avoidance tendencies.

In the next stage of the analysis, the long-term cointegration relationship was investigated. The Johansen cointegration test was used to determine the cointegration relationship. The Johansen cointegration test, developed by Johansen (1988, 1991), identifies series that are cointegrated with each other. The Johansen cointegration test is used to analyze the relationship between multiple time series. Compared to the Engle-Granger approach, the Johansen method provides significant advantages in analysis because it can also be used with non-stationary series (Johansen, 1991). The Johansen cointegration method provides information about long-term cointegration and the number of cointegration vectors. In Johansen cointegration analysis, two statistical calculations are performed: trace and eigenvalue. The formulas for trace and eigenvalue calculations are as follows (Eyüboğlu and Eyüboğlu, 2019):

$$\lambda_{Trace} = -T \sum_{i=r+1}^{p} \ln(1 - \lambda_i) \quad (6)$$

$$\lambda_{max} = -T.\ln(1 - \lambda_{r+1})\ 0 \leq r \leq p \quad (7)$$

Formula 6 shows the trace value and formula 7 shows the eigenvalue statistics calculation. Both formulas use the logarithmic transformation of eigenvalues to determine the cointegration relationship between series.

Johansen cointegration analysis is used to determine long-term cointegration between series. If there is one or more cointegrations in the model, it indicates that the series in the model move together in the long term. If a cointegration vector exists, a Vector Error Correction Model (VECM) is established to identify the long-term relationships and short-term dynamics of the model. VECM analysis reduces short-term dynamics and long-term equilibrium relationships into a single model. The Error Correction Coefficient (ECC) in the model indicates the speed at which short-term deviations in the series return to long-term equilibrium (Engle and Granger, 1987; Zhang et al., 2010). According to Engle and Granger (1987), the error correction coefficients in VECM analysis are expected to be negative and significant. A significant negative coefficient indicates that short-term deviations converge to the long-term equilibrium in the long run. The VECM model is expressed by the following equation (Bekmez and Özpolat, 2013):

$$\Delta X_t = \delta + \sum_{i=1}^{k-1} \gamma_j \Delta X_{t-1} + \mu ECT_{t-1} + \varepsilon_t \quad (8)$$

In Formula 8, Δ represents the difference operator, k represents the delay number, ECT_{t-1} represents the error correction, and μ represents the speed at which imbalances are rebalanced. ΔX_t = $Brent_t$, ONS_t, VIX_t notes the vector of explanatory variables. The parameter $\gamma_j$corresponds to the iShares MSCI ETF return, while $Brent_t$, ONS_t, VIX_t stand for the global risk and uncertainty indicators. The constant term β_0, represents the average level of the series.

In the literature, it has been reported that the VIX index negatively affects stock prices by increasing risk aversion (Gazel, 2020); gold (ONS), due to its safe-haven characteristic, may exhibit a positive relationship with equity markets (Kaul and Sapp, 2007; Baur and Lucey, 2010); and Brent oil may have a negative impact on energy-importing countries through the cost channel, while exerting a positive effect in energy-exporting economies (Park and Ratti, 2008; Cifarelli and Paladino, 2010; Filis et al., 2011). Therefore, the expected coefficient signs are ambiguous for β_1 (Brent) depending on the country's economic structure, positive for β_2 (ONS), and negative for β_3 (VIX).

4. Findings and Discussion

Prior to time series analysis, ADF and PP unit root tests were conducted to determine the stationarity of the series. The results of the traditional unit root test are presented in Table 4.

Table 4. Unit Root Test Results

Variables	I(0)				I(1)			
	Intercept		Trend and Intercept		Intercept		Trend and Intercept	
	ADF	PP	ADF	PP	ADF	PP	ADF	PP
EIDO	-2.234266	-2.386953	-3.278155	-3.278155	-11.84974***	-11.89491***	-11.81889***	-11.86046***
EPHE	-2.168973	-2.280362	-4.08009***	-4.20415***	-12.6351***	-12.70454***	-12.65218***	-12.79402***
EWM	-1.192276	-1.153146	-2.004011	-1.875355	-13.69212***	-13.74074***	-13.66940***	-13.71911***
EWW	-2.213836	-2.110859	-2.295398	-2.199400	-12.84848***	-13.06351***	-12.81489***	-13.09770***
EWZ	-2.9537**	-2.9246**	-3.358403	-3.391310	-12.22942***	-12.82026***	-12.19770***	-12.79951***
EZA	-2.753948	-2.640383	-3.660529**	-3.671065**	-13.42101***	-13.89185***	-13.38766***	-13.86620***
INDA	-1.265029	-1.194056	-3.453263	-3.486990	-12.90572***	-12.95112	-12.86719	-12.90986
MCHI	-2.153999	-2.087302	-2.129463	-2.062132	-13.03174***	-13.04952***	-13.00339***	-13.02695***
THD	-1.911008	-2.023745	-2.411865	-2.519626	-11.80826***	-11.81404***	-11.83158***	-11.88479***
TUR	-1.795247	-1.711072	-1.991429	-1.980333	-11.65176***	-11.99596***	-11.63197***	-12.15539***
Brent	-2.029305	-1.790543	-1.964651	-1.721862	-6.283920***	-11.88266***	-6.297711***	-11.87713***
ONS	-1.732413	-2.133630	-2.133659	-2.487659	-11.81915***	-11.97608***	-11.81248***	-11.96965***
VIX	-2.652258	-2.994314	-2.9684412	-3.419954	-17.69834***	-25.36078***	-17.65617***	-25.42793***
Test Critical Values								
%1 critical value	-3.471987		-4.017185		-3.472259		-4.017568	
%5 critical value	-2.879727		-3.438515		-2.879846		-3.438700	
%10 critical value	-2.576546		-3.143558		-2.576610		-3.143666	

According to traditional unit root test results, the series contain unit roots in their natural logarithmic values and are not stationary. However, it has been determined that the series become stationary after taking the first difference, and therefore all series are I(1) and integrated of the first order.

However, Perron (1989) has stated that applying a traditional unit root test to series with structural breaks reduces the reliability of the analysis results. In line with this, considering the pandemic phenomenon that affected all financial markets globally, a structural break unit root test analysis was performed in order to analyze the stationarity of the series more accurately. Table 5 shows the results of the Zivot-Andrews unit root test.

Table 5. Zivot-Andrews Unit Root Test Results

Variables	I(0)			I(1)		
	t-statistic	Probability	Break Date	t-statistic	Probability	Break Date
EIDO	-4.101100	0.040450	2016M6	-12.10788	0.004310	2020M04
EPHE	-4.702444	0.034287	2020M1	-12.83045	0.037777	2020M04
EWM	-4.755561	0.0218/55	2015M5	-10.31758	0.000006	2016M03
EWW	-4.376221	0.001131	2020M11	-13.34544	0.010373	2020M05
EWZ	-3.934143	0.053168	2017M7	-12.54510	0.012964	2016M02
EZA	-4.120898	0.067514	2018M8	-13.63122	0.015250	2020M04
INDA	-4.025489	0.005525	2020M11	-13.18833	0.002341	2020M04
MCHI	-4.212824	0.001373	2021M11	-13.48165	0.014124	2021M07
THD	-4.178607	0.001593	2017M1	-12.03072	0.009609	2016M01
TUR	-4.708351	0.000018	2022M10	-8.226727	0.007653	2022M07

Brent	-4.176922	0.040359	2014M09	-10.83492	0.026509	2020M03
ONS	-3.810449	0.000849	2020M12	-11.58222	0.000587	2020M07
VIX	-5.072522	0.005643	2020M1	-8.837136	0.025399	2022M10
Test Critical Values						
%1 critical value				-5.57		
%5 critical value				-5.08		
%10 critical value				-4.82		

According to the results of the structural break unit root test, it was found that the breaks were particularly concentrated during the pandemic period. When the stationarity levels of the series were examined, it was found that all series were stationary at the first difference and therefore at the I(1) level, consistent with the results of the traditional unit root test.

