RECENT PERSPECTIVES AND CASE STUDIES IN FINANCE & ECONOMETRICS

Ozan Gönüllü
Başak Turan içke

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Edited By
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Recent Perspectives and Case Studies in Finance & Econometrics

(Edited by: Ozan Gönüllü, Başak Turan İçke)

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IJOPEC Publication Limited
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615 7 Baltimore Wharf
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www.ijopec.co.uk
E-Mail: info@ijopoc.co.uk
Phone: (+44) 73 875 2361 (UK)
(+90) 488 217 4007 (Turkey)

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INTRODUCTION:
RECENT PERSPECTIVES AND CASE STUDIES IN FINANCE AND ECONOMETRICS

The rapidly changing events in the financial and economic world have become a challenge for decision-makers and practitioners. The world appears with the commonality of problems and "image" of variety of solutions. Whether this is a fact or just an acquiescence is controversial. In fact, science creates a great area for these discussions. When making decisions in the field of economics and finance, a deeper insight and detailed analysis are needed. For the analysis; it is necessary to be equipped with information, to act with the correct data, to use the right instruments and to evaluate the results within the objective criteria framework. Making interpretations on the right platform, suggesting solutions, developing theories and making decisions are among the traditional scientific steps. However, the ease of decision making with rational assumptions becomes increasingly difficult along with the tendency of moving away from the rejection of irrationality.

There are remarkable changes in the economy and finance literature. First of all, in this field as in every field, it is seen that solutions are being sought for the main economic problems that coming from the past and still existence by developing models accompanied by the technology and R&D based information. As a simple example of highlighting the point where the finance world reached accompanied with the technology and innovation, while we are writing the introduction for this book and Googled that "Google" results of "Bitcoin" have reached out 427,000,000 results. In addition, thinking that we are expected to make our sample a little more academic, it is seen that Paul Romer who has been awarded the 2018 Nobel Prize in Economics put forward technology and R&D in his study too. Regardless of whether a result occurs or not - at this point we must say that even uncertainty is another sign of change - the developments in the agenda clearly show that our direction evolves towards technology and R&D. However, this is the fact, the intense digital transformation that we have experienced on the one hand makes life easier and on the other hand causes problems that require new solutions.

Another important change is that, as a result of the diversity in the financial markets from the 90s to the present, today's financial institutions offer a wide range of new and highly complex financial products and services to the investors. Moreover, investment opportunities no longer remain within the borders of the country, but also reach beyond the borders. These dramatic changes in the financial system require structural changes in social welfare policies too. Under these circumstances, it is clear that individuals need to develop their ability to read markets. The financial literacy concept stands as a key to make decisions along with the knowledge of individuals' wealth and reducing the possibility of making mistakes in their financial decisions. Therefore, we need to say that there is a need to develop new practices to increase the level of low financial literacy that should be seen not only as a household problem but also as a problem for policymakers of countries. It should not be overlooked that this may be a solution for lack of financial knowledge and qualification issue which is one of the important problems arises from globalization.

The global crisis also emerges as an effective factor in experiencing the changes. Today, as a result of the crises, we can see that the major systematic changes are prepared, even the markets which are detailed, intensive and have long-term restructuring processes are shaken and prefer to divergence. We think that it would not be wrong

to say that the most striking example is the Brexit process. It is clear that after the 2008 global financial crisis, Britain remained between more integration and less integration. Reaching to this point at the cost of losing the great advantages provided by the EU has been amazing for the world. It is undeniable that the problems arising from crises are among the factors that bring the UK which has the strongest financial services infrastructure, regulation and experience in the EU, to this point. The acceleration of the unhappiness which beginning with the unemployment feelings in the lives of households is easily be said that has caused the Brexit decision.

The factors we have listed up to this point are the top among the most important changes in the world of economy and finance. This study, which aims to contribute to the literature by considering the elements we mentioned before and many more, mainly consists of two parts. The first part includes studies on current issues related to financial markets and is composed of six chapters. In the first chapter, financial performance of Deposit Banks in Turkey is analyzed by TODIM method. The size of the financial sector in Turkey as of 2017 is indicated that to reach 1 trillion USD and it is also emphasized that the banking industry has the largest share in this system. Considering the growth potential of the banking industry, it is stated that Turkish Banking System should be closely followed and monitored. In order to make this assessment, the index for each item of CAMELS is estimated and the weighted average of these index values and the financial performance of the banks are compared as a whole and the financial performance of the selected banks is ranked.

In the second chapter, it is discussed that Brexit, which means that the UK desires to leave the EU together with the referendum, will cause which consequences for the EU financial markets and the UK, what changes will happen especially in the banking system, and which consequences will be encountered. In this study, the reasons of Brexit and the development of the process and the factors that lead to Brexit decision are explained. It is also stated that, with the loss of EU financial passporting rights, a loss of employment will occur in London due to the relocating of some of the activities of the banks to Continental Europe, and this loss may not be as big as predicted. On the other hand, it is anticipated that this process will increase the attractiveness of financial centers such as Frankfurt and Paris in an extraordinary level, but it is foreseen that the expectations in this scope will not be happen as well. It is stated that the economic consequences of leaving from the EU with the Brexit decision, were not sufficiently discussed in the public and not sufficiently prepared for the negotiations. Possible exit scenarios that may be encountered as a result of Brexit are emphasized and two of the most probable scenarios among them are discussed. The scenarios, one of them is the free trade agreement that does not include financial services and the other is the No-Deal Hard-Brexit Scenario which means insolvability, are explained by emphasizing what will happen if these two alternatives are realized.

In the third chapter, financial literacy is discussed and evaluated. As a result of the effects of globalization on financial markets. It has been stated that the financial markets are becoming more complex and individuals' financial mistakes possibility increases due to the derivation of many financial instruments and services. In this context, the importance of financial literacy is emphasized. It was emphasized that individuals should be financially literate in order to make safe and sound decisions that are supported by knowledge, on financial issues. It was emphasized that low level of financial literacy should be considered as a significant problem not only for individual economies but also for national economies. When the individual fails to achieve this competence, he either withdraws himself from the financial markets and causes the funds to remain idle, which can lead to inability to provide benefits to the economy of the country, or he may be able to damage both himself and the national economy by making inaccurate financial decisions. The study aimed specifically taking a measure on the level of financial literacy in

the province of Bursa by using the OECD financial literacy survey which is conducted to determine the level of financial literacy. It is found that debt management, savings, inflation and retirement titles are leading topics for the individuals who are evaluated within the scope of financial literacy.

In the fourth chapter, co-movement characteristics of credit default swaps (CDSs) and stock markets are investigated in emerging economies. In this context, weekly data of CDSs and stock market data of nine emerging markets are used. It is observed that changes in stock market returns lead to the dissemination of CDS and stock market indices can be used to predict CDS spreads. In the analysis, findings show reveal a negative correlation between CDSs and stock market indices in more of countries.

In the fifth chapter, the MOVE index, which is one of the financial indicators that affect the decision-making process in the bond market for investors and money market policy practitioners, is discussed. In the study, regarding this index which is closely followed in international financial markets, causal relationship between the 10-year benchmark government bond interest rates for Brazil, China, Indonesia, Philippines, South Africa, India, Mexico, Russia and Turkey are examined. According to the results obtained from the analysis, it is found that considering the changes in MOVE index is an important decision factor for investors and monetary policy practitioners to examine bonds' rates of Indonesia, the Philippines, Mexico and Turkey.

In the sixth chapter, Bitcoin which is traded in the financial markets since 2009 and an alternative for traditional economics and banking systems and also the leader of cryptocurrencies, is discussed. This attractive cryptocurrency which has gained a great value especially by the end of 2017, was examined in the framework of the factors that determine the price of it and the methods used in price formation and analysis. Bitcoin's extremely volatile prices have been evaluated by different methods of analysis and the reasons of these fluctuations are tried to be found. However, the different results obtained in empirical studies indicate that it is too early to reach a common judgement on Bitcoin. It is underlined that the extremely volatile prices are an important risk factor for the cryptocurrency for now, but it is highlighted that it will be at the right place along with supporting by various regulations and a market depth in the future.

The second part of the study consists of chapters covering econometric models. In the first chapter of this part, there is an evaluation which is made within the framework of the Mincer wage equation. In the literature, it is stated that there are many studies about wages and the determinants of the wage, and differentiation can be realized by adding new variables to the analyzes. In this study, unlike previous studies, machine learning methods are used. Authors demonstrate how the machine learning algorithms work in microeconomic data and state that supervised machine learning methods are not yet widely used in empirical economics and econometrics. The results obtained from the study show that Support Vector Regression is the superior method among methods of Least Absolute Shrinkage and Selection Operator, Elastic Net, Regression Trees and Support Vector Regression.

In the second chapter, the relationship between stock prices in BRICS countries is investigated for long and short-term. This analysis is performed by employing Augmented Dickey-Fuller (ADF), the Philips-Perron (PP), Johansen cointegration test, and the Pair-wise Granger causality test. Empirical findings of the study prove that there is a correlation between stock market indices of Brazil-Russia, Russia-China, Brazil-China, Russia-India, Russia-South Africa, India-China, China-South Africa in the long-term; however, findings do not reveal any relationship between stock market indices of Brazil-India, Brazil-South Africa, and India-South Africa in the long-term. In general terms, it is underlined that since BRICS countries have many common features, investing

in the BRICS stock markets would provide a limited variety, and it is emphasized that investing in these markets would not be rational behavior.

In the last chapter, the determinants of customer losses in the real estate market are examined. After noting that the real estate market in Turkey draws an attention especially following the 2001 financial crisis, it is stated that the market has been accelerated with the government's support and cheap funding. It is stated that this rapid rise led to the emergence of many other sub-sectors and it is determined that online real estate markets have become an effective market place for buyers and sellers. In this study, one of the online real estate markets is handled and the determinants of customer demands are analyzed. The results exhibit that factors such as usage intensity of the website, number of listing, and the effectiveness of the site for real estate agents are among the factors that significantly affect the real estate market.

Considering all the parts and chapters, the study which has a very rich perspective has been created with the important and current issues of our day. Lots of topics; from Brexit to Financial Literacy, from CDSs to financial performance characteristics of the banking system, from integration of the BRICS stock markets to wage discussions, from Bitcoin to public debt instruments and to real estate markets are discussed with different perspectives and evaluated. We hope that our book will provide a great benefit for both the academic community and all readers who are interested in economics and finance.

Başak Turan İçke
Ozan Gönüllü

1

FINANCIAL PERFORMANCE OF DEPOSIT BANKS IN TURKEY: AN INVESTIGATION WITH TODIM METHOD[1]

Atalay Çağlar[2]

Abstract:

Total size of assets of the Turkish Financial Industry has reached roughly US$ 1 Trillion by the end of 2017 fiscal year. In consideration of the total size of assets of the Turkish financial industry, which corresponds about to 1.2 times of the GDP in 2017, Turkish Banking Sector seems to have the largest share in the entire Turkish financial system with its significant percentage (86.2%). Since potential issues that may arise in the banking sector could result in severe economic consequences in the country, financial statuses of the Turkish banks are required to be monitored and audited on regular basis. CAMELS ratios comprised of six sub-elements allow monitoring of financial statuses of banks. In the present study, financial performances of 22 Turkish banks were analyzed by employing 21 indicators described for six sub-elements for 2016 fiscal year. In the evaluation process, the TODIM Method, a multi-criteria decision making method, was utilized. The analysis findings were obtained through two different normalization approaches. Moreover, the analyses were expanded for the different values of risk aversion coefficient used in TODIM Method.

Keywords: Bank, CAMELS, TODIM Method

1. Introduction

Developments in the financial markets are considered vitally important for all constituents of an economy. A bank, as a mediator of transferring funds made available by parties yielding positive saving to the ones in need of funds (Solak, 2010), are prominent institutions in financial markets. The funds supplied through banks to the economy for the use of real industry constitute opportunity for economic growth and improvements in fundamental economic indicators especially unemployment rates. Deterioration of financial statuses of banks playing significant effective role in economic development and any failure in their functioning would have adverse consequences on country economy. Accordingly, it is possible to state that strong economy depends on size and robustness of banking sector (Kapucu & Şiriner, 2007). 2001 banking crisis in Turkey could be very picture of which depicts the effect and significance of the sector. Again, it is not possible to deny the heavy burden of the 2008-2009 global financial crisis over the banking sector. According to 2017 Annual Report of the Banking Regulatory and Supervisory Agency (BRSA), total asset size of the Turkish financial sector has increased to 3.8 Trillion TL at the end of 2017 (about US$ 1 Trillion). Within the jurisdiction scope of the BRSA in 2017, share of financial leasing, factoring, consumer finance, and asset management companies in the overall financial sector were reported as 86.2%, 1.5%, 1.2%, 1.1% and 0.1%, respectively. In consideration of the total size of assets of the Turkish financial industry, which corresponds about to 1.2 times the GDP in 2017, Turkish Banking Sector seems to have the largest share

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2 (Pamukkale University), acaglar@pau.edu.tr

in the entire Turkish financial system with its significant percentage (86.2%) (Banking Regulatory and Supervisory Agency, 2017).

As of today, the relevant measures have been taken to consolidate the financial sector and to strengthen financial structures of banks having notably dominant share in the financial system afterwards of 2001 financial crisis. Any negative circumstance with the banking sector, a prominent contributor to healthy and stable development of the country economy, could have adverse impact on overall economy. Hence, it is required to supervise and audit the banking sector (Uysal, 2010). One of the common approaches administered in surveillance of financial structures of banks is CAMELS method regarded as "distance supervision tool" (Gündoğdu, 2017). The CAMELS method allows decision makers to have an objective evaluation by bringing various assessment options at single mutual point (Aytekin & Sakarya, 2013). In the scope of the CAMELS approach, analyses were conducted based on the varying numbers of indicators described under each constituent. In the present study, 2016 financial performances of 22 Turkish deposit banks were analyzed based on 21 indicators described for 6 sub-elements. In the analyses, TODIM (Tomada de Decisão Iterativa Multicritério), one of the multi-criterion decision making methods, was employed. As TODIM Method is distinguished from other multi-criterion decision making methods by including risk factor into decision making process, the weights of indicators and sub-elements were estimated by means of Analytic Hierarchy Process (AHP) utilizing a benchmarking matrix prepared by an expert faculty member. Additionally, the analyses were also conducted for different values of the risk aversion coefficient used in TODIM Method.

In the further sections of the study, CAMELS approach was introduced as well as data and method employed in evaluation of the financial performances of Turkish deposit banks afterwards of presentation of relevant literature. In the conclusion section of the study, findings and analysis results were assessed and possible path was suggested for future studies.

2. CAMELS

The banking sector is backbone for a country economy and considered as a fundamental phenomenon (Sonaje & Nerlekar, 2017). In our contemporary world, banks play substantial role in maintaining economic stability for various industries. In addition to their primary role as an institution for protecting individual savings, they collect back the funds made available to economy and provide various services. Accordingly, robustness and resistance of banks are crucially important for stable and sustainable economic development of a country (Ghazavi & Bayraktar, 2018). In general, financial performance of banks and other financial institutions are assessed through various methods including financial ratio analysis, and performance measuring against budget (Avkıran, 1994). One of the most common methods used in evaluation of bank performances is CAMELS method. CAMELS is a distance surveillance method used for assessing general statuses of commercial banks for their risk exposure (Kaya, 2001). 1991 U.S. Federal Deposit Insurance Corporation (FDIC) regulation law introduced an obligation on all deposit banks to be audited by CAMEL Method annually (Abdullayev, 2013). The CAMELS, one of the preliminary methods developed by FDIC for spotting and resolution of problems in bank operations in advance, is referred by the capital letters of following concepts *"Capital Adequacy", "Asset Quality", "Management Quality", "Earnings", "Liquidity"* and *"Sensitivity to Market Risk"* (Rakocevic & Dragasevic, 2009). As the CAMELS approach is comprised of six essential elements represented by a letter, the analyses are conducted based on different numbers of indicators described under each element.

