Hacettepe University Graduate School of Social Sciences
Department of Economics

NONLINEAR DYNAMICS BETWEEN INVESTOR SENTIMENT AND STOCK MOVEMENTS: EVIDENCE FROM BORSA ISTANBUL

Aslıhan GÜL

Master's Thesis

Ankara, 2021

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YAYIMLAMA VE FİKRİ MÜLKİYET HAKLARI BEYANI

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15/10/2021

Aslıhan GÜL

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ETİK BEYAN

ETİK BEYAN

Bu çalışmadaki bütün bilgi ve belgeleri akademik kurallar çerçevesinde elde ettiğimi, görsel, işitsel ve yazılı tüm bilgi ve sonuçları bilimsel ahlak kurallarına uygun olarak sunduğumu, kullandığım verilerde herhangi bir tahrifat yapmadığımı, yararlandığım kaynaklara bilimsel normlara uygun olarak atıfta bulunduğumu, tezimin kaynak gösterilen durumlar dışında özgün olduğunu, **Doç.Dr., Başak DALGIÇ** danışmanlığında tarafımdan üretildiğini ve Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Yazım Yönergesine göre yazıldığını beyan ederim.

Aslıhan GÜL

To my father

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my advisor Assoc. Prof. Dr. Başak DALGIÇ for her supervision, understanding and support. This thesis would not come to an end without her guidance.

I would like to express my gratitude to the committee members, Assoc. Prof. Dr. Burcu FAZLIOĞLU and Assist. Prof. Dr. Zühal KURUL for their time and insightful comments to improve my work.

I want to emphasize my special thanks to Fırtınay TÜMER for her tremendous support in every aspects of life. She always challenges me to step out of my comfort zone and pushes me to do better.

Moreover, I owe my thanks to my friends Dilara GÜZEL, Ece KOÇAK and Başak Elif VAROL for their sisterhood. I also wish to state my appreciation to my dear friend Berçim BERBEROĞLU for her patience and tolerance during the studying and writing process of the thesis. Her discipline, never-ending encouragement made the process possible to me.

Lastly, I'm very thankful for my dear family for their endless love and motivation.They have always had faith in me.

ABSTRACT

GÜL, Aslıhan. *Nonlinear Dynamics Between Investor Sentiment and Stock Movements: Evidence From Borsa Istanbul*, Master's Thesis, Ankara, 2021.

The aim of this study is to examine nonlinear dynamics between both rational and irrational components of investor sentiment and stock market movements. In order to provide a proper explanation about total investor sentiment, we decompose its irrational and rational components. We examine the nonlinear dynamics between irrational and rational components of investor sentiment, stock market returns and volatility of the BIST 100 Index utilizing threshold regression models. Our findings reveal that (i) in both low and high return states, rational investor sentiment positively impact the stock market returns, (ii) the rational sentiment have more impact in the high return state than that of the low return state, (iii) in the high volatility state, rational investor sentiment negatively impact the stock market volatility. Results suggest that optimistic environment originating from the rational component positively affects the stock market returns where the investors' positive expectations shape the economic environment by decreasing the uncertainty and the volatility of stock market.

Keywords
Behavioral finance, investor sentiment, BIST 100, threshold regression model.

ÖZET

GÜL, Aslıhan. *Yatırımcı Duyarlılığı ile Hisse Senedi Hareketleri Arasındaki Doğrusal Olmayan Dinamikler: Borsa İstanbul Örneği*, Yüksek Lisans Tezi, Ankara, 2021.

Bu çalışmanın amacı, yatırımcı duyarlılığının hem rasyonel hem de irrasyonel bileşenleri ile hisse senedi piyasaları arasındaki doğrusal olmayan dinamikleri incelemektir. Toplam yatırımcı duyarlılığı hakkında doğru bir açıklama yapabilmek için irrasyonel ve rasyonel bileşenlerine ayrıştırılmıştır. BIST 100 Endeksi'nin yatırımcı duyarlılığının irrasyonel ve rasyonel bileşenleri, hisse senedi getirileri ve oynaklığı arasındaki doğrusal olmayan dinamikleri eşik regresyon modelleri kullanılarak incelenmiştir. Bulgularımız, (i) hem düşük hem de yüksek getiri durumlarında, rasyonel yatırımcı duyarlılığının hisse senedi getirilerini olumlu etkilediğini, (ii) rasyonel duyarlılığın yüksek getiri durumunda düşük getiri durumuna göre daha fazla etkiye sahip olduğunu, (iii) yüksek oynaklık durumunda, rasyonel yatırımcı duyarlılığı borsa oynaklığını olumsuz etkilediğini ortaya çıkarmıştır. Sonuçlar, rasyonel bileşenden kaynaklanan iyimser ortamın hisse senedi getirilerini olumlu etkilediğini, yatırımcıların olumlu beklentilerinin ise hisse senedi piyasasındaki belirsizliği ve oynaklığı azaltarak ekonomik ortamı şekillendirdiğini göstermektedir.

Anahtar Sözcükler

Davranışsal finans, yatırımcı duyarlılığı, BIST 100, eşik regresyon modeli.

TABLE OF CONTENTS

List of Abbreviations

ADF	Augmented Dickey Fuller
BIST	Borsa Istanbul
CCI	Consumer Confidence Index
CTS	Consumer Tendency Survey
IPO	Initial Public Offering
OLS	Ordinary Least Squares
PP	Philips Perron
TRM	Threshold Regression Model
US	United States
VAR	Vector Autoregressive

List of Tables

List of Figures

INTRODUCTION

Classical finance theories such as asset pricing models, Modern Portfolio Theory and Efficient Market Hypothesis base their assumptions on the rationality of investors. According to these theories, investor sentiment does not impact on stock prices, where the stock prices are equal to their fundamental values. Even if some investors behave irrationally, informed investors or arbitrageurs stabilize their movements, hereby any impact of irrational investors cannot be tracked in the market. On the other hand, behavioral finance criticizes the rationality assumption of classical theories and asserts that investors may not always act with pure rationality and are subject to sentiments. In asset pricing models including Capital Asset Pricing Model, Fama-French factor models, systematic risk is considered to be the only determiner of the expected returns. In these models, systematic risk is expressed by market-related proxies including beta, market capitalization and book-to-market ratio. In other words, classical models do not associate systematic risk with psychological factors. Nevertheless, behavioral finance theories take into account investor sentiment as an additional risk factor.

There are many studies that investigate the impact of investor sentiments on stock prices. Black (1986) coined the term noise that refers to a contrast concept to the information for the first time. According to Black (1986), noise allows markets to be possible, at the same time it makes them imperfect. A group of investors who try to trade on noise as if it were information called “noise traders”. Noise trading activities may have a prevalent impact on markets and it would be impossible to diversify the deviations based on them. At this point, it can be possible to say noise gain a systemic character as a source of risk. It should be considered in investigation of stock returns (Kandır et al., 2015).