When examining the results of traditional unit root tests such as ADF and PP analyses and structural break unit root tests such as the Zivot-Andrews unit root test, it was determined that all series contained a unit root at the level in both traditional and structural break unit root tests and became stationary in the first difference. Based on the results of the structural break unit root tests, which also indicated that the series became stationary in the first difference, the analysis was continued using the Johansen cointegration test for cointegration.

Before conducting the Johansen cointegration analysis, the optimal lag structure for each model was selected according to the Akaike (AIC) and Bayesian (BIC) information criteria, ensuring the appropriate lag length for subsequent estimation.

Table 6: AIC ve BIC Bilgi Kritereine Göre Gecikme Uzunluğu

Country / ETF	N	Selected Lag *(p*)*	AIC	BIC
Brazil (EWZ)	158	1	-558.907	-549.72
China (MCHI)	158	1	-671.233	-662.045
India (INDA)	158	1	-729.464	-720.276
Indonesia (EIDO)	158	1	-673.758	-664.57
Mexico (EWW)	158	1	-667.989	-658.802
South Africa (EZA)	158	1	-655.961	-646.773
Turkey (TUR)	158	1	-566.85	-557.662
Thailand (THD)	158	1	-721.785	-712.597
Philippines (EPHE)	158	1	-723.91	-714.722
Malaysia (EWM)	158	1	-753.966	-744.778
Gold Volatility (ONS)	158	8	-58.3844	-27.7585
Brent Volatility (Brent)	158	3	418.1425	433.4554
VIX (Global Risk Index)	158	2	-292.944	-280.694

VAR models were constructed based on lag lengths determined using the AIC method, and Johansen cointegration analyses were performed on these models. To determine the cointegration relationships of the time series analysis models examined using the VECM method, the trace and maximum eigenvalue statistical results showing the long-term cointegration relationships between global risk and uncertainty indicators for each model are presented in Table 7.

Table 7: Johansen Cointegration Test

Model	Cointegration Relationship	Trace Test			Max. Eigenvalue Test		
		Eigenvalue Statistic	Trace Statistic	%5 Critical Value	Eigenvalue Statistic	Max Eigen Statistic	%5 Critical Value
Indonesia (EIDO)	r=0	0.171136**	54.33107	47.85613	0.171136**	29.28111	27.58434
	r≤1	0.091756	25.04997	29.79707	0.091756	15.01371	21.13162
	r≤2	0.035780	10.03626	15.49471	0.035780	5.684018	14.2646
	r≤3	0.027513**	4.352239	3.841465	0.027513**	4.352239	3.841465
Philippines (EPHE)	r=0	0.185227***	54.72113	47.85613	0.185227**	31.95597	27.58434
	r≤1	0.082447	22.76516	29.79707	0.082447	13.42306	21.13162
	r≤2	0.039419	9.342106	15.49471	0.039419	6.273774	14.2646
	r≤3	0.019477*	3.068332	3.841465	0.019477*	3.068332	3.841465
Malaysia (EWM)	r=0	0.184217***	59.71347	47.85613	0.184217**	31.76273	27.58434
	r≤1	0.116028*	27.95073	29.79707	0.116028*	19.23954	21.13162
	r≤2	0.043425	8.71119	15.49471	0.043425	6.925741	14.2646
	r≤3	0.011380	1.785449	3.841465	0.011380	1.785449	3.841465
Mexico (EWW	r=0	0.177215***	64.86652	47.85613	0.177215**	30.42941	27.58434
	r≤1	0.150256**	34.43711	29.79707	0.150256**	25.4	21.13162

	r≤2	0.039870	9.037107	15.49471	0.039870	6.347093	14.2646
	r≤3	0.017096	2.690014	3.841465	0.017096	2.690014	3.841465
Brazil (EWZ)	r=0	0.167620***	55.27181	47.85613	0.167620**	28.62071	27.58434
	r≤1	0.102778	26.6511	29.79707	0.102778	16.91853	21.13162
	r≤2	0.033180	9.73257	15.49471	0.033180	5.263862	14.2646
	r≤3	0.028239**	4.468708	3.841465	0.028239**	4.468708	3.841465
South Africa (EZA)	r=0	0.161558**	54.48224	47.85613	0.161558*	27.48865	27.58434
	r≤1	0.106431	26.9936	29.79707	0.106431	17.5549	21.13162
	r≤2	0.031520	9.438693	15.49471	0.031520	4.996319	14.2646
	r≤3	0.028075**	4.442374	3.841465	0.028075**	4.442374	3.841465
India (INDA)	r=0	0.207244***	56.6592	47.85613	0.207244***	36.22936	27.58434
	r≤1	0.085975	20.42984	29.79707	0.085975	14.024	21.13162
	r≤2	0.034168	6.405846	15.49471	0.034168	5.423457	14.2646
	r≤3	0.006278	0.982389	3.841465	0.006278	0.982389	3.841465
China (MCHI)	r=0	0.178310***	59.19945	47.85613	0.178310**	30.63717	27.58434
	r≤1	0.121627*	28.56228	29.79707	0.121627*	20.23067	21.13162
	r≤2	0.032751	8.331612	15.49471	0.032751	5.194731	14.2646
	r≤3	0.019907*	3.136881	3.841465	0.019907*	3.136881	3.841465
Thailand (THD)	r=0	0.161936**	48.68931	47.85613	0.161936*	27.55913	27.58434
	r≤1	0.058556	21.13018	29.79707	0.058556	9.41303	21.13162
	r≤2	0.045656	11.71715	15.49471	0.045656	7.290128	14.2646
	r≤3	0.027979**	4.427025	3.841465	0.027979**	4.427025	3.841465
Türkiye (TUR)	r=0	0.216742***	61.78353	47.85613	0.216742***	38.10972	27.58434
	r≤1	0.095683	23.67382	29.79707	0.095683	15.68983	21.13162
	r≤2	0.029753	7.983986	15.49471	0.029753	4.711896	14.2646
	r≤3	0.020756*	3.27209	3.841465	0.020756*	3.27209	3.841465

At least one long-term and statistically significant cointegration vector has been identified between the MSCI fund values of newly industrialized countries and global risk and uncertainty indicators. This finding confirms the existence of a long-term dynamic relationship between ETF fund values and global risk and uncertainty measures.

This finding shows that there is a strong long-term relationship between global risk and uncertainty and the ETF founds of newly industrialized countries. The findings suggest that the funds exhibit a tendency to adjust to these changes over time, implying that global risk factors exert a lasting influence on the financial asset pricing mechanisms of these economies.