Capital Adequacy: The capital of a bank directly secures the credit and market risks undertaken by itself through operations relevant with compensation of losses of bank customers. As the bank capital is adequately proportioned with the risks exposed, financial structure of a bank gain strength and the trust provided to bank customers develops (Canbaz, 2013). According to the 45th article of the Banking Law with 5411 Serial Number, *maintaining sufficient level of equity against the losses that may arise from the exposed risks refers* Capital Adequacy. Based on the same article, *Banks are obliged to ensure their Capital Adequacy level to persist at minimum level of eight percent pursuant to the procedures and principles given in regulations and to make relevant reporting* (Bankacılık Kanunu, 2005). Hence, in this element, bank capital is assessed in terms of quality and quantity (Ege, Topaloğlu & Karakozak, 2015). Capital Adequacy is considered as important element to gain trust of its funders and to have access to national and international financial resources whenever needed.

Asset Quality: This element is one of the most substantial factors in order to sustain profitability, corporate objective, and operations of banks. Asset Quality is required to be sustained at adequately high level against the risk of failure in collection of receivables, the most important item in banks' equity, with respect to protect their financial statuses (Ayvalı, 2015). Bank Asset Quality is assessed in terms of whether the asset is lucrative, yield rate, continuity of earning, liquidity and whether it is appropriate to financial resources of the institution (Ege *et al.*, 2015). This element represents the quality of current and potential credit risks located in credit and investment portfolios, operations excluded by the financial statements as well as quality of other real estate and equities. In the meantime, this element is part of bank management's effort to determine, estimate, check and survey of credit risks exposed (Tükenmez, Demireli, & Akkaya, 2009). Banks may face default risk despite their adequate capital level because of their poor asset quality (Canbaz, 2013).

Management Quality: The element of Management Quality assesses the capability of management board to determine, estimate, survey and control the risk associated with corporate operations as well as capability to maintain safe, accurate and effective communication by ensuring institutional conformity to the current laws and regulations (Ege *et al.*, 2015). Likewise all businesses, objective of banks is to increase their earnings, profits and corporate market value by keeping their risks levels associated with payables and receivables at certain levels. Thus, this element could be regarded as description, estimation, surveying and controlling risks relevant with current corporate operations and responsibilities of senior bank management. At this point, senior management is required to take necessary precautions with respect to current legislation so as to have safe and accurate operations. Accordingly, Management Quality element refers managerial capacity and performance (Sakarya, 2010)

Earnings: In the banking sector, earnings are considered as an indicator for competitive strength of banks and management quality of their assets as well as determinant of potential to manage corporate risk profile and having robust capital structure (Özden, 2017). As this element assesses profitability of bank, it evaluates earnings from the historical and quality points of view together with sustainability of current status (Kaya, 2001). Quality and quantity of earnings could be influenced by mismanaged credit risk, addition to provision against losses in credit and financial leasing, or excessively high market risk introduced on the corporate earnings by the volatility in interest rates. Issues such as excessive dependency to extraordinary incomes, unfavorable tax impact, and unexpected incidences could lower the quality of earnings. The future earnings could adversely be influenced by difficulty in estimation or control of funding and business expenditures, mismanagement of business strategies, or mismanagement or failure in control of other risks (Federal Deposit Insurance Corporation, 2018).

Liquidity: One of the important risks exposed by banks is Liquidity Risk. In general, the fund management practices are required to target maintaining adequate level of liquidity for banks to meet their financial obligations in timely and effectively manner and to supply adequate cash to their customers when demanded (Kandemir & Demirel Arıcı, 2013). The Liquidity element takes cash position of banks and their liquidity capability. In this regard, indicators such as quantity of liquid assets, their historical survey, solubility of assets into equity, the historical bank performance data for relevant liquation performance, historical liquidity strategies followed by banks in the past, the conformity between short term loans and banks' liquidity status are taken into consideration under this element (Gümüş & Nalbantoğlu, 2015).

Sensitivity to Market Risk: Based on the experiences gained through financial crises, sensitivity and fragility of banks against market risks associated with interest and foreign currency rates, a new element, Sensitivity to Market Risk, was included in CAMEL analysis in 1997, which added an "S" to the end of CAMEL word (Gökmen, 2007). The probability of loss in worth of equities included in investment portfolios of investors in capital markets subject to various factors of foreign currency, interest rate and liquidity is referred as market risk. Accordingly, banks' sensitivity towards volatilities in foreign currencies, stock prices and commodity prices is taken into consideration under this element (Kaya, 2001).

In the scope of the bank evaluation process under CAMELS system, various financial ratios are employed and evaluations are made in a scale ranging between 1 and 5; whereas "1" represents the bank with the highest performance for the concerned element, "5" vice versa. After estimation of each element, the weighted averages of these elements yields the CAMELS score of analyzed bank (Gümüş & Nalbantoğlu, 2015). Recently, it has been frequently encountered with the studies directly using the exact estimation of the ratio instead of giving score to CAMELS ratios in the range of 1 to 5.

3. Literature

There are numbers of studies utilizing from CAMELS ratios to determine financial performance of banks both in Turkey and the world. These studies display differences in terms of methods, concerned variables and time interval, or bank types. Following studies have so far investigated financial performances of Turkish banks especially by using an index estimated with CAMELS ratios.

Kaya (2001) studied Turkish banking system based on the data from the period of 1997 - 2000 through CAMELS ratios. In his study, it was reported that elements of CAMELS system displayed deteriorating performance from 1997 to 2000; and that 17% of the banks passed the CAMELS-1997 assessment successfully were seized by the Government agency of Saving Deposit Insurance Fund (TMSF). Uysal (2010) utilized from selected ratios of the fundamental criterions of CAMELS Method to estimate the Performance Index of the Turkish deposit banks for the period of 2005-2008. The selected ratios were first transformed into an index of the relevant element; then, weighted averages of these indexes were estimated for a general composite index. In another study, Solak (2010) investigated financial performance of Turkish commercial banking sector with 25 CAMELS ratios for the period of 1995-2008. The author estimated both individual CAMELS elements and overall weighted average CAMELS index; and reported that the banking sector index was successful at explaining risk status of the Turkish commercial banks. Similarly, Şen & Solak (2011) investigated the same period for public, private and foreign banks operating in Turkey with CAMELS rating system. The author concluded in one of the findings that although it is difficult to predict exact timing of an approaching crisis by means of CAMELS Method, the method was successful at

estimation of risk exposure of banks. Arıçelik (2010) studied performances of Turkish commercial banks with CAMELS Method for the period of 2002-2009. In his study, 19 ratios were weighted differently to have an overall index for assessment of 13 banks. For the concerned period, the best performing elements were reported as Asset Quality, Management Quality and Liquidity; the element displayed insignificant changes was Sensitivity to Market Risk. Gündoğdu (2017) investigated performance of the largest 10 Turkish banks for the period of 2005-2015. The performance of banks was assessed by means of CAMELS Method estimating financial ratios, various adequacy levels and quality of banks. The study concluded that while performances of Garanti Bankası, Akbank, Halkbank, Ziraat Bankası and Vakıflar Bankası were positive, performances of Finansbank, TEB, Denizbank and Yapı Kredi Bankası were vice versa.

Abdullayev (2013) analyzed the Turkish banking sector for the period of 2005-2008 by means of CAMELS ratios. As the author employed totally 18 indicators, individual weights of indicators and elements were determined to calculate the overall index values. The author also employed correlation analysis in his study covering public, private and foreign capitalized deposit banks. The author estimated overall CAMELS index and referred this as CAMELS Efficiency Index. Aytekin & Sakarya (2013) evaluated performances of deposit banks traded in the Borsa Istanbul (BIST) in order to illustrate the impacts of 2001 domestic financial crisis as well as 2008 global financial crisis on Turkish banking sector by utilizing from CAMELS method. In line with the objective of the study, the financial ratios were determined and used as an input of the CAMELS method; finally, banks were ranked with respect to their performances. Kandemir & Arıcı (2013) approached deposit banks operating in Turkey and comparatively analyzed their performances in groups for the period of 2001-2010. Authors concluded that deposit banks displayed high capital adequacy level and liquidity ratios afterwards of the 2001 banking crisis and therefore they were followed poised path against potential crisis. In the concerned period, foreign capitalized banks were found to be performing well in terms of Asset Quality and Management Quality.

Gümüş & Nalbantoğlu (2015) studied Turkish banking sector for the period of 2002-2013 by means of CAMELS performance analysis method in terms of Capital Adequacy, Asset Quality, Management Quality, Earnings, Liquidity Structure and Sensitivity to Market Risks under groups of Public, Private, Foreign Capitalized and Participation Banks both individually and in groups. The fundamental elements utilized in the analysis and respective ratios were weighted by the authors. The six elements were considered both individually and in groups. According to group evaluation, domestic private banks were found to be best performing banks especially in terms of Management Quality and Earnings owing to their operations and strong capital structures. Ege *et al.* (2015) comparatively analyzed financial statuses of public, private and foreign-capitalized banks in Turkish banking system for the period of 2002-2010. First, 25 indicators selected for public, private and foreign-capitalized banks were combined into a general index for the concerned period, their weighted averages were estimated for the overall combined index. Bayramoğlu & Gürsoy (2017) analyzed 25 deposit banks operated in Turkey for an 11-year period between 2005 and 2015 in terms of their risk-performance through CAMELS method in both individually and as a whole industry. Öztürk Karaçor, Mangır, Kodaz & Kartal (2017) comparatively analyzed bank performance of Turkish banks by means of CAMELS method for the period of 2003-2015. As the study included three public and nine private banks, weights of each CAMEL element and relevant indicators underneath of each element were determined by researchers. The authors concluded that private banks displayed superior performance in terms of Capital Adequacy, Management Quality and Asset Quality ratios and vice versa with Earning and Liquidity elements. Furthermore, public banks were more sensitive to market risks with respect to private banks. Altemur, Karaca & Güvemli (2018) studied financial performance of 10 foreign-capitalized banks by CAMELS method for

an 11-year period between 2006 and 2016. It was reported that the best performing bank was Citibank among others. Ghazavi & Bayraktar (2018) investigated financial performances and credibility of 6 Turkish banks based on CAMELS data for the period of 2005-2016. The authors used totally 27 ratios under 6 elements and made relevant comments for each. According to the average scores of the last three years, whereas Ziraat Bankası was ranked at the top place, it was followed by Garanti Bankası and Akbank, respectively. Halkbank was found to be at the bottom of the ranking list. Keten & Çağlar (2018), by applying CAMELS ratios in Combined Index Approach, investigated 2016 financial performances of deposit banks. In their study, sub-indicators of six different elements were estimated to obtain overall CAMELS Index without using different weighting for elements or indicators. Whereas Citibank, Arap Türk Bankası and Garanti Bankası were ranked at the top of the list, Şekerbank, Turkland Bank and Finansbank were at the bottom, respectively.

4. Evaluation of Financial Performance of a Deposit Bank by TODIM Method

In the present study, financial performance of 22 deposit banks was evaluated by CAMELS ratios for the 2016 fiscal year. There are numbers of studies available, which evaluate bank performance by means of various approaches. Some of these studies include multi-criterion decision making methods. However, number of studies utilizing from the TODIM Method for evaluation of banks' financial performances remains limited. In this study, it was aimed to apply TODIM Method, a multi-criterion decision making method, for evaluation of financial performances of Turkish deposit banks. As TODIM Method, the sole multi-criterion decision making method relying on Probability Expectation Theory, inherently provides an approach taking risk into consideration during decision making process (Rangel, *et al.*, 2011)

4.1. Data

The CAMELS ratios, one of the most preferred methods in financial performance evaluations in the relevant literature, were applied in analyses of the present study. In order to ensure inclusion of all sub-indicators reflecting characteristics of all elements of CAMELS Method, 21 ratios under six elements were covered by the evaluation process. The concerned bank data from 2016 fiscal year were collected from the official website of the Banks Association of Turkey. The ratios included in the study and associated descriptive statistics were summarized in Table 1.

While some CAMELS ratios were in positive direction (max.), some (min.) in vice versa. This situation suggests that they displayed good financial performance. The original values of included variables were included in the study. Only for "YP Assets/YP Liabilities" (S1) indicator, one of the four indicators under the Sensitivity to Market Risk Index, it was considered that its proximity to 100% could minimize the market risk and accordingly this means positive development for bank performance. Therefore, minimization of the absolute difference between S1 Ratio and 100% was aimed within the scope of the study.

Table 1. Financial Ratios and Descriptive Statistics

INDICATORS (RATIOS)	CODE	DIRECTIONS	DESCRIPTIVE STATISTICS			
			MIN	MAX	AVE.	ST. DEV.
CAPITAL ADEQUACY	**C**					
Capital Adequacy Ratio	C1	Positive	13.08	19.80	15.75	1.97
Equities / Total Assets	C2	Positive	7.23	15.90	10.59	2.09
(Equities-Fixed Assets) / Total Assets	C3	Positive	2.72	15.63	7.45	2.77
ASSET QUALITY	**A**					
Total Loans and Receivables / Total Assets	A1	Positive	29.47	77.87	64.71	9.95
Non-Performing Loan (Gross) / Total Loans and Receivables	A2	Negative	1.47	6.61	3.47	1.57
Fixed Assets / Total Assets	A3	Negative	0.27	7.91	3.14	1.73
MANAGEMENT QUALITY	**M**					
Net Profit per Branch	M1	Positive	0.17	24.69	3.56	5.02
Personnel per Branch (Person)	M2	Negative	13.23	58.50	21.60	10.02
Total Operating Earning / Total Assets	M3	Positive	2.96	7.37	4.73	1.02
Non-Performing Loan (Net) / Total Loans A. Receivables	M4	Negative	0.00	4.14	1.10	0.98
EARNINGS	**E**					
Average Asset Profitability	E1	Positive	0.06	2.38	1.13	0.62
Average Equity Profitability	E2	Positive	0.79	18.81	10.48	5.06
Profit Before Tax / Total Assets	E3	Positive	0.01	3.21	1.35	0.78
Net Profit (Loss) of the Period / Issued Capital	E4	Positive	0.90	585.13	75.55	123.71
LIQUDITY	**L**					
Liquid Assets / Total Assets	L1	Positive	13.36	59.91	28.15	10.24
Liquid Assets / Short-Term Liabilities	L2	Positive	25.00	120.78	51.89	19.45
YP Liquid Assets / YP Liabilities	L3	Positive	10.86	71.72	35.49	13.07
SENSITIVITY TO MARKET RISK	**S**					
YP Assets / YP Liabilities	S1	Negative	55.97	108.00	83.75	14.40
Interest Earnings / Total Assets	S2	Negative	3.76	10.52	7.66	1.39
Financial Assets / Total Assets	S3	Negative	3.53	21.78	13.07	5.15
Non-Interest Earnings (Net) / Total Assets	S4	Positive	0.37	3.45	1.26	0.61

4.2. TODIM Method

TODIM Method was first suggested by Gomes & Lima (1992) on the basis of Expectation Theory. As TODIM, an acronym in Portuguese of Interactive and Multi-Criteria Decision Making, is a multi-criterion decision making method, it applies paradigm of Expectation Theory. TODIM Method relies on adaptation of estimation of a global value. This method depends on an explanation empirically proven about how individuals effectively formulize their decisions against risk (Zindani, Maitya, Bhowmika & Chakraborty, 2017). In TODIM Method, utility and cost associated with each alternative are estimated for each criterion with respect to each other. As a result of dual comparison, the best option is concluded among the alternatives. Similar to Expectation Theory, TODIM Method has value function (Tolga & Turgut, 2018). Value function is in "*S*" shape (Krohling & de Souza, 2012). Basically, partial and overall dominance of each alternative on others are estimated; and finally general ranking of alternatives are obtained (Chakraborty & Chakraborty, 2018).

