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Risks of household's stock market participation rush after the monetary policy shifts in turkey

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Abstract

This study investigates the risks associated with rushing household stock market participation, with a specific focus on the impact of monetary policy adjustments in Turkey. After the implementation of heterodox policies, the real returns of almost all financial investment alternatives to the stock market became negative, foreign investors reduced their positions rapidly and considerably, and the size and number of IPOs reached record levels. The empirical investigation employed the SHapley Additive exPlanations (Shap) analysis in addition to the XGBoost machine learning method. The analysis has indicated that the increase in new participants in the stock market can be attributed to a reaction to insufficient financial alternatives and real returns. This phenomenon leads to the presence of the risk of irrational pricing in the market and exposes households to vulnerabilities arising from their risky portfolio.

Keywords: Transformational leadership, self-efficacy, creativity, performance, salespersons, logistics

Introduction

The monetary policies of the Central Bank of Turkey have exhibited contradictions since September 2018. Despite the presence of rising inflation and a decline in international reserves, a heterodox approach to monetary policy was implemented by lowering the policy interest rate, easing credit conditions through credit expansion, and employing indirect interventions in the foreign exchange market until May 2023. In contrast, the central bank launched a shift in its monetary policy towards a more rational, orthodox approach in May 2023. This can be summarized by raising interest rates and reducing its indirect interventions in the foreign exchange market. Even though the first-term policy set's contribution to economic growth was positive, high inflation, inadequate international reserves, and huge forex-based obligations due to the TRY Foreign Exchange Protected Deposit Account ^[1] made it unsustainable.

The monetary policy changes had very important impacts on investor behavior. Foreign investors systematically reduced their positions both in equity and bond markets in the heterodox policy term. From January 2012 to September 2018, the average proportion of foreign investors' holdings in the equities market and treasury bond market stood at 64% and 52%, respectively. These ratios reached their lowest level in May 2023 with 27% for equities and in March 2023 with 12% for the Treasury bond market. On the other hand, households decreased their holdings of domestic currency-denominated financial assets, with the exception of stocks. Due to rising demand from households, the price of non-financial investments such as real estate has hit historic highs. In parallel, stock prices rose, and domestic investors' stock market participation reached unprecedented highs in such a short period of time. The process mentioned above has given rise to numerous challenges, such as a shortage of affordable housing and a substantial current deficit. In addition to the stated consequences, aggressive household stock market participation is one of the most significant changes in the Turkish financial markets after the implementation of heterodox monetary policies. In both theoretical and practical contexts, the overall increase in households'

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¹ The Foreign Exchange Protected Deposit Account is a type of bank deposit account denominated in Turkish Lira. It offers a guarantee by the Treasury Department to compensate for any losses incurred due to exchange rate fluctuations during the duration of the deposit.

participation in the stock market is generally regarded as beneficial. Equities long-term performance is higher than its alternatives in almost any country, and it provides diversification for individuals' portfolios. Nevertheless, it is crucial to note that equities are inherently risky assets, and engaging in their investment without possessing adequate financial literacy might potentially lead to significant complications. Additionally, if the stock market does not have enough depth, inadequate supply against the very high and fast demand may cause unrealistic prices in the market. Undoubtedly, the Turkish equity market has made substantial advancements in all areas. Nonetheless, achieving such a significant transformation generally requires quite a long time. The emergence of such occurrences in the short term, as exemplified by the case of Turkey, engenders vulnerabilities inside financial markets. The objective of this study is to examine the risks associated with rushing households' stock market participation, with a specific focus on the impact of monetary policy adjustments in Turkey.

Literature Review

In recent years, there has been a growing body of research dedicated to examining the factors that influence individuals' decisions to participate in the stock market. Studied monetary gamble and stock market participation by using a "narrow framing" argument. Examined the relation between stock market participation and individuals' IQ, besides wealth, age, income, and some demographic factors. Used the Survey of Health, Ageing and Retirement in Europe (SHARE) to study cognitive abilities and substantial heterogeneity in stock market participation, both within and across countries.

Initial public offerings (IPOs) provide an important way for households to participate in the stock markets. In a theoretical context, the study conducted by) examined the relationship between initial public offerings and the secondary market, specifically focusing on the dynamics of IPO cycles in both hot and cold IPO markets. The study conducted) focused on the examination of financial literacy and price in initial public offerings, with a particular emphasis on the phenomenon of underpricing. Study, which is based on China's IPOs between 1997 and 2009, showed better-developed financial markets that provided more efficient pricing for IPOs due to higher market transparency and less information asymmetry.