At least one long-term cointegration vector identified between ETF indices and global risk and uncertainty indices for all country models; Gazel (2020) identified a long-term cointegration relationship between exchange rates and CDS premiums and Turkish ETF indices, while Yavas and Rezayat (2025) identified a long-term relationship between ETF returns and market volatility. (2016) identify a long-term relationship between ETF returns and market volatility, Aypek et al. (2025) identify sensitivity of Brazilian and Turkish ETFs in the relationship between CDS and MSCI ETFs, and Naeem and Ahmet (2022) identify a long-term cointegration relationship between oil and ETFs.

These findings provide important information that fund investors should consider when determining their long-term portfolio strategies. In addition, the results offer policy implications by guiding policymakers in formulating strategies to preserve financial stability against external shocks driven by global risk and uncertainty factors.

The mathematical specification of these long-run cointegration relationships is reported in Table 8.

Table 8. Normalized Long-run Cointegration Equations for Newly Industrialized Countries

Country	Cointegration Equation
Indonesia (EIDO)	$EIDO_t - -0.007648 \cdot BRENT_t - -0.019757 \cdot ONS_t + 1.442066 \cdot VIX_t + c = 0$
Philippines (EPHE)	$EPHE_t - -0.015034 \cdot BRENT_t - -0.035120 \cdot ONS_t + 1.469171 \cdot VIX_t + c = 0$
Malaysia (EWM)	$EWM_t - -0.008757 \cdot BRENT_t - -0.158262 \cdot ONS_t + 2.606285 \cdot VIX_t + c = 0$
Mexico (EWW)	$EWW_t - 0.013145 \cdot BRENT_t - -0.055583 \cdot ONS_t + 0.561160 \cdot VIX_t + c = 0$
Brazil (EWZ)	$EWZ_t - -0.035618 \cdot BRENT_t - -0.032445 \cdot ONS_t + 4.287352 \cdot VIX_t + c = 0$
South Africa (EZA)	$EZA_t - -0.016733 \cdot BRENT_t - -0.030061 \cdot ONS_t + 2.599188 \cdot VIX_t + c = 0$
India (INDA)	$INDA_t - 0.016516 \cdot BRENT_t - 0.104109 \cdot ONS_t + -1.695478 \cdot VIX_t + c = 0$

China (MCHI)	$MCHI_t - 0.002760 \cdot BRENT_t - 0.064715 \cdot ONS_t + -1.623523 \cdot VIX_t + c = 0$
Thailand (THD)	$THD_t - -0.075545 \cdot BRENT_t - 0.054886 \cdot ONS_t + 7.066709 \cdot VIX_t + c = 0$
Turkey (TUR)	$TUR_t - 0.006028 \cdot BRENT_t - -0.110733 \cdot ONS_t + 1.767981 \cdot VIX_t + c = 0$

The normalized long-run cointegration equations illustrate how and in which direction ETF fund indices in newly industrialized markets respond to global risk and uncertainty factors.

An examination of the equations reveals that the coefficients of the VIX index are generally positive, whereas those of oil and gold variables are mostly negative. This finding suggests that increases in global volatility tend to reduce ETF index values in the long run, although the magnitude and direction of this effect vary across countries. In particular, rising oil prices are observed to negatively affect ETF values in energy-importing economies, while having more moderate or even positive effects in energy-exporting countries. The relatively small and mostly negative coefficients of gold prices indicate that gold serves as a safe-haven asset for investors.

The cointegration test shows that there is a long-term relationship between the variables in a specific direction. This finding confirms that the variables included in the models follow a common long-term path and that there is a cointegration relationship between them. In this regard, the analysis was continued using the VECM method to determine both short-term dynamics and examine the long-term correction mechanism. Furthermore, cointegration only determines whether variables move together or not.

The results of the VECM analysis conducted to determine the deviations from long-term equilibrium in models with long-term cointegration relationships and to analyze short-term relationships are presented in Tables 9 and 10. Panel A in Table 9 shows the long-term VECM results, and Panel B shows the ECC results indicating the time required for short-term imbalances to reach equilibrium.

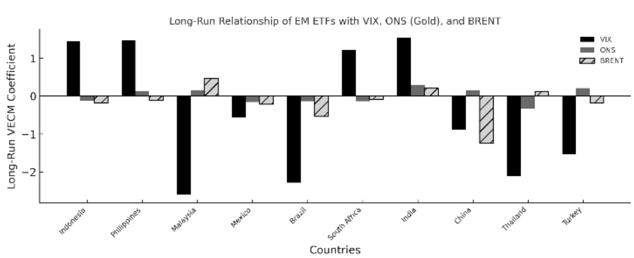
Table 9: VECM Long-Term Analysis Results

Model	ΔMSCI-ETF	ΔVIX	ΔONS	ΔBRENT	C
Panel A. Long-run VECM Estimation Results					
Indonesia (EIDO)	1.000000	1.442066***	-0.119757	-0.1758648*	--3.005025
		(0.24719)	(0.03314)	(0.00687)	
Philippines (EPHE)	1.000000	1.469171	0.035120*	-0.115034***	-3.030628
		(0.21107)	(0.02839)	(0.00586)	
Malaysia (EWM)	1.000000	-2.606285***	+0.158262***	0.458757	-4.010108
		(0.43714)	(0.05886)	(0.01217)	
Mexico (EWW)	1.000000	-0.561160***	-0.055583***	-0.213145***	-2.301164
		(0.10902)	(0.01465)	(0.00303)	
Brazil (EWZ)	1.000000	-2.287352***	-0.032445	0.535618*	-6.373296
		(0.76408)	(0.10188)	(0.02108)	
South Africa (EZA)	1.000000	1.208938	-0.034398	-0.090950	-3.031793
		(0.27652)	(0.03313)	(0.00696)	
India (INDA)	1.000000	1.545054***	0.095917***	0.216380***	-0.169072
		(0.28050)	(0.03481)	(0.00727)	
China (MCHI)	1.000000	-0.878293***	0.061553***	-1.236206*	-0.829908
		(0.21130)	(0.02618)	(0.00549)	
Thailand (THD)	1.000000	-2.12206***	-0.128196	0.120185	14.93411
		(3.21059)	(0.40394)	(0.18390)	
Türkiye (TUR)	1.000000	-1.531528***	0.109070***	-0.179208*	-3.067245
		(0.21766)	(0.02760)	(0.00573)	
Panel B- ECC					
Model	**MSCI-ETF**	**VIX**	**ONS**	**BRENT**	
Indonesia (EIDO)	-0.005702*	-0.223868***	-0.293861***	-0.947065*	
	(0.01712)	(0.05495)	(0.11885)	(0.54580)	
Philippines (EPHE)	-0.009047	-0.282387***	0.286071***	-0.849249*	
	(0.01612)	(0.06034)	(0.13276)	(0.60828)	
Malaysia (EWM)	-0.005014	-0.112922***	0.215394***	-0.222437	
	(0.00696)	(0.02987)	(0.06288)	(0.29635)	
Mexico (EWW)	-0.045005*	-0.153696*	1.154656***	-1.426158*	
	(0.03817)	(0.12782)	(0.25126)	(1.21876)	

Brazil (EWZ)	-0.002134	-0.076142	0.076288**	-0.322965*
	(0.00800)	(0.01808)	(0.03945)	(0.17955)
South Africa (EZA)	-0.016661	-0.191675***	0.324003***	-0.945819*
	(0.02498)	(0.07707)	(0.16167)	(0.74099)
India (INDA)	-0.022182**	0.243729***	-0.227152**	0.463167
	(0.01358)	(0.05289)	(0.11634)	(0.52623)
China (MCHI)	-0.057916***	0.272585***	-0.416463***	1.260900**
	(0.02366)	(0.07731)	(0.16480)	(0.73786)
Thailand (THD)	-0.002683**	0.020746***	-0.010165	0.126086**
	(0.00142)	(0.00545)	(0.01196)	(0.05188)
Türkiye (TUR)	-0.020816	-0.213231***	0.424490***	-1.065171**
	(0.02589)	(0.06017)	(0.12741)	(0.56550)

Panel A in Table 9 shows the long-term VECM analysis results between the ETF funds of 10 reindustrializing countries and VIX, ONS, and Brent oil. To better understand the long-term VECM results, a graph was created from the table results, and the long-term VECM graph is shown in Figure 4.