TODIM Method has been used in wide ranges of studies. Whereas it was applied together with other multi-criterion decision making methods, fuzzy TODIM Method was also preferred in some decision making processes such as appreciation of real estate value (Gomes & Rangel, 2009; Moshkovich, Gomes & Mechitov, 2011; Krohling & de Souza, 2012; Uysal & Tosun, 2014), material selection (Zindani et al., 2017), natural gas arrival terminal (Gomes, Rangel & Maranhão, 2009), on wide-band internet selection (Rangel, Gomes & Cardoso, 2011), selection of ERP software (Kazançoğlu & Burmaoğlu, 2013; Tolga, 2018), selection of mining method (Dehghani, Siami & Haghi, 2017), supply-chain practices (Gomes, Machado, Santos & Caldeira, 2015; Tosun & Akyüz, 2015), student course selection (Aytaç Adalı, 2016), personnel selection (Aytaç Adalı, Tuş Işık & Kundakçı, 2016; Ji, Zhang & Wang, 2018), industrial robot selection (Sen, Datta & Mahapatra, 2016), analysis renewable energy plants (Tolga & Turgut, 2018), and etc. There are limited number of studies in which TODIM Method is applied in the banking sector. Junior (2018) evaluated performances of the largest 6 Brazilian banks by employing Fuzzy TODIM Method on six-year data on nine indicators. Ramooshjan, Rahmani, Sobhanollahi & Mirzazadeh (2015) employed Fuzzy TODIM Method in selection process of bank branch location.

In TODIM method, it is assumed that there are n number of alternatives $A_i (i=1,2,\ldots,n)$ and m number of criterion C_j $(j=1,2,\ldots,m)$. The steps included in TODIM Method were presented below (Gomes et al., 2009; Rangel, Gomes & Moreira, 2009; Aytaç Adalı, 2016; Zindani *et al.*, 2017):

Step 1: The Decision Matrix, matrix (X), exhibiting the performances of each alternative under different criterions was structured as in Equation 1 below.

$$X = [x_{ij}]_{n\times m} = \begin{bmatrix} x_{11} & x_{12} & \cdots & x_{1m} \\ x_{21} & x_{22} & \cdots & x_{2m} \\ \vdots & \vdots & \ddots & \vdots \\ x_{n1} & x_{n2} & \cdots & x_{nm} \end{bmatrix} \qquad (1)$$

Step 2: The matrix (X) is normalized so that the matrix criterions to be comparable. For the normalization process, directions of criterions are important. Criterions are classified in two groups of *cost* or *utility*. Whereas the maximum value is desired for the utility criterion, the contrary is existed for cost criterion (Lourenzutti & Krohling, 2015). There are different approaches available for normalization process. For instance, Aytaç Adalı (2016) employed minimum-maximum approach for normalization. Accordingly, normalization of utility and cost are estimated by Equation 2 below;

$$P_{ij} = \frac{x_{ij}\text{-}min(x_{ij})}{max(x_{ij})\text{-}min(x_{ij})} \quad \text{and} \quad P_{ij} = \frac{max(x_{ij})\text{-}x_{ij}}{max(x_{ij})\text{-}min(x_{ij})} \tag{2}$$

where ($i = 1,2, \dots, m\,; j = 1,2, \dots, n$). In the relevant TODIM Method literature, normalization process is conducted mostly on total values of criterions (Chakraborty & Chakraborty, 2018). Accordingly, normalization of cost and utility is estimated by the Equation 3 below;

$$P_{ij} = \frac{x_{ij}}{\sum_{i=1}^{n} x_{ij}} \quad \text{and} \quad P_{ij} = \frac{1/x_{ij}}{\sum_{i=1}^{n} 1/x_{ij}} \tag{3}$$

Step 3: Weight of each criterion (w_j) is determined. In determination of weights, various methods such as Analytic Hierarchal Process (AHP) could be employed on the discreet of researcher (Zindani, 2017). The respective weight (w_{jr}) of j^{th} criterion against the reference criterion (C_r) is estimated by the Equation 4 below;

$$w_{jr} = w_j \,/\, w_r \tag{4}$$

Where, w_r refers the weight of the reference criterion. Reference criterion is the most substantial criterion for decision maker. In the scope of the present study, w_j was determined by AHP; the criterion with the highest weight was used as reference criterion. That is, $w_r = max\ \{w_j \mid j = 1,2, \dots, m\}$.

Step 4: The dominance score, $\delta(A_i, A_{i'})$, of alternative A_i over alternative $A_{i'}$ is estimated by Equation 5 below;

$$\delta(A_i, A_{i'}) = \sum_{j=1}^{m} \phi_j(A_i, A_{i'}) \quad . \quad \forall(i.i') \tag{5}$$

Under the j^{th} criterion given in Equation (5), The dominance score, $\phi_j(A_i, A_{i'})$, of alternative A_i over alternative $A_{i'}$ is estimated by Equation 6 below;

$$\phi_j(A_i, A_{i'}) = \begin{cases} \sqrt{\dfrac{w_{jr}(P_{ij}\text{-}P_{i'j})}{\sum_{j=1}^{m} w_{jr}}} & , \quad P_{ij}\text{-}P_{i'j} > 0 \\ 0 & , \quad P_{ij}\text{-}P_{i'j} = 0 \\ -\dfrac{1}{\theta}\sqrt{\dfrac{(\sum_{j=1}^{m} w_{jr})(P_{i'j}\text{-}P_{ij})}{w_{jr}}} & , \quad P_{ij}\text{-}P_{i'j} < 0 \end{cases} \tag{6}$$

Where;

P_{ij}-$P_{i'j} > 0$ and P_{ij}-$P_{i'j} < 0$ denote cost or utility of alternative A_i with respect to alternative $A_{i'}$.

θ denotes coefficient of aversion from cost. θ controls the impact that occurs in case of cost. If $\theta < 1$, then costs increase; if $\theta > 1$, then costs decrease. This indicator significantly affects the ranking of alternatives. If θ is determined at lower level, then, the alternative yielding low level of cost for all criterions is desired. On the other hand, if θ is determined at higher level, then, the alternative yielding higher utility is desired despite of the costs caused by some criterions (Lourenzutti & Krohling, 2015). In general, it is taken as $\theta = 1$ based on the ground that costs would contribute into general dominance score with their real values (Gomes *et al.*, 2009).

Step 5: The general dominance of an A_i alternative, (ξ_i), is estimated by the Equation 7 below;

$$\xi_i = \frac{\sum_{i'=1}^{n} \delta(A_i, A_{i'}) - min\{\sum_{i'=1}^{n} \delta(A_i, A_{i'})\}}{max\{\sum_{i'=1}^{n} \delta(A_i, A_{i'})\} - min\{\sum_{i'=1}^{n} \delta(A_i, A_{i'})\}} \quad (7)$$

All alternatives were ranked generally from minimum to maximum of their general dominance scores estimated by the equation above.

5. Findings

In the financial performance analysis of Turkish deposit banks through TODIM Method, totally 21 ratios under each CAMELS elements given in Table 1 were employed. The TODIM Method was applied for each of the six elements so as to estimate index score of concerned element for the relevant bank. Finally, studied banks were ranked with respect to estimated overall index scores. The analysis was also conducted for two different normalizations under Equation (2) and Equation (3) so that the impact of different normalization processes on estimations could be observed. The AHP Method was utilized at the third step of the TODIM Method, concerning determination of criterion weights. In this regard, an expert opinion was consulted with a faculty member who has studies on similar subjects. The faculty was asked to prepare 7 different comparison matrixes for each of the elements and their sub-criterions included by CAMELS Method. The comparison matrixes were prepared based on the significance scale ranging from 1 to 9 as it is suggested by Saaty (1980). In order to ensure consistency of comparison matrixes prepared by AHP, the maximum Consistency Rate should be 0.10. Table 2 exhibits elements' weights determined by AHP from the matrixes satisfying this condition, criterions' weights of under each element, and consistency rates of comparison matrixes utilized during estimation of aforesaid weights. The Consistency Rate of the dual comparison matrix used in determination of indicators' weights not exhibited in Table 2 was estimated at 0.0809.

Table 2. Criterion Weights Determined by AHP

Element	Weight	Rate	Weight	Consistency Rate
Capital Adequacy (C)	0.2598	C1	0.6333	0.0334
		C2	0.2605	
		C3	0.1062	
Asset Quality (A)	0.1464	A1	0.6333	0.0334
		A2	0.1062	
		A3	0.2605	
Management Quality (M)	0.4416	M1	0.3121	0.0878
		M2	0.0618	
		M3	0.4819	
		M4	0.1442	
Earnings (E)	0.0252	E1	0.1360	0.0757
		E2	0.5430	
		E3	0.0765	
		E4	0.2445	
Liquidity (L)	0.0811	L1	0.1062	0.0334
		L2	0.6333	
		L3	0.2605	
Sensitivity to Market Risk (S)	0.0460	S1	0.2816	0.0521
		S2	0.5152	
		S3	0.1454	
		S4	0.0578	

At the 3rd step of the TODIM Method, reference criterion is required to be determined. In the present study, the largest criterion weight determined for each element by means of AHP Method was taken as the reference criterion. Moreover, the cost aversion coefficient contained by Equation (6) was taken as $\theta = 1$. Thus, it was desired that cost could contribute into general dominance score with their real values. ξ_i, general dominance score in Equation (7), was described as index score for six elements of CAMELS. Finally, overall CAMELS Index was estimated based on weighted total of index scores estimated for each of six elements. Table 2 exhibits weights used in estimation of CAMELS Index. Table 3 exhibits the results obtained through normalization under Equation (2) whereas Table 4 exhibits the normalization under Equation (3). The first column of each element in Table 3 and Table 4 denotes each bank's relevant index score while the second column denotes the rank of bank with the relevant element. Banks' individual position in the ranking is determined with respect to their index scores from high to low.

According to the Table 2 containing minimum-maximum normalization results under Equation (2), Citibank A.Ş., Arap Türk Bankası A.Ş. and Turkish Bank A.Ş. were ranked at the top of the list in terms of *Capital Adequacy (C)* element, whereas T. Halk Bankası A.Ş., Fibabanka A.Ş. and Şekerbank T.A.Ş. were at the bottom of the list. In terms of the *Asset Quality (A)* element, whereas Fibabanka A.Ş., Odea Bank A.Ş and Burgan Bank A.Ş. were ranked at the first three places, Turkland Bank A.Ş., Şekerbank T.A.Ş. and Denizbank A.Ş. were at the bottom, respectively. In terms of *Management Quality (M)* element, the best performing banks were determined as TC Ziraat Bankası A.Ş., Akbank

T.A.Ş. and T. İş Bankası A.Ş., while the worst performance was determined with Arap Türk Bankası A.Ş., Odea Bank A.Ş. and Turkland Bank A.Ş., respectively. In terms of *Earnings (E)* element, while Citibank A.Ş., TC Ziraat Bankası A.Ş. and T. Garanti Bankası A.Ş. were ranked at the top of the list, Turkland Bank A.Ş., ICBC Turkey Bank A.Ş. and Alternatifbank A.Ş. were at the bottom, respectively. In terms of *Liquidity (L)* element, the best performing banks were determined as Arap Türk Bankası A.Ş., Alternatifbank A.Ş. and ICBC Turkey Bank A.Ş., while T. Garanti Bankası A.Ş., Burgan Bank A.Ş. and Şekerbank T.A.Ş. were determined as worst performers, respectively. In terms of the last element of *Sensitivity to Market Risk (S),* Alternatifbank A.Ş., Yapı ve Kredi Bankası A.Ş. and Anadolubank A.Ş. were ranked at the top while TC Ziraat Bankası, ICBC Turkey Bank A.Ş. and Finans Bank A.Ş. were at the bottom, respectively. The overall CAMELS Index estimated with weighted averages of indexes of CAMELS elements provides chance to make general evaluation. According to the last two columns of Table 3, the best performing banks were Akbank T.A.Ş., TC Ziraat Bankası A.Ş. and Turkish Bank A.Ş. based on their overall CAMELS Indexes, while Alternatifbank A.Ş., Odea Bank A.Ş. and Şekerbank T.A.Ş. were worst performers, respectively.

Table 3. Results Obtained Through Normalization Process Under Equation (2)

BANK	**C**		**A**		**M**		**E**		**L**		**S**		**CAMELS**	
Akbank T.A.Ş.	0.593	7	0.775	8	0.971	2	0.852	4	0.713	6	0.614	9	0.804	1
TC Ziraat Bankası A.Ş.	0.475	9	0.821	6	1.000	1	0.921	2	0.644	7	0.320	20	0.775	2
Turkish Bank A.Ş.	0.776	3	0.856	4	0.749	7	0.143	19	0.573	9	0.745	5	0.742	3
T. Garanti Bankası A.Ş.	0.706	5	0.624	14	0.809	4	0.864	3	0.279	20	0.554	15	0.702	4
Türkiye İş Bankası A.Ş.	0.465	10	0.569	15	0.840	3	0.780	5	0.488	12	0.586	11	0.661	5
Anadolubank A.Ş.	0.523	8	0.644	13	0.727	8	0.691	8	0.570	11	0.774	3	0.650	6
TEB A.Ş.	0.400	11	0.805	7	0.761	6	0.631	10	0.473	13	0.563	14	0.638	7
Citibank A.Ş.	1.000	1	0.731	9	0.322	18	1.000	1	0.727	5	0.591	10	0.620	8
ING Bank A.Ş.	0.623	6	0.667	11	0.642	11	0.560	14	0.449	16	0.473	16	0.615	9
T. Vakıflar B. T.A.O.	0.220	17	0.551	16	0.790	5	0.740	6	0.434	17	0.766	4	0.576	10
Arap Türk Bankası A.Ş.	0.933	2	0.661	12	0.197	20	0.609	13	1.000	1	0.645	8	0.552	11
T. Halk Bankası A.Ş.	0.173	20	0.673	10	0.689	10	0.679	9	0.342	18	0.669	7	0.524	12
ICBC Turkey Bank A.Ş.	0.360	12	0.854	5	0.442	15	0.085	21	0.771	3	0.169	21	0.486	13
Finans Bank A.Ş.	0.345	13	0.155	19	0.689	9	0.625	11	0.469	14	0.000	22	0.471	14
Fibabanka A.Ş.	0.131	21	1.000	1	0.432	16	0.411	15	0.573	10	0.705	6	0.460	15
Yapı ve Kredi B. A.Ş.	0.285	15	0.295	18	0.547	13	0.614	12	0.302	19	0.828	2	0.437	16
Denizbank A.Ş.	0.285	16	0.000	22	0.571	12	0.723	7	0.599	8	0.575	12	0.419	17
Burgan Bank A.Ş.	0.183	19	0.863	3	0.325	17	0.279	17	0.127	21	0.366	18	0.351	18
Turkland Bank A.Ş.	0.766	4	0.135	20	0.079	21	0.096	20	0.751	4	0.408	17	0.336	19
Alternatifbank A.Ş.	0.210	18	0.374	17	0.256	19	0.000	22	0.774	2	1.000	1	0.331	20
Odea Bank A.Ş.	0.344	14	0.881	2	0.000	22	0.295	16	0.450	15	0.575	13	0.289	21
Şekerbank T.A.Ş.	0.000	22	0.005	21	0.460	14	0.236	18	0.000	22	0.345	19	0.226	22

According to Table 3 summarizing the results obtained through the normalization process under Equation (3), while Citibank A.Ş., Arap Türk Bankası A.Ş. and Turkland Bank A.Ş. were ranked at the first three positions in terms of *Capital Adequacy (C)* element, Alternatifbank A.Ş., Burgan Bank A.Ş. and Şekerbank T.A.Ş. were ranked at bottom of the list, respectively. In terms of *Asset Quality (A)* element, while the first three positions were occupied by Citibank A.Ş., Fibabanka A.Ş., and ICBC Turkey Bank A.Ş., Finans Bank A.Ş., Şekerbank T.A.Ş. and Denizbank

A.Ş. were at the bottom of the ranking. In terms of *Management Quality (M*) element, while the best performers were determined as Turkishbank A.Ş., Akbank T.A.Ş. and TC Ziraat Bankası A.Ş., the lowest performance was determined with ICBC Turkey Bank A.Ş., Burgan Bank A.Ş. and Odea Bank A.Ş.. In consideration of *Earnings (E)* element, while Citibank A.Ş., TC Ziraat Bankası A.Ş. and T. Garanti Bankası A.Ş. were ranked at the top of the performance list, Turkland Bank A.Ş., ICBC Turkey Bank A.Ş. and Alternatifbank A.Ş. were at the bottom. In terms of *Liquidity (L)* element, Arap Türk Bankası A.Ş., Alternatifbank A.Ş. and ICBC Turkey Bank A.Ş. were ranked as the top three banks whereas T. Garanti Bankası A.Ş., Burgan Bank A.Ş. and Şekerbank T.A.Ş. were ranked at the bottom of the list, respectively. In consideration of the final element, *Sensitivity to Market Risk (S),* Fibabanka A.Ş., Citibank A.Ş. and Alternatifbank A.Ş. were ranked at the top of the best performance list, whereas TC Ziraat Bankası A.Ş., Burgan Bank A.Ş. and ICBC Turkey Bank A.Ş. were at the bottom, respectively. According to the last two columns of Table 4, Turkish Bank A.Ş., Citibank A.Ş. and Akbank A.Ş. were ranked as the best banks based on the overall CAMELS Index. In the meantime, Odea Bank A.Ş., Alternatifbank A.Ş. and Burgan Bank A.Ş. were ranked as worst performers, respectively.

