

HOW DO MACROECONOMIC INDICATORS AFFECT STOCK MARKET
RETURNS? AN ANALYSIS OF THE BORSA ISTANBUL STOCK EXCHANGE
AND TÜRKİYE

A THESIS SUBMITTED TO
THE INSTITUTE OF GRADUATE PROGRAMS
OF
İSTANBUL BİLGİ UNIVERSITY

BARAN ALP NARİNOĞLU

IN PARTIAL FULFILLMENT OF THE REQUIREMENTS
FOR
THE DEGREE OF MASTER OF SCIENCE
IN
FINANCIAL ECONOMICS

2025

HOW DO MACROECONOMIC INDICATORS AFFECT STOCK MARKET
RETURNS? AN ANALYSIS OF THE BORSA ISTANBUL STOCK EXCHANGE
AND TÜRKİYE

Baran Alp Narinoğlu
123626001

Prof. Dr. Serda Selin Öztürk
Istanbul Bilgi University

Assist. Prof. Dr. Gizem Turna Cebeci
Istanbul Bilgi University

Assist. Prof. Dr. Nazlı Şahanoğulları
Istanbul Kultur University

Date of Approval: 6/25/2025



I hereby declare that all information in this document has been obtained and presented in accordance with academic rules and ethical conduct. I also declare that, as required by these rules and conduct, I have fully cited and referenced all material and results that are not original to this work.

Name Surname: Baran Alp Narinoglu

Signature:

ABSTRACT

The thesis studied whether stock market returns in Türkiye had any significant determinants using monthly time series data from 2009 to the end of 2024, the sample period depending on the set of included independent variables. The choice of index for the thesis was the XU100's month-over-month logarithmic returns.

A GARCH (1, 1) was used to consider the clustering of volatility in the asset return data. Before modeling, some diagnostic tests were applied on all variables to investigate any potential multicollinearity by an analysis of correlation and stationarity by an analysis with ADF, issues that can hinder the quality of study findings.

Two of the independent variables were found to be significant for the returns of BIST, the global stock market trends, proxied by the MSCI World Price Index, and the F/X rates, proxied by the USD/TRY exchange rate.

Since XU100 was found to have a statistically significant and positive relationship with global markets, the study could confirm that BIST and Türkiye are extremely integrated with global financial markets.

Furthermore, since the depreciation of TRY against the USD was found to be negatively significant in stock market returns, indicating that investors could be averse to investing in Türkiye due to the risk of the currency rate.

All other independent macroeconomic, financial, and dummy variables did not significantly affect stock market returns in Türkiye, suggesting that the usual factors most investors and policymakers pay attention to are not very important for BIST.

Therefore, BIST is first and foremost influenced by global investment sentiments and domestic currency risk, which can be an important reference for both policymakers and

investors, highlighting the need to ensure currency rate stability and build robust regulatory frameworks to minimize the potential negative effects of global markets.

Keywords: Stock Market; Borsa Istanbul; Macroeconomic Indicator; Emerging Market; Exchange Rate



ÖZ

Tez, 2009'dan 2024 sonuna kadar aylık zaman serisi verileri kullanarak Türkiye'deki borsa getirilerinin önemli belirleyicileri olup olmadığını incelemiştir. Örneklem dönemi, dahil edilen bağımsız değişkenler kümesine bağlı olarak değişmiştir. Çalışma için endeks seçimi, XU100'ün aylık logaritmik getirileri olmuştur.

Varlık getirisi verilerindeki oynaklığın kümelenmesine dikkat etmek için GARCH (1, 1) kullanılmıştır. Modelleme öncesinde, çalışma bulgularının kalitesini olumsuz etkileyebilecek potansiyel çoklu doğrusallık ve durağanlık sorunlarını tespit edebilmek için bazı tanımlama testleri, korrelasyon ve ADF, uygulanmıştır.

Bağımsız değişkenlerden ikisinin BIST getirileri için önemli olduğu bulunmuştur: MSCI Dünya Fiyat Endeksi ile temsil edilen küresel borsa eğilimleri ve USD/TRY döviz kuru ile temsil edilen döviz kurları.

XU100'ün küresel piyasalarla istatistiksel olarak anlamlı ve pozitif bir ilişkisi olduğu tespit edildiğinden, çalışma BIST ve Türkiye'nin küresel finans piyasalarıyla son derece entegre olduğunu doğrulayabilmiştir.

Ayrıca, TRY'nin USD karşısındaki değer kaybının borsa getirileri üzerinde negatif olarak anlamlı olduğu tespit edildiğinden, yatırımcıların döviz kuru riski nedeniyle Türkiye'ye yatırım yapmaktan kaçınabilecekleri belirtilebilir.

Diğer tüm bağımsız makroekonomik, finansal ve kukla değişkenler Türkiye'deki borsa getirilerini önemli ölçüde etkilememiştir, bu da çoğu yatırımcı ve politika yapıcıların dikkat ettiği olağan faktörlerin BIST için çok önemli olmadığını göstermektedir.

Bu nedenle, BIST öncelikle küresel yatırımcı duyarlılıkları ve yerel para birimi riskinden etkilenmektedir. Bu durum, hem politika yapıcılar hem de yatırımcılar için önemli bir referans olabilir ve döviz kuru istikrarını sağlamak ve küresel piyasaların olası olumsuz

etkilerini en aza indirmek için sağlam yasal çerçeveler oluşturulması gerektiğini vurgulamaktadır.

Anahtar Kelimeler: Borsa; Borsa İstanbul; Makroekonomik Gösterge; Gelişmekte Olan Piyasa; Döviz Kuru



ACKNOWLEDGMENTS

I would like to acknowledge and thank Ms. Serda Selin Ozturk for all the guidance that she has provided me with throughout the preparation of my master's thesis.



TABLE OF CONTENTS

ABSTRACT	v
ÖZ	vii
ACKNOWLEDGMENTS	ix
TABLE OF CONTENTS	xi
LIST OF TABLES.....	xiii
LIST OF FIGURES	xv
1 INTRODUCTION	1
1.1. Background of the Thesis	1
1.2. Problem Statement and Motivation behind the Thesis.....	2
1.3. Research Questions and Objectives of the Thesis	3
1.4. Contribution of the Thesis	5
1.5. The Thesis's Structure	5
2 LITERATURE REVIEW	7
2.1. Introduction of the Literature Review	7
2.2. Theoretical Foundations	7
2.3. Summary of the Literature (Developed Markets).....	8
2.4. Summary of the Literature (Emerging Markets)	9
2.5. Summary of the Literature (Türkiye)	11
2.6. Summary of the Literature Review	12
3 DATA AND METHODOLOGY	16
3.1. Dependent Variables.....	16

3.2.	Independent Variables	17
3.2.1.	Financial Independent Variables	17
3.2.3.	Dummy Independent Variables	21
3.3.	Data Preparation	22
3.4.	Model Preparation	27
4	RESULTS AND EMPIRICAL FINDINGS	37
4.1.	OLS Results and Empirical Findings	37
4.2.	GARCH Results and Empirical Findings	43
4.3.	Robustness Checks	46
4.4.	Summary of the Results and Empirical Findings	50
	CONCLUSION	51
5.1.	Summary of the Thesis	51
5.2.	Summary of the Key Findings	51
5.3.	Summary of the Thesis's Contribution to the Field	52
5.4.	Policy Implications of the Thesis	53
5.5.	Limitations of the Thesis and Future Research	55
	REFERENCES	57

LIST OF TABLES

Table 2.1. Key Findings of the Past Literature.....	13
Table 3.1. Summary Statistics (MoM IPI & CPI, Incl. BTC, All Dummies)	24
Table 3.2. Summary Statistics (YoY IPI & CPI, Incl. BTC, All Dummies).....	24
Table 3.3. Summary Statistics (MoM IPI & CPI, Excl. BTC, All Dummies)	25
Table 3.4. Summary Statistics (YoY IPI & CPI, Excl. BTC, All Dummies).....	25
Table 3.5. Stationarity Test Results (ADF): Financial & Commodity Variables.....	28
Table 3.6. Stationarity Test Results (ADF): Domestic Macroeconomic Indicators.....	29
Table 3.7. Final Stationarity Test P-Values: Financial Variables	30
Table 3.8. Final Stationarity Test P-Values: Macroeconomic Variables	30
Table 3.9. Correlation of Financial Variables (MoM, Incl. BTC).....	31
Table 3.10. Correlation of Corrected Macro and Dummy Variables (MoM, Incl. BTC)	32
Table 3.11. Correlation of Financial Variables (YoY, Incl. BTC).....	32
Table 3.12. Correlation of Corrected Macro and Dummy Variables (YoY, Incl. BTC)	32
Table 3.13. Correlation of Financial Variables (MoM, Excl. BTC)	33
Table 3.14. Correlation of Corrected Macro and Dummy Variables (MoM, Excl. BTC)	33
Table 3.15. Correlation of Financial Variables (YoY, Excl. BTC).....	33
Table 3.16. Correlation of Corrected Macro and Dummy Variables (YoY, Excl. BTC)	34
Table 4.1. Diagnostic Test Results for OLS Models.....	38
Table 4.2. GARCH (1, 1) Model Estimation Results for XU100 Returns	44
Table 4.3. Robustness Checks: Mean Equation Estimates	46
Table 4.4. Robustness Checks: Variance & Distribution Parameter Estimates	48
Table 4.5. GARCH (1, 1) Mean Equation Results (YoY, Excl. BTC).....	49
Table 4.6. GARCH (1, 1) Variance and Distribution Parameter Estimates (YoY, Excl. BTC)	49

LIST OF FIGURES

Figure 3.1. Monthly Logarithmic Returns of the XU100 Index.....	22
Figure 4.1. OLS Results (MoM, Incl. BTC).....	39
Figure 4.2. OLS Results (YoY, Incl. BTC).....	40
Figure 4.3. OLS Results (MoM, Excl. BTC).....	41
Figure 4.4. OLS Results (YoY, Excl. BTC).....	42
Figure 4.5. Estimated Conditional Volatility from All Four GARCH Models	46



INTRODUCTION

1.1. Background of the Thesis

In countries around the world, stock markets serve as a primary avenue for both individuals seeking funds and those with surplus funds to transparently exchange their resources, thereby fostering organized economic growth and development within the country. Furthermore, as the number of participants and investment alternatives increases, policymakers can utilize stock markets as an economic indicator, as they offer helpful data on the expectations of investors and fund seekers regarding the status of the local and global economy. However, being invested in a single stock market and biased toward the home country limits the investor's potential wealth by minimizing his/her investment universe, as different countries specialize in producing/providing different products/services.

Therefore, as both the number of investors and investable assets increase in an increasingly interconnected world, investors seek to diversify their portfolios across various asset classes and geographies to increase their risk-adjusted potential returns. One of the most popular ways to achieve this diversity is investing in emerging markets with high growth potential, where there is more room for economic growth relative to developed markets. One of the main ways to find investable emerging markets is to look at the country weights of the MSCI Emerging Markets Index (USD), the tracked index of the largest ETF of emerging market equities, which are China (29.57%), India (19.21%), Taiwan (17.08%), South Korea (9.32%), and Brazil (4.55%), in order, according to MSCI (2025).

Although the aforementioned countries represent a significant percentage of the equity products of emerging markets demanded by investors, there are numerous other markets below these five that have persistent demand and growth during the 21st century. Among such markets, Türkiye stands out as a potential focus of research, a G20 economy with 85,664,944 people, representing approximately 1% of the global population (Turkish

Statistical Institute (TUIK), 2024), and a country that has enjoyed significant growth in the quantity of equity investors invested in its national stock exchange, BIST, from around 1,003,707 in January 2010 to 6,869,141 in December 2024 (Merkezi Kayıt Kuruluşu (MKK), 2025), with a CAGR of around 13.68%, while their respective portfolios reflected similar increases from around 130,388 million Turkish Liras to 5,711,806 million Turkish Liras with a CAGR of around 28.66%. The number of public companies stood at 572 in December 2024 (Sermaye Piyasası Kurulu (SPK), 2025), up from 338 at the end of 2010, with a CAGR of 5.40%.

Although BIST is picking up steam in recent years, the history of capital market activity in Türkiye is more than 150 years old, starting with the so-called Dersaadet Tahvilat Borsası, which was established in the Ottoman Empire in 1866. The current version of the national stock exchange started its operations in 1986 (Borsa İstanbul, 2025) as ISE in English or İMKB in Turkish. This structure was a result of the economic liberalization that Türkiye went through in the 1980s; the goal of it was to minimize state participation in the economy and increase market-based activity in the country (Öniş, 1991).