Examined the externalities associated with financial literacy. The researchers employed administrative data from refugees' residents in Sweden for their analysis. The researchers tracked and examined the influence of financial literacy on the financial behaviors of refugees residing in various areas. They find evidence that while the externalities have an impact on retirement savings behavior in the medium term, they also have an impact on stock market participation in the long term.

Financial literacy is a prominent issue of this study in relation to stock market participation. The study conducted by demonstrated the significant implications of financial unawareness in comprehending the stockholding puzzle and evaluating the costs associated with participating in the stock market. Used a composite of datasets encompassing nine European countries. The researchers showed that, in

addition to socio-demographic factors, financial literacy was found to have a significant and favorable impact on individuals' involvement in the stock market. This effect was observed alongside the influence of human capital and social contact. Research studies have examined the indirect relationship between financial literacy and certain social characteristics, such as education and occupation, within this parallel context. In their study, investigated the impact of academic ability, education, and occupation on stock market participation. The researchers collected data from a sample of more than 200,000 people in Estonia. The study conducted by is one of the most recent studies to measure financial literacy in Turkey. The study used the OECD/International Network on Financial Education (INFE) methodology to compare Albania, Armenia, the British Virgin Islands, the Czech Republic, Estonia, Germany, Hungary, Ireland, Malaysia, Norway, Peru, Poland, the Republic of South Africa, and the United Kingdom. Their findings showed Turkey's financial literacy scores, which are a combination of financial attitude, financial knowledge, and financial behavior, fall below the average. Similarly, examined the financial literacy level of Turkey in a recent study. The study investigated various demographic factors, including gender, age, marital status, number of family members, education, income, number of persons with income, household income, and working conditions. The researchers collected data from a random sample of 1,000 individuals. The findings revealed that the overall financial literacy level in Turkey was determined to be 52.9%. In their study, conducted a survey to examine the level of households' financial literacy in the Sakarya region. Similarly, conducted a comprehensive survey to investigate the topic of financial literacy. The insufficient level of financial literacy in Turkey can be attributed, in part, to a historically low saving ratio. There are many studies in the literature that indicate Turkish households positioned their intentions toward buffer-stock saving behavior, spending money versus saving.

Undoubtedly, the stock market holds significant importance as a subject of interest for the media. Numerous prominent financial mass and printed media enterprises have emerged, demonstrating significant dedication to their respective fields. Studied media stock market participation by using combined survey data and bank register data on individual retail investors, that showed media is the only learning channel that increases the likelihood of owning stocks and the portfolio share invested in stocks. Similarly, used deep learning to analyze social media stock market participation through sentiment analysis.

Within the existing body of research, the prevailing methodology employed for studying the subject at hand is using of surveys in a narrow range. In contrast, this study employs a macro-level dataset. In this parallel, investigated institutional, traditional, and behavioral aspects. Their model predictive power is broken down into institutional (country) fixed effects (approximately 30% of total), traditional individual-level factors (50%), and newly uncovered behavioral variables (20%). According to a study conducted by, it was shown that the accumulation of wealth through real estate in China had a significant impact on a rise in participation in the stock market.

Methodology and Data

As previously stated in the introduction, following a heterodox monetary policy adjustment, there has been a notable and rapid increase in stock market participation in Turkey. Although it is known that Borsa Istanbul exhibits a highly developed exchange market that provides a significant amount of liquidity, particularly in terms of depth, the presence of a rush still has certain risks. It is not realistic to argue that both the demand and supply sides were sufficiently prepared for this type of movement. The literature review has identified a significant risk on the demand side, namely the lack of financial literacy. On the other hand, a strong level of demand has the potential to result in inflated market prices that deviate from realistic levels.

Moreover, the decrease in the proportion of foreign investors' holdings within the overall portfolio helps as a mitigating effect. The surge in initial public offering figures can be interpreted as a market response to the robust demand. Nevertheless, numerous instances such as the dot-com era in the United States have demonstrated that capital markets encounter difficulties when confronted with an excessive and rapid surge in demand, resulting in overvalued valuations for companies that are detached from reality.

The primary aim of this study is to reveal the potential risks linked to the increase in individuals participating in the stock market. That is achieved by examining the underlying factors that lead individuals to engage in stock market participation, specifically in response to heterodox policies. The basic idea is the examination of market participation within an empirical model that captures the dynamics of both demand and supply sides. The dependent variable, denoted as "y", represents stock market participation. It is quantified by the monthly number of individuals who hold stocks, as recorded by the Central Stocks Depository and Trade Repository of Turkey.