Table 4. Results Obtained Through Normalization Process Under Equation (3)

BANKA	**C**		**A**		**M**		**E**		**L**		**S**		**CAMELS**	
Turkish Bank A.Ş.	0.791	4	0.822	4	1.000	1	0.129	19	0.570	10	0.570	8	0.843	1
Citibank A.Ş.	1.000	1	1.000	1	0.535	9	1.000	1	0.725	5	0.784	2	0.762	2
Akbank T.A.Ş.	0.675	6	0.779	6	0.814	2	0.805	4	0.711	6	0.554	9	0.752	3
TC Ziraat Bankası A.Ş.	0.525	9	0.770	7	0.811	3	0.871	2	0.640	7	0.206	20	0.691	4
T. Garanti Bankası A.Ş.	0.726	5	0.487	15	0.611	7	0.821	3	0.279	20	0.496	14	0.595	5
Anadolubank A.Ş.	0.597	8	0.492	14	0.587	8	0.629	9	0.567	11	0.700	4	0.580	6
Türkiye İş Bankası A.Ş.	0.473	10	0.494	13	0.640	4	0.740	5	0.486	12	0.492	15	0.559	7
TEB A.Ş.	0.469	11	0.695	10	0.529	10	0.583	10	0.471	13	0.700	5	0.542	8
ING Bank A.Ş.	0.625	7	0.554	11	0.484	13	0.505	14	0.448	16	0.525	10	0.531	9
Arap Türk Bankası A.Ş.	0.919	2	0.709	9	0.121	19	0.549	13	1.000	1	0.487	16	0.513	10
T. Vakıflar B. T.A.O.	0.277	16	0.418	16	0.630	6	0.705	6	0.433	17	0.515	11	0.488	11
Turkland Bank A.Ş.	0.798	3	0.137	19	0.281	16	0.087	20	0.749	4	0.475	17	0.436	12
T. Halk Bankası A.Ş.	0.259	17	0.524	12	0.503	11	0.678	7	0.340	18	0.412	18	0.430	13
Fibabanka A.Ş.	0.213	18	0.954	2	0.189	17	0.370	15	0.572	9	1.000	1	0.380	14
Yapı ve Kredi B. A.Ş.	0.318	15	0.199	18	0.446	14	0.581	11	0.301	19	0.640	6	0.377	15
Finans Bank A.Ş.	0.387	13	0.119	20	0.438	15	0.575	12	0.468	14	0.237	19	0.375	16
Denizbank A.Ş.	0.206	19	0.000	22	0.501	12	0.661	8	0.597	8	0.496	13	0.363	17
Şekerbank T.A.Ş.	0.000	22	0.074	21	0.633	5	0.218	18	0.000	22	0.621	7	0.324	18
ICBC Turkey Bank A.Ş.	0.324	14	0.874	3	0.079	20	0.078	21	0.771	3	0.000	22	0.311	19
Odea Bank A.Ş.	0.396	12	0.810	5	0.000	22	0.262	16	0.449	15	0.502	12	0.288	20
Alternatifbank A.Ş.	0.163	20	0.291	17	0.187	18	0.000	22	0.774	2	0.744	3	0.265	21
Burgan Bank A.Ş.	0.136	21	0.757	8	0.065	21	0.252	17	0.127	21	0.177	21	0.200	22

When results of two different normalization approaches were compared, similar results could be seen despite existence of some minor differences. Based on the overall CAMELS Index ranking results, Akbank A.Ş. and TC Ziraat Bankası were among the first three banks. Similarly, Alternatifbank A.Ş. and Odea Bank A.Ş. were among the last three banks. Again with the same index, ranking of Turkland Bank A.Ş., Citibank A.Ş., ICBC Turkey Bank A.Ş., Burgan Bank A.Ş. and Şekerbank T.A.Ş. was varied minimum four or maximum seven places among others. The ranking of other banks either did not vary or maximum varied for two levels between two approaches.

According to the overall index, TC Ziraat Bankası A.Ş., a public bank ranked at higher position in terms of both approaches, exhibited its lowest performance with the element of Sensitivity to Market Risk. It was notable that the bank was ranked among first three in terms of Management Quality and Earnings elements. Especially high weight level of Management Quality element resulted in higher rank position of TC Ziraat Bankası A.Ş. based on overall index score. Poor Management Quality score of Citibank A.Ş. caused the bank to be ranked at low levels under the first approach. Similar situation existed for Arap Türk Bank A.Ş. as well.

Gomes & Rangel (2009) suggest a sensitivity analysis in order to confirm consistency of results in line with preferences of decision maker. Sensitivity analysis could be implemented by utilizing from criterion weights, selection of reference criterion, cost aversion coefficient, and etc. In the present study, the analysis was conducted for different values of cost aversion coefficient and obtained results were summarized in Table 5. In fact, the analysis was only conducted for normalization approach under Equation (3) and for overall CAMELS Index ranking list instead of conducting individually for each of TODIM application because of limited space. According to Table 5, when cost aversion coefficient increased, CAMELS Index scores of Citibank A.Ş. and Arap Türk Bank A.Ş. increased, which pulled both banks' position up in the ranking. The changes in scores decreased gradually in parallel with increasing cost aversion coefficient when other banks' CAMELS Index scores decreased. This situation suggests results gained consistency. When the ranking was listed based on the largest cost aversion coefficient, Citibank A.Ş. was at the top of the ranking followed by Turkish Bank A.Ş. and Arap Türk Bankası A.Ş., respectively. At the bottom of the same list, there were Yapı ve Kredi Bankası A.Ş., Alternatifbank A.Ş and Burgan Bank A.Ş., respectively. In the scope of TODIM Analyses, the investigations are maintained with respect to the values estimated by the method. On the other hand, the investigation was conducted for the CAMELS Index in the present study. That is, weighted averages of six different TODIM Model results were estimated at a time for analysis purposes. Similar evaluations could be implemented for the scores estimated for elements.

Table 5. CAMELS Indexes for Different Values of Cost Aversion Coefficient

BANK	θ=1	θ=2	θ=3	θ=4	θ=5	θ=6	θ=7	θ=8	θ=9	θ=10
Citibank A.Ş.	0.762	0.812	0.840	0.856	0.867	0.874	0.879	0.883	0.886	0.889
Turkish Bank A.Ş.	0.843	0.799	0.772	0.754	0.742	0.732	0.725	0.719	0.714	0.709
Arap Türk Bankası A.Ş.	0.513	0.509	0.518	0.522	0.524	0.525	0.526	0.526	0.526	0.526
Akbank T.A.Ş.	0.752	0.620	0.556	0.516	0.489	0.470	0.455	0.443	0.434	0.426
T. Garanti Bankası A.Ş.	0.595	0.501	0.458	0.432	0.414	0.401	0.391	0.383	0.377	0.371
TC Ziraat Bankası A.Ş.	0.691	0.551	0.484	0.442	0.415	0.395	0.379	0.367	0.357	0.349
ING Bank A.Ş.	0.531	0.436	0.397	0.372	0.355	0.343	0.334	0.326	0.320	0.315
Anadolubank A.Ş.	0.580	0.456	0.400	0.365	0.341	0.324	0.311	0.301	0.292	0.285
Türkiye İş Bankası A.Ş.	0.559	0.440	0.386	0.353	0.331	0.315	0.303	0.293	0.285	0.279
TEB A.Ş.	0.542	0.431	0.381	0.350	0.328	0.313	0.300	0.291	0.283	0.276
Turkland Bank A.Ş.	0.436	0.354	0.324	0.304	0.292	0.283	0.275	0.269	0.265	0.261
ICBC Turkey Bank A.Ş.	0.311	0.257	0.246	0.239	0.235	0.232	0.229	0.227	0.226	0.224
Odea Bank A.Ş.	0.288	0.252	0.246	0.240	0.235	0.231	0.228	0.225	0.222	0.220
Fibabanka A.Ş.	0.380	0.303	0.275	0.257	0.243	0.233	0.225	0.219	0.214	0.209
T. Vakıflar Bankası T.A.O.	0.488	0.367	0.313	0.280	0.259	0.243	0.231	0.221	0.213	0.207
Denizbank A.Ş.	0.363	0.281	0.251	0.233	0.223	0.215	0.210	0.205	0.202	0.199
Finans Bank A.Ş.	0.375	0.290	0.256	0.234	0.220	0.210	0.201	0.195	0.189	0.185
Şekerbank T.A.Ş.	0.324	0.251	0.224	0.208	0.199	0.193	0.188	0.185	0.182	0.180
T. Halk Bankası A.Ş.	0.430	0.317	0.269	0.239	0.219	0.205	0.194	0.185	0.177	0.171
Yapı ve Kredi Bankası A.Ş.	0.377	0.285	0.247	0.224	0.209	0.197	0.189	0.182	0.176	0.171
Alternatifbank A.Ş.	0.265	0.199	0.183	0.173	0.167	0.163	0.160	0.157	0.155	0.154
Burgan Bank A.Ş.	0.200	0.153	0.145	0.141	0.138	0.137	0.135	0.134	0.133	0.132

6. Conclusion

It is rather clear that developments in financial markets contribute in economic growth. To the end of ensuring positive effect of real sector on manufacturing, employment and growth, financial industry is required to be strong. Furthermore, financial sector also supplies significant employment. As of June 2018, totally 52 banks are in operation, 34 of which are deposit banks. Deposit banks employ 188,500 personnel across 10,500 branches. Financial performance of banks is required be satisfactory since their potential impact on country economy and professional life could be significant. Accordingly, financial performances of Turkish deposit banks were taken into consideration in this study employed TODIM Method, one of the multi-criterion decision making methods. For the variables representing financial performance, CAMELS ratios were preferred. Weights assigned to indicators and elements under scope of TODIM Method application were consulted to an expert opinion and AHP. An index was estimated for each element of CAMELS as overall CAMELS Index was estimated based on weighted average of these index values estimated for each element so that financial performances of banks could be compared in terms of individual elements and as a whole.

The present study contributed to the current literature by employing TODIM Method in such analysis for the first time as well as evaluated 2016 deposit bank performances. Additionally, obtained data was applied two different normalizations and their impacts were observed. It was seen that the ranking of few banks has significantly changed with respect to two empirically different approaches. In general, Akbank T.A.Ş., Turkish Bank. A.Ş., TC Ziraat Bankası A.Ş., T. Garanti Bankası were found to be ranked at high positions while Odea Bank A.Ş. and Alternatifbank A.Ş. were at the bottom. Furthermore, it was seen notable that Arap Türk Bankası A.Ş. was at high ranks in terms of Capital Adequacy and Liquidity elements, they were at low level in terms of Management Quality. TC Ziraat Bankası A.Ş. was ranked at high level in terms of Management Quality and Earnings elements, while it was at the bottom in terms of Sensitivity to Market Risk element.

Repeating of similar studies for multi-annual periods and enrichment with different weighting and approaches would contribute into expansion of periodical supervising and to the financial industry.

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2

IS EUROPEAN FINANCIAL MARKET LOSING CINDERELLA'S SHOE? POSSIBLE CHANGES AFTER BREXIT

Başak Turan İçke[1], Mehmet Akif İçke[2]

Abstract

The UK's Brexit decision in 2016 leads to major changes in the EU financial markets. This leaving decision, which has been made by the British people due to the political considerations as well as negative economic course, has begun to be questioned with the both running out of the time and the emergence of strong evidences of negative consequences beyond the estimations. After the Brexit, the loss of the financial passporting right would be especially in the banking industry will lead to a significant contraction in the British financial sector and the loss of many of the advantages. The process discussed with the Hard Brexit and Soft Brexit scenarios gradually evolves into the non-solution. After the exit, the fact that the framework of the changes in the financial sector is not yet clear is a big obstacle in front of the markets for seeing future. This situation causes British people to question themselves through the mistake of the exit decision.

Key Words: Passporting Rights, Brexit, Financial Market, Banking.

Introduction

With the UK's decision to leave the EU in 2016, it is possible to say that the this is biggest uncertainty that has been faced since establishment of EU. Economic factors are among the leading reasons that push the British people to make this decision. However, beside these factors as well as the influence of political factors such as migration and national sovereignty should not be overlooked. The cumulative impact of both these factors and more of them is understood to have pushed the British people to make this decision. The cumulative impact of both these factors and more of them is understood to have driven the British people to make this decision with their own perspectives.

In this study, with the exit process from the EU, which the UK decided as a result of the referendum; it is discussed which changes will occur in the financial markets and especially in the banking market of the both UK and EU-27 countries, and what consequences can be encountered. In this study, firstly, the reasons of Brexit and its development process are emphasized. In this context, the factors that prepare the ground for the Brexit decision are touched upon. In the second chapter, the probabilities related to the use of passporting rights in the EU Financial Market after Brexit are evaluated. The possible changes that will arise after the UK declares its intention of withdrawal from the EU in 2017 are examined according to positive and negative scenarios. The possibility of losing London's financial passporting is particularly emphasized. In the third chapter, the economic

1 (Istanbul University), batu@istanbul.edu.tr
2 (Istanbul University), mehmet.icke@istanbul.edu.tr

factors which are effective in making the Brexit decision are explained. The impacts of the Brexit decision on the British economy are evaluated within the framework of various factors through emphasizing the importance of the financial sector for the British economy. In the last chapter, the situation of the banking industry after the Brexit is examined in the context of the possibility of the Brexit being concluded without agreement. Also, it is explained that after Brexit there is a need for developing steps to reshape the banking system in the EU-27 and that studies should be carried out in this direction.