Taking the motivation from Black’s (1986) arguments, De Long et al. (1990) develop the noise trader model to lay out the theoretical grounds of investor sentiment. According to this model, while the decisions of rational investors are determined by rational expecta-

tions, noise traders' actions are affected by their sentiments rather than the fundamentals. The unpredictability of the changes in the investor sentiment generates additional risk factor and results in the deviations of the stock prices from their fundamental values. Following the De Long et al., many studies investigate the impact of investor sentiment on stock returns. Their results verify the investor sentiment and stock market returns nexus.

One of the main factors that makes it challenging to examine the effect of investor sentiment on the stock market is that there is no consensus in the literature about the proxy to express it properly, since investor sentiment cannot be observed in the market clearly. In order to accurately analyze the impact of investor sentiment on market movements, it is very crucial to find an appropriate measure. Accordingly, recent literature has attempted to find suitable proxies.. We gather these attempts in two main groups as indirect and direct measures. We also refer indirect measures as market-based, market-independent and web-based proxies. On the other hand, direct measures are based on consumer or investor surveys to capture the investor sentiment level. Each measure has its own advantages and disadvantages. Nevertheless, direct proxies stand out to represent investor sentiment due to their following characteristics. First of all direct proxies are calculated utilizing consumer or investor questionnaires. In these proxies, information is obtained directly from households with the help of surveys. Additionally, these measures reflect the prevailing situation of the economy as well as the households' attitudes towards general economic atmosphere for a short-term period.

As for the definitions of the investor sentiment within the related literature, it can be seen that there are mainly two distinct approaches regarding the constituents of the investor sentiment. One line of literature describes investor sentiment as a concept that has only the rational aspect, the other part of the literature defines investor sentiment by associating it with investors' future opinion. The latter does not suggest that investor sentiment is neither irrational nor rational., Treating investor sentiment just as an irrational phenomenon leads to an incomplete expression of its nature.

In order to provide a proper explanation about total investor sentiment, it is necessary to decompose its irrational and rational components. In this study, we utilize a framework suggested by Verma et al. (2008) to distinguish these aspects of investor sentiment. Contrary to the previous studies, Verma et al. (2008) do not treat investor sentiment as just an irrational concept. We utilize a model that allow us to decompose the rational and irrational aspects of investor sentiment. In this model, we use a total sentiment measure

which is proxied by Turkish Consumer Confidence Index as the dependent variable and a set of economic fundamentals as the independent variable. The economic fundamentals represent the rational side of the investor sentiment and are related to business cycles and macroeconomic fundamentals. After regressing the economic fundamentals on our total sentiment measure, the residuals we obtain represent the factors that are not justified by the fundamentals and form the irrational side of investor sentiment. Next, we examine the nonlinear dynamics between the irrational and rational components of investor sentiment, stock market returns and volatility of the BIST 100 Index utilizing threshold regression models. We base this model choice on the following grounds. First, threshold regression model (TRM) is allows coefficients to change across regimes. These regimes are identified by an endogenous threshold variable and its unknown level of threshold value. TRM is indeed a good substitute to linear models in detecting asymmetric movements observed in the stock markets.

Our contribution to the investor sentiment literature is manifold. In contrary to the literature that treats investor sentiment as if it is a fully irrational concept, following Verma et al.'s (2008) approach, we decompose investor sentiment into its rational and irrational components. There are several studies that exploring investor sentiment and stock movements nexus by focusing on the emerging markets. It is important to examine these relationships in such markets, since market inefficiencies are more likely to be observed in these markets. Furthermore, these markets may suffer more from the unpredictable changes in sentiments which may result in increased noise trading activities. In this context, we execute our analyses for an emerging market Borsa Istanbul utilizing the most recent data. Apart from these studies, our investigation of the investor sentiment, stock market returns and volatility nexus considers the nonlinear dynamics between these concepts. As explained above, we utilize TRM that allow us to examine the nonlinear relationship between the investor sentiment and stock market movements.TRM is an extended version of the linear regression allowing coefficients to change across regimes. These regimes are identified by whether the threshold variable is above or below some unknown level of a threshold value. These models are good substitutes to linear models in detecting asymmetric movements observed in the stock markets.

Our study consists of five chapters. In Chapter 1, we present the theoretical background of our investigation and briefly review the empirical literature on investor sentiment. In this chapter, we start by shedding light on the history of investor sentiment. Next, we explain the proxies that are frequently used to measure investor sentiment and discuss the pros and cons of these measures. Afterwards, we point out the framework we have

adopted and the studies following this approach. In Chapter 2, we introduce our dataset including Consumer Confidence Index which is utilized to proxy total investor sentiment, economic fundamentals representing the rational aspect of investor sentiment and stock market data. In Chapter 3, we describe our framework and model specification. In Chapter 4, we present our findings and finally, Chapter 5 concludes the study.

Chapter 1

THEORETICAL AND EMPIRICAL BACKGROUND

1.1 THE CONCEPT OF INVESTOR SENTIMENT

Classical finance theories such as asset pricing models, Modern Portfolio Theory and Efficient Market Hypothesis base their assumptions on the rationality of investors. According to these theories, investor sentiment does not impact on stock prices, and the stock prices are equal to their fundamental values. Even if some investors behave irrationally, informed investors or arbitrageurs stabilize their movements, hereby any impact of irrational investors cannot be observed in the market. On the other hand, behavioral finance criticizes the rationality assumption of classical theories and asserts that investors may not always act with pure rationality and are subject to sentiments. In asset pricing models such as Capital Asset Pricing Model and Fama-French factor models, systematic risk is considered to be the only determiner of the expected returns. In this models, systematic risk is expressed by market-related proxies including beta, market capitalization and book-to-market ratio. In other words, classical models do not associate systematic risk with psychological factors. Nevertheless, behavioral finance theories consider investor sentiment as an additional risk factor.

The studies constructing theoretical foundations of the impact of investor sentiments on stock prices is Black (1986), Trueman (1988), Shleifer and Summers (1990), Campbell and Kyle (1993), Barberis et al. (1998), Hong and Stein (1999). For the first time, Black (1986) introduced the term noise that refers to a contrast concept to the information. According to Black (1986), noise allows markets to be possible, at the same time it makes them imperfect. The group of investors who try to trade on noise are called “noise traders”. Noise trading activities may have a prevalent impact on markets and it would be

impossible to diversify the deviations based on them. At this point, noise gain a systemic character as a source of risk and it should be considered in investigation of stock returns (Kandır et al., 2015).

Motivated by Black (1986)'s arguments, De Long et al. (1990) develop the noise trader model laying out the theoretical grounds of investor sentiment. According to this model, while the decisions of rational investors are determined by rational expectations, noise traders' actions are affected by their sentiments rather than the fundamentals. The unpredictability of the changes in the investor sentiment generates additional risk factor and results in the deviations of the stock prices from their fundamental values. Following the De Long et al. (1990), several studies such as De Bondt (1993), Clarke and Statman (1998), Fisher and Statman (2000), Lee et al. (2002) and, Brown and Cliff (2004) investigate the impact of investor sentiment on stock returns. The results of these investigations verify the investor sentiment and stock market returns nexus. However, the literature on examining the relationship between investor sentiment and stock prices reveals contradictory results on whether the casual impacts can be attributed to rational risk factors, irrational risk factors or both. The previous literature considers investor sentiment as a fully irrational concept and disregard the extent to which investor sentiment is rational or irrational. From this perspective, the next section will shed light on the rational and irrational aspects of investor sentiment.