In Turkey, there is a historical tendency among households to give priority to investments in property, with a particular emphasis on real estate. Consequently, the ownership rate of financial assets in general is relatively low at 17 percent, which is significantly lower compared to more developed economies. While bank deposit account ownership is the highest preferred among the financial investment instruments, more sophisticated financial investment instruments, such as bonds, mutual funds and stocks, is

virtually absent in Turkey. There are many factors that influence investment decisions. In inflationary times, such as the recent one in Turkey, this choice favors foreign exchange deposit accounts. Furthermore, heterodox policy included indirect interventions to keep exchange rates low. Because of that, it is assumed real returns of financial alternatives are the dominant factor for portfolio allocation decisions. Hence, in order to reflect the demand side, alternative investments' real returns are used in addition to the actual stock market return. The average maturity of bank deposits provides a rough idea of the time horizon for financial investments. That is less than a year in Turkey. As a result, real returns are calculated for the semiannual investment period. Real returns are the average of both CPI and PPI-based real returns. More specifically, the semiannual average real return of bank deposit accounts, which is denoted X_1 , the semiannual real USD-EUR foreign currency basket return, which is denoted X_2 , the semiannual real treasury bond portfolio return, which is denoted X_3 , the semiannual real gold return, which is denoted X_4 , the semiannual real BIST 100 Index return, which is denoted X_5 , and the semiannual real BIST IPO return, which is denoted X_6 , are included as dependent variables (features) to capture demand. In the present context, the supply side is reflected by taking into account the proportion of foreign investors' holdings in the overall stock portfolio and the entire count of publicly traded companies in BIST. As seen from Table 2, as expected, there is a negative correlation between alternative financial real returns and stock market participation. However, the negative correlation is the highest for the real bank deposit return with -0.56 and the lowest for the real gold return with -0.009. Similarly, there is a positive correlation between stock market participation and real stock market and real IPO returns, which are 0.29 and 0.56, respectively. Even though the correlation signs are the same as expected from a theoretical point of view, they are low. These low correlations can be interpreted as indicating that traditionally, investors hold stock market investments far outside of their scope. As mentioned earlier, the proportion of foreign investors' stake in the entire stock market portfolio (denoted as X_7) and the number of listed businesses (denoted as X_8) are included as independent variables in order to capture the supply aspect.

Table 1: Descriptive Statistics

	y	X7	X1	X5	X2	X4	X3	X8	X6
Count	139.00	139.00	139.00	139.00	139.00	139.00	139.00	139.00	139.00
Mean	1539121.64	0.57	-2.96	1.56	2.26	5.19	-6.25	423.58	24.87
Std	873094.30	0.12	8.41	16.88	15.94	22.24	23.74	32.09	38.18
Min	1016763.00	0.27	-35.49	-33.78	-39.77	-42.97	-79.48	368.00	-34.14
25%	1059801.50	0.50	-5.45	-10.63	-6.57	-9.39	-15.92	408.00	1.89
50%	1093927.00	0.63	-0.44	0.87	0.72	6.20	-5.38	412.00	12.91
75%	1709973.00	0.64	2.08	10.60	13.27	16.23	8.40	424.00	36.81
Max	5058304.00	0.66	10.36	75.78	57.68	78.49	58.62	539.00	182.47

One of the major outcomes of the implementation of heterodox policies was a decline in foreign portfolio investments. Although a decrease in interest rates is often perceived as a good sign for the stock market, the

implementation of heterodox policies has led to increased macro-level vulnerability. Consequently, this has resulted in a rise in hedging costs and foreign exchange risks for foreign investors. As a result, the share of foreign investors

in the stock market experienced a subsequent decline. In addition to their favorable impact on foreign reserves, foreign investors, acting as high-level institutional investors, play a crucial role in facilitating efficient asset pricing within financial markets. It is important to note that the predominance of household investment as a replacement for the outflow of foreign investors may pose a potential risk to pricing efficiency. The total number of listed companies is a function of initial public offerings and BIST delisting decisions. Nevertheless, the delisting figures for BIST are remarkably low and extraordinary. Therefore, initial public offerings constitute the primary driver for the overall quantity of listed companies. At first glance, stock market participation through the IPO is a positive reaction. However, if this process is not managed in balance could be

harmful for new participants due to lack of financial literacy. At first glance, stock market participation via the IPO seems to be a positive response. Nevertheless, if this process is not effectively regulated, it may pose risks for new participants as a result of their lack of financial literacy.

