NONLINEAR RELATIONSHIPS BETWEEN THE PARTICIPATION INDEX AND KEY FINANCIAL ASSETS: A QUANTILE REGRESSION ANALYSIS

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Abstract

This study analyzes the sensitivities of participation indices, designed for investors with religious-based concerns about the origin of corporate earnings and who prefer not to receive interest income, to gold, Euro, USD, and BIST100 index. The purpose of this study is to analyze the complex relationships between the Participation Index 30 in BIST and four significant saving alternatives: gold, the US dollar (USD), the Euro (EUR), and stock exchanges (BIST100) index using Quantile Regression analysis. Daily data between 16.11.2021-02.01.2024 were used in this study. According to the results; there is no impact of the euro exchange rate and value of gold on the participation index return. The impact of the exchange rate of the United States Dollar (USD) on the participation index return indicates a very limited positive relationship at the lowest quantile level. The relationship between BIST100 index return and the participation index return variable shows a positive strengthening impact at the all quantile levels between %10 and %90, and these effects demonstrate a high level of statistical significance.

Keywords   *: Participation Index, Quantile Regression, BIST, Exchange Rate, Gold*

JEL Classifications   *: C32, C58, G10*

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KATILIM ENDEKSİ VE TEMEL FİNANSAL VARLIKLAR ARASINDAKİ DOĞRUSAL OLMAYAN İLİŞKİLER: BİR KUANTİL REGRESYON ANALİZİ

Öz

Bu çalışmada, şirket kazançlarının kaynağı konusunda dini temelli kaygıları olan ve faiz geliri elde etmemeyi tercih eden yatırımcılar için tasarlanan katılım endekslerinin altın, Euro, ABD Doları ve BIST100 endeksine olan duyarlılıkları analiz edilmektedir. Bu çalışmanın amacı, BIST Katılım Endeksi ile dört önemli tasarruf alternatifi olan altın, ABD Doları (USD), Avro (EUR) ve hisse senedi (BIST100) endeksi arasındaki karmaşık ilişkileri Kuantil Regresyon analizi kullanarak analiz etmektir. Çalışmada 16.11.2021-02.01.2024 tarihleri arasındaki günlük veriler kullanılmıştır. Sonuçlara göre; Euro döviz kurunun ve altının değerinin katılım endeksi getirisi üzerinde etkisi yoktur. Amerikan Doları (USD) döviz kurunun katılım endeksi getirisi üzerindeki etkisi ise en düşük kantil seviyesinde çok sınırlı pozitif bir ilişkiye işaret etmektedir. BIST100 endeks getirisi ile katılım endeksi getirisi değişkeni arasındaki ilişki ise %10 ile %90 arasındaki tüm kantil seviyelerinde istatistiksel olarak anlamlı ve pozitif yönlü özellikler sergilemektedir.

Anahtar Kelimeler   : *Katılım Endeksi, Kuantil Regresyon, BIST, Döviz Kuru, Altın*

JEL Sınıflandırması   : *C32, C58, G10*

INTRODUCTION

Since interest is forbidden in Islam and Judaism, products based on the principle of non-interest have been developed in order to bring the funds that cannot be transferred to the economy and therefore remain idle into the economy in order not to get involved in interest-based financial instruments, especially in Muslim societies. In this context, participation banks, participation funds and participation indices, which aim to attract interest-averse savers, emerge as potentially important financial products.

The relationship between the participation index, which is traded on the stock exchange, and a range of economic factors is attracting attention from both researchers and investors. Time series asymmetry refers to the presence of distinct statistical characteristics when the direction of time is reversed. This phenomenon is frequently observed in financial data. Quantile regression models can address this issue by explicitly modeling various segments of the conditional distribution, rather than solely focusing on the average. They are able to approximate the tail behavior, which is essential for comprehending extreme events in finance. These models are capable of accommodating non-linear relationships, which is advantageous when the relationships between variables undergo changes over time. Quantile regression offers a comprehensive understanding of the association between variables at various points of the conditional distribution, unlike mean regression models. A quantile regression approach will be applied to obtain insights into the relationship between different quantiles of the participation index. Previous studies used quantile regression as a methodological approach for investigating the correlation between gold and various other factors, including commodity indices and implied volatility (Pierdzioch, Risse, Rohloff, 2015; Panagiotou, 2021). These studies demonstrate the importance of including various quantiles when analyzing the correlation between gold and other economic variables.