Figure 4. Long-Term VECM Results



A negative relationship between VIX and ETF funds has been identified in the long term. The findings suggest that rising global uncertainty amplifies risk perception in financial markets, triggering capital outflows and resulting in a downward adjustment in ETF prices. This finding is consistent with the results of Shank and Vianna (2016) and Yavas and Rezayat (2016). Contrary to expectations, a positive relationship was found between Indian ETF index and the VIX. This result may be attributed to factors such as the country's economic outlook and policies, investor sentiment, and the type of fund portfolio (e.g., a portfolio composed of defense industry companies). In the models created for South Africa and Philippine ETF funds, no long-term VECM relationship with the VIX was identified. The insignificant relationship obtained for South Africa and the Philippines indicates that these countries are less sensitive to global risk and uncertainty and that the country-spesific risk factors of the relevant countries are more decisive in fund prices. This outcome may be explained by South Africa's vulnerability to domestic risk factors and the limited depth of the Philippine financial market.

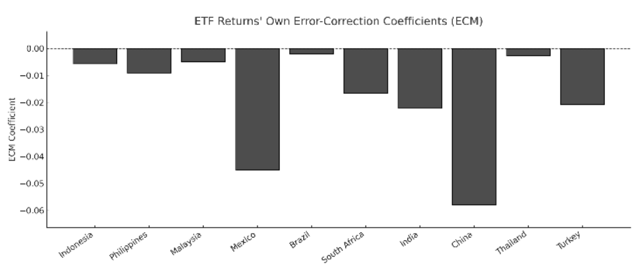
In the analysis of the relationship between gold volatility (ONS) and ETF funds, a generally negative association has been identified. This suggests that increases in gold market volatility exert an adverse impact on ETF performance. This finding supports the flight-to-safety behavior, reaffirming gold's role as a safe-haven asset. While it partially contradicts the results of Naeem and Ahmed (2022), it is consistent with the findings of Baur and Lucey (2010), Hood and Malik (2013), and Jain and Biswal (2016). For Malaysia, Mexico, Thailand, and Turkey, the negative and statistically significant coefficients indicate that during periods of heightened global risk, gold's safe-haven property becomes more prominent, and increases in gold volatility drive investors away from risky assets. This outcome highlights the fragility of fund markets in these countries. In contrast, positive and significant relationships were identified for India and China, suggesting that rising gold volatility supports ETF performance in these economies. This can be attributed to the traditional and cultural role of gold as an investment instrument, particularly in India. Meanwhile, for Thailand, Indonesia, Brazil, and South Africa, the relationship between the ONS variable and ETF funds was statistically insignificant, indicating that gold volatility has a limited influence on ETF performance in these markets.

When examining the short-run relationship between BRENT, representing oil market volatility, a significant negative association is found across several country models. An increase in oil market volatility, driven by heightened global risk perception, tends to raise perceived risk in financial markets and consequently deteriorate fund performance. Moreover, higher Brent oil volatility may lead to a decline in ETF prices, particularly in newly industrialized net oil-importing countries, due to their heavy dependence on energy imports. For countries such as Turkey, China, and India, which have substantial oil deficits, the negative impact of rising Brent oil prices on financial markets is theoretically expected. The long-run VECM results further confirm this theoretical expectation. In contrast, for Malaysia, an oil-exporting economy, the model reveals no significant long-run relationship between fund prices and Brent oil volatility. Similarly, for South Africa and Thailand, where oil consumption is relatively low, the relationship between ETF funds and Brent oil volatility is also found to be statistically insignificant.

In conclusion, the long-run analysis results indicate that global risk and uncertainty indicators have heterogeneous effects on ETF prices, with the direction of these effects varying according to each country's structural characteristics. During periods of elevated global risk, increased volatility in gold and oil markets influences capital flows and exerts downward pressure on ETF prices. However, in some markets, this pressure may reverse due to country- and investor-specific factors. These findings suggest that in newly industrialized countries, financial market responses to global uncertainty are asymmetric and shaped by country-specific dynamics.

Johansen cointegration and long-term VECM results have determined the long-term relationships between countries' ETF funds and global risk and uncertainty indicators. This result shows the long-term equilibrium relationship between the variables. The dynamic structure of the models was examined to analyze how and at what speed this equilibrium relationship is achieved. The error correction coefficient was calculated to determine the speed at which short-term imbalances return to equilibrium in the long term. Negative and statistically significant error correction coefficients indicate that when an imbalance occurs in the model, there is a corrective response that tends to return to long-term equilibrium. The ECC values of the models created for each country are presented in Panel B of Table 7. Based on the coefficients in the table results, summary graphs were created using the ECC values of the models and are presented in Figure 5.

Figure 5. ECC of ETF Funds



According to Table 9, Panel B, and Figure 5, it has been determined that ETF funds for Indonesia Mexico, India, China, Thailand have negative and statistically significant ECC values. The relationship between risk and uncertainty and ETF funds for these countries shows that ETF markets have corrective responses to imbalances in the long term and reach equilibrium. On the other hand, the same is not true for Turkey, South Africa, Brazil, Malaysia, and Philippines. In the models created for these countries, it was found that of ETFs do not return to the equilibrium point in response to long-term imbalances. While it can be said that investors respond quickly to information and that there is a highly efficient market for markets that tend to return to equilibrium, the same is not true for markets that do not tend to return to equilibrium. The findings for Turkey, South Africa, Brazil, Malaysia, and Philippines are consistent with the results of Zhank and Vianna (2016) and Yavas and Rezayat (2016), which indicate that ETF funds operate more efficiently in developed markets, while responses are limited and delayed in emerging markets. Additionally, unlike the findings of Aypek et al. (2025), which indicate that Turkey exhibits high sensitivity to CDS shocks, the ECC results obtained for the Turkey model reveal that reactions do not lead to sustained corrections in the long term.

In addition to long-term trends, a short-term VECM analysis was conducted to identify short-term fluctuations. The short-term VECM analysis reveals the short-term relationships between investment funds and risk and uncertainty indicators.