1.2 RATIONAL AND IRRATIONAL INVESTOR SENTIMENT

As for the definitions of the investor sentiment in the literature, there exist two distinct approaches regarding to the constituents of the investor sentiment. One line of literature describes investor sentiment as "the beliefs about future cash flows or discount rates that are not supported by the prevailing fundamentals" (Baker and Wurgler, 2006a) and "a belief about future cash flows and investment risks that is not justified by the facts at hand" (Baker and Wurgler, 2007) and, asserts that the investor sentiment is a pure irrational concept. Studies referring to this aspect of investor sentiment generally characterize this type of investors as uninformed investor, noise trader or unsophisticated investor etc. Regarding to this approach that points to this aspect of investor sentiment, we will use the term "irrational investor sentiment" henceforth.

The other part of the literature defines investor sentiment as "how investors form beliefs" Barberis et al. (1998) or "simply optimism or pessimism about stocks in general" (Baker

and Wurgler, 2007). These type of rationale does not suggest that investor sentiment is neither irrational nor rational. According to this view, investor sentiment is related to investors' future opinion. Regarding to this approach that points to this side of investor sentiment, we will use the term "total investor sentiment" from now on.

Treating investor sentiment as if it were just an irrational phenomenon leads to the incomplete expression of its nature. In order to provide a proper explanation about total investor sentiment, it is necessary to decompose its irrational and rational components. From this point of view, Verma et al. (2008) suggest a methodological framework to distinguish these aspects of investor sentiment. According to Verma et al., total sentiment is mostly proxied by consumer or investor surveys in the behavioral finance literature and, included in the models as the dependent variable where there is a set of economic fundamentals for the independent variables. These economic fundamentals represent the rational side of the investor sentiment and are related to business cycles and macroeconomic fundamentals. The error term in these models represents the factors that are not justified by the fundamentals and shows the irrational form of the investor sentiment.

Prior to Verma et al. (2008), behavioral finance literature treated investor sentiment as an irrational concept only. Verma et al. brought a new approach by considering both irrational and rational components of investor sentiment. Moreover, they conducted analyses simultaneously for both individual and institutional investors which have been previously overlooked in the literature. They decompose the irrational and rational factors of individual and institutional investor sentiment and examine the impact of these elements on U.S. market returns by utilizing VAR specifications. According to impulse response function results, while both constituents of investor sentiment are significant, the effect of fundamentals-driven sentiment is greater than that of the irrational component on stock returns. They also find that irrational investor sentiment has a more rapid and noticeable impact than rational investor sentiment.

After Verma et al.'s (2008) contribution to the behavioral finance literature, several studies were carried out adopting their approach. The common characteristics of these studies that modelling individual investor sentiment are that they utilize consumer confidence indices to proxy the total sentiment and decompose the irrational components of investor sentiment by regressing the economic fundamentals on this variable. On the other hand, the variable set used by these studies for economic fundamentals varies. This set includes variables such as economic growth (Verma et al., 2008; Calafiore et al., 2010; Sayim and

Rahman, 2015a; Sayim and Rahman, 2015b; Bayram, 2017; Perez-Liston et al., 2018; JP Morgan Emerging Markets Bond Index (Calafiore et al., 2010; Bayram, 2017); short-term interest rates (Verma et al., 2008; Calafiore et al., 2010; Sayim and Rahman, 2015a; Sayim and Rahman, 2015b; Bayram, 2017; Perez-Liston et al., 2018); currency fluctuations (Verma et al., 2008; Calafiore et al., 2010; Sayim and Rahman, 2015a; Sayim and Rahman, 2015b; Bayram, 2017); term of trade (Calafiore et al., 2010; Sayim and Rahman, 2015a; Sayim and Rahman, 2015b; Bayram, 2017); inflation (Calafiore et al., 2010; Sayim and Rahman, 2015a; Sayim and Rahman, 2015b; Bayram, 2017; Perez-Liston et al., 2018; momentum factor (Verma et al., 2008); premium on portfolio of high-book/market stocks relative to low-book/market stocks (Verma et al., 2008); premium on portfolio of small stocks relative to large stocks (Verma et al., 2008); business conditions (Verma et al., 2008; Calafiore et al., 2010; Bayram, 2017); dividend yield (Verma et al., 2008; Calafiore et al., 2010), default premium (Johnk and Soydemir, 2015); the term premium (Johnk and Soydemir, 2015) and; the change in the S&P 500 dividend yield in excess of the risk free rate (Johnk and Soydemir, 2015). The related studies usually focus on the following markets: Dow Jones Industrial Average (Verma et al., 2008), S&P500 (Verma et al., 2008; Johnk and Soydemir, 2015), Bovespa (Calafiore et al., 2010), Mexican stock market (Perez-Liston et al., 2018; and Borsa Istanbul (Sayim and Rahman, 2015a; Sayim and Rahman, 2015b; Bayram, 2017). As can be seen, in most of the studies, the relationship between investor sentiment and market movements has been investigated for emerging markets. It is important to examine such relationships in emerging markets, since market inefficiencies are more likely to be observed in these markets. Furthermore, these markets may more suffer from the unpredictable changes in sentiments which may result in increased noise trading activities (Bayram, 2017).

Calafiore et al. (2010) investigate the influence of the consumer and business investor sentiments on market returns for Brazil. Their results reveal that rational business and consumer sentiments have positive and statistically significant impacts on Bovespa returns. On the other hand, in terms of irrational investor sentiment, the impact remains insignificant for consumer sentiment and, is reversed for business sentiment which implies the response of Bovespa returns to irrational business sentiments is negative. Moreover, in terms of magnitude, rational business and consumer sentiments have a greater impact on stock returns compared to irrational sentiments. Another study for the emerging markets is conducted by Perez-Liston et al. (2018) for the Mexican stock market. Results indicate that both rational and irrational investor sentiment positively impact the stock returns. Moreover, the impact of rational sentiment is more pronounced in Mexican market compared to irrational sentiment. Additionally, they investigate the spillover effect of U.S.

investor sentiment on the Mexican market returns and found a significant spillover effect from U.S. investor sentiment on Mexican stock returns.