The Participation Index in Islamic finance is a stock exchange index governed by particular regulations for selecting stocks. The Participation-30 index was established in Turkey in 2011. This index comprises stocks that adhere to the principles of participation banking. In 2014, the Participation-50 index and Model Portfolio index were established, leading to the calculation of three participation indexes. These indexes primarily function based on profit and loss sharing and provide assistance to the real sector. The companies operating in participation indexes focus on producing goods and services, which makes these indexes especially significant for commodity markets and commodity indexes (Kevser & Dogan, 2020).

The Participation Index serves as a crucial metric to evaluate market sentiment, investor confidence, and the general direction of financial markets. Gold, which has gained comprehension for its historical function as a means of protecting wealth and a secure asset during times of economic uncertainty, assumes a crucial position within investment portfolios as an alternative guarantee against variations in the financial markets. In the context of global economics, the United States Dollar (USD) and the Euro (EUR) hold a position of importance as current currencies, exerting important affect over various aspects of international trade, financial transactions, and investment choices.

For a company to be part of the participation index in Turkey, it must not be involved in banking, insurance, leasing, factoring, interest-based activities, alcoholic beverages, gambling, games of chance, pork and similar food, press, broadcasting, advertising, tourism, entertainment, tobacco products, weapons, or currency futures trading. Companies in the index must have total interest-bearing loans and interest-bearing cash and securities amounting to less than 30% of their market value, and income from specified areas must be less than 5% of total income when evaluating their financial ratios. Investors seeking to invest in stocks of companies adhering to Islamic finance principles and interest-free investment typically look to the participation index. Recently, there has been a rise in the participation index transaction volume and the number of investors, leading to an increase in its significance. Hence, it is crucial to identify the macro factors influencing the participation index (Ögel and Gökgöz, 2020).

Using the technique of quantile regression enables us to overcome the limitations imposed by traditional linear regression methods by effectively capturing the heterogeneous nature of relationships across different quantiles of the distribution. The current methodology accepts the potential variations in the relationships between financial variables under different market conditions, emphasizing the requirement for a comprehensive analysis that extends beyond simple mean-based relationships. This study utilizes quantile regression to capture the non-linear associations between the participation index and important financial assets. It enables the modeling of various components of the conditional distribution, facilitating a more comprehensive analysis. This method is capable of estimating the tail behavior, which is essential for comprehending extreme events in finance. It is capable of managing non-linear relationships, which is beneficial when the connections between variables undergo changes over time. Quantile regression offers a comprehensive understanding of the association between variables at various points of the conditional distribution, unlike mean regression models.

This study aims to utilize quantile regression analysis to examine the intricate and non-linear connections between the Participation Index and significant financial assets, namely gold, the US dollar (USD), the Euro (EUR), and stock exchanges (BIST100). The study aims to overcome the limitations of conventional linear regression approaches by using quantile regression methodology. This approach captures the diverse interactions that occur across different quantiles within the distribution. The goal is to offer a thorough comprehension of the intricate interplay between the Participation Index and financial assets, while acknowledging the possibility of variations in correlations under different market conditions. The study seeks to surpass simplistic mean-based connections and investigate the evolution of these associations at various quantile levels.

I. LITERATURE REVIEW

İçellioğlu (2018) examined the data from the Participation-30 Index and the BIST-100 Index from 2013 to 2018 to explore the presence of short and long-term relationships between participation indices in capital markets and traditional indices. The study concluded that the BIST-100 Index did not have a short-term impact on the Participation-30 Index.

In their study, Mishra et al. (2019) use an innovative approach known as the Wavelet-based Quantile-on-Quantile Regression Model to investigate the impact of various quantiles derived from the decomposed time series of WTI Brent Crude Oil Prices on the quantiles of the Dow Jones Islamic Stock Index by employing daily data from 1st January 1996 to 13th April 2018. The research findings demonstrate the varied effects of global crude oil prices on the Islamic Stock Index. The initial test of the original time series data indicates a persistent and positive effect observed across all quantiles.

Nevertheless, as the time series is decomposed, the initially positive impact gradually decreases. Significantly, as the global prices of crude oil stabilize, an obvious negative effect becomes increasingly conspicuous. The study suggests that there is an initial positive correlation between fluctuations in oil prices and the Islamic Stock Index in the short term. However, once stability is achieved, there is a subsequent negative impact on the index.