This policy change was made clear in the subsequent decades, where BIST started to list some of the SOE stocks, such as the telecommunications provider Türk Telekomünikasyon A.Ş. and Turkish Airlines, Türk Hava Yolları Anonim Ortaklığı, which deeply helped Türkiye increase the liquidity of its capital markets (Öniş & Yeldan, 2005; Organisation for Economic Co-operation and Development (OECD), 2006). Later, during 2013, the exchange took its current form as BIST by combining the equity, precious metals, and derivatives markets in one structure (Borsa İstanbul, 2025).

1.2. Problem Statement and Motivation behind the Thesis

With all this development behind its stock exchange, Türkiye provides a puzzling picture, which motivates this study.

Interestingly, the per capita GDP increased from \$10,629.233 to \$15,463.289 and had a relative standard deviation measure of approximately 15.43%, according to the International Monetary Fund (2025), even during political changes, such as a move from

a parliamentary democracy to a presidential system in 2017, severe depreciation of its currency, persistent and significantly high inflation, and the COVID-19 pandemic. This changing environment, which shows clear opportunities and risks for investors and important hidden risks, emphasizes the need to look at how the market responds to real economic indicators.

In such a way, the study wants to understand the contrast of ever more popular capital markets in a country with increased macroeconomic volatility, as there could be potential value in how price discovery works in BIST. What are domestic and international investors looking for when investing in BIST, or what should they respond to? Is BIST able to price changes in the economic profile of Türkiye and/or alternative global markets? If not answered, these questions can pose serious risks and limitations to the way policymakers and investors view and treat Türkiye and dissuade them from investing in a high-growth economy.

To address this problem, a study that quantitatively tests and seeks to understand this under-researched market could be of importance if it is able to answer which forces, if any, do affect the returns of the stock market. This will be done by using mostly domestic macroeconomic indicators and global financial commodities/sought-after financial assets, as they are usually the first step of an analysis when deciding to invest in a country.

1.3. Research Questions and Objectives of the Thesis

As experienced and inexperienced investors increase their participation in the Turkish stock market, an analysis of what they should prioritize and review before investing should be researched so that they can make informed decisions and increase their wealth. In this context, a key area of study in quantitative finance is to examine how the publicly available macroeconomic data of a country relates to its main stock indices, since this information is easy for the average investor to access and understand due to the extensive news and commentary available, which significantly influences people's perceptions of the overall economy. Moreover, for both individual and professional investors, looking at changes in indicators such as CPI, interest rates, growth in GDP, and exchange rates is

fundamental, as they are related to policy and potential policy changes of the central bank and other government entities. However, how macroeconomic indicators are priced in the equity prices shows the efficiency of the stock market and helps investors prepare their future investments and their portfolio allocations, whether they should be invested at all in the market, and what they should invest in. Consequently, the following questions should be addressed in the study:

1. Which of the independent variables, macroeconomic and financial, have a significant and consistent relationship with returns of XU100 after controlling for volatility?
2. Are these relationships affected by major events that occurred in or in Türkiye during the sample period and cause structural breakdowns?
3. What are the conclusions that policymakers and investors should draw from the study's findings?

Therefore, an examination of the correlation between macroeconomic indicators and equity performance within this particular Turkish setting can provide significant information. So, people interested in investing in fast-moving emerging markets might look at how observable and quantified macroeconomic metrics relate to the returns of public equities, which are among the most popular investments in Türkiye for both national and international investors. This knowledge could help them in the future when they look at other markets with similar characteristics, not just Türkiye. The study ideally aims to achieve the following objectives:

1. Identify which macroeconomic and financial independent variables are relevant to stock market returns and compare their significance or insignificance to findings of previous literature.
2. Test whether major events that came to be during the sample period of the study had any effects on the relationships between the variables by utilizing dummy variables.

1.4. Contribution of the Thesis

This study seeks to add to the literature on emerging markets and Türkiye in three different ways.

First, it studies Türkiye and BIST by using a recent data set ending in December 2024, which includes a period in which Türkiye went through an unusual set of changes, including a coup attempt in 2016, a constitutional referendum in 2017 when the governance structure of the country was changed, and the COVID-19 pandemic. Since most Türkiye-related research covering BIST and XU100 does not cover the post-2010 period, there could be room for updated key findings and relationships between variables not reflected in previous research.

Second, to answer its research questions, the main model choice is the GARCH framework, which is capable of adequately representing the time-dependent volatility of financial markets, making it more suitable than standard single- or multiple-linear regression models for the purposes of the study.

Third, this study seeks to present a nuanced and quantitative result on what drives XU100 after accounting for a large sample of independent variables, domestic and international, to provide a current reference for market participants to consider in their future investment activity.

By doing so, this study aims to address a gap in financial economics research because Türkiye is not studied enough compared to how many Turkish and international investors are involved, since its organized and regulated exchange is relatively new, starting in 1986, despite having strong and growing interest from local investors for many years.

1.5. The Thesis's Structure

This thesis organizes the remaining sections as follows. The second chapter will provide a comprehensive review of the existing literature that aims to identify similar points regarding Türkiye, other emerging markets, and developed markets to establish a

comparative basis for this thesis. The third chapter lists the data that will be used in this thesis, provides their sources and relevant summary statistics, and the methodology that will be utilized to test the Turkish stock market. The next chapter will present the test results and discuss the empirical findings. In the final chapter, the main findings of the thesis are summarized with a conclusion and turned into points of suggestion for future research and policymakers.



LITERATURE REVIEW

2.1. Introduction of the Literature Review

Before being able to analyze Türkiye and BIST, a review of existing literature in the field must be provided as the basis for the remainder of the thesis. Consequently, prior research seeking to understand how macroeconomic metrics of an economy affect its stock indices is divided into their subsections: (1) Studies in Developed Markets. (2) Studies in Emerging Markets. (3) Studies in Türkiye. The rationale behind this division is that markets of different sizes would behave relatively differently and, therefore, should be addressed separately. Whether there is an actual difference in findings between such markets is to be discussed in this section and would provide the thesis with a basis to compare Türkiye if it behaves relatively differently.

2.2. Theoretical Foundations

Before reviewing the literature related to the research question of this study, an analysis of the financial theory behind the concepts discussed is relevant, as the test of the relationship between stock market returns and macroeconomic independent variables is based on APT (Ross, 1976) and EMH (Fama, 1970), two of the seminal works in modern finance. EMH is usually used to test whether such a relationship exists, while APT is commonly used as a framework to explain stock market returns with changes in external macroeconomic data.

The main point of EMH is that asset prices reflect all the information available completely; it is usually known in three distinct forms.

1. Weak Form: This version implies that current asset prices reflect all past market prices and data.
2. Strong Form: This version implies that current asset prices reflect all private and public information.

3. Semi-Strong Form: This version implies that current asset prices reflect all public information.

For this study, the semi-strong form is important because it shows that all publicly available information, like domestic economic data, commodity prices, and other investments, is fully and quickly reflected in current stock prices. This study looks at how XU100 is related to various independent factors to see if the semi-strong form of EMH applies to Türkiye and its stock market.

On the other hand, APT is a framework comprising multiple independent variables that states that the returns of an asset are a linear function of external risk factors, which the theory does not specify, and allows testing a range of independent variables, such as macroeconomic indicators. The commonly cited work for this example is Chen et al. (1986); the authors used a set of predetermined macroeconomic variables against the returns of the stock market, which is similar to the approach of this study.

2.3. Summary of the Literature (Developed Markets)

According to the definition provided by the International Finance Corporation (IFC) (1988), developed markets are characterized by strong integration into global markets, political stability, well-developed regulatory frameworks, and relatively lower volatility. Although they are expected to provide a lower rate of return than the emerging markets, they are able to provide a higher level of predictability and have a longer history of data that can be reviewed and tested by academia. However, most of the studies available at the time of the investigation relate to stock prices and their relationship to the macroeconomic variables of the USA. There are some common findings across different studies.

Starting with Fama (1981), a relatively strong negative relationship between inflation and stock market returns is shown, which implies that stocks as an asset class cannot be present as strong hedges during inflationary periods. Pearce (1983) supports the findings of Fama (1981) and shows that stock prices react significantly to unexpected changes in

inflation and news about production levels, indicating that stock markets respond strongly to economic surprises.

Chen et al. (1986) extended the analysis by incorporating multiple macroeconomic factors, including industrial production, risk premiums, and spreads on debt instruments, in relation to the US stock markets. Their findings show that unexpected changes in macroeconomic factors greatly affect stock market returns, highlighting the benefits of using multiple factors instead of just one, which is better for these types of studies.

Lee (1992) used a different approach to test several macroeconomic variables against the stock markets in the USA, which included interest rates, real economic activity, and inflation. The author discovered that the returns of the shares occurred before changes in real economic activity and inflation, suggesting that the stock market in the USA might predict these economic factors.

2.4. Summary of the Literature (Emerging Markets)

Although studies that test the relationship between macroeconomic variables and stock returns in a country usually test common factors, one can assume that the findings or the significance of the findings could vary due to the way emerging markets are expected to behave. According to the input provided by the International Finance Corporation (IFC) (1988), emerging markets, due to their distinct characteristics relative to developed markets, tend to showcase political instability, currency fluctuations, and inadequate regulatory frameworks, implying that they are expected to be riskier than their developed counterparts. Accordingly, an analysis of past literature regarding the behavior of other developing countries and their stock markets is to be compared to Türkiye in the later parts of this thesis.

Goriaev & Zobotkin (2006) utilized the Russian stock market as a basis for their study and found that it is significantly affected by changes in global stock market index levels, oil prices, and liquidity measures enacted by the Russian state. In addition, the authors recommended using dynamic models in such studies due to the fact that Russia, like other emerging markets, is exposed to higher volatility and changing structures.

Mangani (2011) studied the South African stock market by focusing on the effects of monetary policy on the JSE with a VAR framework and found that changes in monetary policy were significant on the returns of the stock market. Explicitly, the study has presented that as monetary policy without prior notice became more conservative, i.e., increases in the interest rate set by the central bank, stock prices were negatively affected. This finding can be understood in two ways: first, the South African stock market is strongly sensitive to the monetary policy of its country, implying that the trustworthiness of its central bank is action-dependent; second, tightened monetary policy deters investors from buying equities.

Basu & Chawla (2012) used APT on the Indian stock market and found similar results to previous studies: the most influential factors in the returns of Indian stocks were changes in the stock market indices and inflation. Like Chen et al. (1986), the authors emphasized the importance of using multifactor models in the study to capture systematic risks as a result of the volatile environment of India, one of the two largest emerging markets in the world.

Lastly, Ramos et al. (2016) picked Brazil as their country of choice with its BOVESPA index. The findings of their study emphasized that both internal and external economic factors were significant, such as exchange rate changes. They, accordingly, suggested that heightened movements in the F/X rate had a severe impact on the returns of Brazilian stocks, even more so than the macroeconomic variables used in the study, demonstrating the importance of the currency risk in emerging markets.

Overall, while different factors affect the stock indices of different countries to different levels of significance, there is some relative common ground between developed and developing countries, implying that the stock markets around the world are either interconnected to a certain extent or are exposed to common macroeconomic risk factors, independent of their size and development.

2.5. Summary of the Literature (Türkiye)

Although demand for Turkish equities, especially by local investors, is on an upward trajectory, the academic literature on Turkish stocks or the overall Turkish stock market is severely limited in numbers relative to other developing markets.

Muradoglu & Metin (1995) published one of the first studies to test the relationship between returns of Turkish stocks and Türkiye's macroeconomic variables, especially with respect to monetary variables, using a cointegration approach. The authors found long-term equilibrium relationships between interest rates, money supply, budget deficits, and stock prices. In addition, they also underlined the importance of considering structural changes when analyzing the relationship between stock prices and macroeconomic variables, as it can affect market behavior over overtime.

Building on the previous study, Muradoglu et al. (1996) further studied the links between stock prices and macroeconomic variables using the Engle-Granger two-step approach and Johansen's maximum likelihood method and found, similar to the previous study, strong evidence of cointegration. This supports the idea that the stock market in Türkiye is influenced by the macroeconomic profile of the country.

Later, Muradoglu et al. (2000) provided one of the more comprehensive studies related to returns in the Turkish stock market and how it is affected by Türkiye's macroeconomic characteristics. The authors used vector autoregression and causality tests in their study and discovered that changes in stock prices and inflation in Türkiye affect each other, suggesting that there is a two-way relationship between what people expect from the stock market and the country's monetary policy. However, they observed that the relationship was not stable over time and was severely affected by changes in policy and financial crises, revealing that such structural breaks can significantly affect the nature and strength of these relationships.