XGBoost Algorithm

As seen in Table 2, there exists a strong correlation among some dependent variables. The presence of multicollinearity in a linear model is evident. XGBoost, known as the extreme gradient boosting method, is a tree-based machine learning approach employed for empirical investigation to deal with the issue of multicollinearity. One additional benefit of using XGBoost in this research is its efficient performance for small data sets.

Table 2: Correlation Table

Y	1	-0.94	-0.56	0.29	-0.21	-0.0088	-0.35	0.85	0.56	-1.00
X7	-0.94	1	0.71	-0.23	0.25	0.045	0.41	-0.78	-0.64	0.75
X1	-0.56	0.71	1	0.065	0.098	0.1	0.77	-0.52	-0.34	0.50
X5	0.29	-0.23	0.065	1	-0.49	-0.28	0.48	0.26	0.57	-0.25
X2	-0.21	0.25	0.098	-0.49	1	0.6	-0.32	-0.16	-0.26	-0.00
X4	0.0088	0.045	0.1	-0.28	0.6	1	-0.092	-0.032	-0.17	-0.25
X3	-0.35	0.41	0.77	0.48	-0.32	-0.092	1	-0.27	0.055	-0.50
X8	0.85	-0.78	-0.52	0.26	-0.16	-0.032	-0.27	1	0.33	
X6	0.56	-0.64	-0.34	0.57	-0.26	-0.17	0.055	0.33	1	-0.75

The XGBoost algorithm is widely recognized and highly efficient in implementing the Gradient Boosted Trees algorithm. This supervised learning approach focuses on function approximation by optimizing loss functions and employing various regularization techniques. The objective function (loss function and regularization) at iteration t that we need to minimize is the following:

Equation 1

$$L^t(X) = \sum_{i=1}^N l(y_i - \hat{y}_i^{t-1} + f_t(X_i)) + \Omega f_t$$

Equation 1 presents the formal mathematical expression of the objective function, whereby N denotes the total number of samples, X represents the model parameters, l represents the loss function, and Ωf_t denotes the regularization term. The Grid Search CV hyperparameter optimization method is applied to identify the necessary parameters for the XGBoost algorithm, which are shown as follows: 'colsample_bytree': 0.7, 'learning_rate': 0.05, 'max_depth': 7, 'min_child_weight': 4, 'n_estimators': 500, 'nthread': 4, 'objective': 'reg:linear', 'silent': 1, 'subsample': 0.7. As mentioned earlier, one of the objectives of the empirical research is to analyze the drivers of the stock market participation rush following the implementation of heterodox monetary policies. For that reason, SHapley

Additive exPlanations is used as an interpretation tool for XGBoost which is one of the black box prediction algorithms. SHAP analysis enables the interpretation of predictions for a given observation or a window-period observation. More technically, the SHAP method is a game-theoretic methodology that aims to provide explanations for the output of machine learning models. The main objective of the SHAP framework is to provide a comprehensive explanation for the predictions produced by a machine learning model. This is achieved by quantifying the individual contribution of each feature (an independent variable) towards the overall forecast.

This part contains a straightforward analysis divided into two phases. The initial phase involves analyzing the average impact of independent variables using feature importance figures and tables, which illustrate the contribution of features (independent variables) to the model. The second phase of the analysis involved assessing the Shap values associated with the period following the implementation of heterodox policies.

Results

Based on the findings presented in Figure 1, it is evident that XGBoost exhibits a notably higher degree of predictive accuracy. Mean absolute error (MAE) is 3421. As previously stated, XGBoost can be classified as a black box model. As a result, Shap analysis is used to understand the model results.