In Miyazaki's (2019) study, a quantile regression approach was used to analyze the relationships between gold and several financial indicators, including stock market return, stock market return volatility, crude oil, the value of the US dollar against major currencies, and overall financial market conditions in the US. The sample period covers approximately the last three decades, encompassing weekly data from 5 January 1990 to 27 April 2018. The research discovered that the relationship between gold returns and financial indicators demonstrates fluctuations across different quantiles, suggesting a non-constant relationship between gold and financial indicators.

In their study, Romano et al. (2019) present a novel approach that demonstrates full adaptability to heteroscedasticity. This study presents an innovative method that effectively addresses the issue of heteroscedasticity by integrating conformal prediction and classical quantile regression. The new methodology leverages the advantages of both methodologies, thereby guaranteeing an adaptive capacity for adaptation. The current research offers theoretical validation of the reliability of coverage, which is further substantiated by conducting comprehensive experiments on well-known regression datasets. The comparative analysis demonstrates that our approach is more efficient in generating shorter intervals compared to other conformal methodologies.

In the study of Liu (2020), gold and government bonds are reconsidered as potential safe-haven assets during market turmoil across 16 international markets in the last 20 years. The study employs the extremal quantile regression model by Chernozhukov and Fernandez-Val for analysis. The findings suggest that government bonds are more likely to qualify as active safe havens, gaining value amid market turmoil. Gold, on the other hand, is generally seen as a passive safe haven, not strongly correlated with market declines. However, at the extreme 0.001 quantile level, neither asset qualifies as a safe haven. Given their similar occurrences as safe havens, distinguishing between the "flight-to-liquidity" and "flight-to-quality" hypotheses is challenging. The preferred markets for safe-haven investment are the United States and Singapore, while France and Hungary are less recommended for investing in their local gold markets as safe havens.

Ögel and Gökgöz (2020) examined the correlation between interest rates, USD/TRY, and EURO/TRY variables with BIST 100 (Borsa Istanbul) and KATLM (KATILIM 30) indices using a one-break cointegration analysis that considered structural breaks and Fourier Granger causality analysis. The study concluded that there is no cointegration relationship between the variables. There is a causal relationship from the USD/TL exchange rate to both indices, but not from the EURO/TL exchange rate. There is no causal relationship between the interest rate and the Participation 30 index.

In their study, Powell (2020) presents a methodology for the estimation of unconditional quantile treatment effects (QTEs). This approach allows for the estimation of QTEs in the presence of one or more treatment variables, regardless of whether they are discrete or continuous. Furthermore, this methodology accounts for the need to condition on covariates.

In their study, Dawar et al. (2021) employ a quantile-based regression methodology to provide a more comprehensive analysis of the dependence structure through various market conditions. This research used quantile regression to analyze the correlation between crude oil prices and three clean energy stock indices. The results indicated a decline in the correlation between clean energy stock returns and crude oil returns. The observed lagged impact of WTI oil returns on clean energy stock returns demonstrated statistical significance, suggesting that clean energy stock returns respond distinctively to new information regarding oil returns through various market conditions. The study additionally discovered an important effect of negative oil returns in periods characterized by a pessimistic market outlook, while the impact was found to be statistically insignificant during periods of optimistic market sentiment.

Emeç (2021) investigated the correlation among gold prices, funds collected by participation banks, and the participation index in Turkey. Fourier Cointegration Test and Generalized Variance

Analysis were performed using monthly data from 2011 to 2021. The Fourier Cointegration Test indicates that the series are cointegrated in the long run. The Generalized Variance Analysis shows that the participation index is influenced by the gold price and the amount of funds over an extended period.

Panagiotou (2021) studied the correlation between gold prices and implied volatility in the futures markets by using a non-parametric quantile regression methodology. The research revealed that the implied volatility of gold prices displays an important ability for predicting gold returns. Moreover, the relationship between gold and implied volatility displays different patterns across various quantiles.

By employing the limitations identified in the existing body of research of Adebayo et al., (2021), their study employs the quantile-on-quantile methodology to examine the effect of economic globalization on carbon emissions in Australia during the period spanning from 1970 to 2018. The results indicated a significant positive relationship between globalization and carbon emissions across all quantiles. Furthermore, there is a positive relationship that exists between carbon emissions and coal consumption across all quantiles. In addition, the study employed the quantile regression test for the purpose of verifying the validity of the findings. The findings of this test were found to align with the results obtained through the quantile-on-quantile approach. The study's findings have been found to be accurate and suitable for informing policy decisions aimed at minimizing carbon emissions in Australia.