Erdogan & Ozlale (2005) used a special statistical model that changes over time and found that a large part of the changes in stock returns in Türkiye can be explained by economic factors, especially when the stock market is very unstable. This finding further

bolsters the basis of our study, implying that the macroeconomic profile of Türkiye has an effect on how its stock market behaves.

Using a different approach from most studies in this section, Gök & Çiftçi (2017) present the impact of politics and political risks on the returns of BIST. The authors are able to show that an increase in perception of political risk in Türkiye has a statistically significant and negative relationship with the returns of the stock market, implying that, in an emerging market like Türkiye, politics can be considered a systematic source of risk and affect investor sentiment to a large extent.

In a relatively recent study, Aydoğan & Uslu (2021) utilized a wavelet coherence analysis to test the effect of changes in F/X rates in Türkiye on stock prices in Türkiye. In periods of severe volatility and worsening financial conditions, they have a significant negative correlation, but this relation is not consistently stable over time and is shown to be a time-dependent determinant whose effect peaks in times of financial crises.

Although many studies have provided insightful results on how the Turkish stock market behaves over time in relation to changes in its macroeconomic variables, they do not reflect the many changes that occurred in Türkiye during the 21st century, such as the 2017 constitutional referendum, the COVID-19 pandemic, and the persistently high inflationary period after the start of the COVID-19 pandemic.

2.6. Summary of the Literature Review

A summary of the previously reviewed literature is provided to present repeating themes and common findings across studies conducted in Türkiye, emerging markets, and developed markets.

In both developed and developing markets around the world, inflation, interest rates, industrial production levels, and changes in exchange rates were consistently presented as significant to the returns of stock markets in many different countries. One could assume that they were consistently present because they reflect how an individual

investor/corporation expects the economy's state to be in future periods, changing how and where they employ capital.

In addition, especially emerging markets show strong sensitivity to global market mechanisms, such as changes in commodity prices (mainly oil in most studies) and international stock market indices such as the MSCI Emerging Markets Index.

Several studies that focused on Türkiye have shown a feedback mechanism between stock prices and macroeconomic variables, where economic conditions influence stock prices, and conversely, shifts in investor behavior and sentiment impact macroeconomic variables.

However, how political changes, financial crises, and significant non-financial events in a country like Türkiye affect the strength and relationship between stock market returns and macroeconomic variables are only tested in a small number of studies that do not cover the latest periods of change in the country, indicating a major gap in current research.

To conclude the literature review subsection of the thesis, a summary of the key findings of the literature referenced is provided in Table 2.1.

Table 2.1. Key Findings of the Past Literature

Author(s) & Year	Region	Methodology	Key Findings
Fama (1981)	USA	OLS Regression	The study found a significant negative relationship between inflation and stock market returns, challenging the idea of stocks as an inflation hedge.
Pearce (1983)	USA	Regression Analysis	The study found that stock prices react significantly to unexpected economic news, particularly surprises in inflation and production levels.
Chen, Roll & Ross (1986)	USA	APT / Multi-factor Model	The study demonstrated how systematic risks, such as unexpected changes in macroeconomic factors

			like industrial production and risk premiums, significantly impact stock returns.
Lee (1992)	USA	Causality Tests	The study discovered a causal relationship where stock returns lead (i.e., predict) changes in real economic activity and inflation.
Goriaev & Zabotkin (2006)	Russia	OLS Regression	The study found that the Russian stock market is significantly affected by global factors like world stock indices and oil prices, as well as domestic liquidity.
Mangani (2011)	South Africa	VAR	The study showed that monetary policy is not neutral; specifically, unexpected increases in the policy interest rate have a significant negative impact on stock returns.
Basu & Chawla (2012)	India	APT / Multi-factor Model	The study found that stock market indices and inflation were the most influential factors driving Indian stock returns, emphasizing the use of multi-factor models.
Ramos et al. (2016)	Brazil	Econometric Modeling	The study demonstrated that exchange rate volatility is a primary source of systematic risk for the Brazilian market, with its impact intensifying during crises.
Muradoglu & Metin (1995)	Türkiye	Cointegration Analysis	The study established the existence of long-term equilibrium relationships between monetary variables and stock prices.
Muradoglu et al. (1996)	Türkiye	Cointegration Tests	The study confirmed strong evidence of cointegration between macroeconomic variables and stock prices using multiple methods.
Muradoglu et al. (2000)	Türkiye	VAR / Causality Tests	The study discovered a two-way causal relationship between stock

			prices and inflation and noted that these relationships were unstable.
Erdogan & Ozlale (2005)	Türkiye	Time-Varying Model	The study found that the explanatory power of economic factors on stock returns increases significantly during periods of high market instability.
Gök & Çiftçi (2017)	Türkiye	Regression Analysis	The study demonstrated that political risk has a statistically significant and negative effect on Borsa Istanbul returns, acting as a systematic risk factor.
Aydoğan & Uslu (2021)	Türkiye	Wavelet Coherence Analysis	The study indicated that the negative relationship between the exchange rate and stock prices is dynamic and time-dependent, intensifying during periods of financial stress.

DATA AND METHODOLOGY

In this study, the work is done using monthly time-series data from BIST, the XU100, selected macroeconomic indicators from Türkiye, global stock indices, the MSCI Emerging Markets Index to represent markets with similar dynamics, and the MSCI World Index to represent developed markets.

The period that this study covers is from June 2009 to December 2024, comprising on the lower hand 125 up to 187 monthly observations after filtering according to a predetermined set of criteria, which are applied to transform and merge to generate four different datasets of interest for the study.

All of the aforementioned monthly observations were collected on a monthly basis according to release cycles and formats and did not require recalculation to fit into the dataset.

3.1. Dependent Variables

- The Turkish Stock Market Index: XU100

The dependent variable of choice for this study is the log-adjusted monthly stock market return of Türkiye's most famous stock market index, XU100, sourced from Eikon of LSEG Data & Analytics, formerly Refinitiv, representing roughly the 100 largest and highest trade volume companies available on BIST to act as a proxy of Türkiye's stock market performance. Log returns were calculated from end-of-month closing levels of the index using the following formula.

$$R_t = \ln \left(\frac{XU100_t}{XU100_{t-1}} \right) \quad (3.1)$$

where $XU100_t$ shows the end-of-month close index level of the XU100 index at t , $XU100_{t-1}$ shows the end-of-month close index level of the XU100 index at $t - 1$, the previous month.

3.2. Independent Variables

3.2.1. Financial Independent Variables

- The Exchange Rate: USD/TRY

The independent variable of choice as a proxy for the exchange rate for this study is the log-adjusted monthly changes in the USD/TRY exchange rate, sourced from Eikon of LSEG Data & Analytics, formerly Refinitiv, based on the end-of-month bid levels, which is calculated as follows.

$$R_t = \ln \left(\frac{USD/TRY_t}{USD/TRY_{t-1}} \right) \quad (3.2)$$

where USD/TRY_t shows the end-of-month bid level of the USD/TRY exchange rate at t , USD/TRY_{t-1} shows the end-of-month bid level of the USD/TRY exchange rate at $t - 1$, the previous month.

- Developed Markets Stock Market Index: MSCI World

The independent variable of choice as a proxy for developed countries' stock markets for this study is the log-adjusted monthly returns on the MSCI World Price Index in USD, sourced from Eikon of LSEG Data & Analytics, formerly Refinitiv, based on the end-of-month closing levels of the index, which are calculated as follows.

$$R_t = \ln \left(\frac{MSCIWorld_t}{MSCIWorld_{t-1}} \right) \quad (3.3)$$

where $MSCIWorld_t$ shows the end-of-month close index level of the MSCI World index at t , $MSCIWorld_{t-1}$ shows the end-of-month close index level of the MSCI World index at $t - 1$, the previous month.

- Emerging Markets Stock Market Index: MSCI Emerging Markets

The independent variable of choice as a proxy for emerging countries' stock markets for this study is the log-adjusted monthly returns on the MSCI Emerging Markets Price Index in USD, sourced from Eikon of LSEG Data & Analytics, formerly Refinitiv, based on the closing levels of the index at the end of the month, which are calculated as follows.

$$R_t = \ln \left(\frac{MSCIEmergingMarkets_t}{MSCIEmergingMarkets_{t-1}} \right) \quad (3.4)$$

where $MSCIEmergingMarkets_t$ shows the end-of-month closing index level of the MSCI Emerging Markets index at t , $MSCIEmergingMarkets_{t-1}$ shows the end-of-month close index level of the MSCI Emerging Markets index at $t - 1$, the previous month.

- Gold

The independent variable of choice as a proxy for gold for this study is the log-adjusted monthly changes in the XAU/USD exchange rate, obtained from Eikon of LSEG Data & Analytics, formerly Refinitiv, based on the end-of-month bid levels, which is calculated as follows.

$$R_t = \ln \left(\frac{XAU/USD_t}{XAU/USD_{t-1}} \right) \quad (3.5)$$

where XAU/USD_t shows the end-of-month bid level of the XAU/USD exchange rate at t , XAU/USD_{t-1} shows the end-of-month bid level of the XAU/USD exchange rate at $t - 1$, the previous month.

- Bitcoin

The independent variable of choice as a proxy for Bitcoin, the most well-known cryptocurrency in the world, for this study is the log-adjusted monthly changes in the BTC/USD exchange rate, sourced from Eikon of LSEG Data & Analytics, formerly Refinitiv, based on the end-of-month bid levels, which are calculated as follows.

$$R_t = \ln \left(\frac{BTC/USD_t}{BTC/USD_{t-1}} \right) \quad (3.6)$$

where BTC/USD_t shows the end-of-month bid level of the BTC/USD exchange rate at t , BTC/USD_{t-1} shows the end-of-month bid level of the BTC/USD exchange rate at $t - 1$, the previous month.

- Brent Oil

The independent variable of choice as a proxy for oil prices for this study is the log-adjusted monthly changes in Brent crude prices, sourced from Eikon of LSEG Data & Analytics, formerly Refinitiv, based on closing levels at the end of the month, which are calculated as follows.

$$R_t = \ln \left(\frac{LCOQ5_t}{LCOQ5_{t-1}} \right) \quad (3.7)$$

where $LCOQ5_t$ shows the end-of-month closing price of Brent Crude at t , $LCOQ5_{t-1}$ shows the end-of-month closing price of Brent Crude at $t - 1$, the previous month.

3.2.2. Macroeconomic Independent Variables

- The Unemployment Rate

The unemployment rate in Türkiye, sourced from Eikon of LSEG Data & Analytics, formerly Refinitiv, was included to test whether labor market conditions have an effect on returns on its national stock exchange. The unemployment rate was obtained as

decimal percentages and, to maintain consistency between variables, its logarithmic conversion was different to calculate the monthly dynamics as $UnempLogChange_t = \ln(UR_{dec,t}) - \ln(UR_{dec,t-1})$.

- M2 Monetary Base

To proxy an indicator of liquidity for the Turkish economy, the M2 money supply was included and sourced from CBRT. The logarithmic change of the change was calculated as $M2LogChange_t = \ln(M2L_t) - \ln(M2L_{t-1})$.

- The Discount Rate

To proxy for the CBRT's monetary policy stance, the discount rate, sourced from FRED, was utilized and, like the unemployment rate, was different to calculate the changes over the month for consistency as $DiscLogChange_t = \ln(DR_{dec,t}) - \ln(DR_{dec,t-1})$.

- The Industrial Production Index

To proxy for Türkiye's industrial sector's dynamics, the IPI's change both as a month-over-month and year-over-year data was sourced from Eikon of LSEG Data & Analytics, formerly Refinitiv, and, to ensure that it is consistent with other dependent and independent variables of the rate of change, it was transformed into logarithmic changes as $\Delta \ln IPI_t = \ln(1 + g_{IPI,t})$.

- The Consumer Price Index

To include inflation in the study, both monthly and annual changes in the CPI were sourced from TÜİK and converted the logarithmic change to $\Delta \ln CPI_t = \ln(1 + \pi_t)$ to ensure consistency with other variables in the model.

3.2.3. Dummy Independent Variables

To understand whether non-financial political changes that affected Türkiye changed the significance or direction of the relationship between the aforementioned dependent and independent variables, three dummy variables are constructed to test this inquiry.

- The Coup Attempt of July 2016

A dummy variable on a step basis that takes the value 1 from July 2016 onward and 0 before the month is generated to determine whether the effect of the coup attempt and subsequent decisions by the government regarding the attempt affected the findings of the study.