Reasons and the Development Process of Brexit

Since the World War II, an economic, political and cultural integration in Europe has been possible through the European Union. However, this integrity has got a big blow with the Brexit. For the UK, leaving from the EU means withdrawal from the EU's supranational political institutions. In addition, with Brexit, having problem of obstacles in the exchange of goods, services and people with EU-27 will be inevitable for the UK. Moreover, as a result of this process, questions regarding the future sustainability of the EU will be inevitable too. (Sampson, 2017, p.163) The idea of Brexit is of course has not existed in a day. To be one of the strong and large countries of the EU, the sacrifices, concessions and cost-benefit analysis carried out in the establishment process of the EU has pushed UK to make this decision. It is possible to summarize some of the situations in which the UK is uncomfortable in the EU process and the reasons for the Brexit decision: (Srovnalikova & Razinskaite, 2017, pp.98-99; Welfens, 2017, p. 114)

- Arguments that the EU has threatened British sovereignty and weakened national policies; and Brussels's getting more power than necessary
- Restriction of England's movement area by EU through regulations,
- Low legitimacy and responsibility of EU but very high power of bureaucrats.
- The argument that the UK's radical reforms needs and dynamism are prevented by the EU's bureaucracy, its acquis and overestimate of its institutional interests,
- Even if the EU is considered to be a good idea in general terms, switching to the Euro is perceived as a complete disaster.
- In addition to the EU allowing too many immigrants from outside the union, the acceleration of migration from Eastern European countries to the UK harms British citizens. These migrations are perceived as less work opportunity and lower wages for British workers,
- The UK's financial contribution to the EU budget is very high and it is believed that it will be more beneficial to keep this money within the country.
- The UK is expected to make easier and more advantageous free trade agreements with other countries if it is outside the EU,
- Brexit will not constitute a national security risk since the UK remains a NATO member.

These factors and some of the other factors perhaps their numbers can be increased further are among the factors that have brought the UK to the point of separation negotiations with the EU. These factors influence the way of Britain's leaving process from the EU and even regulates its economic relations with the EU-27 after the exit. Britain's official exit from the EU will take place on 29 March 2019. However, till the end of 2020 a transition

process was accepted as a result of the consensus reached with the EU and it was envisaged that the UK would remain in the European Single Market until this date. (Kaya, Schildbach & Lakhani, 2018, p.3). Until the Brexit idea came to the fore, it would not be wrong to say that the UK took advantage of the financial integration in the EU. Especially in 2016, the UK was acting as de facto "Europe's Investment Banker". However, according to James and Quaglia, with the situation after the Brexit, a period of direct challenge to the interests of London will manifest itself (James and Quaglia, 2017, p.3)

The United Kingdom, which officially declared its request to withdraw from the union on March 29, 2017, initiated negotiations on the withdrawal agreement. In accordance with the Article 50 of the Lisbon Treaty which includes the rules on leaving the EU, the withdrawal negotiations are allowed to last for a maximum of two years. At the end of this period, the EU membership of the UK will end automatically unless the Member States decides to extend the negotiations unanimously (Bundesverband der Deutschen Industrie, 2018b, p.6). If the UK does not make a new agreement with the EU after the Brexit, trade practices will be carried on within the framework of the WTO requirements. Since there is no agreement between the parties so far, the future relationship between the two parties remains uncertain (Sampson, 2017, p.165).

Will the EU Financial Market Passporting Rights Be Able to Use After the Brexit?

The EU financial market passporting rights provide an opportunity to the financial institution and its institutions and affiliates established in any EU Member State and to offer financial services in all EU countries without any additional restrictive prevention. Passporting rights can be used in other countries by the establishment of a branch or in the provision of services. In the second case, institutions can offer financial services without physically establishing branches in another country. When a UK-based financial institution provide financial services in another EU country is obliged to inform its controlling and supervisory authorities about its activities. However, controlling and supervisory authority remains in the institution in the main country. In the case of England, the supervisory authority is The Prudential Regulation Authority (PRA) at the Bank of England (BoE) (Miethe & Pothier, 2016, p.365).

In 2016, approximately 5,500 financial service providers in the UK benefited from financial passporting rights to operate in the entire EU. On the contrary, approximately 8,000 financial service providers operating in the EU have used financial passporting right in the UK. The EU financial passporting right stands out as an important component for the preferences of third-country banks outside the EU to settle in the London financial center. The banks of these countries through settling in London take advantage of the scale there and also automatically gain the right to operate freely in all EU financial markets (Triebe, 2018, p.6). The UK has a gateway characteristic for capital inflows to the EU even for partly because of that reason. This feature is clearly evident when observe direct investments and portfolio investments from the US to the EU. Even though Germany, France and the Netherlands create attractive investment areas, Britain is still prominent as the most desirable region. While portfolio investments from the US to the UK are one and a half times larger than Germany and France, this difference goes up to three times in direct investments (Miethe and Pothier, 2016, p. 365).

Institutional structure of EU regulates the banks which have not EU financial passporting rights in different ways. If the requirements in the main country is similar with the EU regulations, the EU may offer a limited access to European Single Market for foreign financial service providers. In such a case, the third country is required to harmonize its financial arrangements with the EU. However, the assessment of this compliance depends on the

will of the EU institutions. Furthermore, right of access to the single market is not guaranteed and the status of withdrawal by the EU is protected its validity all the time (Triebe, 2018, p.6).

If the UK and the EU could not come to an agreement on financial services after the Brexit, the passporting execution in the financial sector will be terminated. Status of the UK banks will change to third country status for EU countries after Brexit and they will not be able to serve for EU customers directly from London. They will be required to move to one of the EU-27 countries to continue their services. This situation may realize either as a subsidiary, or less likely as a branch of parent bank, only depending on the consequence of the new trade agreement between the EU-27 and the UK. The situation for the EU-27 banks in the UK is slightly different. Banks do not need to be relocated; but, their legal structures in London are important for the UK, EU-27 and non-EU firms. If the EU-27 banks provide services to British or non-EU customers through their (London) branches, they may be obliged to support these branches. However, the Bank of England (BoE) indicates that it may allow the smaller EU-27 investment banks to continue their operations as branches, although it has not yet defined the details. In the case of doing business by non-EU banks with their EU-27 customers out of London, will face problems of both the UK and EU-27 banks. Banks of non-EU countries will have to carry their operations to the EU-27 and support their branches in order to protect their financial passporting rights (Kaya, et al., 2018, p.8). If a bank outside the Europe will establish branches in Paris or Frankfurt, it will be obliged to implement the regulatory and supervisory mechanisms of the both main country, the UK and the EU. The fulfillment of the requirements of these three different supervisory regimes will also lead to cost increases. In such a case, banks, of course, will relocate their activities and resources to EU countries instead of having to pay high costs (Kılcı, 2018, p.14).

In the event that the UK loses its EU financial passporting right, there may be recessions in London's financial intermediary position since investments from outside the EU will lead to other directions. At this point, the Netherlands and Ireland rather than other countries are expected to be slightly more prominent countries as the alternative access route to the EU capital inflow. When we look at the US's direct and portfolio investments to the EU as a percentage of GDP, the Netherlands and Ireland have already seemed relatively high (Bundesverband Deutscher Banken, 2018a, p. 4). In the case of British institutions lose their financial passports, it is seen that Frankfurt will be the first choice for banks that will be adversely affected by Brexit. To the beginning of September, approximately 25 banks took the step towards the preference of carrying their headquarters from London to Frankfurt. Paris is ranking in number two with 9 banks, followed by Luxembourg, Dublin and Amsterdam. While in terms of insurance and investment funds institutions, it seems that Dublin and Luxembourg are frontrunner financial centers (Helaba, 2018, p. 10).

How the economic relations between the UK and the EU will be conducted in the post-Brexit period of the UK is still unclear. Various scenarios have come up within terms of the exit process from the EU and post-emergence economic relations with the EU. Some of these scenarios are not accepted by the EU, while others are not adopted by the UK too. The costs that the UK will face with Brexit will vary mainly depending on the "Hard Brexit" or "Soft Brexit" scenarios that will emerge as a result of the negotiations with the EU. Hard Brexit means that the UK will not be a member of the EU Single Market both during exit process and after exit from the EU and will not create a customs union with the EU. On the other hand, the Soft Brexit concept refers to the option of integrating the UK into the European Single Market with a Norwegian-like structure (Hosp, 2017, pp.3-4). In the case of Soft Brexit, British firms will face lower costs. However, in the case of Hard Brexit, it is stated that the costs will increase due to a much lower access to the EU market (Van Reenen, 2016, p.368).

The option of Britain to join the European Economic Area, also called the Norwegian scenario, or the UK's participation into the customs union, is rejected by the UK. On the other hand, a free trade agreement option containing financial services, is not accepted by the EU too (Neuhäuser, 2017, p.19). Equivalence scenario due to the difficulties in implementing, and since the positioning scenario of the London financial center as an offshore financial center is unrealistic both of them are not so popular. In the Brexit negotiations, EU insists that British financial institutions and banks should lose its EU passport right as a result of Brexit (Triebe, 2018, p.6). Because of the behaviors of the parties and time of the Brexit negotiations are exhausted, most likely to be implemented scenarios are 'Scenario for Free Trade Agreement that Does Not Include Financial Services' and 'No-Deal Hard-Brexit Scenario'. Both scenarios mean that financial passport rights can no longer be used and allowing for free entry into the EU-27 markets for the British financial sector. Against the possibility of the disagreement in Brexit scenario, it is seen that some financial companies organize their business and activities independently from outcome of the negotiation. As a result of having a significant demand compared to the EU-27, it is already known that there is a trade surplus in the financial services of the UK. The main problem here is that, because of hard Brexit, losing some of Britain's customers or earnings is more likely (Vries, Gartner, Haentjens, Korteweg, Markakis, Repasi, & Tegelaar, 2017, p. 15).

By the reason of the balances in domestic politics in the UK and maintaining EU's tough stance against to an agreement in accordance with the UK's wishes, Hard-Brexit, which expresses the possibility of being out of the EU without an agreement, becomes increasingly prominent. In such a case, it is emphasized that acting complying with the rules of World Trade Organization can be a last resort. This process will bring great challenges for the UK, because until today the arrangements made with the World Trade Organization have been made by the EU on behalf of the UK. With the UK moving out of the EU, it would be compulsory to adopt a multilateral arrangement that has to be ratified by all of the member countries of the World Trade Organization and which has not yet had an example (Aran, 2017, p.7).

When we consider the profound and intertwined economic relations between the UK and the EU, the option of non-solution will bring the potential negative consequences of Brexit to the highest level. Approaching to the foreseen deadline for negotiations, it is seen that the rhetoric of "no deal is better than a bad deal" converges to the rhetoric of "lack of agreement is the worst deal for all parties"(Efe, 2017, p.132). At this point, it is necessary to decide on additional time for the negotiations, and to provide more opportunities to the economy and the actors to prepare more for the new situation. Thus, it will be achievable to prevent the scenario of insolvability (Deutsches Aktieninstitut, 2017, pp. 9-10).

In July 2018, British Prime Minister Theresa May presented the Brexit White Paper, which includes the recommendations of the UK in the Brexit negotiations with the EU. Hence, in the EU Summit Brexit negotiations, which will begin in October 2018, the start-up position of the UK has been approximately shaped (Monier, 2018, p.1). From the testimonies in the Brexit White Paper, it appears that the British government would prefer to negotiate a free trade agreement with the EU that does not include the financial sector. The UK wishes that trading goods and agricultural products with the EU will carry on as customary as possible after the Brexit. Within this framework, for procurement of goods, the UK seem to be ready to accept EU standards and regulations. On the other hand, it is observed that concrete measures on financial services trade is not touched adequately in the Brexit White Paper. This situation leads to comments that the financial sector is less important than the real sector for the British government in the Brexit bottleneck. It seems that in order to retain EU financial passporting

rights the British government does not want to take the disagreement risk with the EU. It is understood that loss of financial passporting rights will not play a decisive role during the Negotiations in October which would have serious consequences for the British financial sector. Therefore, at the latest in December 2020, the UK's financial institutions will lose their passporting rights (Schäfer, 2018, p.654). The impact of Brexit on the UK's ongoing relationship with the EU will depend on the model chosen. However, the issue of which exit strategy will be accepted in the negotiations remains ambiguity. Therefore, the concrete targets for cooperation with the EU in the financial sector still continue to stay in the dark. Brexit will not only affect the UK's ongoing relations with the EU, but also relations with third countries. Consequently, the impact of the chosen path will be broadly covering a great area (Coiley, 2016, p.1).

Economic Consequences of Brexit

In 2016, the British people decided to leave the EU. At that time, many economists expressed their expectation of a Brexit shock in the British economy. The starting point of these economists was that Britain, which decided to abandon the world's biggest trading bloc, would not be preferred by firms and investors, and this would have a serious impact on the British economy. When we review the economic data of England, it would not be wrong to say that the shock has not been occurred significantly. Instead of that, the probability of showing signs of stagnation of the British economy has been becoming gradually higher.

Undoubtedly, Britain's leaving from the EU will cause extensive results in both the UK and the EU financial sector. Especially considering that London is the leading financial center in Europe, the impacts of Brexit on European economies become more important. As long as being the EU member, the UK-based financial institutions can benefit from specific EU rights to provide their services in the European Single Market without any restrictions. In this context, prior to the exit the UK constitutes a critical connection point for the corporate client market of the major European banks in the EU financial system. In addition, the UK is a gateway to the European Single Market for capital inflow from non-EU countries. It is obviously clear that if non-EU member UK loses its unrestricted access ability to the single market, these two functions will not have much importance. (Miethe & Pothier, 2016, pp. 365, 370)

When looking at Brexit financially, it seems inevitable that serious situations arise. It is stated that a protectionist war especially among the UK-based finance industry and other EU financial centers can blaze up with the support of national institutions. More precisely, it is emphasized that the EU (which is mentioned for core member states of the EU) wishes to restrict the ability of the UK based firms to provide financial services. In this way, it is desired that many financial activities and institutions in the UK are forced to move to the headquarters in the EU (Howarth & Quaglia, 2018,1120).

The financial sector is one of the most important sectors for the British economy. The financial sector contributes about 10% to the UK GDP. According to the Office for National Statistical data, Britain earns around £ 190-205 billion per year from the financial services industry. The Gross Added Value is £ 120 - 125 billion per year and 1.1 million people are employed in this area. It is stated that the financial services industry generates approximately $ 60-67 billion tax annually in the country and also contributes a trade surplus of £ 58 billion to the UK's balance of payments. According to the experts, the UK has gain about 20% of its annual revenue thanks to its passport right to access the EU market. According to the results of a survey conducted by a British consultancy firm, the

UK likely loses approximately 40% to 50% of its transactions with the EU as a result of the UK's exit from the Single Market (Ringe, 2017, p.11).

It is beneficial to explain briefly the economic factors of Brexit affecting financial sector more closely. One of the medium-term impacts is that the UK will no longer contribute to the post-Brexit EU budget. This situation will constitute a significant conflict point for EU countries. It is not possible that the amount which is not paid by the UK to the EU budget would be compensated by all other member states. In such a case, it is most likely that the share of Greece and East European countries, which are in the position of net buyers, from the EU budget will be reduced. This will not be good news for Greece, which has not yet overcome the debt payment crisis and still in financial trouble. On the other hand, the acceleration of capital flows to EU emerging countries from European low interest rate countries have could bring a crisis similar to the 1997 Asian crisis. Brexit's one of the both short-term and long-term significant impact on the world economy will be increase the fluctuations in the stock markets (Welfens, 2017, p.114).