Alptürk et al. (2021) analyzed the impact of crude oil prices on participation indices using the Lee-Strazicich Unit Root Test and Toda-Yamamoto Causality Test, and the findings were presented through time series analysis techniques. The results show that crude oil prices have no impact on the Participation-30 index.

Sertkaya (2022) studied how the exchange rate and gold prices impact the Participation-50 index through the ARDL bounds test method. He utilized weekly data from 2014 to 2021 in his research. The researcher found that the price of gold per gram had a statistically significant and positive impact on the Participation-50 index. The USD/TL exchange rate significantly and negatively impacts the Participation-50 index.

Mensi et al., (2023) applied quantile regression as a statistical technique to estimate the correlation between the quantiles of gold and stock returns. They analyzed the daily closing prices of gold and stock market indices in the MENA region, specifically in the UAE, Bahrain, Lebanon, Qatar, Egypt, Jordan, Kuwait, Morocco, Oman, and Saudi Arabia. In addition, they took into account the international gold prices, measured in U.S. Dollars per ounce. The time frame for the samples spans from July 2004 to February 2020. The research conducted yielded strong proof indicating a significant relationship between the quantiles of gold and stock returns. Specifically, there were significant positive correlations observed between the returns of MENA gold and stocks.

Kılıç and Türkkan (2023) studied the correlation in Turkey between the participation index and the exchange rate, gold, and oil. They conducted their research utilizing Johansen cointegration and Toda-Yamamoto causality tests with weekly data from 03.01.2016 to 26.12.2021. The participation index, exchange rate, gold, and oil series were found to be cointegrated in the long term.

II. DATA AND METHODOLOGY

The purpose of this study is to analyze the complex relationships between the Participation Index 30 (KAT30) of BIST and four significant saving alternatives: gold, the US dollar (USD), the Euro (EUR), and BIST100 index. The data regarding gold, the KAT30 index, and BIST100 index used in this study were sourced from the www.investing.com database. The data relating to the dollar and euro currencies is sourced from the evds.tcmb.gov.tr website. The daily data collected between November 16, 2021 and January 2, 2024. The participation index (KAT30) data, obtained from the investing.com site, has been examined starting from November 16, 2021, as the records for this index at the site began on this date.

When the assumptions related to regression analysis are satisfied, the objective is to minimize the sum of squared errors. The Least Squares method (LSM) is used to minimize the sum of squared errors.

This approach demonstrates a high degree of sensitivity towards abnormal values. When the assumptions underlying linear regression analysis are not satisfied, one can use Quantile Regression (QR) analysis, which is a reliable regression technique. Quantile regression (QR) is a statistical technique that applies the use of the median and quantiles, also known as percentiles, instead of to the mean. The application of QR enables the reduction of not only the sum of squared errors but also other relevant quantities. By using this approach, it provides the opportunity to conduct a more detailed examination of the data (Koenker & Machado, 1999; Akyüz, 2023).

Assuming that the errors are identical and follow a similar distribution The simple linear quantile regression model can be mathematically represented as follows:

$$F^{-1}\left(\frac{\tau}{X}\right) = \alpha + \beta X + F_\varepsilon^{-1}(\tau)$$

Let $F^{-1}\left(\frac{\tau}{X}\right)$ symbolizes the conditional quantile τ of the dependent variable, which has been calculated from the opposite direction of the F (Y/X) distribution. Furthermore, let $F^{-1}(\tau)$ represent the error value related with the quantile τ. When using quantiles, it is important to remember that the expected value of the errors will not be equivalent to zero. Conditional quantile functions are calculated by QR. In this context, the method estimates the models of the dependent variable by considering a specific quantile value, and it does so based on the set of independent variables (Alexander, 2008).

The coefficients in quantile regression models determine the effect of a unit change in the independent variable on a specific quantile of the dependent variable (Hao & Naiman, 2007).