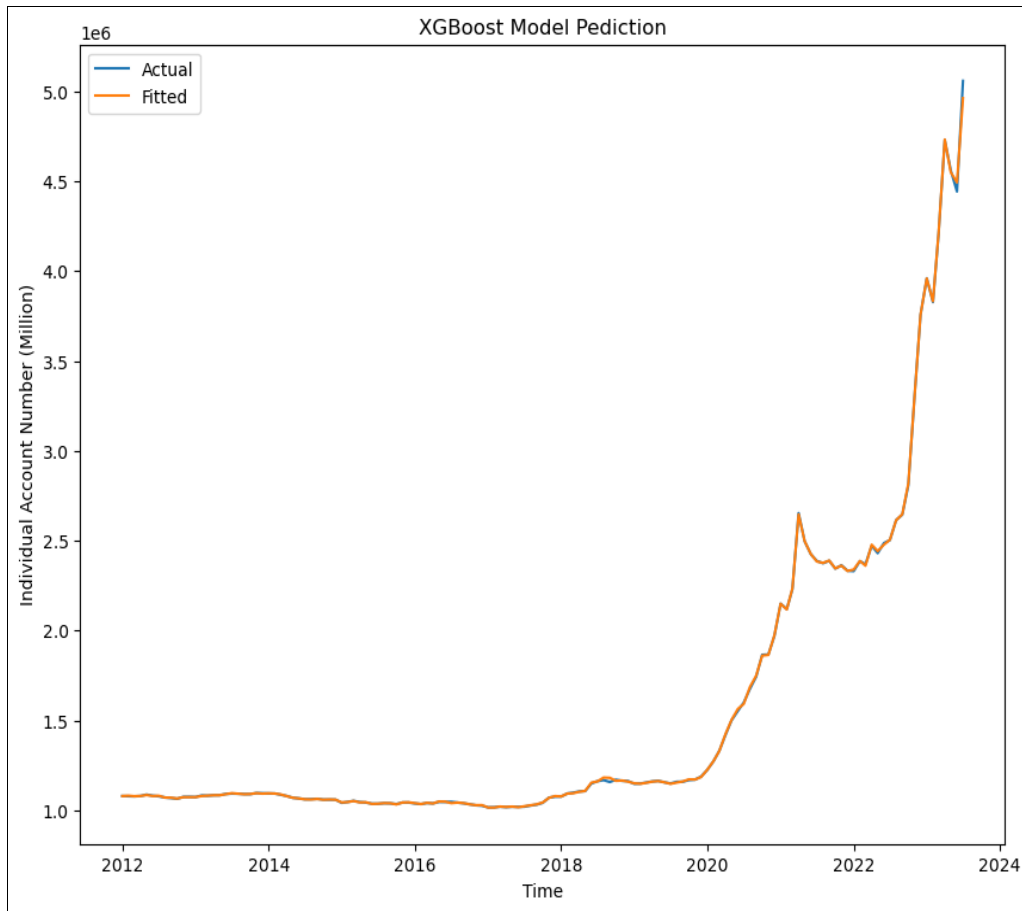


Fig 1: XG Boost Model Prediction

Shap analysis generates a pair of extremely useful visual analysis charts. The first is feature importance. The concept behind SHAP feature importance is straightforward: Features (independent variables) that possess significant absolute Shapley values hold substantial importance. In order to assess the global significance, the absolute Shapley values per feature are averaged across the dataset.

Equation 2

$$I_j = \frac{1}{n} \sum_{i=1}^n |\theta_j^i|$$

Where:

I_j is *j*. feature (independent variable) global importance

θ_j^i is *j*. feature (independent variable) *i*. Shap value

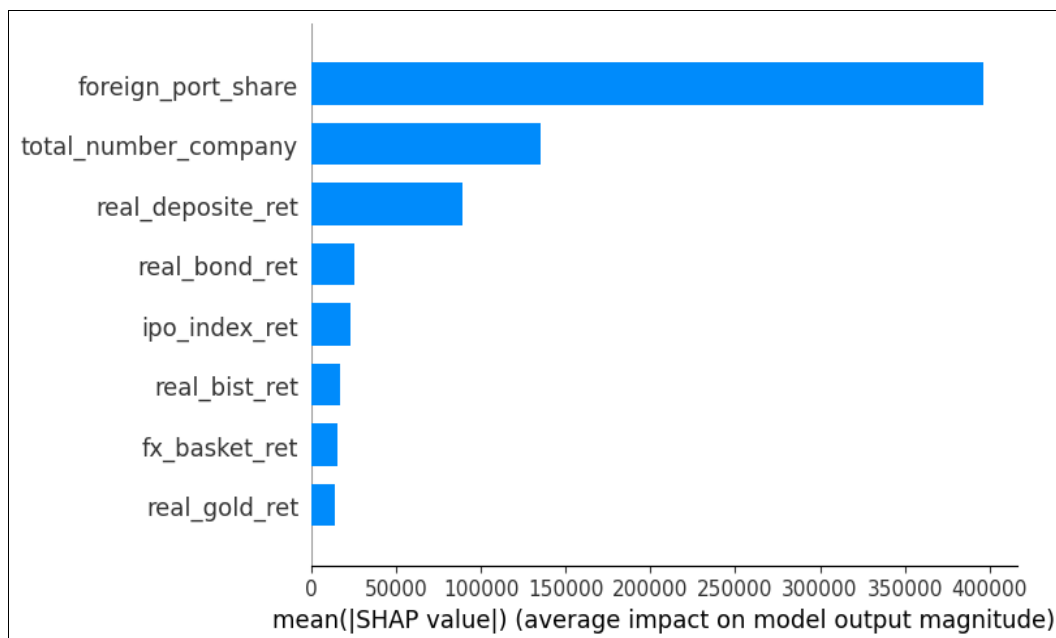


Fig 2: SHAP Feature Importance

Table 3: Feature Importance Table

Independent Variables	Contribution to Model (%)
Foreign Investors 'Portfolio Share	55
Total Number of Listed Company	19
Real Bank Deposit Return	12
Real Treasury Bond Return	4
Real BIST IPO Index Return	3
Real BIST Index Return	2
Real FX-Basket Return	2
Real Gold Return	2