Table 10. VECM Short-Term Analysis Results

	MSCI-ETF	VIX	ONS	BRENT
Panel A-Indonesia				
ΔMSCI-ETF		0.271195	-0.096777	-2.956403*
ΔVIX	-0.016750		-0.23465*	-0.261092
ΔONS	-0.005744	0.031113		0.167588
ΔBRENT	0.000319	0.003562	0.021923*	
Panel B- Philippines				
ΔMSCI-ETF		-0.074356	0.445675	-4.632999*
ΔVIX	-0.002504		-0.183081	-0.460725
ΔONS	-0.012160*	0.021904		0.116529
ΔBRENT	-4.91E-05	0.002887	0.019604*	
Panel C-Maleysia				
ΔMSCI-ETF		-0.082049	0.079359	-4.284917*
ΔVIX	-0.003804		-0.29630*	-0.730333
ΔONS	-0.000833	0.027330		0.161437
ΔBRENT	-0.000888	0.008078	0.017584	
Panel D-Mexico				
ΔMSCI-ETF		0.158507	-0.267888	-0.812482
ΔVIX	0.015523		-0.36056*	-0.370557
ΔONS	0.004146	0.008978		0.181400
ΔBRENT	-0.000188	0.011103*	0.005373	
Panel E-Brazil				
ΔMSCI-ETF		-0.046769	-0.017792	-2.731910*
ΔVIX	-0.011895		-0.185697	-0.330395
ΔONS	-0.018268	0.028592		0.242232
ΔBRENT	0.001098	0.003184	0.020891*	
Panel F-South Africa				
ΔMSCI-ETF		0.124185	-0.127057	1.003065
ΔVIX	0.030177		-0.214244	0.418143
ΔONS	-0.003614	-0.004642		0.203553
ΔBRENT	-0.005044*	0.011332*	0.024231*	
Panel G-India				
ΔMSCI-ETF		-0.055682	-0.98709*	0.805169
ΔVIX	-0.020501		-0.117515	-0.494485
ΔONS	-0.012843*	0.021498		0.066468
ΔBRENT	-0.002304*	0.008578*	0.028532*	
Panel H-China				
ΔMSCI-ETF		-0.043011	0.233479	0.926647
ΔVIX	-0.045145*		-0.143489	0.397364
ΔONS	-0.003637	0.016577		0.120794
ΔBRENT	-0.000591	0.012635*	0.020981	

Panel I-Thailand				
ΔMSCI-ETF		0.031557	-0.625439	-6.74502**
ΔVIX	0.016741		-0.029915	0.451942
ΔONS	-0.01818**	0.031683		0.161459
ΔBRENT	-0.001658	0.006662	0.026489*	
Panel J Turkey				
ΔMSCI-ETF		0.200163	-0.353809	-3.826224**
ΔVIX	0.022846		-0.327686*	0.543199
ΔONS	-0.000989	0.018318		0.125106
ΔBRENT	-0.002560	0.008968	0.012843	

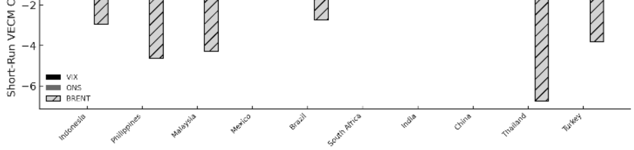
Relying on the short-run coefficients reported in Table 8, the following equations present the estimated short-run VECM relationships for each country. These equations capture the short-run adjustments in ETF returns in response to changes in financial uncertainty (VIX) and commodity market volatilities (ONS and BRENT).

Tablo 9. Short-run VECM Equations ETF Returns

Country	ΔMSCI-ETF Equation
Indonesia (EIDO)	$\Delta MSCI\_ETF\_t = 0.271\Delta VIX\_t - 0.097\Delta ONS\_t - 2.956^{*}\Delta BRENT\_t$
Philippines (EPHE)	$\Delta MSCI\_ETF\_t = -0.074\Delta VIX\_t + 0.446\Delta ONS\_t - 4.633^{*}\Delta BRENT\_t$
Malaysia (EWM)	$\Delta MSCI\_ETF\_t = -0.082\Delta VIX\_t + 0.079\Delta ONS\_t - 4.285^{*}\Delta BRENT\_t$
Mexico (EWW)	$\Delta MSCI\_ETF\_t = 0.159\Delta VIX\_t - 0.268\Delta ONS\_t - 0.812\Delta BRENT\_t$
Brazil (EWZ)	$\Delta MSCI\_ETF\_t = -0.047\Delta VIX\_t - 0.018\Delta ONS\_t - 2.732^{*}\Delta BRENT\_t$
South Africa (EZA)	$\Delta MSCI\_ETF\_t = 0.124\Delta VIX\_t - 0.127\Delta ONS\_t + 1.003\Delta BRENT\_t$
India (INDA)	$\Delta MSCI\_ETF\_t = -0.056\Delta VIX\_t - 0.987^{*}\Delta ONS\_t + 0.805\Delta BRENT\_t$
China (MCHI)	$\Delta MSCI\_ETF\_t = -0.043\Delta VIX\_t + 0.233\Delta ONS\_t + 0.927\Delta BRENT\_t$
Thailand (THD)	$\Delta MSCI\_ETF\_t = 0.032\Delta VIX\_t - 0.625\Delta ONS\_t - 6.745^{**}\Delta BRENT\_t$
Turkey (TUR)	$\Delta MSCI\_ETF\_t = 0.200\Delta VIX\_t - 0.354\Delta ONS\_t - 3.826^{**}\Delta BRENT\_t$

In the short-term VECM analysis, the models created for each country are presented separately in Table 8. Table 8 shows the short-term VECM results in Figure 6.

Figure 6. Short-Term VECM Relationship



The short-run VECM results presented in Table 10 and Figure 6 illustrate the short-term interactions between global volatility indicators and commodity market fluctuations. In the short run, the coefficients of the VIX variable are generally negative, with statistically significant results observed for India and China. This finding suggests that rising global risk has a decisive short-term negative impact on ETF investors in these two countries. In contrast, in Indonesia, Malaysia, the Philippines, and Turkey, the VIX coefficients are mostly negative but statistically insignificant, indicating that global risk is not priced uniformly across markets and that differences in financial depth, investor composition, and domestic market structure lead to heterogeneous reactions. Regarding the ONS variable, which represents gold market volatility, significant short-term negative relationships are identified for India, Thailand, and the Philippines, implying that increases in gold volatility accelerate fund outflows. The coefficient of – 0.987 calculated for India highlights the strong traditional preference for physical gold, which tends to suppress financial market activity. This result is consistent with previous studies emphasizing gold's role as a safe-haven asset during periods of elevated uncertainty (Baur and Lucey, 2010; Hood and Malik, 2013; Jain and Biswal, 2016). Conversely, in Malaysia and China, the gold variable exhibits a positive but statistically insignificant relationship, suggesting a limited short-run effect. For the BRENT variable, representing oil market volatility, significant negative relationships are found in the models for Indonesia, the Philippines, Malaysia, Brazil, Thailand, and Turkey. This indicates that increased oil market uncertainty does not amplify financial market volatility but rather reflects investors' short-term portfolio rebalancing behavior in response to fluctuations in energy markets.

The short-run VECM results indicate that the interactions between global and domestic volatility indicators and ETF prices in newly industrialized countries are asymmetric and country-specific. The analysis reveals that changes in the VIX index do not significantly affect ETF prices in most markets, although negative and significant effects are observed in some economies. This finding suggests that investors in these markets exhibit risk-averse behavior and respond differently to global shocks compared to other countries. Furthermore, gold volatility has been found to exert a negative impact on ETF values in certain markets, confirming that gold maintains its safe-haven role in the short run. Regarding oil volatility, the results show that rising uncertainty in energy markets restricts ETF performance in some countries, reflecting the varying sensitivity of financial markets to commodity-driven shocks.