As it can be easily predicted, the first reaction from the economic environment to the Brexit decision came from the financial markets. With the Brexit decision, expectations were deteriorated in the UK and the most serious reflection of the decision revealed itself by a serious decline in the international value of Pound. It has been predicted that Brexit would have a slowdown effect on growth of the British economy; however, it should not be forgotten that Brexit has not yet been completed. For this reason, in terms of negative economic impacts, the end of December 2020, which is the date on which Britain will actually cut off economic ties with the EU will be a critical threshold. As it is known, the global financial crisis of 2008-2009 has had serious consequences on the British financial markets up to the bankruptcies of banks this crisis was overcome with a series of non-orthodox economic policy precautions. Today, in the period when the financial crisis prevailed, there were no bankruptcies for British banks and also serious negative developments in the British financial system. Therefore, Brexit does not have a power to trigger a major crisis similar to crises in the period of 2007-2010 in the UK. The higher probability is the gradually slowing of economic growth. However, it should not be underestimated that a politically ill-managed Brexit could trigger a new financial market crisis (Welfens, 2017, pp. 105-106).

The UK will not desire to give up an expanding banking center. According to the IMF, the financial industry contributes 7% of the UK GDP, pays 11% of the taxes and provides about 6% of the workplaces with the sub-sectors. The financial sector comes into prominence as the UK's largest export segment. This feature helps the UK to decrease the current account deficit. While trading goods and services with the EU, which is the most important trade partner of the UK, the UK has trade surplus only from services. Thus, the emergence of a fair and balanced Brexit agreement from the point of view of the UK if and only be possible by considering the financial services. Britain's will be that this agreement is not a standard solution but should be a unique solution. The British side desires that the agreement should be in the form of a free trade agreement which involves financial services (Triebe, 2018, p.4).

In addition, after the Brexit, because both the EU and the UK would consider the other region to be worse, a need to harmonize the credit markets also arises. Thus, capital requirements would increase unexpectedly in both regions. Therefore, costs of capital may increase. A solution at this point is the harmonization of individual loan agreements. The politically most difficult solution is the protection of existing credit agreements. On the other hand, after the Brexit, it is necessary to coordinate the capital adequacy conditions regarding with the assets (Vereinigung der Bayerischen Wirtschaft, 2018, p. 30).

In the literature, it can be said that there are studies that have concluded that Brexit will make Britain worse than it is. This is because Brexit has introduced barriers in terms of trade and migration issues between the UK and the EU. In empirical studies, it is estimated that the probable losses of the EU 27 countries after the Brexit will be less than the losses of the UK (Sampson, 2017, pp. 163-164). Many economists, along with Brexit's decision, state that GDP of the UK will decrease between 20% and 2% in the long term. Moreover, as a result of the uncertainty resulting from the separation, the decrease in investment volume is inevitable. Due to the uncertainty, it is possible to see decreases in the volume of both foreign trade and long-term direct investments. Thus, it may be inevitable to face with slowdown in economic growth and even perhaps recession in economy. On the other hand, with the slowdown in the British economy and due to the decrease in tax revenues there is also a danger of an increase in the budget deficit (Srovnalikova & Razinskaite, 2017, p.99). Refinancing of government debt has also become a major stress factor for the UK. It is already known that public debt is around 90% of GDP. In case of the above-mentioned risks occur, the fact that the losses in the GDP become further aggravated also stands as a great risk (Kierzenkowski, Pain, Rusticelli, & Zwart, 2016, p. 23).

A small group of economists argue that withdrawal from the EU may lead to a slight increase in the UK GDP. The expectation that the UK has very fast and successful results in negotiations with foreign countries along with free trade and a largely liberalizable business environment is the basis for these predictions. According to them, the business conditions in UK currently have the most liberal structure among the developed world countries and this situation provides a great advantage to the country (Srovnalikova & Razinskaite, 2017, p.99).

The UK Treasury's study shows that in the long term, Brexit will reduce the UK's GDP compared with the country's staying in the EU, while the magnitude of this loss will be directly related to the results of the post-Brexit trade and investment regime. Regardless of the exit scenario chosen, whichever scenario takes place, it is pointed out the probability of that in any case the UK will permanently weaken (impoverished). Brexit is stated to contain significant short-term risks, even including stagnation. It is stated that the exit decision will be a great shock to the economy and three different components of this shock are mentioned. The first effect will be the effect of less open trade and direct transition to the investment regime. With leaving the current situation, employers will be expected to act in toward reduce costs by reducing investments. The second is the effect of uncertainty. This effect is expected to emerge on investors. Investors' decisions regarding new projects will be adversely affected and the problem of lower demand in the economy will be added on the agenda. The effect of financial stability is mentioned as thirdly. This effect includes risks arising from the reassessment of the risks of financial assets in the UK. It is exposed that comparing with a jump in unemployment a slight shock scenario would correspond to a loss of 3.6% in GDP in just two years. In case of severe shock, it is estimated that this loss will lead 6% decrease in GDP and a more severe unemployment effect (Begg, 2016, p.31).

It is estimated that the economic cost of Brexit will reflect as a national income contraction of 6.2% by 2030 for the UK. It is stated that this ratio means a decrease of £ 4,300 in the annual budget of households. In addition, with the decrease of investments until 2030, it is expected that 820 thousand people lose their jobs, pound will depreciate by 15% and inflation will rise by 2.7%. It has been observed that, with the panic following the referendum, while the pound has depreciated by 7.2% against the euro, in the London Futures Exchange loss on the value of the stocks up to 8%. In the light of this data, it is obviously clear that after the Brexit decision, the prominent title of the UK's negotiation with the EU should be "financial services and regulations" (Alsan, 2016, p.65).

UK Financial and Banking Sector After Brexit

Over the last half-century, the United Kingdom has emerged as an important attraction center for foreign banks. According to the Global Financial Center Index London is recognized as the most important financial center in Europe and even in the world. 60% of European capital market transactions and 40% of financial assets in Europe are managed in London. Today, almost one-fifth of global banking activities are performed in the UK. In total, more than 260 credit institutions use London as a financial center while providing financial services to both the EU and whole the World (Bundesverband Deutscher Banken, 2018a, p. 3). In 2017, almost half of the bank assets in the UK (49%) are composed of foreign-owned banks. Foreign ownership share in banking industry is less than 20% in the USA, 14% in Germany and 4% in Japan. Serving for British customers constitute an important part of the foreign bank activities in the UK (Kaya et. al, 2018, p.8). Since the UK became a member of the EU, the banking industry can be said that has grown significantly. While the ratio of banking industry assets to GDP was approximately 100% in the year that England became a member of the EU, this ratio approached to 450% in 2013 (Miethe & Pothier, 2016, p.364).

Ramiah et al. conducted a study to measure the impact of the Brexit referendum on various sectors in the UK. According to the results obtained from this study, along with the Brexit the banking industry is among the most adversely affected industries (second is the entertainment industry). They also stated that, after the Brexit referendum, the returns of the stocks of the companies in the banking industry are highly adversely affected. For example, on the tenth day following the referendum, they calculate that the losses in the banking sector have reached 15.37%. One of the most important factors that triggered this negative situation is the loss of passporting rights in the financial services sector. (Ramiah, Pham & Moosa, 2017, p. 2511)

It is expected that each financial center in Europe will try to use its comparative advantage after Brexit. The reason behind that is what can be gained from Brexit in terms of new financial operations depends heavily on the national diversity of financial capitalism. At this point, after the Brexit, it can be stated that Germany and France would have the largest banking sector in the EU (respectively, first and second), according to the total assets, with the intensification of special investment banking activities in Frankfurt and Paris. However, because of some reasons the European financial centers have always been less attractive rather than London. In particular, the UK has a relatively more flexible regulatory framework, a higher level of expertise, number of advantages in the English common law and the country's developed especial infrastructure for financial services make London more attractive. Therefore, it is clear that some reforms should be made in the system for those who remain behind after the Brexit. It is widely observed that transnational coalitions created by financial solidarity are very effective. In the context of Brexit, it is expected that financial institutions engaged in cross-border businesses in the UK and in the EU will face limited access to the Single Market after the Brexit, and therefore the profits of these financial institutions will be reduced. For this reason, it is expected to establish a transnational coalition on both sides of the channel in order to preserve the current level of market access between the UK and the EU. It would not be wrong to say that the financial services that will be mostly affected by Brexit will be investment banking and Euro exchanges. The UK's four biggest banks (HSBC, Royal Bank of Scotland, Barclays and Lloyds TSB) are known to be against to Brexit. In 2017, the British banks announced an urgent action plan for transferring their staff and activities to the EU-27 unless Brexit negotiations ensure full access to the Single Market (Djankov, 2017, p.2).

London's investment banking sector is dominated by foreign banks, which have approximately 50% of the UK banking system. Most of the transactions are carried out through branches which use the only European passport to

serve the whole EU. After Brexit, the banks of countries that are not members of the EU, but whose headquarters are in UK, will lose their right to benefit from this opportunity. The EU-27 would have to establish its own subsidiaries this means a fund about 35 to 45 billion Euros, which would be allocated for this purpose (Kaya, et al., 2018, p.11). In addition, as a result of the loss of passporting rights, UK asset managers will have to trust on the national special regimes and regulations of the various countries in which they will trade to sell their products to the EU. Changing practices from one EU country to another will be inevitably increase the complexity and costs (Cardi, 2017, p. 389).

Setting sails to new horizons for the UK will be possible along with the Brexit. For example, by developing new tax practices, it will be possible to create the chance to become the world's largest offshore financial center. Because, historically, the UK is linked to a number of offshore financial centers, many of which are considered as tax havens with zero corporate and personal income tax rates. It is observed that the UK's concerns about integration with offshore financial centers have started to be explained (Miethe & Pothier, 2016, pp.370-371).

In support of this view, the UK, together with Brexit, will be free for making worldwide agreements and determining competitive tax rates and will be unimpeded in adopting policies that will bring and large investors to the UK. (Cardi, 2017, p. 392). However, for now, it is stated as a finding in which alliances remain limited and failed to achieve mobilizing the EU private and public sector actors significantly. In the private sector, AFME (it is possible to say that it is an important lobbying group) and some UK based financial institutions emphasize that there will be a long transition period after the conclusion of the Brexit negotiations and special agreements can be made. A group of Germans (and other EU-27) officials acknowledge that London has an important place in the European financial environment. In this context, it is stated that the important thing is, as Brexit negotiations progress, the ability for gaining a momentum for transnational coalitions covering EU partners. However, it can be expressed that there is a greater risk that a neo-mercantilist war will emerge by EU members to encourage their own national financial centers and withdraw financial operations from the UK. Frankfurt is one the biggest city of Germany, which is one of the largest member countries, is introduced as the main target of the banks for now. On the other hand, the existence of French efforts to increase the attractiveness of Paris cannot be denied. At this point, the EU Commission and the ECB pursue the integrity of the single market. It is obviously clear that these organizations want to build a flat playground in the EU (Howarth & Quaglia, 2018, p.1129)

Brexit has created a need for a basic review of the operations and structures of many banks in the UK. For example, HSBC announced its decision to stay in the UK by doing this review. It will be necessary to decide whether banks in this scope need to be restructured for their operations in Europe and in the UK, and whether establishing group companies in one or more-member countries. According to Dimon, CEO of JP Morgan, Brexit will be able to reverse the growth for international banks in London for decades. Moreover, he declares that along with the Brexit the UK-based banks will no longer provide services throughout the EU (Coiley, 2016, March, 1).

After Brexit in Europe, there is a need for stepping further development to reshape the banking system in the EU-27. In particular, it can be said that the European Stability Mechanism (ESM) and the European Deposit Insurance Fund, which will be established within the framework of the European Stability Insurance Program, may be considered valuable in this context. Simultaneously it is important to regulate country risk exposure limits of the euro zone banks and to create a single necessary rule book for banking supervision. Completing the banking union in Europe will be a threat to the dominance of US investment banks. The strengthening of the banking union should ensure better sharing of not only the risks but also the benefits of the expanding Eurozone finance

sector after the Brexit among the Eurozone countries. In other words, there is always a danger of reluctance to sharing of risk without benefit sharing. This situation will make the Euro Zone's expanded financial sector more vulnerable to financial instability (Sapir, Schoenmaker &Veron, 2017, p.7).

The UK's retail and commercial (corporate) banking is highly effective, and about 80% of its revenues are not directly linked to the passport. However, according to the estimates, it is stated that share of the EU in the UK's banking transactions is about 23% and the income obtained from these transactions is £ 25 billion. The possible impact of Brexit on banks affiliated to the EU market may be increase in operating costs due to the need for restructuring and the opening of subsidiaries in the EU. In this respect, leaving London would be a reasonable strategy for small banks after the Brexit. Or banks can continue to consolidate with other banks for maintaining to serve the EU markets. Larger banks will be able to operate in the city along with reorganization and also harmonization with the EU rules (Djankov, 2017, p.6).

Conclusion

The tending of different countries to the process of economic integration causes for all parties to face some advantages and disadvantages in each integration phase. As the process of integration deepens and progresses, and over a certain period of time, the economic gains of that integration become increasingly internalized by the public and perceived as a natural situation. While the economic gains of integration are gradually forgotten, the adverse effects thought to be created by integration are becoming more and more apparent. On such a ground, economic disintegration tendencies, which are not always required to be based on a rational basis, can gain a momentum. From the UK point of view, the immigration problem, the large current account deficit and the developments in debt financing are the most important factors that push the country to the Brexit. These factors that can be said as the metal fatigue of the integration process is thought to effective in the Brexit referendum. As the actual leaving EU date is approaching and the losses relating to Brexit cost to the public, the desire to revise the UK's decisions comes more on the agenda. When we think with simple logic, just as integration has advantages in the past, economic losses inevitably will be happened in the case of disintegration too. Therefore, as a result of Brexit, economic losses will be inevitable for both the UK and the EU-27 countries. It is not possible to say that there is a consensus on the impact of the Brexit decision on finance and the banking sector. However, we can state that the most important determinant of pros and cons of Brexit decision depends on the scenario to be applied. Developments will be directly affected by the result of preferred alternative among Hard Brexit, Soft Brexit, or non-solution scenarios. In today's conditions, it cannot be claimed that the UK, which is planned to leave the Union at the end of 2020, is ready for this process. This uncertainty does not only push the UK but also pushes all relevant economies. In the following days, the importance of the EU market for the UK and the position of London, the world's leading financial center for the EU, will force the both sides to find an agreement ground. While the uncertainty about the process will be great, it is clear that after the Brexit the British banking sector will no longer remain the same.

In addition, the loss of EU financial passporting rights will result in a loss of employment for London due to the relocating of some of banking operations to Continental Europe. However, it is seen that this loss will not be as large as it is exaggerated. However, the comments that Brexit would cause an improbable decline in London's position as a financial center, and even trigger a financial crisis do not seem very realistic. On the other hand, it

should be noted that the discourse of what, this process would significantly increase the attractiveness of financial centers such as Frankfurt and Paris, is exaggerated.

In our point of view, in the Brexit decision, it is observed that economic reasons fell behind the political rationales. It seems that the economic problems facing the UK which leaving the EU are not sufficiently discussed and not sufficiently prepared for negotiations. One thing that can be said today is that because of the UK, which will finally be out of the EU in December 2020, the capital market in Europe will not be the same after the Brexit. In this framework when discussing for the banking sector, it is inevitable that the UK will face significant losses if it loses the financial passporting right after the Brexit preference. With the loss of the financial passporting right, since the investments coming from outside the EU will turn to other routes, London will lose its financial intermediary position and face losses. Of course, as a result of Brexit, the UK and the EU countries outside the UK will face economic losses. Moreover, considering the international companies operating in Europe, it is seen that there is a large audience affected by this situation. The fact that the framework of the possible changes in the economic environment after the exit is not yet clear stands as a major barrier for the markets to see the future. This shortcoming makes markets uneasy and markets do not like uneasiness.