Figure 2 shows the Shap Features Importance. Likewise, Table 3 presents the features importance along with their corresponding percentages in tabular form. This result indicates two significant issues. The first is households' stock participation, which corresponds at an important level with the outflow of foreign investment and new supply through IPOs. It is important to note that the majority of foreign investors are institutional investors. Foreign investor participation increases stock price informativeness and market liquidity. Similarly, discovered that a greater proportion of institutional holdings is associated with greater price informational efficiency for a cross-section of

NYSE-listed equities between 1983 and 2003. Figure 3, which shows individual investors shares of the total market portfolio, also validates this inference. The proportion of shares held in individual investors' portfolios showed a significant increase from 18-20% to 38-40% subsequent to the implementation of heterodox policies. The level of financial literacy in Turkey is very low in comparison to other developed countries,. As shown in Figure 1, it is notable that the momentum of households' stock market participation is overwhelming. Therefore, it is not an exaggeration to assume the majority of new participants lack financial literacy. This situation could cause rise to two issues: inefficient pricing in the market and heightened vulnerability of households to financial crises. Even in advanced economies, such as the dot-com era in the United States during the turn of the millennium, there were outcomes that were not desired. Prior to the year 2000, similar to now but to a lesser extent, households' stock market participation increased rapidly in Turkey. However, following the 2001 financial crisis, individual investors suffered significant losses in their portfolios, causing retail investors to stay away from the market for a long time.