For Turkish stock exchange, Sayim and Rahman (2015a) examine the effect of individual investor sentiment on the stock returns and volatility using monthly data for the period of 2004-2010. They show that unexpected changes in rational and irrational investor sentiment positively and significantly impact Borsa Istanbul returns. Their results also reveal that unanticipated increase in the rational component of investor sentiment negatively and significantly affects Borsa Istanbul volatility which suggests that an unexpected increase in rational sentiment decreases Borsa Istanbul volatility. In another study, Sayim and Rahman (2015b) investigate the impact of rational and irrational factors of U.S. and institutional and individual investor sentiment on Borsa Istanbul returns and volatility. Results indicate that (i) there is a significant spillover effect of investor sentiment on volatility and stock return of Borsa Istanbul where (ii) the effect of institutional sentiment is greater than that of individual sentiment, (iii) the impact of rational sentiment on Borsa Istanbul returns is faster, yet not greater than that of irrational sentiment (iv) there is negative relationship between investor sentiment and Borsa Istanbul volatility. Similarly, Bayram (2017) analyze the dynamic relationship between rational and irrational individual and institutional sentiments and stock returns for the period between December 2003 and January 2010. The results reveal that both individual and institutional rational sentiment positively and significantly affect the BIST 100 Index returns while irrationality-driven component of investor sentiment remains insignificant.

1.3 INVESTOR SENTIMENT PROXIES

In order to accurately analyze the impact of investor sentiment on market movements, it is very important to appropriate measure to represent it (Baker and Wurgler, 2007). Although, there is no proxy on which the scholars have reached a consensus, recent literature has attempted to find a proper proxy for investor sentiment. We gather these attempts in two main groups as indirect and direct measures. Following section provides a survey for these proxies.

1.3.1 Indirect Investor Sentiment Proxies

Studies utilizing indirect measures to express investor sentiment mainly use the market-based, market independent and web-based proxies. Studies utilizing the market-based

measures include the following proxies in their models i.e. closed-end fund discounts (Lee et al., 1991; Chopra et al., 1993; Neal and Wheatley, 1998), option implied volatility index (Whaley, 2009), market liquidity (Baker and Stein, 2004), mutual fund flows (Warther, 1995; Bailey et al., 2011), composite index consisting of market-based measures (Baker and Wurgler, 2006b; Baker and Wurgler, 2007) and so on. There are several reasons why these measures are not appropriate proxies for investor sentiment. First, some of the market-based measures including closed-end fund discounts and IPO may not readily available for emerging markets. Second, the frequency of these proxies is relatively low and may not be suitable for observing the short-term effects of investor sentiment (Seok et al., 2019). As for second group of indirect investor sentiment proxies, scholars associate investor sentiment with market independent events or phenomenon including sunshine (Hirshleifer and Shumway, 2003), seasonal affective disorder (Kamstra et al., 2003), soccer results (Edmans et al., 2007). Since these proxies explain investor sentiment with very specific cases, they may not be sufficient to describe the nature of investor sentiment. As for the last category of indirect proxies, investor sentiment literature utilizes several web sources including news sentiment (Tetlock, 2007), social-media sharings (Bollen et al., 2011) and, search engine queries (Da et al., 2015) for web-based measures.

1.3.2 Direct Investor Sentiment Proxies

Direct measures form the second group of investor sentiment proxies. Studies that prefer to use direct proxies refer to The Index of Consumer Sentiment (Lemmon and Portniaguina, 2006), UBS/Gallup Survey (Qiu and Welch, 2006), Turkish Consumer Confidence Index (Sayim and Rahman, 2015a; Bayram, 2017), Turkish Business Confidence Index (Bayram, 2017), American Association of Individual Investors (Verma and Soydemir, 2006; Verma et al., 2008) and, Investors Intelligence (Verma and Soydemir, 2006). There are many advantages of using a direct proxy as investor sentiment. Direct proxies are calculated utilizing consumer or investor questionnaires. In these proxies, information is obtained directly from households with the help of surveys. Additionally, these measures reflect the prevailing situation of the economy as well as the households' attitudes towards general economic atmosphere for short term periods.

For Turkey, the calculation of Turkish Consumer Confidence Index is based on the Consumer Tendency Survey (CTS). CTS is carried out in a monthly interval by a computer-based, face-to-face interview method in cooperation with the Turkish Statistical Institute and Central Bank of the Republic of Turkey. In CTS, consumers' opinions and expect-

ations about personal financial conditions and general economic situation and their expenditure as well as their saving behaviors for the near future are considered.

Chapter 2

DATA

2.1 DATA

In this section, we introduce the dataset that we utilize in this study. Our analysis consists of two stages. In the first stage, following Verma et al.'s (2008) framework, we decompose total investor sentiment into rational and irrational components. In distinguishing these elements, we utilize two types of data. The first one is the Consumer Confidence Index which is utilized to proxy total investor sentiment. Second dataset consists of macroeconomic fundamentals which represents the rational side of the investor sentiment. By regressing macroeconomic fundamentals on total investor sentiment, we obtain an error term which expresses the irrational investor sentiment. In the second step, we investigate the impact of these components on BIST 100 Index returns and volatility. In this context, we utilize monthly data from February 2005 to May 2020. This period is selected due to availability of data where Turkish Industrial Production data starts from the January 2005. In addition, since Terms of Trade data is available as of May 2020, the period begins as of that date.

2.1.1 Consumer Confidence Index

In order to proxy total investor sentiment we utilize Turkish Consumer Confidence Index (CCI) in line with the investor sentiment literature (Verma et al., 2008; Calafiore et al., 2010; Sayim and Rahman, 2015a; Bayram, 2017). The calculation of CCI is based on the Consumer Tendency Survey (CTS) which is executed by Turkish Statistical Institute in cooperation with the Central Bank of Turkey. CTS is carried out monthly by a computer-based, face-to-face interview method. In CTS, consumers' opinions and expectations

about personal financial conditions and general economic situation and their expenditure as well as their saving behaviors for the near future are considered. The sample size of CTS consists of approximately 5,000 households which are randomly selected at the age of 16 and above.

CCIs are collected in pursuance of the European Union's balance method. The balance value is measured for each question by taking the difference between the negative and positive responses. Then, by adding 100 to this balance value, diffusion indices are created for each question. Lastly, the general index is calculated by taking arithmetic means of these indices. CCI takes values within the range of 0-200. If it is above 100, it means consumer confidence is evaluated to be optimistic outlook. If it is below 100, consumer confidence is considered to be in pessimistic direction. We obtained CCI data from Turkish Statistical Institute.