- The Constitutional Referendum of April 2017

A dummy variable on a step basis that takes the value 1 starting from April 2017 onward and 0 before the month is generated to seize whether the effect of the constitutional referendum, in which the Turkish public voted to abolish the parliamentary system for a presidential republic system, had an effect on the study's potential findings.

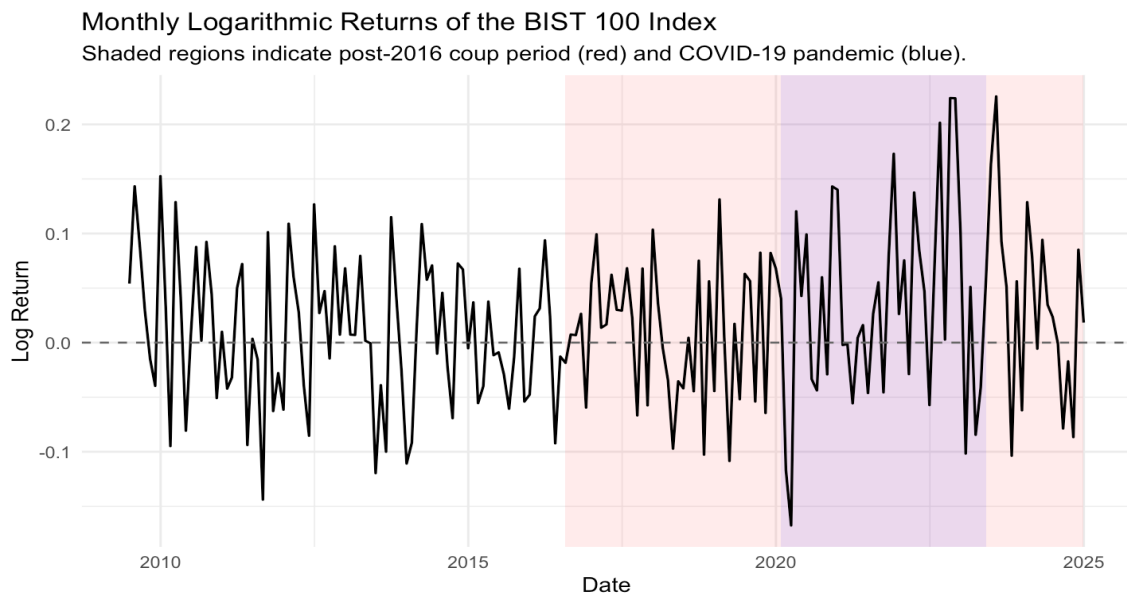
- The COVID-19 Pandemic

A dummy variable on a step basis that takes the value 1 starting from January 2020, when the World Health Organization determined that COVID-19 was a public health emergency of international concern, until May 2023, and 0 after, is generated to seize whether the effect of the global pandemic had an effect on the relationship of stock market returns and macroeconomic indicators.

To visualize the dummy variables, Figure 3.1 is provided to present the log-returns of the XU100, where periods that are included in the data set in the form of dummy variables are colored. The figure, to some extent, can indicate volatility clustering, periods of high

volatility following periods of high volatility (Mandelbrot, 1963), such as during the COVID-19 pandemic (shown as blue in the figure). The dummy variable generated to account for the 2017 constitutional referendum is not visually included in Figure 1, as its time frame is wholly covered by the dummy variable representing the coup attempt in 2016.

Figure 3.1. Monthly Logarithmic Returns of the XU100 Index



3.3. Data Preparation

All data preparation and presentation performed and provided for the study was done using the R programming language. Within its capabilities, four separate datasets were constructed by incorporating the dependent variables mentioned above to different extents:

- `dfMomWithBtc_AllDummies`

This data set includes all dummy variables, month-over-month changes in the industrial production index and the consumer price index, and Bitcoin.

- `dfYoyWithBtc_AllDummies`

This data set includes all dummy variables, year-over-year changes in the industrial production index and the consumer price index, and Bitcoin.

- `dfMomNoBtc_AllDummies`

This data set includes all dummy variables, month-over-month changes in the industrial production index and consumer price index, and excludes Bitcoin.

- `dfYoyNoBtc_AllDummies`

This data set includes all dummy variables, year-over-year changes in the industrial production index and consumer price index, and excludes Bitcoin.

The reason for the separation into four different datasets is that the thesis sought to analyze the data with and without Bitcoin, since the data provider for this study only included end-of-month BTC/USD bid levels starting from July 2014, to assess whether it could be academic inspiration for further investigation, and to analyze the data with month-over-month and year-over-year changes in the consumer price index and the industrial production index of Türkiye separately to see whether short- or long-term trends in these data are more relevant.

Four tables that are created that summarize the relevant statistical measures of the datasets are provided in the next two pages, starting with Table 3.1 (`dfMomWithBtc_AllDummies`), Table 3.2 (`dfYoyWithBtc_AllDummies`), Table 3.3 (`dfMomNoBtc_AllDummies`), and Table 3.4 (`dfYoyNoBtc_AllDummies`), consecutively. The list of summary statistics provided includes the sample size of time series data (N), the mean, median, sample standard deviation, and the minimum and maximum values within the sample of each variable.

Table 3.1. Summary Statistics (MoM IPI & CPI, Incl. BTC, All Dummies)

Statistic	N	Mean	Median	St. Dev.	Min	Max
XU100	126	0.020	0.021	0.075	−0.168	0.226
USD/TRY	126	0.022	0.015	0.054	−0.082	0.339
MSCI World	126	0.006	0.012	0.043	−0.145	0.119
MSCI Emerging Markets	126	0.0002	0.002	0.049	−0.170	0.137
Brent Crude	126	−0.003	0.009	0.119	−0.798	0.335
Gold	126	0.005	0.0002	0.040	−0.085	0.103
Bitcoin	125	0.041	0.042	0.208	−0.529	0.533
Unemployment Rate	126	−0.001	0.000	0.039	−0.219	0.124
M2	126	0.023	0.021	0.028	−0.038	0.169
Discount Rate	126	0.012	0.000	0.127	−0.414	0.749
Industrial Production Index	126	0.003	0.011	0.118	−0.380	0.303
Consumer Price Index	126	0.019	0.013	0.022	−0.015	0.127
Coup Attempt Step Dummy	126	0.810	1	0.394	0	1
Referendum Step Dummy	126	0.738	1	0.441	0	1
COVID-19 Step Dummy	126	0.325	0	0.470	0	1

Table 3.2. Summary Statistics (YoY IPI & CPI, Incl. BTC, All Dummies)

Statistic	N	Mean	Median	St. Dev.	Min	Max
XU100	126	0.020	0.021	0.075	−0.168	0.226
USD/TRY	126	0.022	0.015	0.054	−0.082	0.339
MSCI World	126	0.006	0.012	0.043	−0.145	0.119
MSCI Emerging Markets	126	0.0002	0.002	0.049	−0.170	0.137
Brent Crude	126	−0.003	0.009	0.119	−0.798	0.335
Gold	126	0.005	0.0002	0.040	−0.085	0.103
Bitcoin	125	0.041	0.042	0.208	−0.529	0.533
Unemployment Rate	126	−0.001	0.000	0.039	−0.219	0.124
M2	126	0.023	0.021	0.028	−0.038	0.169

Discount Rate	126	0.012	0.000	0.127	−0.414	0.749
Industrial Production Index	126	0.035	0.032	0.085	−0.377	0.507
Consumer Price Index	126	0.221	0.138	0.173	0.064	0.618
Coup Attempt Step Dummy	126	0.810	1	0.394	0	1
Referendum Step Dummy	126	0.738	1	0.441	0	1
COVID-19 Step Dummy	126	0.325	0	0.470	0	1

Table 3.3. Summary Statistics (MoM IPI & CPI, Excl. BTC, All Dummies)

Statistic	N	Mean	Median	St. Dev.	Min	Max
XU100	179	0.016	0.014	0.074	−0.168	0.226
USD/TRY	179	0.018	0.013	0.049	−0.082	0.339
MSCI World	179	0.007	0.012	0.043	−0.145	0.119
MSCI Emerging Markets	179	0.001	0.002	0.051	−0.170	0.137
Brent Crude	179	0.0002	0.010	0.105	−0.798	0.335
Gold	179	0.005	0.001	0.044	−0.117	0.114
Unemployment Rate	179	−0.003	0.000	0.037	−0.219	0.124
M2	179	0.020	0.017	0.024	−0.038	0.169
Discount Rate	179	0.007	0.000	0.112	−0.414	0.749
Industrial Production Index	179	0.004	0.008	0.109	−0.380	0.303
Consumer Price Index	179	0.015	0.010	0.020	−0.015	0.127
Coup Attempt Step Dummy	179	0.570	1	0.496	0	1
Referendum Step Dummy	179	0.520	1	0.501	0	1
COVID-19 Step Dummy	179	0.229	0	0.421	0	1

Table 3.4. Summary Statistics (YoY IPI & CPI, Excl. BTC, All Dummies)

Statistic	N	Mean	Median	St. Dev.	Min	Max
XU100	187	0.018	0.017	0.074	−0.168	0.226
USD/TRY	187	0.017	0.013	0.049	−0.082	0.339

MSCI World	187	0.007	0.012	0.043	−0.145	0.119
MSCI Emerging Markets	187	0.002	0.002	0.051	−0.170	0.137
Brent Crude	187	0.001	0.010	0.103	−0.798	0.335
Gold	187	0.005	0.001	0.045	−0.117	0.121
Unemployment Rate	187	−0.003	0.000	0.037	−0.219	0.124
M2	187	0.020	0.017	0.024	−0.038	0.169
Discount Rate	187	0.005	0.000	0.111	−0.414	0.749
Industrial Production Index	187	0.041	0.039	0.080	−0.377	0.507
Consumer Price Index	187	0.173	0.098	0.158	0.039	0.618
Coup Attempt Step Dummy	187	0.545	1	0.499	0	1
Referendum Step Dummy	187	0.497	0	0.501	0	1
COVID-19 Step Dummy	187	0.219	0	0.415	0	1

According to Tables 3.1 and 3.2, comprising 126 monthly observations from July 2014 until December 2024 (125 for Bitcoin, since the first return data are calculated for August 2014), the BIST main index had an average logarithmic return of approximately 2.00% with a standard deviation of around 7.50%. During the period, Bitcoin was both the asset with the highest mean return of 4.10% and with the highest standard deviation of around 20.80%.

In Table 3.1, the main macroeconomic variables to be considered include a mean 2.20% month-over-month depreciation of the TRY against the USD, an average 1.90% month-over-month log increase in CPI, and a low 0.30% month-over-month log increase in the IPI. The main difference between Tables 3.1 and 3.2 is, as expected from a country with high economic volatility, in the IPI and CPI macroeconomic independent variables. Unlike the month-over-month IPI, the year-over-year log change averaged around 3.50%, while the year-over-year CPI log increase shows a significantly larger average of around 22.10%. For both data sets, including Bitcoin, the dummy variables cover around 81% for the 2016 coup attempt, 73.80% for the 2017 constitutional referendum, and 32.50% for COVID-19, respectively.

Excluding Bitcoin from the independent variables expands the size of the sample data to 179 for month-over-month CPI and IPI data and to 187 for year-over-year variants. In Table 3.3, the XU100 index averages a monthly logarithmic return that is slightly lower, around 1.60%, with a volatility of approximately 7.40%. The depreciation of the TRY against the USD showcases a similar trend of around 1.80%. Both CPI and IPI are in ranges similar to the previous datasets, lying at 1.50% and 0.40%, respectively. Due to the extended sample period, the dummy variables cover a relatively smaller part of the data set: 57.00% of the data lie after the 2016 coup attempt, 52.00% of them are after the 2017 constitutional referendum, and approximately 22.90% of them are within the aforementioned COVID-19 period.

In Table 3.4, the largest sample available in this study can be observed with 187 observations using year-over-year changes of CPI and IPI, exclusive of Bitcoin. The mean log-change of XU100 is similar, around 1.80%, with the same volatility of approximately 7.40%. The year-over-year log changes in CPI and IPI indicate an annual inflation of 17.30% and a growth in industrial production of 4.10%, respectively. The dummy variables are again adjusted and cover around 54.50% for the post-coup attempt, 49.70% for the post-referendum, and 21.90% during the COVID-19 periods, respectively.

3.4. Model Preparation

Before the preparation of the statistical model to address the main question of this study, all time series dependent and independent variables should be tested to determine whether they are stationary or non-stationary.

This is an important step prior to the analysis because non-stationary data in a test could be indicative of a relationship even if it does not exist, a spurious result. The ADF test (Dickey & Fuller, 1979) is the choice of this study to address the aforementioned issue by testing the presence of a unit root in each time series data. If the null hypothesis of the ADF is accepted, the series has a unit root and is considered nonstationary.