Consider the scenario where Y_i is a set of independent and symmetrically distributed random variables, following a symmetric distribution function F. Additionally, let β be a random variable with a median value. Thereby, consider the presence of the following function:

$$Y = \beta + \varepsilon_i.$$

In this model, the sample quantile τ is calculated by minimizing the following expression (Koenker & Hallock, 2001):

$$min_\beta \frac{1}{n}\left\{\sum_{i:y_i \geq \beta} \tau |y_i - \beta| + \sum_{i:y_i < \beta}(1 - \tau)|y_i - \beta|\right\}$$

If the model obtained in this case is represented as a linear regression model in the following way:

$$Y_i = x_i'\beta + \varepsilon_i$$

The quantile regression τ is also estimated as follows:

$$min_\beta \frac{1}{n}\left\{\sum_{i:y_i \geq x_i'\beta} \tau |y_i - x_i'\beta| + \sum_{i:y_i < x_i'\beta}(1 - \tau)|y_i - x_i'\beta|\right\}$$

then the following minimisation is obtained (Koenker & Bassett, 1978):

$$min_\beta \frac{1}{n}\left\{\sum_{i=1}^{n} \rho_\tau(y_i - x_i\beta)\right\}$$

The application of quantile regression to estimate parameter values based on different independent variable X values provides better results in the presence of anomalies.

Some characteristics of QR analysis include the following (Alakaya, 2019; Akyüz, 2023):

- The least squares method (LSM) offers perspectives on the mean of the conditional distribution of y, whereas QR provides perspectives into the complete conditional distribution of y in relation to x.

- This method enables the development of models even when the data sets violate the assumption of homogeneous variance and consist of outliers.

- The reliability of QR estimates increases when errors do not follow a normal distribution.

- The use of quantiles in instead of the mean within quantile regression offers an additional benefit in terms of examining particular areas within the distribution and achieving more dependable estimates for parameters.

- In the context of the least squares method (LSM), in the presence of outliers, it is usual to either eliminate these values from the dataset or apply suitable transformations. In the context of QR analysis, the consideration of outliers allows for a more comprehensive results to be achieved.

- The application of the least squares method (LSM) can be used when the dataset is derived from a parametric distribution. The application of Quantile Regression (QR) does not require the use of a specific parametric distribution. When the assumption of normality is violated or when there are long tails in the data, an alternative statistical modeling approach, such as robust regression, offers a more comprehensive solution compared to the least squares method (LSM). Hence, the QR method is considered to be a more preferred approach for regression analysis.

III. RESULTS AND DISCUSSION

In the study, the relationship between BIST Participation 30 Index (KAT30) and Gold (XAU), Dollar (USD), EURO (EUR), and BIST100 Index is analysed with Quantile Regression model using daily return data between 16.11.2021-02.01.2024. In the study, Eviews 9 package programme was used for descriptive statistics, unit root tests and normality tests, and Python programme was used for Quantile Regression analysis. Descriptive statistics of the variables are given in Table 1.

Table 1. Descriptive Statistics

Stats		EUR	KAT30	USD	XAU	BIST100
Mean		0.0024	0.0040	0.0025	0.0026	-0.0025
Median		0.0012	0.0043	0.0005	0.0019	-0.0033
Maximum		0.0862	0.1427	0.0881	0.1127	0.1715
Minimum		-0.2529	-0.1428	-0.2547	-0.1897	-0.1223
Std. Dev.		0.0180	0.0252	0.0176	0.0184	0.0243
Skewness		-6.0450	-0.5550	-6.5549	-2.0884	1.2152
Kurtosis		99.8029	10.8394	112.5176	35.4047	12.7877
Jarque-Bera	Test Statistics	171305.3	1128.4	218987.5	19215.2	2258.7
	p Value	0.0000	0.0000	0.0000	0.0000	0.0000

When Table 1 is analysed, the mean values and medians of the data for 533 observations differ for each variable. While the mean and median are similar for some variables (EUR and USD), there are significant differences in others (BIST100, KAT30, and XAU). The reason why the mean and median of BIST100, KAT30, and XAU are quite close to each other is that the data of these two variables are relatively close to a normal distribution, as seen in both skewness and kurtosis values. The maximum and minimum values of all variables are spread over a wide range. This indicates that the variables have different value ranges in general. While the standard deviation values for EUR, USD and XAU are close to each other, KAT30 and BIST100 have higher valuee. This indicates that the data of KAT30 and BIST100 are more likely to deviate from the mean than the others, in other words, they are more risky. While skewness value for BIST100 is positive, the skewness values for EUR, USD and XAU are negatively skewed away from zero. Although the skewness in the KAT30 variable also has a negative