Two scenarios appear to come forward among the exit scenarios. First, a free trade agreement with non-financial services mentioned in the Brexit White Paper in July 2018 or the second scenario is the No-Deal Hard-Brexit Scenario, which means insolvability. It seems that the UK government, which has difficulties in preparations and timing, and has significant shortcomings in many priority areas, is likely to make a preference which ignoring financial services. In other words, we can see that the UK push the financial sector to the background, for saving the real sector. Since the foreseen free trade agreement will not cover financial services, the UK-based financial institutions will lose their financial passporting rights, which offer free access to EU financial markets and the operations of UK-based banks in the EU will also be adversely affected. Undoubtedly, many banks in the UK are thinking and planning to transfer all or part of their operations to one of the financial centers in EU countries.

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3

THE IMPORTANCE OF FINANCIAL LITERACY AND ASSESSING THE LEVEL OF FINANCIAL LITERACY IN BURSA PROVINCE

Elif Yücel[1], Oğuz Kuyumcu[2]

Abstract

The developments in the world economic system have caused lots of changes in the global financial system in this century. The globalization of the financial markets of the countries has encouraged free market regimes and the competition in these markets has increased steadily. Today, there are a lot of and complex financial products and services in financial markets so this situation causes more financial mistakes. Therefore, the concept of financial literacy, which means that individuals can make informed, efficient and reliable decisions in financial matters, is a matter that should be given importance. The low level of financial literacy is not just an individual problem. Because when individuals make financial mistakes, these mistakes can affect the other financial and social decisions and lots of people can affected from these decisions. Add to this, they often try to stay as far away from the financial system as possible in order not to encounter similar losses. As a result, the volume of financial markets is contracting first. This leads to a negative impact on real markets and a decrease in economic growth. So the main objective of this study that is prepared in line with this importance, is to measure the level of basic financial literacy in Bursa province. For this purpose, the survey method was preferred in order to reach a wide audience in this study. The questionnaire was prepared by the help of questionnaires conducted by the OECD in 2011 and 2012 to measure financial literacy. Bursa province was selected as population in terms of it is a metropolitan city and the cost of the survey and reached 790 persons. The findings were analyzed with the SPSS package program and consequently it was concluded that the basic level of financial literacy in Bursa proved to be sufficient. In addition, it was seen that debt management, saving and retirement issues are more important issues for the respondents. And also the financial issues that participants interested in at the most were inflation and pension plans, unfortunately. So this result shows the general economic situation in our country.

Key Words: Financial Awareness, Financial Literacy, Financial Literacy Level

1. Introduction

With the spread of the free market economy, the need for financial knowledge is increasing. Individuals need financial information to make the most appropriate financial decision from a wide variety of options in today's market conditions and to increase their financial security. In the direction of this need, the concept of financial literacy has become a necessary issue for both individuals and countries. In general, financial literacy is the ability to use individual financial information as needed and to be able to make financial decisions correctly. It is the

1 (Uludağ University), emugal@uludag.edu.tr
2 (Uludağ University), oguz.kuyumcu@btu.edu.tr

ability to interpret the conditions and conditions that affect the acceptance of the economic situation and the taking of economic decisions (Worthington, 2006, p.59).

Individuals have to make many financial decisions at the same time as they make their savings plans when investing to evaluate their money or considering retirement periods, while creating their daily and long-term budgets. In this process, it is inevitable to have a certain financial literacy level (Tosun, 2015, p.41). By increasing financial literacy, preference mistakes caused by behavioral financing are reduced to a minimum level, resulting in a stronger financial system and the ability of regulatory and supervisory authorities to fulfill their duties at the maximum level (Özçam, 2006, p.19). In addition, effective financial systems can be created because the financial literacy levels of the individuals are improved and savings are made effectively, investments are increased and financial fraud is prevented.

The main objective of this study, prepared in the direction of this importance of financial literacy, is to evaluate the basic financial literacy level in our country. The study was carried out in the province of Bursa in terms of being a metropolis and involving people that have different income and education levels. Unlike many studies in the literature, this study is thought to contribute to the literature in terms of a broad audience coverage that reflects the country as a whole.

2. Financial Literacy Concept and the Importance of Financial Literacy

Financial literacy is a concept developed primarily to ensure that individuals take a variety of financial measures to raise the level of general welfare and thus avoid financial problems (Bihari & Shukla, 2012, p.43). Financial literacy states that financial concepts can be known and understood at a certain level so that individuals can make informed, effective and trustful decisions in financial matters (Capuano & Ramsay, 2011, p.37) Knowledge level related to financial instruments is portfolio management and diversification, mortgage types, inflation, credit notes, savings funds and other financial instruments. (Hastings et al., 2012, p.5). Essentially, two classes can be distinguished as basic level and advanced level in terms of financial literacy. Information on risk and risk types, inflation effects, interest calculations, basic banking transactions and etc. are within the scope of basic level financial literacy while management of financial investment instruments such as stocks, bonds and derivative products, understanding of the balance between risk and return, market technical analysis and etc. are within the scope of advanced level financial literacy (Lusardi, 2008, pp.4-8).

In a society, the level of financial literacy can be low because of many different reasons. At the beginning of these reasons, general awareness of the importance of individual financial needs is low. Financial awareness is fundamentally the basis of financial literacy and financial awareness must first be acquired to raise the level of financial literacy (Lee & Tweedie, 1976, p.304). In communities where the level of financial literacy is low, individuals have little knowledge of the diversity and performance of financial products. They also do not have enough information about the ways in which information about financial products and their benefits can be obtained (Mason & Wilson, 2000, p.7). However, the ability of individuals to accurately assess and manage all their risks and benefits leads to an increase in welfare levels, especially in the long term. Parallel to this, when the increase of the level of financial literacy spreads the whole society, the level of social welfare will also increase. In societies where financial literacy is high, under favour of the individuals who save correctly, the level of national saving also increase and prevent the individual and social financial crises (Japelli & Padula, 2011, p.272). Increasing the financial literacy rate in a country ensures that people in that country behave rationally in the economy. It is expected that these

rational individuals will realize the importance of saving and keep the savings required for themselves and their families at the necessary level. The high level of savings plays an important role in the development and growth of the country's economy (Eskici, 2014, p.1).

The fact that the level of financial literacy is low is not only a problem specific to individuals. Individuals who can't manage their money properly can't overburden, bankrupt, etc. they also cause damage to the sector (Reyes, 2006, p.82). However, when individuals make financial mistakes, they often try to stay as far away from the financial system as possible to avoid similar losses. As a result, the volume of financial markets is contracting first. This situation brings with it the adverse effect of real markets and the decrease of economic growth (Gökmen, 2012, p.48). Financial literacy is very important in terms of stability in an economy. The informed consumers will do a good market research before the purchase of financial products and increase the market efficiency. Due to educated and conscious consumers, poor quality, very expensive and, inappropriate financial products have to leave the market (Bernanke, 2011, p.1). Some of the financial literate individuals can convert their savings to investments. Some of these investments are in financial markets and some of them are in real sector. Thanks to these investments, both financial and real markets are growing. With the growth of financial markets, the possibilities of providing resources of the enterprises are increasing and parallel to this, the enterprises can grow or enter new business lines so they can contribute to the employment (Miller et al., 2009, p.3). In addition, thanks to financial literate investors, effective market conditions can be achieved. Thus, due to bargaining, detailed market research and conscious financial literate individuals, excessive price increases in the market and also ınflation can prevent. One of the most important reasons of inflation is the irrational behavior of the individuals. Financial literate individuals are able to take individual precautions by monitoring the current market, especially during times of rising inflation.

When people think that they have more information than they actually have, they begin to make false especially in the real economy and finance, and it causes them to suffer from the market. Unfortunately, this damage is not limited to financial matters either. The financial problems experienced by individuals also bring with it social problems such as the children being taken to working life at an early age, the increase of divorce rates, the emergence of psychological illnesses and exhibiting behaviors in contradictory social rules. So increasing the financial education level of society is the most important solution for all these problems. Today, many organizations emphasize the need for dissemination of finance education in their work. The first step in raising awareness of the importance of financial literacy is to disseminate financial education. Thus, the financial risks are reduced and the liquidity in the markets is increased (Danışman et al., 2016, p.5).

3. Literature Review

Many studies in the literature focus on measuring the financial literacy level of university students and determining the factors that affect students' financial literacy levels (Chen ve Volpe, 1998; Cude vd., 2006; Jorgensen, 2007; Robb ve Sharpe, 2009; Sabri ve Macdonald, 2010; Hashim ve Kayode, 2013; Fatoki, 2014). And also in our country, the majority of studies in the related literature have been seen only on university students (Er vd., 2014; Kılıç vd., 2015; Özdemir vd, 2015; Bayram, 2015; Çam ve Barut, 2015; Barış, 2016, , Biçer ve Altan, 2016; Danışman vd. 2016; Şamiloğlu vd., 2016; Coşkun, 2016, Demirkol ve Erduru, 2017; Güvenç, 2017.). But this group already has a certain level of education and unfortunately it represents a minority part of our society. Hashim ve Kayode (2013), Er vd. (2014), Fatoki (2014) ve Özdemir vd. (2015) have determined that the financial literacy level of students receiving financial education in undergraduate programs is higher in their studies. Sabri ve Macdonald

(2010) students with high levels of financial literacy have more savings tendencies and therefore have fewer financial problems. Similarly, Chen and Volpe (1998) ile Bayram (2015) conclude that students are saving more money because their level of knowledge about investing is low. Cude vd. (2006), Jorgensen (2007) ve Kılıç vd. (2015) have come to the conclusion that their work is a very important effect of their families in financial knowledge and behavior of students. Some studies in the literature have also found that financial literacy does not influence students to make rational decisions in financial matters (Robb ve Sharpe, 2009; Çam ve Barut, 2015; Barış, 2016).

Many of the studies in the literature on measuring the level of financial literacy also measure participants' knowledge of which financial issues they are most likely to have and to identify the factors that affect financial literacy levels (Chen ve Volpe, 1998; Worthington, 2006; Mandell, 2008; Lusardi, 2008; Lusardi ve Tufano, 2009; Temizel, 2010; Rooij vd., 2011; Almenberg ve Save Söderbergh, 2011; Lusardi ve Mitchell, 2014). Many studies in the literature have found that males have higher levels of financial literacy (Chen ve Volpe, 1998; Worthington, 2006; Lusardi, 2008; Mandell, 2008; Almenberg ve Save Söderbergh, 2011; Lusardi ve Mitchell, 2014). It has also been observed that some of the studies in the literature are directed at determining the relationship between financial literacy and saving behavior Lusardi - Mitchell (2007), Banks vd. (2009), Sekita (2011), Delafrooz - Paim (2011), Japelli - Padula (2013), Hilgert vd. (2013), Henager - Mauldin (2015) found that individuals with higher levels of financial literacy in their work are more successful because they are more conscious about saving.

4. Research Methodology

In this study, we aimed to measure the level of financial literacy in our country and evaluate the proposals for development. In order to reach a wide audience, questionnaire method was preferred. The questions in the questionnaire have been adapted to our country from the OECD's 2011 and 2012 survey of financial literacy surveys. The questionnaire consists of three main parts besides the demographic information about the participants. At the first part there are 15 closed-end questions to measure preferences and experiences related to basic financial instruments. The second is a section composed of 20 questions prepared with a 3-point Likert scale to determine participants' knowledge levels of basic financial instruments. The final section consists of 19 questions on the 5-point Likert scale where opinions on financial issues and financial literacy development are included.

In the study, the reliability analysis of 19 questions that prepared in 5-point Likert adapted from the questions of OECD was made through SPSS package program and Cronbach's Alpha value was determined as 0.896. Thus, it is seen that the questionnaires are also highly reliable when applied in our country. The universe of the study is the Bursa city center. Bursa, is the fourth largest city in Turkey and has a very cosmopolitan structure due to the migrations that occurred by the years, that can represent the general of our country. When the sample of the research was determined, the sample size was first determined to reflect the reality of the analysis[3***]. According to this, since the population of Bursa Province is determined as 2.936.803 according to the census made in 2017, with the 5% error margin, the 95% confidence interval and ½ average frequency of the survey, the number of individuals to be sampled is calculated as 384. Later, by means of simple random sampling, 790 persons over 18 years of age were interviewed in various districts in the center of Bursa to fill the questionnaires. Then the data obtained were analyzed with the help of SPSS 17.0 package program and the results of the research were gained

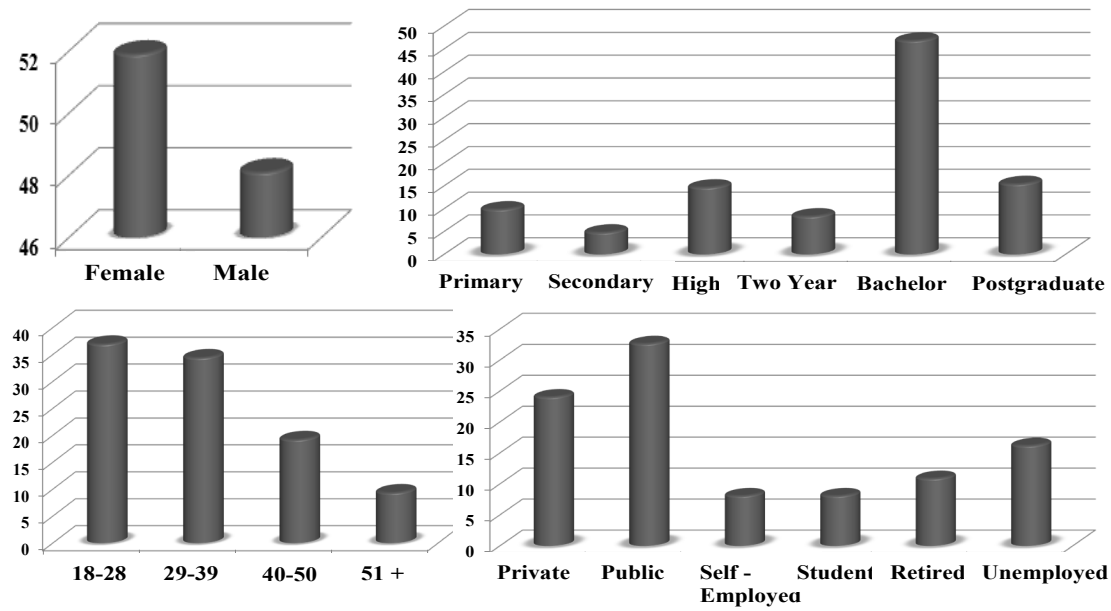
3 *** $n = (N t^2 p q) / (d^2(N-1)+ t^2 p q)$

5. Findings of Research

In the study, the demographic characteristics of 790 people were evaluated first.

Graph 1: *Frequency Distributions of Participants' Demographics*

Çalışmada ilk olarak araştırmaya dahil olan 790 kişinin demografik özellikleri değerlendirilmiştir. **Graph 1:** Frequency Distributions of Participants' Demographics



As can be understood from Graph 1, 48% of the respondents are male and 52% are female, and a normal distribution is seen. When the age distribution of the participants is examined, it is determined that the vast majority is from the younger societies. In particular, it is preferable to have more expenditures and to concentrate on this age range, where financial planning should be started, in terms of survey results. When we examine the educational levels of the participants, we can see that a very large majority are university graduates. This is caused by the people with higher education levels are more interested in the surveys. In the occupational distributions of participants, public and private sector workers are dominated.

In the first part of the survey, it is aimed to measure preferences and experiences related to basic financial instruments. The answers given most frequently by the participants are given in Table 1.