2.1.2 Market Fundamentals

To decompose irrational and rational investment sentiment, we regress economic fundamentals on total investor sentiment proxied by CCI. In this model, economic fundamentals represent the rational aspect of the investor sentiment. The variables we utilize for economic fundamentals are compiled from the asset pricing literature:

- Economic growth (IIP) is measured as the monthly change in the Turkish industrial production index (Schwert, 1990; Verma et al., 2008; Calafiore et al., 2010; Bayram, 2017),

- Short-term interest rates (IRATE) are measured as the monthly yield on the one-year Turkish Treasury bill,

- Inflation (CPI) is measured as the monthly changes in the Turkish consumer price index (Fama and Schwert, 1977; Sharpe, 2002; Bayram, 2017),

- Currency fluctuations (ERATE) are measured as the changes in the Turkish lira and U.S. dollar exchange rate (Elton and M, 1991; Calafiore et al., 2010; Verma et al., 2008; Bayram, 2017,

- Term of trade (TOT) is measured as the monthly ratio between the export price index and the import price index (Calafiore et al., 2010; Bayram, 2017),

- JP Morgan Emerging Markets Bond Index + Turkey rate (EMBI) is used to measure the specific country risk of Turkey (Calafiore et al., 2010; Bayram, 2017)

We obtained Turkish industrial production index from Turkish Statistical Institute, Turkey 1-year bond yield and changes in Turkish Lira to U.S. dollar exchange rate index from Investing.com, consumer price index from Central Bank of the Republic of Turkey and Terms of Trade and JP Morgan Emerging Markets Bond Index from World Bank Global Economic Monitor Database.

2.1.3 Stock Market Data

In the second step of our analysis, we examine the impact of the rational and irrational components of investor sentiment on the BIST 100 Index returns and volatility. In this context, we utilize BIST 100 Index return indices data from Borsa Istanbul database. We select market index as BIST 100 Index since it includes the 100 companies that have the highest capitalization and represents the majority of the Turkish stock market in size. Besides, the reason of why we use the return indices data instead of the closing price is that the return indices reflect the corporate actions including stock splits and dividends. Hence, using return indices data takes into account income returns as well as the capital returns. Table 1 shows the list of above-mentioned variables, their descriptions along with their sources.

Variable	**Description**	**Source**
RET	BIST 100 Index Returns	Borsa Istanbul
VOL	BIST 100 Index Volatility	Borsa Istanbul
CCI	Consumer Confidence Index	TÜİK
IRATE	Turkey 1 Year Bond Yield	Investing.com
IIP	Industrial Production Index	TÜİK
EMBI	JP Morgan Emerging Markets Bond Index + Turkey rate	WB GEM
TOT	Terms of Trade	WB GEM
CPI	Consumer Price Index	TCMB
ERATE	Changes in Turkish Lira to US dollar exchange rate	Investing.com

Table 1: Variables, descriptions and data sources.

Chapter 3

METHODOLOGY

3.1 METHODOLOGY

Since investor sentiment consists of rational and irrational components, stock returns and volatility are affected by both fundamental-driven and noise characteristics of investor sentiment. In order to provide a proper explanation about investor sentiment, we decompose its irrational and rational elements by following Verma et al. (2008). According to this approach, total sentiment which is proxied by CCI is included in the model as the dependent variable as well as a set of economic fundamentals as the independent variable.

Accordingly, we utilize following equation to decompose rational and irrational aspects of investor sentiment

$$SENT_t = \gamma_0 + \gamma_j \sum_{j=1}^{J} FUND_{jt} + \xi_t \tag{3.1}$$

Where $SENT_t$ represents the changes in investor sentiment at time t which is proxied by CCI; γ_0 is the constant term, γ_j is the parameter to be estimated and; ξ_t is the error term. $FUND_{jt}$ is the set of macroeconomic fundamentals including economonic growth, short-term interest rate, inflation representing rational expectations based side of the investor sentiment. The fitted values from Equation 3.1 ($SENT_t$) gives the rational component of investor sentiment (RAT, hereafter) while the residuals of this equation (ξ_t) represents the irrational side of investor sentiment (IRR, hereafter). (See Figure 1.)

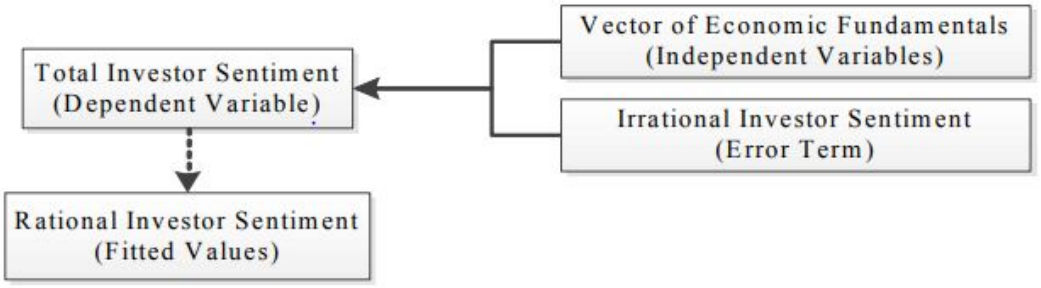

Figure 1: Rational and Irrational Components of Investor Sentiment
Source: Johnk (2012)

After obtaining rational and irrational components of investor sentiment, the next stage of our analysis is to investigate their impacts on BIST 100 Index returns and volatility. The continuously compounded returns for the BIST 100 Index are calculated as follows (Hull, 2019):

$$R_t = ln\frac{P_t}{P_{t-1}} \tag{3.2}$$

where R_t is the continuously compounded return, P_t is the value of the BIST 100 Index at the end of month t.

In order to calculate an unbiased estimate of the volatility, σ, using the most recent m observations on the R_t, we utilize the following equation (Hull, 2019):

$$\sigma_n^2 = \frac{1}{m-1}\sum_{t=1}^{m}(R_{n-t} - \bar{R})^2 \tag{3.3}$$

Where $\bar{R}$ is the mean of the R_t.

In order to examine the nonlinear dynamics between rational and irrational elements of investor sentiment and stock market returns and volatility, we utilize threshold regression models (TRM). Following section provides explanations about this approach.

3.1.1 Threshold Regression Model

In this stage of our analyses, in order to reveal the nonlinear relationship between stock market returns, volatility and investor sentiment, we utilize Threshold Regression Model. TRM is basically an extended version of the linear regression allowing coefficients to change across regimes. These regimes are identified by whether the threshold variable is above or below some unknown level of a threshold value γ. These models are good substitutes to linear models in detecting asymmetric movements observed in the stock markets.

TRM with two regions defined by a threshold γ can be written as:

$$y_t = x_t\beta + z_t\delta_1 + \epsilon_t, \;\; if \;\; -\infty < w_t < \gamma \tag{3.4}$$

$$y_t = x_t\beta + z_t\delta_2 + \epsilon_t, \;\; if \;\; \gamma < w_t < \infty \tag{3.5}$$

"where y_t is the dependent variable, x_t is a $1 \times k$ vector of covariates possibly containing lagged values of y_t, β is a $k \times 1$ vector of region-invariant parameters, ϵ_t is an IID error with mean 0 and variance σ^2, z_t is a vector of exogenous variables with region-specific coefficient vectors δ_1 and δ_2, and w_t is a threshold variable. The parameters of the model are β, δ_1 and δ_2. Region 1 is defined as the subset of observations in which the value of w_t is less than the threshold γ. Similarly, Region 2 is defined as the subset of observations in which the value of w_t is greater than γ" (StataCorp, 2021).