value, it is observed that it is much closer to zero than the other variables. Accordingly, it can be interpreted that negative gains are more than positive gains for KAT30, EUR, USD, and XAU. However, the fact that the skewness of the KAT30 variable is quite close to zero compared to the skewness of the other variables shows that negative earnings and positive earnings are close to each other. The kurtosis values are greater than 3. Since the kurtosis values of EUR and USD variables are quite high, it is seen that the data belonging to these two variables have leptokurtic Kurtosis characteristics. Accordingly, it can be said that the data belonging to EUR and USD variables show a very pointed distribution. Since the kurtosis values of BIST100, KAT30, and XAU variables are quite close to 3 compared to the other two variables, it can be said that the data belonging to these two variables are closer to the normal distribution. Jarque-Bera test is used to evaluate the conformity of the data to normal distribution. The test statistics are very high and the probability values (p-value) are very low. This indicates that the data do not fit the normal distribution.

Table 2. Unit Root Tests

	ADF				PP			
	Test Statistics	Confidence Interval		p Value	Test Statistics	Confidence Interval		p Value
KAT30	-22.2372	%1	-3.45	0.00	-22.2249	%1	-3.45	0.00
		%5	-2.87			%5	-2.87	
		%10	-2.57			%10	-2.57	
EUR	-12.9457	%1	-3.45	0.00	-17.553	%1	-3.45	0.00
		%5	-2.87			%5	-2.87	
		%10	-2.57			%10	-2.57	
USD	-12.8117	%1	-3.45	0.00	-17.7924	%1	-3.45	0.00
		%5	-2.87			%5	-2.87	
		%10	-2.57			%10	-2.57	
XAU	-17.9740	%1	-3.45	0.00	-17.8093	%1	-3.45	0.00
		%5	-2.87			%5	-2.87	
		%10	-2.57			%10	-2.57	
BIST100	-25.92585	%1	-3.45	0.00	-25.81496	%1	-3.45	0.00
		%5	-2.87			%5	-2.87	
		%10	-2.57			%10	-2.57	

According to the analysis of the data provided in Table 2, it is noticeable that the ADF (Augmented Dickey-Fuller) unit root test statistics indicate values that fall less than the critical values at the significance levels of 1%, 5%, and 10%. Therefore, the null hypothesis related to the existence of a unit root is rejected at all levels of statistical significance.

The analysis of Table 2 demonstrates that the Phillips-Perron (PP) test statistics indicate values that are less than the critical values determined at the 1%, 5%, and 10% levels of significance. Hence, the null hypothesis, which suggests an existence of a unit root, is rejected. Based on the statistical tests performed, especially the Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests, it has been determined that the condition of stationarity is satisfied for all the series under test.

When the quantile regression relationship between the variables is analyzed separately, it is seen that the explanatory power of the model drops dramatically. Therefore, all variables were analyzed in the same model. Quantile regression analysis results are given in Table 3.

Table 3. Quantile Regression Analysis

		Coefficients					
		C	EUR	USD	XAU	BİST100	Pseudo R^2
Quantiles	0.1	-0.007512***	-0.020421	0.031391*	0.001662	0.998905***	0.717480
	0.2	-0.004685***	-0.059187	0.015189	0.049765	0.999551***	0.717410
	0.3	-0.002959***	-0.004322	0.016730	-0.003988	0.988628***	0.718862
	0.4	-0.001684***	0.011405	0.018661	-0.027642	0.993318***	0.719260
	0.5	-0.000203	-0.030447	0.027394	-0.005339	0.999208***	0.719667
	0.6	0.001106***	-0.023601	0.015212	0.018916	0.994623***	0.723608
	0.7	0.002626***	0.010732	0.002795	0.005822	1.001935***	0.730342
	0.8	0.004296***	0.022448	0.022777	-0.009687	0.994964***	0.736734
	0.9	0.008189***	0.040716	0.046768	0.002265	0.984505***	0.762558

*p<0.1, **p<0.05, ***p<0.01 indicates levels of significance.

Table 3 shows that the effect of the Euro exchange rate and gold prices on the KAT30 variable is not statistically significant at all quantile levels. However, the effect of the USD exchange rate on the KAT30 variable is statistically significant at the lowest quantile level analyzed (10%). Accordingly, each unit change in the USD exchange rate affects the KAT30 variable symmetrically by approximately 3.1%. In addition, the effect of the BIST100 variable on the KAT30 variable is statistically significant and strong at all quantile levels. The explanatory power of the models is above 71% at all quantile levels, so the explanatory power of the models is high.