Results generated as a result of applied ADF tests to all four separate datasets are presented in Tables 3.5 and 3.6. For almost all independent and dependent variables used

in the study, the tests yielded p-values with results less than 5%—the significance level to reject the null hypothesis. Accordingly, they are considered stationary, implying that the logarithmic returns or changes presented in the aforementioned subsection are effective.

However, there are outliers that must be addressed before the next step of the study. The year-over-year CPI logarithmic changes in both provided data sets were found to be nonstationary at p-values of 0.174 and 0.172, respectively. Moreover, the month-over-month CPI and the year-over-year IPI change were found to be non-stationary as a result of the ADF test in one of the data sets included, with p-values of 0.057 and 0.069, respectively.

Table 3.5. Stationarity Test Results (ADF): Financial & Commodity Variables

	XU100	USD/TRY	MSCI World	MSCI Emerging Markets	Brent Crude	Gold	Bitcoin
ADF Stat. (MoM, BTC)	-5.377	-5.912	-5.056	-4.681	-5.976	-4.978	-4.417
P-Value (MoM, BTC)	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ADF Stat. (YoY, BTC)	-5.377	-5.912	-5.056	-4.681	-5.976	-4.978	-4.417
P-Value (YoY, BTC)	0.010	0.010	0.010	0.010	0.010	0.010	0.010
ADF Stat. (MoM, No BTC)	-5.447	-5.842	-5.787	-5.186	-5.455	-4.731	-
P-Value (MoM, No BTC)	0.010	0.010	0.010	0.010	0.010	0.010	-
ADF Stat. (YoY, No BTC)	-5.379	-5.987	-6.110	-5.517	-5.634	-5.084	-
P-Value (YoY, No BTC)	0.010	0.010	0.010	0.010	0.010	0.010	-

Note: A dash (-) indicates the variable was not included in that particular data set specification.

Table 3.6. Stationarity Test Results (ADF): Domestic Macroeconomic Indicators

	Unemployment Rate	M2	Discount Rate	Industrial Production Index (MoM)	Industrial Production Index (YoY)	Consumer Price Index (MoM)	Consumer Price Index (YoY)
ADF Stat. (MoM, BTC)	-4.768	-4.727	-4.473	-7.597	-	-3.550	-
P-Value (MoM, BTC)	0.010	0.010	0.010	0.010	-	0.041	-
ADF Stat. (YoY, BTC)	-4.768	-4.727	-4.473	-	-3.336	-	-2.967
P-Value (YoY, BTC)	0.010	0.010	0.010	-	0.069	-	0.174
ADF Stat. (MoM, No BTC)	-5.404	-4.534	-5.110	-8.357	-	-3.398	-
P-Value (MoM, No BTC)	0.010	0.010	0.010	0.010	-	0.057	-
ADF Stat. (YoY, No BTC)	-5.450	-4.615	-5.241	-	-4.181	-	-2.967
P-Value (YoY, No BTC)	0.010	0.010	0.010	-	0.010	-	0.172

Note: A dash (-) indicates the variable was not included in that particular data set specification.

Table 3.7. Final Stationarity Test P-Values: Financial Variables

	XU100	USD/TR Y	MSCI World	MSCI Emerging Markets	Brent Crude	Gold	Bitcoin
P-Value (MoM, BTC)	0.010	0.010	0.010	0.010	0.010	0.010	0.010
P-Value (YoY, BTC)	0.010	0.010	0.010	0.010	0.010	0.010	0.010
P-Value (MoM, No BTC)	0.010	0.010	0.010	0.010	0.010	0.010	-
P-Value (YoY, No BTC)	0.010	0.010	0.010	0.010	0.010	0.010	-

Note: A dash (-) indicates the variable was not included in that particular data set specification.

Table 3.8. Final Stationarity Test P-Values: Macroeconomic Variables

	Consumer Price Index (MoM)	Consumer Price Index (YoY)	Discount Rate	Industrial Productio n Index (MoM)	Industrial Productio n Index (YoY)	M2	Unemploy ment Rate
P-Value (MoM, BTC)	0.010	-	0.010	0.010	-	0.010	0.010
P-Value (YoY, BTC)	-	0.032	0.010	-	0.010	0.010	0.010
P-Value (MoM, No BTC)	0.010	-	0.010	0.010	-	0.010	-
P-Value (YoY, No BTC)	-	0.010	0.010	-	0.010	0.010	-

Note: A dash (-) indicates the variable was not included in that particular data set specification.

As a result of using the first differences of the three independent variables with unit roots, the study ensures that all time series used are stationary and can proceed without the risk of spurious correlations and/or regressions.

Afterwards, to find out if there are any potential multicollinearity issues among the independent variables among all four datasets, correlation matrices are generated, as high correlation between the potential predictors can minimize the effect of regression estimates and prevent the study from providing insights and interpretation. The results are present in Tables 3.9 to 3.16.

There are only two instances where the correlations between the independent variables are greater than an absolute value of 0.70, indicating potential multicollinearity (Hair et al., 2010): the correlation between the logarithmic returns of the equity indices (from 0.75 to 0.79) and the dummy variables of the 2016 coup attempt and the 2017 presidential referendum (0.81 to 0.91).

Excluding these cases, other independent variables show relatively low levels of correlation, implying that they can be used without multicollinearity concerns. For independent variables that exhibit high levels of correlation, a decision must be made to exclude one of the two in the upcoming models.

Table 3.9. Correlation of Financial Variables (MoM, Incl. BTC)

Variable	USD/TRY	MSCI World	MSCI Emerging Markets	Brent Crude	Gold	Bitcoin
USD/TRY	1.00	-0.06	-0.19	-0.11	-0.17	-0.06
MSCI World	-0.06	1.00	0.75	0.46	0.13	0.36
MSCI Emerging Markets	-0.19	0.75	1.00	0.42	0.33	0.21
Brent Crude	-0.11	0.46	0.42	1.00	0.01	0.18
Gold	-0.17	0.13	0.33	0.01	1.00	0.08
Bitcoin	-0.06	0.36	0.21	0.18	0.08	1.00

Table 3.10. Correlation of Corrected Macro and Dummy Variables (MoM, Incl. BTC)

Variable	Unemployment Rate	M2	Discount Rate	Industrial Production Index (MoM)	Consumer Price Index (MoM)	Coup Attempt Step Dummy	Referendum Step Dummy	COVID-19 Step Dummy
Unemployment Rate	1.00	-0.03	-0.05	-0.21	0.02	-0.04	-0.07	-0.11
M2	-0.03	1.00	-0.09	-0.04	0.12	0.20	0.22	0.25
Discount Rate	-0.05	-0.09	1.00	-0.08	-0.10	0.07	0.08	-0.04
Industrial Production Index (MoM)	-0.21	-0.04	-0.08	1.00	-0.02	-0.01	-0.01	-0.01
Consumer Price Index (MoM)	0.02	0.12	-0.10	-0.02	1.00	0.00	0.00	-0.01
Coup Attempt Step Dummy	-0.04	0.20	0.07	-0.01	0.00	1.00	0.81	0.33
Referendum Step Dummy	-0.07	0.22	0.08	-0.01	0.00	0.81	1.00	0.41
COVID-19 Step Dummy	-0.11	0.25	-0.04	-0.01	-0.01	0.33	0.41	1.00

Table 3.11. Correlation of Financial Variables (YoY, Incl. BTC)

Variable	USD/TRY	MSCI World	MSCI Emerging Markets	Brent Crude	Gold	Bitcoin
USD/TRY	1.00	-0.06	-0.19	-0.11	-0.17	-0.06
MSCI World	-0.06	1.00	0.75	0.46	0.13	0.36
MSCI Emerging Markets	-0.19	0.75	1.00	0.42	0.33	0.21
Brent Crude	-0.11	0.46	0.42	1.00	0.01	0.18
Gold	-0.17	0.13	0.33	0.01	1.00	0.08
Bitcoin	-0.06	0.36	0.21	0.18	0.08	1.00

Table 3.12. Correlation of Corrected Macro and Dummy Variables (YoY, Incl. BTC)

Variable	Unemployment Rate	M2	Discount Rate	Industrial Production Index (YoY)	Consumer Price Index (YoY)	Coup Attempt Step Dummy	Referendum Step Dummy	COVID-19 Step Dummy
Unemployment Rate	1.00	-0.03	-0.05	0.00	0.02	-0.04	-0.07	-0.11
M2	-0.03	1.00	-0.09	-0.11	0.02	0.20	0.22	0.25
Discount Rate	-0.05	-0.09	1.00	-0.11	0.15	0.07	0.08	-0.04
Industrial Production Index (YoY)	0.00	-0.11	-0.11	1.00	-0.02	0.01	0.00	-0.02
Consumer Price Index (YoY)	0.02	0.02	0.15	-0.02	1.00	0.05	0.04	0.09
Coup Attempt Step Dummy	-0.04	0.20	0.07	0.01	0.05	1.00	0.81	0.33
Referendum Step Dummy	-0.07	0.22	0.08	0.00	0.04	0.81	1.00	0.41
COVID-19 Step Dummy	-0.11	0.25	-0.04	-0.02	0.09	0.33	0.41	1.00

Table 3.13. Correlation of Financial Variables (MoM, Excl. BTC)

Variable	USD/TRY	MSCI World	MSCI Emerging Markets	Brent Crude	Gold
USD/TRY	1.00	-0.18	-0.31	-0.15	-0.19
MSCI World	-0.18	1.00	0.79	0.48	0.14
MSCI Emerging Markets	-0.31	0.79	1.00	0.43	0.32
Brent Crude	-0.15	0.48	0.43	1.00	0.08
Gold	-0.19	0.14	0.32	0.08	1.00

Table 3.14. Correlation of Corrected Macro and Dummy Variables (MoM, Excl. BTC)

Variable	Unemployment Rate	M2	Discount Rate	Industrial Production Index (MoM)	Consumer Price Index (MoM)	Coup Attempt Step Dummy	Referendum Step Dummy	COVID-19 Step Dummy
Unemployment Rate	1.00	0.00	-0.05	-0.13	0.01	0.02	-0.01	-0.07
M2	0.00	1.00	-0.07	-0.01	0.10	0.28	0.29	0.29
Discount Rate	-0.05	-0.07	1.00	-0.06	-0.10	0.10	0.11	-0.01
Industrial Production Index (MoM)	-0.13	-0.01	-0.06	1.00	-0.03	-0.01	-0.01	-0.01
Consumer Price Index (MoM)	0.01	0.10	-0.10	-0.03	1.00	0.01	0.00	0.00
Coup Attempt Step Dummy	0.02	0.28	0.10	-0.01	0.01	1.00	0.90	0.47
Referendum Step Dummy	-0.01	0.29	0.11	-0.01	0.00	0.90	1.00	0.52
COVID-19 Step Dummy	-0.07	0.29	-0.01	-0.01	0.00	0.47	0.52	1.00

Table 3.15. Correlation of Financial Variables (YoY, Excl. BTC)

Variable	USD/TRY	MSCI World	MSCI Emerging Markets	Brent Crude	Gold
USD/TRY	1.00	-0.19	-0.32	-0.15	-0.18
MSCI World	-0.19	1.00	0.79	0.47	0.16
MSCI Emerging Markets	-0.32	0.79	1.00	0.43	0.32
Brent Crude	-0.15	0.47	0.43	1.00	0.09
Gold	-0.18	0.16	0.32	0.09	1.00

Table 3.16. Correlation of Corrected Macro and Dummy Variables (YoY, Excl. BTC)

Variable	Unemployment Rate	M2	Discount Rate	Industrial Production Index (YoY)	Consumer Price Index (YoY)	Coup Attempt Step Dummy	Referendum Step Dummy	COVID-19 Step Dummy
Unemployment Rate	1.00	-0.01	-0.06	0.01	0.04	0.00	-0.03	-0.08
M2	-0.01	1.00	-0.07	-0.09	0.02	0.28	0.30	0.30
Discount Rate	-0.06	-0.07	1.00	-0.12	0.13	0.11	0.12	0.00
Industrial Production Index (YoY)	0.01	-0.09	-0.12	1.00	-0.02	-0.01	-0.01	-0.02
Consumer Price Index (YoY)	0.04	0.02	0.13	-0.02	1.00	0.06	0.05	0.09
Coup Attempt Step Dummy	0.00	0.28	0.11	-0.01	0.06	1.00	0.91	0.48
Referendum Step Dummy	-0.03	0.30	0.12	-0.01	0.05	0.91	1.00	0.53
COVID-19 Step Dummy	-0.08	0.30	0.00	-0.02	0.09	0.48	0.53	1.00

To understand the potential relationship between macroeconomic indicators, financial variables, and the returns of the Turkish stock market, this study uses a two-step approach.