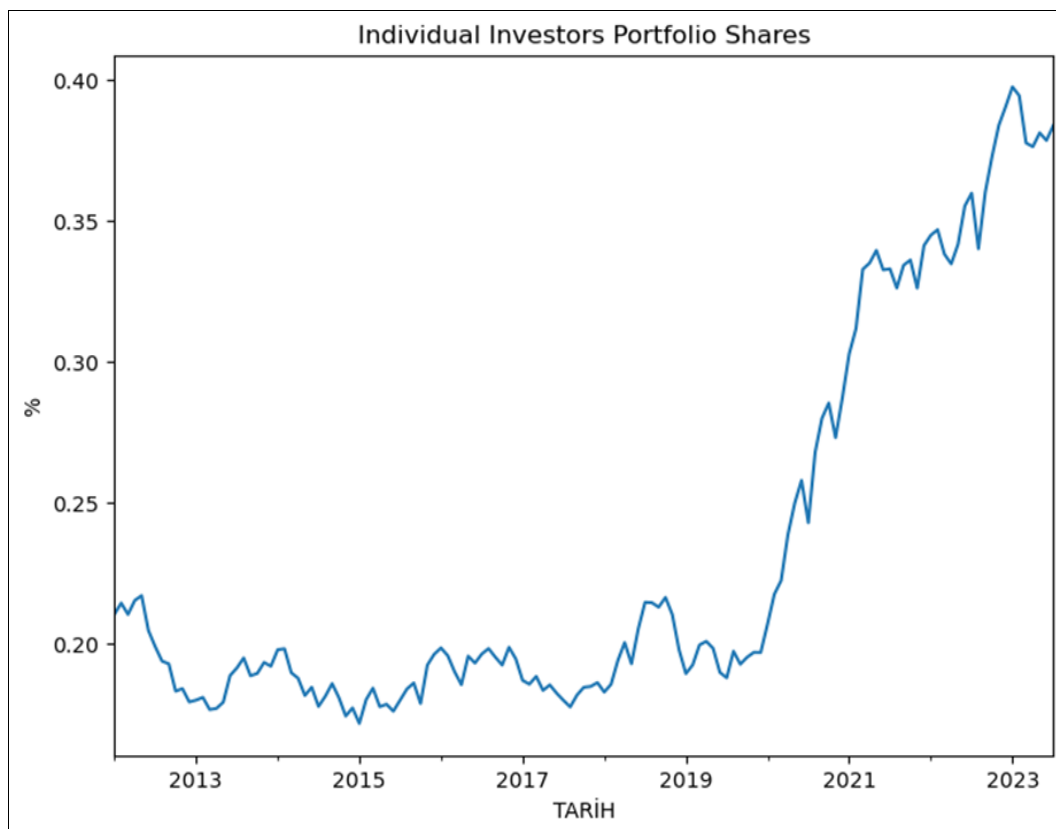


Fig 3: Individual Investors Contribution

Table 3 shows that, aside from the real bank deposit return, the contribution of alternative financial returns to the model is limited. While real bank deposit returns provide 12%, real Treasury bond returns, real gold returns, and real FX returns contribute 4%, 2%, and 2%, respectively. Returns contribution to the model on the equity side, on the other hand, are 3% and 2%, respectively, for the BIST IPO Index and the BIST 100 Index, which address the second issue. This implies that the lack of adequate real alternative

financial returns has a much greater impact on household equity market participation than stock market or IPOs' performance. To put it differently, the primary determinant in their decision-making process is the unsatisfactory real returns on alternative financial investments. However, in terms of risk, the stock market differs dramatically from alternative assets. To begin with, interest-based investments do not involve principal risk. Second, BIST Istanbul volatility has been historically very high. A prudent stock

market investment necessitates a certain level of financial literacy, the availability of hedging tools, and a sufficient amount of capital to undertake long-term risks. Nevertheless, results show that (new) participants invest mostly to protect their savings against inflation. Hence, the majority of new participants invest in the market without implementing rational portfolio allocation and hedging.

Up to this point, the analysis of model outcomes relies on Shap Feature Importance, which does not account for the relational effects of features (independent variables). The Shap analysis enables the construction of Figure 4, which combines feature importance with feature effects. Every data point represented on the summary plot corresponds to a Shapley value assigned to a certain feature and occurrence.

The vertical position is selected by the feature, whereas the horizontal position is determined by the Shapley value. The hue is indicative of the relative value of the feature, ranging from low to high. The points that overlap are randomly displaced in the y-axis direction, allowing us to visually perceive the distribution of the Shapley values for each feature. The features have been arranged in accordance with their respective levels of significance. This chart allows the analysis of heterodox policies in a specific manner. As previously stated, with the implementation of heterodox policies, the real returns of almost all financial investment alternatives to the stock market became negative, foreign investors reduced their positions rapidly and considerably, and the size and number of IPOs reached record levels.