The quantile regression models are given in Table 4:

Table 4. The Quantile Regression Models

Quantiles	0.1	$KAT30_i = -0.007512 + 0.031391USD_i + 0.998905BIST100_i + e_t$
	0.2	$KAT30_i = -0.004685 + 0.999551BIST100_i + e_t$
	0.3	$KAT30_i = -0.002959 + 0.988628BIST100_i + e_t$
	0.4	$KAT30_i = -0.001684 + 0.993318BIST100_i + e_t$
	0.5	$KAT30_i = 0.999208BIST100_i + e_t$
	0.6	$KAT30_i = 0.001106 + 0.994623BIST100_i + e_t$
	0.7	$KAT30_i = 0.002626 + 1.001935BIST100_i + e_t$
	0.8	$KAT30_i = 0.004296 + 0.994964BIST100_i + e_t$
	0.9	$KAT30_i = 0.008189 + 0.984505BIST100_i + e_t$

The variables in the models are constructed by taking into account the statistically significant variables. According to the 10% quantile value of the dependent variable, constant term, USD exchange rate and BIST100 index returns are included in the model. In models other than the 50% quantile value, the equation consists of the constant term and the BIST100 index return. In the model with a 50% quantile value, only the BIST100 index return is included in the model since it is statistically significant. As can be seen in all of the established models, the effect of BIST100 index returns on KAT30 is quite high.

CONCLUSION AND EVALUATION

The utilization of quantile regression methodology allows for the mitigation of constraints imposed by conventional linear regression approaches, as it effectively captures the diverse nature of interactions across various quantiles within the distribution. The existing methodology acknowledges the possibility of differences in the correlations between financial variables across different market situations. It highlights the need for a thorough examination that goes beyond simplistic mean-based relationships.

The objective of this study is to examine the complex relationships between the Participation Index (KAT30) and four major saving alternatives, namely gold, the US dollar (USD), the Euro (EUR),

and stock exchanges (BIST100) through using the technique of Quantile Regression analysis. This study employed daily data collected from November 16, 2021 to January 2, 2024. There is no statistically significant relationship between the Euro exchange rate and gold prices and the KAT30 variable at any of the quantile levels. The effect of the USD exchange rate on the KAT30 variable, on the other hand, is statistically significant at the percentage level that represents the lowest quantile that was examined. To put this into perspective, the KAT30 variable is influenced in a symmetrical manner. Additionally, the effect of the BIST100 variable on the KAT30 variable is strong and statistically significant at all quantile levels. This is the case regardless of quantity. The models have an explanatory power that is greater than 70 percent across all quantile levels, which indicates that the models have a high level of explanatory power.

There is no statistically significant correlation between the participation index and gold, euro, and USD, which are traditional investment options for investors who prefer non-interest-bearing assets. Interest-averse investors do not view the Participation Index traded on BIST as a viable alternative investment to gold and foreign exchange.

The study's results demonstrate both parallels and discrepancies with certain prior studies in the literature. The study has identified a statistically significant correlation between the USD exchange rate and the KAT30 variable at the lowest quantile level. This result aligns with Sertkaya (2022)'s discovery that the dollar exchange rate has a negative impact on the participation index. Furthermore, a robust and statistically significant correlation exists between the BIST100 variable and the KAT30 variable across all quantile levels. This result aligns with the studies conducted by Emeç (2021) and Kılıç and Türkkan (2023) which suggest a correlation between the participation index and the variables identified by these researchers. However, it contradicts the findings of İçellioğlu (2018).

The study's results indicated that there is no statistically significant correlation between the Euro exchange rate, gold prices, and the KAT30 variable. This result aligns with the studies conducted by Ögel and Gökgöz (2020) and Alptürk et al. (2021). The absence of a statistically significant relationship between the Euro exchange rate, gold prices, and the KAT30 variable contradicts Sertkaya's (2022) study results. The inconsistencies could stem from variations in data sets, modeling methods, or economic and financial variables.

The findings of this study indicate that the variables within the dataset under analysis demonstrate varying behavior throughout different ranges of values. Furthermore, it is evident that the association between the dependent variable and the independent variables may undergo variations across different segments of the dataset. The utilization of this kind of examination can prove quite useful in acquiring a broader understanding of the interconnection between variables. This study can be extended by using different variables and data sets in future studies.

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