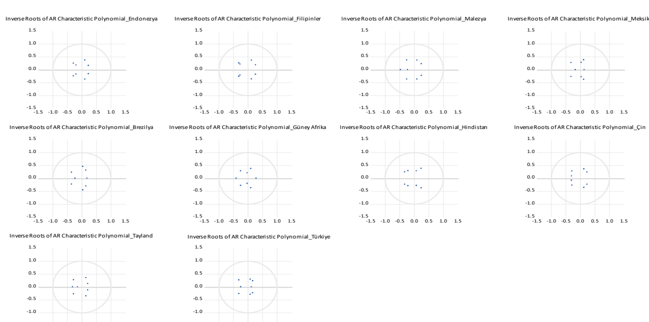
Overall, the results reveal that ETF markets exhibit heterogeneous short-term responses depending on the type of uncertainty and the underlying economic structure, indicating that global risks are not transmitted to financial markets in a fully synchronized manner. These findings suggest that in newly industrialized economies, investor behavior and portfolio allocation decisions play a crucial role in short-term risk management.

The reliability of the findings obtained as a result of econometric analyses is directly related to the validity of the model assumptions. For this reason, autocorrelation, heteroscedasticity, and normality tests were performed to evaluate the accuracy and stability of the VECM model used in the study. Additionally, AR polynomial inverse roots were used to determine the stability of the model, and Cusum and CusumQ stability tests were conducted to determine whether the model exhibited structural breaks over time. Robustness tests are presented in Table 9, AR polynomial inverse roots indicating model stability are shown in Figure 7, and structural break tests over time are presented in Figure 8.

Tablo 9. Stability Tests

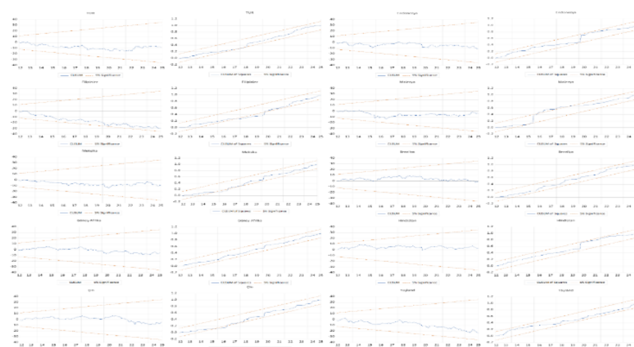
	Indonesia	Philippines	Malaysia	Mexico	Brazil	South Africa	India	China	Thailand	Türkiye
Otokorelasyon										
F istatistik	1.551513	1.484712	1.081609	1.485323	1.473987	1.510998	1.315280	1.264657	0.870570	1.038080
p value	0.2854	0.1011	0.3702	0.1009	0.1,52	0.0917	0.1833	0.2161	0.6039	0.4146
Heteroskedastisite										
F istatistik	0.098512	1.533917	0.029674	1.793453	0.058455	2.545008	0.025746	1.926163	1.044774	1.610062
p value	0.2158	0.2079	0.4589	0.1507	0.5377	0.0582	0.4184	0.1276	0.2548	0.1893
Test of Normality										
Jargue-Bera	0.779909	2.845908	5.712795	1.261136	0.877873	2.197862	0.584257	0.968725	5.445951	0.829050
p value	0.677088	0.241001	0.057475	0.532289	0.644722	0.333227	0.746672	0.628541	0.065679	0.660654

Figure 7. AR Root Tests



As a result of the reliability tests performed, it was determined that there was no time dependency in the residuals of the models with autocorrelation tests, that the models satisfied the constant variance assumption with heteroscedasticity tests, and that the residual terms were normally distributed with normality tests. The AR Root test was performed for the dynamic stability of the models, and it was determined that all roots remained within the circle and that the models were stable. Additionally, Cusum and CusumQ plots, which were used to determine the structural stability of the models over time, showed that there were no structural breaks or deviations from the parameters in the models. The reliability results indicate that the established VECM models are consistent and stable.

Figure 8. Cusum ve CusumQ Tests



5. Conclusion

This study examines the short- and long-run relationships between the iShares MSCI ETF indices of ten newly industrialized countries and global risk and uncertainty indicators — namely, the VIX index, gold volatility (ONS), and oil volatility (BRENT) — using the Johansen cointegration test and the Vector Error Correction Model (VECM). The logarithmic data obtained at a monthly frequency were found to be stationary at the I(1) level, and at least one long-run cointegration vector was identified among the countries. This finding indicates that ETF markets are integrated with global developments in the long run, and that investor behavior is systematically influenced by global risk dynamics.

A generally negative and statistically significant relationship was found between the VIX index and ETF prices. This result suggests that increases in global risk perception amplify uncertainty in financial markets and drive investors away from risky assets. A rise in the VIX level triggers capital outflows from emerging markets, leading to a downward movement in ETF prices over the long term. In contrast, the positive coefficient obtained for the Indian model may be associated with country-specific factors, such as the structural characteristics of the economy, investor behavior, and the composition of the fund.

For the ONS variable representing gold volatility, the results reveal a generally negative and significant relationship with ETF prices. This finding indicates that increases in gold market volatility strengthen investors' safe-haven demand for gold and prompt a withdrawal from risky assets. The negative coefficients observed for Malaysia, Mexico, Thailand, and Turkey suggest that higher gold volatility constrains investor behavior and leads to a decline in ETF prices. Conversely, positive and significant relationships were identified for India and China, where rising gold volatility appears to support ETF market performance. For India in particular, this relationship may be explained by gold's traditional role as a preferred investment instrument and its integration into the domestic financial system. Overall, the influence of gold volatility on ETF markets varies across countries, reflecting differences in investor behavior and financial culture.

The findings regarding oil volatility (BRENT) reveal a negative and significant relationship for energy-importing countries (Turkey, China, and India) and an insignificant relationship for energy-exporting economies (Brazil and Malaysia). This result suggests that higher oil volatility increases production costs and macroeconomic risks in energy-dependent economies, thereby exerting downward pressure on ETF markets. In contrast, for energy exporters, the stabilizing effect of oil revenue mitigates this impact, resulting in a weaker or insignificant relationship. These results demonstrate that the transmission of oil price shocks to financial markets is asymmetric, depending on each country's energy trade position.

The error-correction coefficients were found to be negative and statistically significant for most countries. This indicates that ETF markets tend to return to equilibrium in the long run following short-term deviations, confirming the dynamic stability of the estimated models.

Overall, the long-run relationships between VIX, gold, and oil volatility indicators and ETF prices demonstrate that global risks are transmitted to financial markets at varying degrees across newly industrialized economies. These findings underscore the importance for ETF investors and portfolio managers of incorporating global uncertainty factors into their investment decisions. Country-specific differences in financial fragility, energy dependence, and investor behavior play a determining role in these relationships.

The study employed the VECM approach, which assumes linear relationships. Future research may extend this analysis by employing nonlinear models such as NARDL or TVP-VAR to examine asymmetric or time-varying effects. Moreover, while this study utilized monthly data, employing weekly or daily data could allow for a more precise measurement of short-term responses. Incorporating investor sentiment indicators into future models would also enable a deeper understanding of the role of investor psychology in ETF market dynamics.