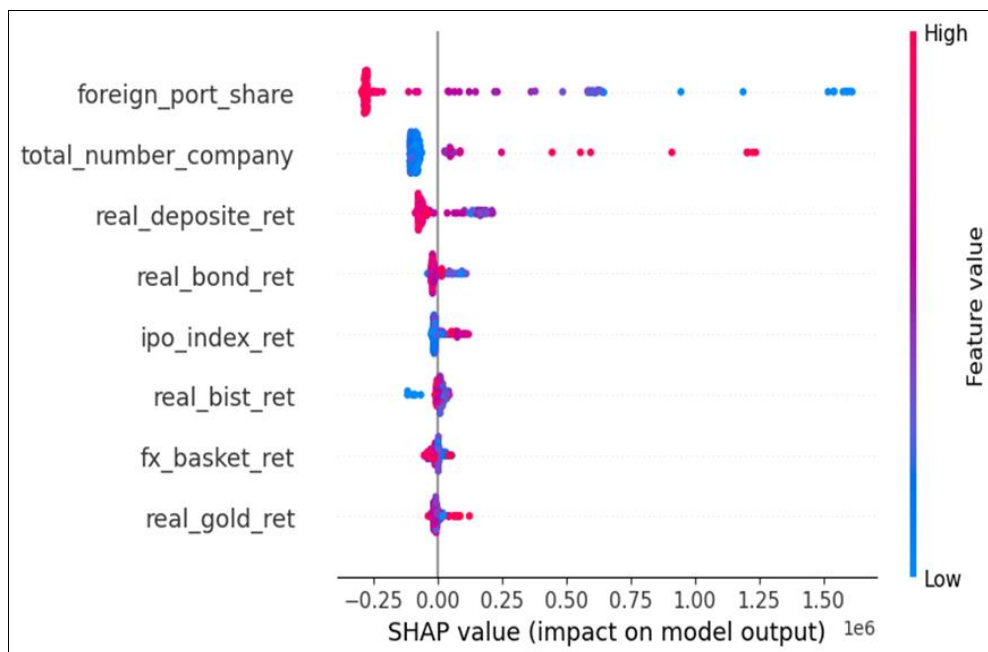


Fig 4: Shap Feature Effects

The most critical details in Figure 4 are the total number of listed companies, the actual BIST IPO Index return, and the real BIST Index return. The influence of the total number of listed companies, which is used as a proxy for initial public offerings, is significantly greater for larger values compared to lower values. This suggests that a significant proportion of new market participants choose to enter through initial public offerings. The majority of initial public offering companies can be classified as growth companies. Naturally, compared to other secondary market companies, the market has relatively less information about them. Even market professionals find it challenging to value and analyze their risks. As a result, they have high risk-reward potential. The institutional contribution to initial public offerings (IPOs) plays a crucial role in the effective distribution of risks and the setting of fair and reasonable pricing. In the opposite circumstance, like recent times in Turkey, Figure 4 indicates that individual investors are carrying considerable risks. Similarly, whereas high real IPO Index returns have a high positive impact on an individual's stock market participation, low real returns have a little (near to zero) impact. It demonstrates that successful stories have a greater influence on new stock market participants than unsuccessful stories. In a theoretical

model, demonstrated that investment banks play a crucial role in enhancing the quality of initial public offering (IPO) firms during the IPO wave, which enables ex ante low-quality firms to go public. In contrast, while strong negative real BIST 100 Index returns reduce individual stock market participation, high positive real BIST Index returns have a far smaller impact on increasing participation. The phenomenon can be explained through the various techniques employed by IPO businesses and underwriters in their promotional activities around initial public offerings. This effect is difficult to measure, but Figure 5 illustrates the normalized search trend for the term 'halka arz' (Turkish translation of IPO) on the Google platform, which gives us a rough idea. There is a peak in the search that reaches 10 times higher than past levels in recent times. Hence, public interest in IPOs on social media is much higher than normal, probably due to advertisements for the IPOs. This conclusion is compatible with findings that media has a strong impact on increasing stock market participation. Similarly, analyzed media impact through social media worldwide. His findings show a pro-cyclical trust of household investors in social media for stock investing that was high in early 2000 before the dot.com crises and gradually high in recent times.

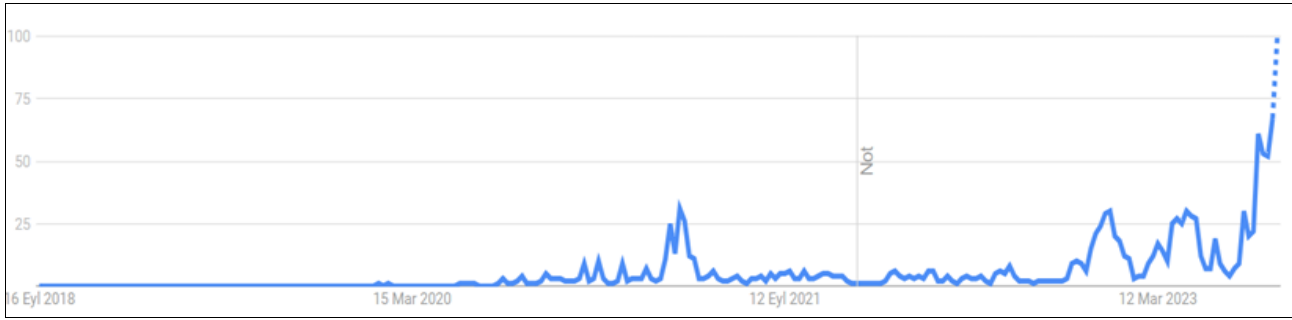


Fig 5: Google Searching Trend for IPO statement

Conclusion

In theory and practice, household stock market participation is considered positive progress for both households and the economy. Investors can increase their returns and diversify their portfolios to reduce risk. It is tremendously beneficial to provide financing for private investments, particularly in nations with savings deficits such as Turkey. Equity investment, on the other hand, is risky and necessitates some level of financial literacy as well as sufficient funds for diversification. In reality, nations with strong stock market participation, such as the United States, the United Kingdom, and Japan, have a long-established culture of stock market investment. Instances where stock market participation increases very fast and significantly, such as the current situation in Turkey, pose substantial risks to both individual households and the overall economy. This study presents two significant results. The first, foreign investor outflows and fresh supply through IPOs, have been met directly by households rather than indirectly by institutional investors such as investment funds. The percentage of individuals' shares in the total market portfolio had significant growth, rising from 18% to a record high of 40%. The fall in the share of institutional investors in the stock market could cause substantial risk for irrational pricing. The second risk is the household's vulnerability to shocks due to their risky portfolio. A record number of investors have just started to invest in the equity market without enough financial literacy, without access to financial tools for hedging, and with inadequate capital to construct a well-diversified portfolio to manage their risk.

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