In our analysis, we assert that the BIST 100 Index returns are determined based on the fitted values (RAT) and residuals (IRR) collected from the Equation (3.1.) which represent the irrational form of investor sentiment. We utilize the one-period lagged values of the BIST 100 Index returns (RET_{t-1}) as the threshold variable to separate the sample into states since we assume one threshold. So the model based on threshold regression takes the following form:

$$RET_t = \beta_{10} + \beta_{11}RAT + \beta_{12}IRR + \epsilon_t, \;\; if \;\; -\infty < RET_{t-1} < \gamma \tag{3.6}$$

$$RET_t = \beta_{20} + \beta_{21}RAT + \beta_{22}IRR + \epsilon_t, \;\; if \;\; \gamma < RET_{t-1} < \infty \tag{3.7}$$

Similarly, in the second stage of our analysis, we model BIST 100 volatility using RAT and IRR. Again, we use one-period lagged values of the BIST 100 Index volatility (VOL_{t-1}) as the threshold variable, and we assume one threshold, so the model becomes:

$$VOL_t = \delta_{10} + \delta_{11} RAT + \delta_{12} IRR + \epsilon_t, \;\; if \;\; -\infty < VOL_{t-1} < \gamma \tag{3.8}$$

$$VOL_t = \delta_{20} + \delta_{21} RAT + \delta_{22} IRR + \epsilon_t, \;\; if \;\; \gamma < VOL_{t-1} < \infty \tag{3.9}$$

Unlike the linear models, this type of analyses allows the role of RAT and IRR to change depending on whether the BIST 100 Index returns and volatility are below or above unknown level of γ. In these equations, one-period lagged values of BIST 100 Index returns and volatility act as a sample-splitting variable. The impact of RAT and IRR on BIST 100 Index returns will be β_1 and β_2 and, the impact on BIST 100 volatility will be δ_1 and δ_2 for low and high states, respectively.

Chapter 4

RESULTS

4.1 DESCRIPTIVE STATISTICS

Table 2 shows the descriptive statistics of the variables which is introduced in the previous chapter. The mean of the Consumer Confidence Index is closer to its maximum value with 4.49 than the minimum value which gives a sign about the sentiment is more bullish in the most of the investigated period. The standard deviation of CCI is 7.0 per cent. The mean of the market return is 0.98 per cent, while the standard deviation is 7.6 per cent per month (26.32% annualized). The market return has a higher standard deviation than the CCI which implies that the monthly returns are more volatile than the sentiment during the sample period.

Variable	Obs	Mean	SD.	Min	Max
RET	185	0.0098	0.0767	-0.2719	0.2133
VOL	185	0.0704	0.0264	0.0199	0.1516
CCI	185	4.4977	0.0706	4.3023	4.6123
IRATE	185	0.0099	0.0037	0.0041	0.0203
IIP	185	4.4305	0.2298	4.0431	4.7913
EMBI	185	5.6701	0.3057	5.0901	6.6024
TOT	185	0.9982	0.0442	0.9108	1.1127
CPI	185	0.7623	0.8925	-1.4400	6.3000
ERATE	185	0.0088	0.0442	-0.0818	0.2833

Notes: This table reports the descriptive statistics of the variables of the study. Variables are as follows, RET: Monthly continuously compounded returns of BIST 100 Index, VOL: Volatility of BIST 100 Index, CCI: Natural logarithm of Turkish Consumer Confidence Index, IRATE: Monthly yield on the one-year Turkish Treasury bill, IIP: Natural logarithm of Turkish Industrial Production Index, EMBI: Natural logarithm of JP Morgan Emerging Markets Bond Index + Turkey rate, TOT: Natural logarithm of Terms of Trade, CPI: Consumer Price Index, ERATE: The changes in Exchange Rate Between Turkish Lira and US Dollar.

Table 2: Descriptive Statistics

4.2 ESTIMATION RESULTS

First, in order to check for the unit-roots, we apply Augmented Dickey Fuller (ADF) test (1979, 1981) and Philip Perron (PP) test (1988) on each variable. Table 3 shows the results of ADF and PP tests. The null hypothesis of ADF test and PP test is rejected for RET, VOL, CPI and ERATE variables which indicates the stationary of these variables. On the other hand, CCI, IRATE, IIP, EMBI and TOT are stationary at their first differences.

Variable	Augmented Dickey Fuller Test				Phillips Perron Test			
	Level		1st Difference		Level		1st Difference	
	w/o Trend	w/ Trend	w/o Trend	w/ Trend	w/o Trend	w/ Trend	w/o Trend	w/ Trend
RET	-7.852***	-7.863***			-13.559***	-13.538***		
VOL	-3.129**	-3.155*			-3.247**	-3.371*		
CCI	-2.673	-2.898	-7.535***	-9.42***	-2.766	-2.972	-12.282***	-12.244***
IRATE	-2.021	0.611	-7.521***	-7.535***	-2.015	-1.976	-12.361***	-12.345***
IIP	-1.651	-0.934	-5.769***	-5.862***	-1.423	-2.214	-16.562***	-16.563***
EMBI	-1.878	-2.582	-7.94***	-8.008***	-1.947	-2.638	-10.763***	-10.762***
TOT	-1.911	-2.199	-10.18***	-10.223***	-2.224	-2.457	-15.531***	-15.6***
CPI	-7.395***	-7.609***			-10.357***	-10.509***		
ERATE	-7.939***	-8.227***			-12.213***	-12.394***		

Notes: This table reports the unit root test results of the variables. Variables are as follows, RET: Monthly continuously compounded returns of BIST 100 Index, VOL: Volatility of BIST 100 Index, CCI: Natural logarithm of Turkish Consumer Confidence Index, IRATE: Monthly yield on the one-year Turkish Treasury bill, IIP: Natural logarithm of Turkish Industrial Production Index, EMBI: Natural logarithm of JP Morgan Emerging Markets Bond Index + Turkey rate, TOT: Natural logarithm of Terms of Trade, CPI: Consumer Price Index, ERATE: The changes in Exchange Rate Between Turkish Lira and US Dollar. *, **,***Significance at the 10, 5 and 1 percent levels, respectively.

Table 3: Unit Root Test Results

After checking the stationary of each variable, the ordinary least square (OLS) regression model is estimated based on the Equation 3.1. This model shows the impacts of the macroeconomic fundamentals on the CCI and allows us to decompose the rational and irrational components of the investor sentiment. Fitted values of this regression represent the rational aspect of the investor sentiment, while residuals are the irrational component. Table 4 shows the OLS estimation results. Results reveal that investor sentiment is significantly negatively related with EMBI and CPI which implies that an increase in those variables negatively affect Turkish investor sentiment. The Adjusted R-square value (0.1796) indicates that the macroeconomic fundamentals can explain investor sentiment about twenty percent. The Durbin-Watson statistic (2.00) suggests that there is no first-order serial correlation in error term. Consequently, the results show that the investor sentiments are affected by macroeconomic fundamentals in consistent with the previous literature (Verma et al., 2008; Sayim and Rahman, 2015a; Sayim and Rahman, 2015b; Bayram, 2017).