References

Akaike, H. (1978). On the Likelihood of a time series model. *Journal of the Royal Statistical Society: Series D (The Statistician)*, *27*(3-4), 217-235. https://doi.org/10.2307/2988185

Ambachtsheer, K. P. (1987). Pension fund asset allocation: In defense of a 60/40 equity/debt asset mix. *Financial Analysts Journal*, 43(5), 14-24.

Aypek, N., Cingöz, F., & Deniz, F. (2025). Borsa yatirim fonu endekslerinin kredi temerrüt swap primi değişimlerine tepkileri: Karılgan beşli ülkeler örneği. Üçüncü Sektör Sosyal Ekonomi Dergisi, 60(1), 281-296.

Başarır, Ç. & Keten, M. (2016). Gelişmekte olan ülkelerin CDS primleri ile hisse senetleri ve döviz kurları arasındaki kointegrasyon ilişkisi. *Mehmet Akif Ersoy Üniversitesi Sosyal Bilimler Enstitüsü Dergisi*, *8*(15), 369-380. https://doi.org/10.20875/sb.72076

Baur, D. G., & Lucey, B. M. (2010). Is Gold a hedge or a safe haven? An analysis of stocks, bonds and gold. *Financial Review*, 45(2), 217-229. https://doi.org/10.1111/j.1540-6288.2010.00244.x

Bekmez, S. ve Özpolat, A. (2013). Gelir esnekliğinin ve kentsel dönüşüm uygulamalarinin konut talebine etkisinin VECM yöntemi ile tahmin edilmesi. *Akdeniz İİBF Dergisi*, *13*(27), 99-113.

Bernanke, B. S. (1986). Alternative explanations of the money-income correlation. *Carnegie-Rochester Conference Series on Public Policy*, *Elsevier*, *25*(1), 49-99. DOI 10.3386/w1842

Bernanke, B. S., & Mihov, I. (1998). Measuring monetary policy. *The Quarterly Journal of Economics, 113*(3), 869-902. https://doi.org/10.1162/003355398555775

Bhattacharjee, A. & Das, J. (2020). Do Indian stock prices respond to domestic macroeconomic variables. *NMIMS Management Review*, *38*(3), 55-71.

Bloomberght (2024). Fitch: Türkiye'de islami finans büyüklüğü 100 milyar dolara ulaşabilir, <https://www.bloomberght.com/fitch-turkiyede-islami-finans-buyuklugu-100-milyar-dolara-ulasabilir-2341117>20.08.2024. (Erişim Tarihi: 04.11.2024).

Booth, D. G., & Fama, E. F. (1992). Diversification returns and asset contributions. *Financial Analysts Journal,* 48(3), 26-32.

Borsa İstanbul (BİST) (2024). <https://borsaistanbul.com/tr/endeks/1/3/katilim>, (Erişim Tarihi: 20.11.2024).

Chan, K. C., Fung, H. G. & Zhang, G. (2009). On the relationship between asian credit default swap and equity markets. *Journal of Asia Business Studies*, *4*(1), 3-12. https://doi.org/10.1108/15587890980000414

Chan-Lau, J. A. & Kim, Y. S. (2004). Equity prices, credit default swaps, and bond spreads in emerging markets. *IMF Working Paper*, WP/04/27, International Capital Markets.

Cifarelli, G., & Paladino, G. (2010). Oil price dynamics and speculation: A multivariate financial approach. *Energy Economics*, 32(2), 363-372.

Coronado, M., Corzo, M. T. ve Lazcano, L. (2012). A case for europe: the relationship between sovereign CDS and stock indexes. *Frontiers in Finance and Economics, 9*(2), 32-63.

Dewandaru, G., Rizvi, S.A.R., Masih, R., Masih, M. & Alhabshi, S.O. (2014). Stock market co-movements: Islamic versus conventional equity indices with multi-timescales analysis. *Economic Systems*, *38*(4), 553-571. https://doi.org/10.1016/j.ecosys.2014.05.003

Ehrmann, M., Fratzscher, M., Mehl, A., & Bekaert, G. (2011). Global crises and equity market contagion. Working Paper Series 1381, European Central Bank.

Elliott, G., Rothenberg, T. J. & Stock, J. H. (1992). Efficient tests for an autoregressive unit root. *NBER Technical Working Papers Series*, 130, Technical Working Paper, Cambridge, Mass.

Engle, R. F., & Granger, C. W. (1987). Co-integration and error correction: Representation, Estimation, and testing. *Econometrica: journal of the Econometric Society*, 251-276. https://doi.org/10.2307/1913236

Filis, G., Degiannakis, S., & Floros, C. (2011). Dynamic correlation between stock market and oil prices: The case of oil-importing and oil-exporting countries. *International Review of Financial Analysis*, 20(3), 152-164.

Gazel, S. (2020). The effect of exchange rate and CDS premium on msci etf investments: A NARDL model for Turkey. *International Journal of Eurasia Social Sciences/Uluslararasi Avrasya Sosyal Bilimler Dergisi*, 11(40).

Granger, C. W. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica: Journal of the Econometric Society,* 424-438. https://doi.org/10.2307/1912791

Habib, M. & Islam, K. U. (2017). Impact of macroeconomic variables on islamic stock market returns: Evidence from NIFTY 50 shariah index. *Journal of Commerce and Accounting Research*, *6*(1), 37-44.

Hakim, S. & Rashidian, M. (2002). *Risk and return of islamic stock market indexes*, In 9th Economic Research Forum Annual Conference in Sharjah, United Arab Emirates.

Hamilton, J. D. (1994). *Time series analysis*, Princeton University Press.

Hammoudeh, S., Mensi, W., Reboredo, J. C. & Nguyen, D. K. (2014). Dynamic dependence of the global islamic equity index with global conventional equity market indices and risk factors. *Pacific-Basin Finance Journal,* 30, 189-206. https://doi.org/10.1016/j.pacfin.2014.10.001

Ho, C.S.F., Abd Rahman, N.A., Yusuf, N.H.M. & Zamzamin, Z. (2014), Performance of global islamic versus conventional share indices: International evidence. *Pacific-Basin Finance Journal,* 28, 110-121. https://doi.org/10.1016/j.pacfin.2013.09.002

Hood, M., & Malik, F. (2013). Is gold the best hedge and a safe haven under changing stock market volatility?. *Review of Financial Economics*, 22(2), 47-52.

Horn, M., & Oehler, A. (2020). Automated portfolio rebalancing: Automatic erosion of investment performance?. *Journal of Asset Management*, 21, 489-505

İçellioğlu, C. Ş. (2018). Sermaye piyasalarinda islami endeksler ve geleneksel endeksler arasındaki ilişkiler: Katılım 30 endeksi ve BİST 100 endeksi. *Cumhuriyet Üniversitesi İktisadi ve İdari Bilimler Dergisi, 19*(2), 132-144.

Jain, A., & Biswal, P. C. (2016). Dynamic linkages among oil price, gold price, exchange rate, and stock market in India. *Resources Policy*, *49*, 179-185.