The first step in the analysis is done using a model estimated by OLS (Gujarati & Porter, 2009), a standard multiple linear regression model. It is defined below.

$$R_t = \beta_0 + \sum_{i=1}^k \beta_i X_{i,t-l} + \sum_{j=1}^m \gamma_j D_{j,t} + \epsilon_t \quad (3.8)$$

where:

- R_t is the logarithmic return of the BIST XU100 index at time t .
- β_0 is the constant (intercept) term.
- $X_{i,t-l}$ represents the vector of k independent macroeconomic and financial variables at time t , with a potential lag of l months.
- $D_{j,t}$ is the vector of m dummy variables used to test for structural breaks.
- β_i and γ_j are the regression coefficients to be estimated.

- ϵ_t is the error term at time t .

However, time series data, especially related to financial markets, have been shown to have variable volatility over time, forming clusters of volatility, where a portion of the sample exhibiting high volatility is usually followed by continued high volatility (Mandelbrot, 1963). This phenomenon means that the variance of the regression model error term is not stable over time, conditional heteroskedasticity (Engle, 1982).

To address both points by modeling returns (conditional mean) and volatility (conditional variance) at the same time, this study uses the GARCH framework, specifically the GARCH (1, 1) model (Bollerslev, 1986), as it is a common and strong approach for modeling and testing changes in asset prices in financial econometrics.

The model consists of two primary equations, one for the conditional mean and one for the conditional variance. The conditional mean equation to model the returns of the stock market is defined below as a linear function.

$$R_t = \beta_0 + \sum_{i=1}^k \beta_i X_{i,t-l} + \sum_{j=1}^m \gamma_j D_{j,t} + \epsilon_t \quad (3.9)$$

where:

- R_t is the logarithmic return of the BIST XU100 index at time t .
- β_0 is the constant (intercept) term.
- $X_{i,t-l}$ represents the vector of k independent macroeconomic and financial variables at time t , with a potential lag of l months to capture delayed effects. The optimal lag length will be determined using information criteria (e.g., AIC/BIC).
- $D_{j,t}$ is the vector of m dummy variables used to test for structural breaks.
- β_i and γ_j are the regression coefficients to be estimated.
- ϵ_t is the error term at time t , where $\epsilon_t = \sigma_t z_t$ and $z_t \sim N(0,1)$.

The conditional variance equation of the error term ($h_t = \text{Var}(\epsilon_t | \Omega_{t-1})$) to model the volatility by the aforementioned GARCH process is defined below as a linear function.

$$h_t = \omega + \alpha \epsilon_{t-1}^2 + \delta h_{t-1} \quad (3.10)$$

where ω , α , and δ are the parameters to be estimated. The term ϵ_{t-1}^2 is the ARCH term, representing news about volatility from the previous period, while h_{t-1} is the GARCH term, representing the forecast variance from the previous period. For the variance to be stable, conditions $\omega > 0$, $\alpha \geq 0$, and $\delta \geq 0$ must be met, together with the stationarity condition $\alpha + \delta < 1$



RESULTS AND EMPIRICAL FINDINGS

4.1. OLS Results and Empirical Findings

The initial analysis follows the models specified in the previous section and utilizes OLS. The results are presented in Tables 4.2–4.5, while the model diagnostics are provided in Table 4.1 to provide a fundamental understanding of the nature of the relationships between the independent variables and the returns of XU100 prior to the GARCH framework.

In every model presented using OLS, the MSCI World Index is shown to have a statistically significant and positive relationship with XU100 returns, with a p-value of less than 0.01. This consistent finding highlights the interconnectedness of the Turkish stock market with global stock market trends, reflecting what is happening around the most developed stock markets around the world.

Interestingly, in the sample that includes Bitcoin with month-over-month CPI and IPI changes, Bitcoin is weakly and negatively significant with a p-value of less than 0.10, possibly indicating a capital movement. as competing assets of investors in the Turkish stock market.

In models that exclude Bitcoin, the logarithmic change of USD/TRY is also statistically significant and negative on XU100 returns with a p-value of less than 0.05, meaning that the depreciation of the lira has a negative impact on the returns of the stock market in Türkiye, which can signal economic instability for a country with consistent current account deficits.

Furthermore, in the larger samples without Bitcoin, the logarithmic change in the money supply, M2, shows a relatively low significant positive relationship with a p-value of less than 0.10, indicating that increased liquidity can be positive on stock prices.

Other independent variables, although macroeconomic and/or financial, were not statistically significant on stock market returns in Türkiye in these OLS models. Furthermore, the dummy variables for the 2016 coup attempts and the COVID-19 pandemic period were not significant.

On the other hand, the power of the models, shown by the adjusted and -statistic measures, was shown to be strongly significant with values of from around 12.50% to 16.20% and values of p-values for the -statistic less than 0.01, implying that the independent variables of the models are together significant in explaining stock market returns in Türkiye.

To verify the robustness of the models, a number of diagnostic tests were used, shown in Table 4.1. The finding that is most relevant for the next part is that the models indicate heteroskedasticity. The p-values for the Breusch-Pagan test for all models were less than 0.01, rejecting the null hypothesis and showing a common characteristic of time series financial data: clustering of volatility, referenced in the previous section.

However, both the Breusch-Godfrey, meaning that there is no serious presence of autocorrelation, and the Jarque-Bera, meaning that the data likely follow a normal distribution, tests present positive results.

Overall, the OLS models supply the study with a baseline understanding of the significance of some independent variables of the sample data, but the significant presence of heteroskedasticity implies that the standard errors generated of the OLS coefficient can be biased and erratic. Therefore, this makes relying solely on the OLS difficult, which is why this study also uses a GARCH model to address this concern.

Table 4.1. Diagnostic Test Results for OLS Models

Model Specification	Heteroskedasticity (BP Test)	Serial Correlation (BG Test)	Normality of Residuals (JB Test)
Model 1 (MoM, Incl. BTC)	31.345 (0.0017)	10.133 (0.0715)	0.653 (0.7216)
Model 2 (YoY, Incl. BTC)	30.250 (0.0026)	8.315 (0.1397)	1.517 (0.4684)
Model 3 (MoM, Excl. BTC)	37.478 (0.0001)	10.432 (0.0639)	2.155 (0.3405)
Model 4 (YoY, Excl. BTC)	33.155 (0.0005)	7.804 (0.1674)	1.966 (0.3742)

Table reports the test statistic with the p-value in parentheses. For the Breusch-Godfrey test, serial correlation was tested up to 5 lags.

Figure 4.1. OLS Results (MoM, Incl. BTC)

	<i>Dependent variable:</i>
	BIST 100 Log Returns
usdTryLogReturn	-0.367 t = -1.537
msciWorldLogReturn	0.588*** t = 3.262
brentLogReturn	0.086 t = 1.410
goldLogReturn	-0.033 t = -0.190
btcLogReturn	-0.057* t = -1.711
unemploymentLogChange	0.071 t = 0.417
m2LogChange	0.754 t = 1.579
discountLogChange	0.011 t = 0.218
ipiMmLogChange	0.003 t = 0.049
cpiMmLogChange_diff	0.113 t = 0.310
coup2016StepDummy	0.009 t = 0.521
covidDummy	0.015 t = 1.007
Constant	-0.003 t = -0.191
Observations	125
R ²	0.210
Adjusted R ²	0.125
Residual Std. Error	0.071 (df = 112)
F Statistic	2.482*** (df = 12; 112)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Figure 4.2. OLS Results (YoY, Incl. BTC)

	<i>Dependent variable:</i>
	BIST 100 Log Returns
usdTryLogReturn	-0.349 t = -1.484
msciWorldLogReturn	0.629*** t = 3.555
brentLogReturn	0.066 t = 1.056
goldLogReturn	-0.004 t = -0.021
btcLogReturn	-0.053 t = -1.634
unemploymentLogChange	0.060 t = 0.363
m2LogChange	0.713 t = 1.499
discountLogChange	-0.005 t = -0.093
ipiYyLogChange_diff	-0.033 t = -0.339
cpiYyLogChange_diff	0.407 t = 1.555
coup2016StepDummy	0.009 t = 0.526
covidDummy	0.013 t = 0.905
Constant	-0.003 t = -0.207
Observations	125
R ²	0.227
Adjusted R ²	0.144
Residual Std. Error	0.070 (df = 112)
F Statistic	2.742*** (df = 12; 112)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Figure 4.3. OLS Results (MoM, Excl. BTC)

	<i>Dependent variable:</i>
	BIST 100 Log Returns
usdTryLogReturn	-0.405** t = -2.053
msciWorldLogReturn	0.517*** t = 3.640
brentLogReturn	0.060 t = 1.066
goldLogReturn	-0.118 t = -0.949
unemploymentLogChange	0.032 t = 0.226
m2LogChange	0.663* t = 1.660
discountLogChange	0.009 t = 0.183
ipiMmLogChange	0.008 t = 0.163
cpiMmLogChange.diff	0.114 t = 0.353
coup2016StepDummy	0.008 t = 0.673
covidDummy	0.017 t = 1.198
Constant	-0.001 t = -0.096
Observations	178
R ²	0.198
Adjusted R ²	0.145
Residual Std. Error	0.068 (df = 166)
F Statistic	3.719*** (df = 11; 166)
<i>Note:</i>	*p<0.1; **p<0.05; ***p<0.01

Figure 4.4. OLS Results (YoY, Excl. BTC)

<i>Dependent variable:</i>	
BIST 100 Log Returns	
usdTryLogReturn	-0.453** t = -2.387
msciWorldLogReturn	0.574*** t = 4.108
brentLogReturn	0.028 t = 0.483
goldLogReturn	-0.164 t = -1.397
unemploymentLogChange	0.048 t = 0.346
m2LogChange	0.711* t = 1.815
discountLogChange	-0.011 t = -0.227
ipiYyLogChange_diff	0.003 t = 0.041
cpiYyLogChange_diff	0.352 t = 1.451
coup2016StepDummy	0.007 t = 0.582
covidDummy	0.016 t = 1.089
Constant	0.0004 t = 0.051
Observations	186
R ²	0.212
Adjusted R ²	0.162
Residual Std. Error	0.068 (df = 174)
F Statistic	4.256*** (df = 11; 174)
<i>Note:</i> *p<0.1; **p<0.05; ***p<0.01	

4.2. GARCH Results and Empirical Findings

In this subsection, the GARCH models' outputs are presented in Table 4.6 to address the shortcomings of the OLS framework when working with time-series data, whose heteroskedasticity was confirmed in the previous subsection.

First, the suitability of the GARCH model is apparent in the parameters calculated according to the variance equation; in the four models, the GARCH term is highly significant with p-values less than 0.01, demonstrating momentum in volatility (past volatility is a robust predictor of actual volatility). Furthermore, both the sum of the ARCH term and the GARCH term, $\alpha + \beta$, are, in all models, close to 1, indicating that there is a persistence in volatility in XU100: the shocks to volatility in the Turkish stock market are long-lasting and substantiate why a GARCH approach is more suitable to address the main question of the study. Furthermore, the use of the skewed Student's t-distribution is also shown to be appropriate to understand the nature of the XU100's returns, based on the significance of the skew and shape parameters.

On the other hand, the main findings of the mean equation emphasize determinants similar to the OLS model. In all four model specifications, the MSCI World Price Index is the most persistent and statistically significant predictor of XU100 returns with p-values less than 0.01, in line with the OLS models, bolstering the understanding that the returns of the Turkish stock market are strongly influenced by the performance of the global stock market. The approximate effect of a 1% change in the MSCI World Index on the returns of the XU100 ranges from 0.61% to 0.71% in the sample data sets of this study when other factors are kept constant. Furthermore, in models that exclude Bitcoin with larger sample sizes, the depreciation of the Turkish Lira has a negative and statistically significant relationship with the returns of the XU100 with p-values less than 0.01 in Model 3 and 0.05 in Model 4, in line with the specifications of the previous model.

An important difference between the two approaches is that two of the weakly significant determinations of the OLS models lose their status and are not shown to be significant in the GARCH model: Bitcoin and M2 money supply. Furthermore, in support of the previous framework, the majority of independent variables, including dummy variables, are statistically insignificant in predicting the returns of the stock market in Türkiye.