Dependent Variable: $SENT$				
	Coefficient	SE	t-Statistic	Prob
Variable				
IRATE	1.1154	1.6754	0.67	0.506
IIP	0.0759	0.0496	1.53	0.128
EMBI	-0.0663***	0.0201	-3.29	0.001
TOT	-0.0009	0.103	-0.01	0.993
CPI	-0.0092***	0.002	-4.54	0
ERATE	0.0016	0.0482	0.03	0.974
Cons.	0.0062**	0.0024	2.58	0.011
R-squared	0.2065			
Adj R-squared	0.1796			
F-statistic	7.68			
Prob>F	0			
Root MSE	0.02406			
Durbin-Watson Stat.	2.00416			

$$SENT_t = \gamma_0 + \gamma_j \sum_{j=1}^{J} FUND_{jt} + \xi_t$$

Notes: Variables are SENT: Turkish Consumer Confidence Index, IRATE: Interest Rate, IIP: Turkish Industrial Production Index, EMBI: JP Morgan Emerging Markets Bond Index + Turkey rate, TOT: Terms of Trade, CPI: Consumer Price Index, ERATE: Exchange Rate Between Turkish Lira and US Dollar. **,***Significance at the 5 and 1 percent levels, respectively.

Table 4: OLS Estimation Results

After OLS estimation, we execute Breusch-Godfrey Serial Correlation LM Test to check whether there is a serial correlation problem. Table 5 reports Breusch-Godfrey Serial Correlation LM Test results. Results show that there is no serial correlation problem with this equation since p-value of 0.8746 is greater than 0.05.

Breusch-Godfrey LM test for autocorrelation			
lags(p)	chi2	df	Prob
1	0.025	1	0.8746
H_0: No serial correlation.			

Table 5: Breusch-Godfrey Test Results

In order to check the heteroscedasticity, we apply Breusch-Pagan/Cook-Weisberg test. Table 6 reports Breusch-Pagan/Cook-Weisberg test results. Result imply that there is no heteroscedasticity with p-value of 0.4488.

Breusch-Pagan/Cook-Weisberg test for heteroskedasticity			
chi2(1)	Prob	df	Prob
0.57	0.4488	1	0.8746
H_0: Constant variance.			

Table 6: Breusch-Pagan/Cook-Weisberg Test Results

4.2.1 Threshold Regression Model Results

In order to investigate the nonlinear dynamics between rational and irrational components of investor sentiment, market returns and volatility, we utilize threshold regression models. RET and VOL are employed as dependent variables while rational and irrational components of investor sentiment are included in the model as explanatory variables. We use one-period lagged values of RET and VOL as threshold variables.

Table 7 shows the results of the model which RET is a dependent variable. STATE #1 represents the state where the market return is below the threshold value while STATE #2 shows the state where the market return is above the threshold value. From now on, we will call these states low return and high return state, respectively. In both low and high states, sign of the rational investor sentiment is positive and significant. However, the influence of irrational investor sentiment on stock returns is found insignificant. In contrast with Verma et al. (2008) which focus on the US markets, our finding is in line with Calafiore et al. (2010) and Bayram (2017) who find no significant effect of irrational investor sentiment for the emerging markets (Brazil and Turkey, respectively). This inconsistency can be explained by the fact that the markets used in the studies are included in the developed and developing categories. In terms of the positive sign of rational component of investor sentiment, our finding may imply that the optimistic environment originating from the rational component of investor sentiment positively and significantly impact the stock market returns. This is consistent with the Verma et al. (2008), Calafiore et al. (2010), Sayim and Rahman (2015a), Sayim and Rahman (2015b) and Bayram (2017) who reveal similar results. Moreover, the rational sentiment creates more impact in the high state (3.28) than that of the low state (1.88).

Dependent Variable: RET				
Variable	Coefficient	SE	Z	Prob
STATE #1				
RAT	1.886818***	0.63339	2.98	0.003
IRR	0.059472	0.39611	0.15	0.881
Cons.	0.033853***	0.0099	3.42	0.001
STATE #2				
RAT	3.288063***	0.60904	5.4	0
IRR	0.301075	0.26185	1.15	0.25
Cons.	-8.80E-05	0.0062	-0.01	0.989
Threshold Variable: RET_{t-1}				
Number of threshold	1			
Threshold	-0.032			
AIC	-973.76			
BIC	-954.471			
HQIC	-965.942			
HQIC	-1464.3			

Table 7: Threshold Regression Model Results for RET

Table 8 presents the results of the model where VOL is a dependent variable. STATE #1 represents the state where the market volatility is below the threshold value while STATE #2 shows the state where the market volatility is above the threshold value. We will call these states low volatility and high volatility state, hereafter. In the low state, both the impact of the rational and irrational investor sentiments are found insignificant. In the high state, only the negative influence of rational investor sentiment on market volatility is found to be significant. This finding may imply that the investors' positive expectations shape the economic environment by decreasing the uncertainty and the volatility of stock market. This is also in line with the results of Sayim and Rahman (2015a) who conclude that rational investor sentiment negatively affects volatility of the market returns.

Dependent Variable: VOL				
Variable	Coefficient	SE	Z	Prob
STATE #1				
RAT	-0.0508	0.14548	-0.35	0.727
IRR	-0.0398	0.07092	-0.56	0.574
Cons	0.058009***	0.00159	36.49	0
STATE #2				
RAT	-0.39277**	0.16974	-2.31	0.021
IRR	-0.0713	0.09273	-0.77	0.442
Cons	0.09946***	0.00245	40.6	0
Threshold Variable: VOL_{t-1}				
Number of threshold	1			
Threshold	0.0807			
AIC	-1472.1			
BIC	-1452.8			
HQIC	-1464.3			

Table 8: Threshold Regression Model Results for VOL

Chapter 5

CONCLUSION

The aim of this study is to examine the nonlinear dynamics between both rational and irrational components of investor sentiment and stock market movements. In order to provide a proper explanation about total investor sentiment, we decompose its irrational and rational components. From this point of view, we utilize Verma et al.'s (2008) framework to distinguish these aspects of investor sentiment. In this respect, we utilize a total sentiment measure which is proxied by Turkish Consumer Confidence Index in our estimation model as the dependent variable and a set of economic fundamentals as the independent variable. After regressing the economic fundamentals variable set on the total sentiment measure, the fitted values give the rational component of investor sentiment and the residuals form the irrational side of investor sentiment. In the last stage of our analysis, we examine the nonlinear relationship between the irrational and rational components of investor sentiment, stock market returns and volatility of the BIST 100 Index utilizing threshold regression models.

Our findings reveal that in both low and high return state, rational investor sentiment positively impact the stock market returns. We also find that the rational sentiment has more impact in the high return state than that of the low return state. In addition, in both states, the influence of irrational investor sentiment on stock returns is found insignificant. While our results are in line with Calafiore et al. (2010) and Bayram (2017) who find no significant effect of irrational investor sentiment for the emerging markets (Brazil and Turkey, respectively), are incompatible with Verma et al. (2008) which focus on the US markets. This inconsistency can be explained by the fact that the markets used in the studies are included in the developed and developing categories. Furthermore, in the high volatility state, rational investor sentiment is found to negatively impact the stock market volatility.