Johansen, S. (1988). Statistical Analysis of Cointegration Vectors. *Journal of Economic Dynamics and Control, 12*(2-3), 231-254. https://doi.org/10.1016/0165-1889(88)90041-3

Johansen, S. & Juselius, K. (1990). Maximum Likelihood Estimation and Inference on Cointegration—With Appucations to the Demand for Money. *Oxford Bulletin of Economics and Statistics*, *52*(2), doi:169-210. 10.1111/j.1468-0084.1990.mp52002003.x

Kenourgios, D., Naifar, N., & Dimitriou, D. (2016). Islamic financial markets and global crises: Contagion or decoupling?. *Economic Modelling*, *57*, 36-46. https://doi.org/10.1016/j.econmod.2016.04.014

Koch, T. W. & Saporoschenko, A. (2001). The effect of market returns, interest rates, and exchange rates on the stock returns of Japanese horizontal keiretsu financial firms. *Journal of Multinational Financial Management, 11*(2), 165-182. https://doi.org/10.1016/S1042-444X(00)00048-7

Konak, F. & Türkoğlu, D. (2022). Borsa Istanbul bünyesinde katılım endeksi oluşturulmasının hisse senedi fiyatlari üzerindeki etkisi. *USBAD Uluslararası Sosyal Bilimler Akademi Dergisi*, *4*(10), 813-831. https://doi.org/10.47994/usbad.1140256

Longstaff, F. A., Pan, J., Pedersen, L. H., & Singleton, K. J. (2011). How sovereign is sovereign credit risk?. *American Economic Journal: Macroeconomics*, *3*(2), 75-103.

LSEG (London Stock Exchange Group). (2024). <https://www.lseg.com/en/data-analytics/products/eikon-trading-software/islamic-finance>, (Erişim Tarihi: 20.12.2024).

MacKinnon, J.G., Haug, A.A. & Michelis, L. (1999). Numerical Distribution functions of likelihood ratio tests for cointegration. *Journal of Applied Econometrics*, 14, 563-577. https://doi.org/10.1002/(SICI)1099-1255(199909/10)14:5<563::AID-JAE530>3.0.CO;2-R

Maysami, R. C., Lee, C. H. & Hamzah, M. A. (2004). Relationship between macroeconomic variables and stock market indices: Cointegration evidence from stock exchange of Singapore's All-S sector indices. *Jurnal Pengurusan*, 24, 47-77.

Naeem, M. A., Qureshi, F., Arif, M. & Balli, F. (2021). Asymmetric relationship between gold and islamic stocks in bearish, normal and bullish market conditions. *Resources Policy,* 72, 102067. https://doi.org/10.1016/j.resourpol.2021.102067

Naifar, N. (2016). Do global risk factors and macroeconomic conditions affect global islamic index dynamics? A quantile regression approach. *The Quarterly Review of Economics and Finance*, 61, 29-39. https://doi.org/10.1016/j.qref.2015.10.004

Nath Sahu, T., Bandopadhyay, K. & Mondal, D. (2014). An empirical study on the dynamic relationship between oil prices and Indian stock market. *Managerial Finance*, *40*(2), 200-215. https://doi.org/10.1108/MF-06-2013-0131

Nishat, M., Shaheen, R. & Hijazi, S. T. (2004). Macroeconomic factors and the Pakistani equity market. *The Pakistan Development Review*, *43*(4), 619-637.

Özer, A., Kaya, A. & Özer, N. (2011). Hisse senedi fiyatlari ile makroekonomik değişkenlerin etkileşimi. *Dokuz Eylül Üniversitesi İktisadi İdari Bilimler Fakültesi Dergisi*, *26*(1), 163-182.

Panda, C. (2008). Do interest rates matter for stock markets?. *Economic and Political Weekly*, *43*(17), 107-115.

Purbowisanti, R. (2018). The relationship between exchange rates and islamic indices in Indonesia and Malaysia. *An-Nisbah: Jurnal Ekonomi Syariah*, *4*(2), 30-52.

Rahim, Y.A. & Masih, M. (2015). Is islamic stock index secured against interest rate risk? Evidence from wavelet analysis. *MPRA Paper,* 65259, Munich, Germany.

Raza, N., Ali, S., Shahzad, S. J. H., Rehman, M. U. & Salman, A. (2019). Can alternative hedging assets add value to islamic-conventional portfolio mix: Evidence from MGARCH models. *Resources Policy*, 61, 210-230. https://doi.org/10.1016/j.resourpol.2019.02.013

Rizvi, S. A. R., Bacha, O. I. ve Mirakhor, A. (2016). Public finance and islamic capital markets: Theory and application, içinde: Iqbal, Z., Sultan, J. ve Asutay, M.Springer (Ed.). *Capital Markets: Conventional Versus Islamic* (s. 45-63), New York: Palgrave Macmillan.

Sahu, P. K., Dey, S., Sinha, K., Singh, H. & Narsimaiaha, L. (2019). Cointegration and price discovery mechanism of major spices in India. *American Journal of Applied Mathematics and Statistics*, *7*(1), 18-24. doi:10.12691/ajams-7-1-3

Sakti, M. R. P. & Harun, M. Y. (2013). Relationship between islamic stock prices and macroeconomic variables: Evidence from Jakarta stock exchange islamic index. *Global Review of Islamic Economics and Business, 1*(1), 71-84. https://doi.org/10.14421/grieb.2013.011-06

Sancar, C., Uğur, A. & Akbaş, Y. E. (2017). Hisse senedi fiyat endeksi ile makroekonomik değişkenler arasındaki ilişkinin analizi: Türkiye örneği. *International Journal of Social Sciences and Education Research*, *3*(5), 1774-1786.

Shahzad, S. J. H., Ferrer, R., Ballester, L. & Umar, Z. (2017). Risk transmission between islamic and conventional stock markets: A return and volatility spillover analysis. *International Review of Financial Analysis*, 52, 9-26. https://doi.org/10.1016/j.irfa.2017.04.005

Sims, C. A. (1986). Are Forecasting models usable for policy analysis?, *Quarterly Review*, *10*(Win), 2-16.

Shiller, R. J. & Beltratti, A. E. (1992). Stock prices and bond yields: Can Their comovements be explained in terms of present value models?. *Journal of Monetary Economics, 30*(1), 25-46. https://doi.org/10.1016/0304-3932(92)90042-Z

Syzdykova, A. (2018). Makroekonomik değişkenler ve hisse senedi piyasası ilişkisi: KASE örneği. *Çankırı Karatekin Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, *8*(2), 331-354. https://doi.org/10.18074/ckuiibfd.444811

Tarı, R. & Yıldırım, D. Ç. (2009). Döviz kuru belirsizliğinin ihracata etkisi: Türkiye için bir uygulama. *Yönetim ve Ekonomi Dergisi, 16*(2), 95-105.

Vejzagic, M. & Zarafat, H. (2013). Relationship between macroeconomic variables and stock market index: Cointegration evidence from FTSE bursa Malaysia hijrah shariah index. *Asian Journal of Management Sciences & Education*, *2*(4), 94-108.

Yalçınkaya, Ö. (2019). Türkiye ekonomisinde dış borçların sürdürülebilirliğinin analizi: Doğrusal ve doğrusal olmayan birim kök testlerinden kanıtlar (1970-2018). *Maliye Dergisi,* 176, 27-51.

Yavas, B. F., & Rezayat, F. (2016). Country ETF returns and volatility spillovers in emerging stock markets, Europe and USA. *International Journal of Emerging Markets*, 11(3), 419-437.