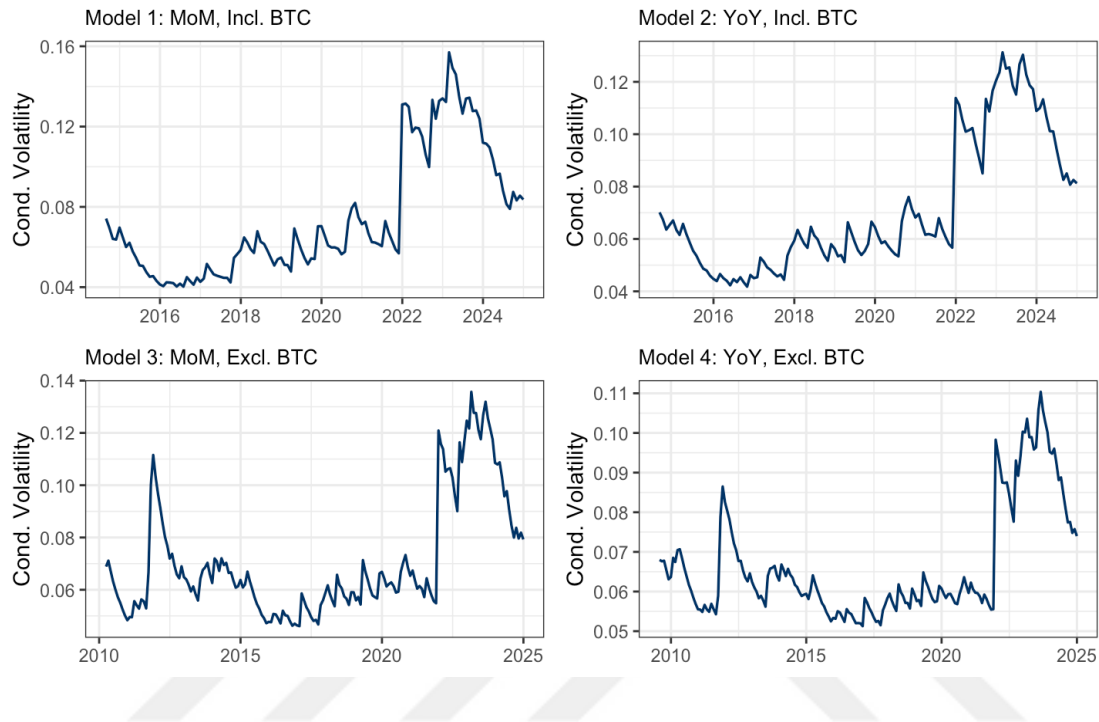
Table 4.2. GARCH (1, 1) Model Estimation Results for XU100 Returns

	Model 1	Model 2	Model 3	Model 4
2-2 (lr)3-3 (lr)4-4 (lr)5-5 <i>Specification</i>	<i>MoM, Incl. BTC</i>	<i>YoY, Incl. BTC</i>	<i>MoM, Excl. BTC</i>	<i>YoY, Excl. BTC</i>
Mean Equation				
Constant (μ)	-0.004	-0.002	0.000	0.004
	(0.005)	(0.008)	(0.007)	(0.007)
USD/TRY	-0.346	-0.392	-0.515**	-0.590**
	(0.329)	(0.350)	(0.194)	(0.237)
MSCI World	0.710***	0.713***	0.607***	0.608***
	(0.197)	(0.198)	(0.170)	(0.163)
Brent Crude	0.023	0.048	0.029	0.038
	(0.127)	(0.048)	(0.071)	(0.058)
Gold	0.318	0.257	0.062	-0.055
	(0.276)	(0.170)	(0.184)	(0.167)
Bitcoin	-0.037	-0.035	-	-
	(0.028)	(0.031)	-	-
Unemployment Rate	-0.223	-0.173	0.359	0.414
	(0.229)	(0.318)	(0.411)	(0.462)
M2	0.070	0.284	-0.007	-0.035
	(0.616)	(0.791)	(0.064)	(0.068)
Discount Rate	0.002	-0.015	0.010	-0.024
	(0.055)	(0.051)	(0.046)	(0.077)
Industrial Production Index (MoM)	0.010	-	0.512	-
	(0.063)	-	(0.480)	-
Consumer Price Index (MoM)	0.910	-	0.009	-
	(0.936)	-	(0.006)	-
Industrial Production Index (YoY)	-	0.001	-	-0.024
	-	(0.078)	-	(0.077)
Consumer Price Index (YoY)	-	0.376	-	0.255
	-	(0.299)	-	(0.276)

Coup Attempt Step Dummy	0.016	0.011	0.007	0.005
	(0.012)	(0.008)	(0.017)	(0.017)
COVID-19 Step Dummy	0.004	0.006	-	-
	(0.018)	(0.017)	-	-
Variance Equation				
ω	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)
α_1 (ARCH)	0.195	0.146*	0.147	0.073
	(0.165)	(0.082)	(0.125)	(0.046)
β_1 (GARCH)	0.804***	0.853***	0.838***	0.882***
	(0.094)	(0.069)	(0.124)	(0.090)
Distribution				
Skew	0.639	0.844***	0.830***	0.978***
	(0.407)	(0.266)	(0.162)	(0.136)
Shape	5.253**	5.749	5.100**	6.195**
	(1.654)	(3.744)	(2.474)	(2.856)
Observations	125	125	178	186
Log Likelihood	170.13	168.53	240.79	249.04
Akaike Inf. Crit.	-2.434	-2.408	-2.515	-2.495

In Figure 4.1, the conditional volatility based on the variance equation is present for the four data set specifications, as each subplot in the figure has relatively different data and sample periods specified in the previous section. The main finding based on the visual representation is that there is consistency across all four data sets in volatility patterns. All four models present an increased trend to increase overall volatility both after 2016 and 2020, indicating clear peaks where XU100 and investors respond to periods of financial and political distress. The other element that is also understandable is that using GARCH over OLS was warranted to capture visually clear changes in risk and volatility over the years in the Turkish stock market.

Figure 4.5. Estimated Conditional Volatility from All Four GARCH Models



4.3. Robustness Checks

To test the validity of the findings, since the author arbitrarily chose between independent variables to minimize the effects of multicollinearity, two alternative models were prepared and presented in Tables 4.7 and 4.8, based on the largest data set used in the study, along with a summary of the findings in the main model, originally provided in the previous subsection.

Table 4.3. Robustness Checks: Mean Equation Estimates

Parameter	Primary Model	Alternative A (MSCI EM)	Alternative B (Ref. Dummy)
Constant (μ)	0.004 (0.007)	0.009 (0.007)	0.005 (0.007)

USD/TRY Exchange Rate	-0.590*** (0.188)	-0.335* (0.179)	-0.588*** (0.188)
Global Index Return	0.608*** (0.134)	0.716*** (0.115)	0.610*** (0.134)
Brent Oil Return	0.038 (0.051)	0.001 (0.053)	0.040 (0.051)
Gold Return	-0.055 (0.115)	-0.144 (0.109)	-0.062 (0.115)
Unemployment Change	0.012 (0.132)	0.088 (0.130)	0.016 (0.132)
M2 Money Supply	0.414 (0.386)	0.115 (0.375)	0.411 (0.386)
CBRT Discount Rate	-0.035 (0.050)	-0.012 (0.045)	-0.037 (0.051)
IPI (YoY, diff)	-0.024 (0.071)	-0.041 (0.066)	-0.025 (0.071)
CPI (YoY, diff)	0.255 (0.283)	0.362 (0.283)	0.263 (0.282)
Structural Break Dummy 1	0.008 (0.010)	0.004 (0.009)	0.007 (0.010)
Structural Break Dummy 2	0.005 (0.014)	0.012 (0.014)	0.005 (0.015)

Coefficients are shown with robust standard errors in parentheses. *, **, *** indicate significance at 10%, 5%, and 1% levels. Alt. A uses MSCI EM instead of MSCI World. Alt. B uses the 2017 Referendum dummy instead of the 2016 Coup dummy.

Table 4.4. Robustness Checks: Variance & Distribution Parameter Estimates

Parameter	Primary Model	Alternative A (MSCI EM)	Alternative B (Ref. Dummy)
ω (Variance Constant)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
α_1 (ARCH Term)	0.073 (0.053)	0.099 (0.088)	0.071 (0.052)
β_1 (GARCH Term)	0.882*** (0.103)	0.840*** (0.162)	0.886*** (0.101)
Skew Parameter	0.978*** (0.124)	1.018*** (0.136)	0.975*** (0.119)
Shape Parameter	6.195** (2.822)	6.532** (2.966)	5.977** (2.744)

Robust standard errors in parentheses. *, **, *** indicate significance at 10%, 5%, and 1% levels.

In the first alternative, called Model A, the MSCI World Index was changed to the MSCI Emerging Markets Index, yielding similar results: it is also statistically significant and has a positive relation with stock market returns in Türkiye. Interestingly, the significance of the depreciation of the lira against the dollar still stands: it is statistically significant and has a negative relationship.

In the second alternative, called Model B, the constitutional referendum's dummy variables are used instead of the coup attempt's dummy variable in the model. The results are practically the same: the determinants and their significance remain consistent. and do not present any new findings.

In summary, the robustness checks confirmed the findings of the main model of the study, a summary of which is provided in Tables 4.9 and 4.10: The returns of the XU100 index are affected by global markets, positively, and F/X rates, negatively. Since these alternative models did not yield alternative results, this study can claim that its findings are not monuments of a single model and are relevant across other models, adding to the plausibility of the study's empirical findings.

Table 4.5. GARCH (1, 1) Mean Equation Results (YoY, Excl. BTC)

Variable	Coefficient
Constant (μ)	0.004
	(0.007)
USD/TRY Exchange Rate	-0.590***
	(0.188)
MSCI World Index	0.608***
	(0.134)
Brent Oil Return	0.038
	(0.051)
Gold Return	-0.055
	(0.115)
Unemployment Change	0.012
	(0.132)
M2 Money Supply	0.414
	(0.386)
CBRT Discount Rate	-0.035
	(0.050)
IPI (YoY, diff)	-0.024
	(0.071)
CPI (YoY, diff)	0.255
	(0.283)
Coup Dummy	0.008
	(0.010)
COVID-19 Dummy	0.005
	(0.014)

Table 4.6. GARCH (1, 1) Variance and Distribution Parameter Estimates (YoY, Excl. BTC)

Parameter	Estimate
ω (Variance Constant)	0.000
	(0.000)
α_1 (ARCH Term)	0.073
	(0.053)
β_1 (GARCH Term)	0.882***
	(0.103)

Skew Parameter	0.978***
	(0.124)
Shape Parameter	6.195**
	(2.822)

4.4. Summary of the Results and Empirical Findings

To summarize the points of this section, the GARCH approach lays out a more robust overview of the determinants of the returns of the Turkish stock market. XU100 is, on a month-to-month basis, affected mainly by external changes, market sentiments about global stock prices, confirming Bekaert & Harvey (2003), whose work documents the magnitude of integration of emerging markets with global markets, and the performance of the TRY against the USD, confirming Ramos et al. (2016), who have shown that the currency exchange rate is a systematic risk factor in Brazil.

Although the macroeconomic picture of Türkiye definitely affects external factors to some extent (especially the USD/TRY exchange rate), they do not appear to be significant in the month-over-month changes of the XU100 before or after controlling the volatility of the variables.

Consequently, the study can suggest that for the sample period, the potential effects of most macroeconomic and financial variables were subdued by sentiment and depreciation of Türkiye's currency, aligning with the time-dependent and unstable relationships between such variables similar to Aydoğan & Uslu (2021).

CONCLUSION

5.1. Summary of the Thesis

The purpose of this study was to assess the relevance of macroeconomic indicators and changes in prices of potentially relevant commodities and financial alternatives on the stock market of Türkiye by using the XU100 index. This was done using monthly time series data from June 2009 to December 2024 (depending on the data set).

In the next subsections, the methodology of the study, key findings, its potential contribution to the available body of literature, and policy implications are provided based on the main sections of the study. Consequently, the shortcomings of the study are addressed and used as a basis for future research for Türkiye and similar markets.

5.2. Summary of the Key Findings

The study analysis was conducted after the needed data transformation and before testing to confirm that the data used were appropriate for the study objectives. With the help of GARCH models, the study was able to show that

1. BIST is consistently, positively, and significantly affected by changes in global stock markets, which were included as an independent variable as the MSCI World Price Index, an index composed mainly of stocks from developed countries.
2. The depreciation of TRY against the USD, which was the proxy choice F/X of the study, has a negative impact on the returns of the Turkish stock market in the larger datasets from 2009 to 2024.