Our results imply that the optimistic environment originating from the rational component of investor sentiment impact the stock market returns positively and the investors' positive expectations shape the economic environment by contributing to the decrease in the uncertainty and the volatility of stock market. These have clear implications for investors and policy makers since the influence of rational investor sentiment on stock market movements is evident. In other words, the fundamentals-driven sentiment dominates the stock market in terms of its impact on both stock market returns and volatility. Therefore, one can say that the rational expectations argument is prevailing in Borsa Istanbul. Stabilizing effect of fundamentals-driven investor sentiment may allow the authorities in their policy designing process to reduce uncertainty in the market. On the other hand, we show that the irrational component of investor sentiment has no significant effect on stock market returns and volatility. This results in reductions in the probability of occurrence of the excesses in the stock market such as underreaction and overreaction. By this channel, stock prices are less likely to deviate from their fundamental values. These statistical properties of the investor sentiment components help practitioners to enhance their investment decisions by incorporating these elements to asset valuation processes.

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APPENDIX 1: ORIGINALITY REPORT

HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
YÜKSEK LİSANS TEZ ÇALIŞMASI ORİJİNALLİK RAPORU

HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İKTİSAT ANABİLİM DALI BAŞKANLIĞI'NA

Tarih: 15/10/2021

Tez Başlığı : Yatırımcı Duyarlılığı İle Hisse Senedi Hareketleri Arasındaki Doğrusal Olmayan Dinamikler: Borsa İstanbul Örneği

Yukarıda başlığı gösterilen tez çalışmamın a) Kapak sayfası, b) Giriş, c) Ana bölümler ve d) Sonuç kısımlarından oluşan toplam 47 sayfalık kısmına ilişkin, 15/10/2021 tarihinde şahsım/tez danışmanım tarafından Turnitin adlı intihal tespit programından aşağıda işaretlenmiş filtrelemeler uygulanarak alınmış olan orijinallik raporuna göre, tezimin benzerlik oranı % 27' dir.

Uygulanan filtrelemeler:
1- ☒ Kabul/Onay ve Bildirim sayfaları hariç
2- ☒ Kaynakça hariç
3- ☐ Alıntılar hariç
4- ☒ Alıntılar dâhil
5- ☒ 5 kelimeden daha az örtüşme içeren metin kısımları hariç

Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Çalışması Orijinallik Raporu Alınması ve Kullanılması Uygulama Esasları'nı inceledim ve bu Uygulama Esasları'nda belirtilen azami benzerlik oranlarına göre tez çalışmamın herhangi bir intihal içermediğini; aksinin tespit edileceği muhtemel durumda doğabilecek her türlü hukuki sorumluluğu kabul ettiğimi ve yukarıda vermiş olduğum bilgilerin doğru olduğunu beyan ederim.

Gereğini saygılarımla arz ederim.

15/10/2021

Adı Soyadı: Aslıhan GÜL
Öğrenci No: N17135509
Anabilim Dalı: İktisat
Programı: Tezli Yüksek Lisans (İngilizce)

DANIŞMAN ONAYI

UYGUNDUR.

Doç.Dr., Başak DALGIÇ

HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
MASTER'S THESIS ORIGINALITY REPORT

HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
ECONOMICS DEPARTMENT

Date: 15/10/2021

Thesis Title : Nonlinear Dynamics Between Investor Sentiment and Stock Movements: Evidence From Borsa Istanbul

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15/10/2021

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Student No:	N17135509
Department:	Economics
Program:	Master of Arts With Thesis (English)

ADVISOR APPROVAL

APPROVED.

Doç.Dr., Başak DALGIÇ

APPENDIX 2: ETHICS BOARD WAIVER FORM

HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
TEZ ÇALIŞMASI ETİK KOMİSYON MUAFİYETİ FORMU

HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İKTİSAT ANABİLİM DALI BAŞKANLIĞI'NA

Tarih: 15/10/2021

Tez Başlığı: Yatırımcı Duyarlılığı İle Hisse Senedi Hareketleri Arasındaki Doğrusal Olmayan Dinamikler: Borsa İstanbul Örneği

Yukarıda başlığı gösterilen tez çalışmam:

1. İnsan ve hayvan üzerinde deney niteliği taşımamaktadır,
2. Biyolojik materyal (kan, idrar vb. biyolojik sıvılar ve numuneler) kullanılmasını gerektirmemektedir.
3. Beden bütünlüğüne müdahale içermemektedir.
4. Gözlemsel ve betimsel araştırma (anket, mülakat, ölçek/skala çalışmaları, dosya taramaları, veri kaynakları taraması, sistem-model geliştirme çalışmaları) niteliğinde değildir.

Hacettepe Üniversitesi Etik Kurullar ve Komisyonlarının Yönergelerini inceledim ve bunlara göre tez çalışmamın yürütülebilmesi için herhangi bir Etik Kurul/Komisyon'dan izin alınmasına gerek olmadığını; aksi durumda doğabilecek her türlü hukuki sorumluluğu kabul ettiğimi ve yukarıda vermiş olduğum bilgilerin doğru olduğunu beyan ederim.

Gereğini saygılarımla arz ederim.

15.10.2021

Adı Soyadı:	Aslıhan GÜL
Öğrenci No:	N17135509
Anabilim Dalı:	İktisat
Programı:	Tezli Yüksek Lisans(İngilizce)
Statüsü:	☒ Yüksek Lisans ☐ Doktora ☐ Bütünleşik Doktora

DANIŞMAN GÖRÜŞÜ VE ONAYI

Doç.Dr., Başak DALGIÇ

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HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
ETHICS COMMISSION FORM FOR THESIS

HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
ECONOMICS DEPARTMENT

Date: 15/10/2021

Thesis Title: Nonlinear Dynamics Between Investor Sentiment and Stock Movements: Evidence From Borsa Istanbul

My thesis work related to the title above:

1. Does not perform experimentation on animals or people.
2. Does not necessitate the use of biological material (blood, urine, biological fluids and samples, etc.).
3. Does not involve any interference of the body's integrity.
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I declare, I have carefully read Hacettepe University's Ethics Regulations and the Commission's Guidelines, and in order to proceed with my thesis according to these regulations I do not have to get permission from the Ethics Board/Commission for anything; in any infringement of the regulations I accept all legal responsibility and I declare that all the information I have provided is true.

I respectfully submit this for approval.

15.10.2021

Name Surname:	Aslıhan GÜL
Student No:	N17135509
Department:	Economics
Program:	Master of Arts with Thesis (English)
Status:	☒ MA ☐ Ph.D. ☐ Combined MA/ Ph.D.

ADVISER COMMENTS AND APPROVAL

Doç.Dr., Başak DALGIÇ