3. Almost all macroeconomic indicators of the Turkish economy did not lead to a statistically significant relationship between them and stock market returns; once, with the help of GARCH models, volatility clustering was properly addressed.
4. XU100 has shown volatility clustering, which was significant and persistent in the initial approach of the OLS framework, confirming that using GARCH was appropriate for this study.

5.3. Summary of the Thesis's Contribution to the Field

The key findings of this study provide additional information to the existing literature in the field in a diverse set of ways.

Most importantly, the returns of the XU100 and the MSCI World Price Index are in a relationship that is consistent, significant, and positive, in line with previous studies that claimed emerging markets are severely affected by global financial flows and risk sentiment, such as Bekaert & Harvey (2003) and Calvo & Reinhart (2000).

Second, they confirm Gorjaev & Zabotkin (2006) and their findings about the Russian stock market: There is a strong relationship between the domestic and global stock markets in emerging markets. However, the significance of the exchange rate triumphs over those of domestic macroeconomic indicators, which can potentially imply that changes in F/X rates can be considered the primary economic indicator in Türkiye that can shape investor confidence, the financial health of corporations traded in the stock market, and future expectations of other macroeconomic indicators, such as inflation. This finding is in support of Ramos et al. (2016) and contradicts important studies in the field, such as Fama (1981), that were based on the stock market returns in the USA, where inflation was found to be significant.

Another important finding of this study was that almost all domestic macroeconomic factors, including changes in CPI and IPI, were not shown to have a significant relationship with stock market returns in Türkiye in the GARCH framework. This also

contradicts previous studies on other emerging markets (Basu & Chawla, 2012; Mangani, 2011), which found inflation to be a significant determinant in India and monetary policy in South Africa, respectively. One could argue that since this study covered a sample period during which Türkiye went through a significant depreciation of its currency against F/X, the currency risk may have overshadowed the effects of other changes in Türkiye's macroeconomic picture. Likewise, this possibility associates the findings of this study with those of Aydoğan & Uslu, 2021, and Gök & Çiftçi, 2017, that showed the relevance of political (Gök & Çiftçi, 2017) and currency-related risks (Aydoğan & Uslu, 2021).

Moreover, since the study found many independent variables insignificant in the returns of the Turkish stock market, it differs from the early studies that worked in Türkiye, although they covered a much earlier period of the BIST, such as Muradoglu et al. (2000); for that reason, this study can imply that how investors perceive the Turkish stock market and traded companies changed severely during the twentieth century, moving towards the global appetite for equity investing and domestic currency risks.

5.4. Policy Implications of the Thesis

The key findings of the study, which consider global market sentiment and F/X risk as main determinants of XU100 returns, can offer policymakers and investors guidance on how to review them.

5.4.1. Implications for Policymakers

For policymakers, the more relevant finding would be the effect of the depreciation of TRY against USD on stock market returns, implying that ensuring stability of the F/X levels can lead to greater financial stability in Türkiye and BIST because this negative relationship can lower investor demand and sentiment in two main ways:

1. As international non-Turkish investors seeking to invest in Türkiye do so by exchanging their local currencies for TRY, the depreciation increases their risk accordingly.
2. As multinationals are likely to issue debt instruments in many different currencies, the severe depreciation of TRY against foreign currencies can affect their financial health by lowering their ability to service their debt, known as the balance sheet channel of currency crises (Aghion et al., 2001; Krugman, 1999).

Thus, adopting policies that increase the investing public's trust in TRY is fundamental to the consistent demand for Turkish equities.

Furthermore, since there is a persistent and significant relationship between changes in global stock markets and those of Türkiye, policymakers must understand that Türkiye is integrated into the global economy and is highly exposed to its risks, meaning that BIST is going to be affected by global economic and financial trends that are out of the control of Turkish policymakers. This issue is standard for emerging markets (Calvo & Reinhart, 2000), and correspondingly should inspire policymakers to improve the durability of the Turkish economy and markets and try to attract long-term capital, which is less prone to enter and/or exit quickly (Claessens et al., 1995).

5.4.2. Implications for Investors

For investors, understanding the factors that influence BIST and their extent is fundamental to effective portfolio management.

First, the strong and consistent correlation of XU100 with the MSCI World Price Index, an index of mostly developed markets, implies that although Türkiye is an emerging market that is not part of the index, the added diversification is limited as it moves in tandem; this is a shared property of integrated emerging markets according to Bekaert & Harvey (2003).

Second, since currency risk is significant to the returns of the Türkiye stock market to some extent, for foreign investors, investing in Türkiye without a currency hedge could mean that any gains they can generate can be offset by the depreciation of the lira when exiting/changing their portfolio positions, which is a fundamental risk that international investors must consider and manage to generate returns (Adler & Dumas, 1983). For local investors, depreciation can signal an upcoming period of negative returns, which can discourage them from participating in the stock market.

5.5. Limitations of the Thesis and Future Research

Although the study provides valuable information to investors on what they should review before considering adding exposure of Turkish equities to their portfolios, it is relevant to address the limitations of the study's approach and provide a basis for future research in the field.

First, the study used monthly time series data in its models, potentially providing a time period that is too short or too long for the market to price in changes in Türkiye's macroeconomic developments. Therefore, a study using higher- or lower-frequency data can potentially capture a different understanding of what independent variables are significant in the returns of the XU100.

Second, although the study used a GARCH(1, 1) model and found relevant results, to test the tendency of stock market volatility to increase relatively more during periods of negative returns than those of positive returns, the so-called leverage effect (Black, 1976), an EGARCH model (Nelson, 1991) to test for this phenomenon, which could affect key findings.

Third, more independent variables could be added to the model to reflect and identify other potential relationships that this study did not test, such as capital flows or political risk indices, to further account for the characteristics of emerging markets, such as Türkiye.

Lastly, even though this study deemed the used dummy variables as insignificant on returns of XU100, different model choices could yield different results, such as Markov switching regressions (Hamilton, 1989), to provide further testing on the potential impacts of structural breaks.



REFERENCES

- Adler, M., & Dumas, B. (1983). International portfolio choice and corporation finance: A synthesis. *The Journal of Finance*, 38(3), 925–984.
- Aghion, P., Bacchetta, P., & Banerjee, A. (2001). Currency crises and monetary policy in an economy with credit constraints. *European Economic Review*, 45(7), 1121–1150.
- Aydoğan, B., & Uslu, H. (2021). The dynamic relationship between stock prices and exchange rates in turkey: A wavelet coherence analysis. *The North American Journal of Economics and Finance*, 58, 101518.
- Basu, D., & Chawla, D. (2012). An empirical test of the arbitrage pricing theory on the indian stock market. *Journal of Financial Management and Analysis*, 25(2), 27–37.
- Bekaert, G., & Harvey, C. R. (2003). Emerging markets finance. *Journal of Empirical Finance*, 10(1-2), 3–55.
- Black, F. (1976). Studies of stock price volatility changes. *Proceedings of the 1976 Meetings of the Business and Economic Statistics Section*, 177–181.
- Bollerslev, T. (1986). Generalized autoregressive conditional heteroscedasticity. *Journal of Econometrics*, 31(3), 307–327.
- Borsa İstanbul. (2025). *History of borsa istanbul*. <https://www.borsaistanbul.com/en/sayfa/37/history>.
- Calvo, G. A., & Reinhart, C. M. (2000). When capital inflows come to a sudden stop: Consequences and policy options. *Reforming the International Monetary and Financial System*.

- Chen, N.-F., Roll, R., & Ross, S. A. (1986). Economic forces and the stock market. *The Journal of Business*, 59(3), 383–403.
- Claessens, S., Dooley, M. P., & Warner, A. (1995). Portfolio capital flows: Hot or cold? *The World Bank Economic Review*, 9(1), 153–174.
- Dickey, D. A., & Fuller, W. A. (1979). Distribution of the estimators for autoregressive time series with a unit root. *Journal of the American Statistical Association*, 74(366a), 427–431.
- Engle, R. F. (1982). Autoregressive conditional heteroscedasticity with estimates of the variance of united kingdom inflation. *Econometrica*, 50(4), 987–1007.
- Erdogan, M., & Ozlale, U. (2005). Effects of macro-economic variables on stock returns: The case of turkey. *European Trade Study Group (ETSG) 7th Annual Conference*.
- Fama, E. F. (1970). Efficient capital markets: A review of theory and empirical work. *The Journal of Finance*, 25(2), 383–417.
- Fama, E. F. (1981). Stock returns, real activity, inflation, and money. *American Economic Review*, 71(4), 545–565.
- Gök, T., & Çiftçi, M. (2017). The impact of political risk on the istanbul stock exchange. *Borsa Istanbul Review*, 17(1), 36–49.
- Goriaev, A., & Zabolkin, A. (2006). Risks of investing in the russian stock market: A survey. *Emerging Markets Review*, 7(4), 380–407.
- Gujarati, D. N., & Porter, D. C. (2009). *Basic econometrics* (5th ed.). McGraw-Hill Irwin.
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis* (7th ed.). Prentice Hall.
- Hamilton, J. D. (1989). A new approach to the economic analysis of nonstationary time series and the business cycle. *Econometrica*, 57(2), 357–384.

International Finance Corporation (IFC). (1988). *Emerging stock markets factbook*. International Finance Corporation.

International Monetary Fund. (2025). *World Economic Outlook Database: Gross Domestic Product Per Capita, Current Prices*. <https://www.imf.org/external/datamapper/NGDPDPC@WEO/TUR>.

Krugman, P. (1999). Balance sheets, the transfer problem, and financial crises. In *International finance and financial crises: Essays in honor of robert p. Flood, jr.* (pp. 31–55). Springer.

Lee, B.-S. (1992). Causal relations among stock returns, interest rates, inflation, and money. *The Journal of Finance*, 47(4), 1591–1603.

Mandelbrot, B. B. (1963). The variation of certain speculative prices. *The Journal of Business*, 36(4), 394–419.

Mangani, R. (2011). The effects of monetary policy on the stock market in south africa. *Journal of African Economies*, 20(3), 470–491.

Merkezi Kayıt Kuruluşu (MKK). (2025). *Uyruk bazında yatırımcı sayıları (number of investors by nationality)*. <https://www.vap.org.tr/uyruk-bazinda-yatirimci-sayilari>.

MSCI. (2025). *MSCI Emerging Markets Index (USD) Fact Sheet*. <https://www.msci.com/documents/10199/c0db0a48-01f2-4ba9-ad01-226fd5678111>.

Muradoglu, G., & Metin, K. (1995). Efficiency of the turkish stock market with respect to monetary variables. *METU Studies in Development*, 22(3), 297–313.

Muradoglu, G., Metin, K., & Argaç, R. (1996). Stock prices and macroeconomic variables: Evidence from the istanbul stock exchange. *Applied Financial Economics*, 6(5), 415–420.

- Muradoglu, G., Taskin, F., & Bigan, R. (2000). Causality between stock returns and macroeconomic variables in emerging markets. *Russian and East European Finance and Trade*, 36(6), 33–53.
- Nelson, D. B. (1991). Conditional heteroskedasticity in asset returns: A new approach. *Econometrica*, 59(2), 347–370.
- Öniş, Z. (1991). Political economy of turkey in the 1980s: Anatomy of unorthodox neoliberalism. In M. Heper & J. M. Landau (Eds.), *Political parties and democracy in turkey*. I.B. Tauris.
- Öniş, Z., & Yeldan, E. (2005). The turkish economy in the post-1980 era: A political-economy perspective. In S. Togan & B. N. arol (Eds.), *The turkish economy: The real economy, corporate governance and reform* (pp. 1–46). Edward Elgar Publishing.
- Organisation for Economic Co-operation and Development (OECD). (2006). *OECD economic surveys: Turkey 2006*. OECD Publishing.
- Pearce, D. K. (1983). Stock prices and the economy. *Economic Review*, 3–18.
- Ramos, S., W. Ziegelmann, F. von, & Santos, J. dos. (2016). The role of macroeconomic variables in the bovespa index. *Brazilian Business Review*, 13(4), 117–139.
- Ross, S. A. (1976). The arbitrage theory of capital asset pricing. *Journal of Economic Theory*, 13(3), 341–360.
- Sermaye Piyasası Kurulu (SPK). (2025). *Halka açılan şirket sayısı (number of publicly offered companies)*. <https://spk.gov.tr/ihrac-verileri/halk-acilan-sirket-sayisi>.
- Turkish Statistical Institute (TUIK). (2024). *The results of address based population registration system, 2023*. <https://data.tuik.gov.tr/Bulten/Index?p=The-Results-of-Address-Based-Population-Registration-System-2023-49684&dil=2>