Table 1: *Preferences and Experiences of the Participants in the Survey about Basic Financial Instruments*

Questions	Most Supported Answer	Frequency
How to make your financial investments?	In consultation with different financial institutions	37,6
What sources of information affect your financial investment decisions?	Own Experience	24,8
Have you ever lost money your financial investments?	No	38,73
How did you save your money before?	Time Deposit	43,1
Have you earned from your savings before?	Yes	51,9
What kind of support have you received from a financial advisor before?	I did not apply to any financial advisor	55,9
Which financial decision you had previously received that you regret?	I have never regret	59
How many years should a person start making a financial plan for retirement?	18-28	56,71
Have you ever used any loan before?	No	41,3
What reasons have you used for individual loan before?	I haven't use any loan	41,3
Have you ever used mortgage before?	No	87,8
Where do you get the money when you need the emergency money?	Debt from family members or nearby	49,4
How much is your highest credit card debt until today?	0-1500 TL	51,4
How many credit cards do you have?	1	44,3
Who is responsible for payments in your house	Man / Father	44,3

As can be seen from Table 1, most of the participants use only one credit card and participants' total credit card debts to date are not too high. This indicates that the credit card is being used more accurately in our society and that the credit card is not seen as an effective means of borrowing. When we evaluate the use of financial loans, 41% of the participants have never used financial loans before. Especially the rate of using mortgage among participants is very low. Nevertheless, because we are a nation among warm-blooded individuals, individuals can manage their debts more easily by owing from their family members or their relatives. More than half of the respondents think that financial plans must be made for retirement periods up to the age of 28. From here we can reach the conclusion of how we attach importance to retirement period as a society. It is also stated that 50% of the participants derive a profit from their savings. However, generally time deposit, which is generally the safest and most classical financial instrument, is preferred for savings. According to the answers given to the survey, it can be said that the participants are not very willing and successful about the investment. Only 38% of the respondents stated that they have succeeded in financial investments. As a result, the financial advisor's lack of help is great. 56% of the participants have never received financial advisor assistance**.**

In the second part of the study, it was aimed to determine the knowledge levels of the participants about the basic financial instruments. The results are shown in Table 2.

Table 2: *Level of Knowledge of Survey Participants about Basic Financial Instruments*

Basic Financial Instruments	**Level of Knowledge**		
	1	**2**	**3**
Exchange Rates	24,1	28,4	47,6
Individual Pension	21,3	25,8	52,9
Investment Fund	43	35,2	21,8
Mortgage	42,3	34,9	22,8
Guaranteed Loan	37,7	31,4	30,9
Unsecured Loan	31,5	19,9	48,6
Credit Card	13,7	12,9	73,4
Time Deposit Account	23,8	19,2	57
Savings Fund	41	38	21
Micro-credit	58	29,9	12,2
Life, Health etc. Insurances	25,1	34,4	40,5
Stocks	36,2	28,1	35,7
Bonds	42,5	28,4	29,1
Prepaid Card	54,2	27,8	18
Participation Banking	43	28,9	28,1
Inflation	18	24,8	57,2
Taxation	22,8	34,2	43
Business World	26,8	35,5	37,7
Government Incentives	26,6	38,5	34,9
Capital Market	41,3	36,2	22,5

In the light of the information in Table 2, the participants are generally knowledgeable about foreign exchange, individual pension, unsecured loan, credit card, time deposit account, insurances as life and health insurances etc.. Of course the most knowledgeable financial instrument is credit card and it is followed by a time deposit account.

When we investigated the effect of the demographics of the respondents on the level of basic financial literacy, we first measured the effect of the gender difference on the basic financial literacy level by the Independent Sample T - Test and found that gender did not have a great influence on financial literacy, unlike most literature.

Table 3: *The Level of Knowledge on Basic Financial Instruments Differences According to Gender (T-Test) Age – Education Level and Occupational Distributions (ANOVA)*

One-Way ANOVA		
		Sig. Value
Education Level	For All Financial Instruments	0,00
Age		0,00
Occupation		0,00
Independent Sample T-Test		
Gender		**Sig. Value**
	Exchange Rates	,000
	Bank Guaranteed Loan	,016
	Stocks	,045

Using the results in Table 3, it can be said that there is a meaningful difference between men and women's knowledge level about exchange rate, Guaranteed Loan and stocks since sig. values are <0.05. The effect of education level, age range and occupational distribution on the level of basic financial literacy in the study was measured by the ANOVA test. In Table 3, it can be said that there is a meaningful difference between knowledge levels of either age ranges, education level or occupational distributions since all sig. values are <0.05. It has been determined that the level of knowledge about financial instruments decreases as the age range increases, while the level of knowledge about financial instruments increases as the level of education increases. When the occupational groups are evaluated, the group with the lowest level of knowledge is the self-employed, while the group with the highest level of knowledge is the employees in the public sector.

In the last part of the study, statements about the opinions of the participants on the financial issues and the development of financial literacy were evaluated. The most and least supported opinions of participants can be seen on Table 4.

Table 4: *Most and Least Supported Opinions By Survey Participants*

Most Supported Opinions By Survey Participants	**Frequency**
I'm reviewing all my financial possibilities before making an investment	%83,6
I always pay my bills on time	%83,6
I think that the lack of financial information is damaging to the country's economy.	%71,6
Least Supported Opinions By Survey Participants	
I live for today. What happens tomorrow is unknown	%15,2
Spending the money for a long time makes me happier than saving.	%20,8
Money is just for me to spend	%21,8

According to the Table 4, the level of interest and attention on financial matters in our country is high, and in parallel with this, it can be reached that the result of trying to save money by paying attention to expenditures.

6. Conclusion and Recommendation

The increase of financial literacy level in a country will also increase social welfare and it is expected that the level of financial literacy will increase because of the developing societies with increasing of social welfare. This study, prepared in line with the development of financial literacy, also tried to measure the basic financial literacy level in Bursa which has a cosmopolitan structure that can reflect our country in general and analyzed the opinions of the participants about basic financial instruments.

When we analyze the findings of the survey designed by adapting the OECD survey forms to our country, we find that the basic financial literacy levels of the respondents in general are sufficient. The vast majority of respondents believe that they have sufficient knowledge about basic financial instruments such as foreign exchange, individual pensions, unsecured loans, credit cards, time deposit accounts, insurances and stocks. However, the level of interest and attention on the financial issues of the participants was also found very high. In addition, participants are aware of the importance of financial literacy and believe that the lack of financial information is damaging to the country's economy. When the participants' level of knowledge about the basic financial instruments were analyzed for differences depending on their demographic characteristics, the difference between the gender and knowledge levels of the participants was not found, unlike some studies in the literature. There was a significant difference in the study only between the knowledge levels of women and men regarding the exchange rate, guaranteed loans and stocks. The effect of the education level on financial literacy is parallel to other studies in the literature. It can be said that as education level increases, financial literacy increases. The opposite is occurred for the age range. As age gets older, financial literacy is decreased.

However, according to the findings obtained from the survey results, debt management and saving money was learned by the people in Bursa province. Because the vast majority of respondents have learned controlling their credit card usage and haven't used financial credits randomly. They can manage their debts more easily by borrowing from family members or relatives. The majority of participants believe that retirement plans should be made until the age of 30. From here we can reach the conclusion of how we attach importance to retirement period as a society. It also found that 50% of the participants derive a profit from their savings. However, generally time deposit, which is generally the safest and most classical financial instrument, is preferred for savings. According to the answers given to the survey, it can be said that the participants are not very willing and successful about the investment. This is due to the fact that the level of general welfare of our society is not too high. It is natural that individuals who can meet their basic needs with their income, prefer savings than investments.

As a result, the level of financial literacy in the Bursa province is sufficient but it is thought that it will be beneficial to further develop it. Almost all of the participants say that the lack of financial information is damaging to the country's economy. For this purpose, the priority is to provide training support. Due to the lack of capacity of the departments providing financial education, basic level financial education should be given compulsory at secondary school level. The greatest support for this is expected from government and non-governmental organizations. In addition, in order to spread the precept of financial literacy in every part of the society, wide publicity can be reached with public service announcement etc. and social consciousness can be provided.

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4

THE CO-MOVEMENT OF CREDIT DEFAULT SWAPS AND STOCK MARKETS IN EMERGING ECONOMIES

Musa Gün[1]

Abstract

This study examines the links between credit default swap spreads and major stock market indices with weekly data spanning from the beginning of 2010 to the end of 2017 for nine emerging countries including Brazil, Chile, Colombia, Czech Republic, Mexico, Peru, Poland, Russia, and Turkey.

We analyze the lead-lag relationship through the use of a Vector Autoregressive model. And, we observe a negative correlation between the credit default swap spreads and stock market indices for most emerging economies. There is a strong and significant unidirectional causality from stock market index returns to the CDS spread changes. The findings of the analyses show that the stock market plays a leading role in all sample countries during the case period.

Key Words : Credit Default Swaps, Equity Indices, Emerging Markets.

Jel Classification : G10, G12, G15.

1. Introduction

The great expansion of the product range and the variety of the market participants in the international financial markets have increased the importance of risk management. The most thriving financial improvements of recent decades are the credit derivate products, of which the well-known is the credit default swap (CDS). Credit derivatives provide transferring credit risk from one contractor to another one. Credit risk is the possibility that one of the contract parties will not able to fulfill his obligations. Credit derivatives are the tools that help banks, financial institutions and investors manage this risk. For example, if a debtor cannot pay the debts, losses will occur on the investments and these losses can be compensated by credit derivatives. Banks and investors prefer credit derivatives over insurance contracts because of their low transaction costs, quick payments and more liquidity.

Among the credit derivative products, CDS contracts build the basis of the market. CDS could be considered as an insurance transaction that is made to guarantee the receivable of the creditor. The cost of this insurance is the spread determined by the CDS rates. The higher the risk of debt, the higher the CDS point is. The increase in CDS rates indicates that risk of the debt or the economy has increased. Thus, beyond the insurance function against the default risk, CDS provides insight about the countries' risks. Especially foreign investors primarily analyze the CDS of the country while they are making an investment in that country. The CDS spreads offer an opportunity to evaluate market views on the countries' credit risks. The fluctuations in the credit risk indicators

1 (Recep Tayyip Erdogan University), musa.gun@erdogan.edu.tr

both affect the CDS markets and the stock markets. Therefore, the relationship between CDS spreads and stock prices have attracted increasing attention since the introduction of the derivative markets.

The finance theories such as the Efficient Market Hypothesis developed by Fama (1965, 1970, 1991) claims that securities prices fully reflect all available information. Therefore, it is assumed that the prices of the financial instruments adjust simultaneously when there is new information. However, market practitioners and empirical studies argue that the CDS instrument reacts first to new information on credit risk since the CDS is the most liquid instrument in the credit derivatives market and it ensures more efficient allocation and pricing of the credit risk than other credit-related assets. In this sense, for example, the studies were done by Longstaff, Mithal, and Neis (2003), Hull, Predescu, and White (2004), and Blanco Brennan and Marsh (2005) which analyze the CDS, bond and equity markets in the United States and Europe validate this claim. That is, the CDS acts as a leading indicator in detecting fluctuations in credit risk. The spreads on the swap rates widen when deterioration in credit risk is detected or perceived by the market, and tighten when there is less credit risk perceived. The changes in the spreads are expected to occur before the stock market reacts. So, the CDS market anticipates corporate credit deterioration well before other capital markets do. In other words, the CDS market provides the real-time assessment of credit risk, acts as a leading indicator, and delivers greater efficiency than the equity market.

Credit derivative instruments are actively traded in the developed countries. Emerging economies have only a limited proportion of total market volume. But, in the recent years, emerging market credit derivatives have shown a rapid evolution, and CDS has become a preeminent instrument in the structured credit market in emerging economies. Many studies have been published on credit derivatives markets, particularly on certain CDS markets. And one of the significant matter to look at is the relationship CDS has with equities. With this motivation, we examined the relationships between CDS spreads and market indices over January 2010 to December 2017 using the data set of the following nine emerging market countries: Brazil, Chile, Colombia, Czech, Mexico, Peru, Poland, Russia, and Turkey.

The remainder of the paper proceeds as follows. Section 2 provides a brief overview of the literature review describing the theoretical relationship between CDS spreads and other market instruments especially equities. Section 3 presents the data set, empirical methodology and the outputs of the analysis. Lastly, we conclude the paper in Section 4.

2. Literature Review

Many empirical studies exploring the relationship between CDS spreads, stock market returns, and other financial assets and indicators have been published since the introduction of CDS in 1994 by JP Morgan. There are different findings in the literature regarding whether or not there is a relationship between CDS and other instruments. We review the literature in the scope of this study analyzing the interaction between CDS spreads and stock market indices. Studies generally discover the country-specific statement on the association between CDS spreads and stock market indices. In this context, Geske and Delianedis (2001) examine the corporate bonds and credit spreads in the United States market. The sample contains 470 firms for the period from November 1991 to December 1998. Their analysis results show that credit risk and credit spreads are not wholly clarified by default spread, leverage, firm-specific risk, and recovery risk, but basically owns to other factors such as taxes, liquidity, and market risk indicators.

The findings of various researches, performed by Longstaff et al. (2003), Hull et al. (2004), and Blanco et al. (2005) prove that credit default swap markets lead to the price formation, especially in developed economies. Besides, in emerging markets, the consequences of the study which examines the equilibrium price relationships and price discovery between credit default swap, bond, and equity markets for the period March 2001–May 2003 are miscellaneous. To illustrate, the credit default swap is the most significant determinant for the price formation process in Colombia and Russia. The significance of the credit default swaps and bonds is equal in Brazil and Bulgaria, though (Chan-Lau, Jorge, and Kim, 2004).

Longstaff, Mithal, and Neis (2005) claim that the stock market and the CDS market move together. The study analyzes the credit default swap spreads for 5-year contracts and corresponding corporate bond prices. The results of the analysis present that the default component accounts for the majority of corporate spreads across all credit ratings.

Pan and Singleton (2007) make research on the CDS spreads during the period of March 2001 to August 2006 and note that the credit spreads for Mexico, Korea, and Turkey share a strong common relation to the United States stock market volatility, which is represented by the VIX index. The research shows that the VIX index is strongly associated with sovereign spreads and thus, the index is an important indicator in explaining credit risk changes. Chan, Fung, and Zhang (2008) investigate the dynamic relationship between sovereign CDS spreads and stock prices. Their sample covers seven Asian countries for the period from January 2001 to February 2007. The findings of the study show a strong negative correlation between the spread and the stock indices. On the other hand, Greatrex (2008) reports a positive relationship between the VIX index and credit default swap spreads. Similarly, Kapar and Olmo (2011) examine the link between the VIX index and credit default swaps for the period of April 2005 to November 2010. The outputs of the study show that the iTraxx Europe index, the VIX index, the implied volatility, and the stock prices are all cointegrated with CDS spreads. Fung, Sierra, Yau, and Zhang (2008) analyze the lead-lag relationship between the CDS market and the stock market in the United States covering the years from 2001 to 2007. They report that there is a mutual correlation between CDS spreads and stock returns with regard to volatility and pricing. That's why investors should take information about both markets into consideration while they are making an investment decision. The analysis conducted by Norden and Weber (2009) present the sensitivity of CDS spreads to the stock market and the higher contribution effect of the CDS market to the price discovery. They conclude that stock market indices are capable of forecasting the CDS spreads.

The study exploring the effect of great shifts in the CDS spreads on the equity values shows that the correlation between CDS spreads and stock prices are inverse and the relationship is regime dependent especially during the period of financial crisis (Trutwein, Ramchander, and Schiereck, 2011).

Within the scope European debt crisis that took place in 2010, Coronado, Corzo, and Lazcano (2012) study the correlation between CDS rates and stock indices of eight European economies. The examination using a vector autoregressive model and a panel data model indicates that the swap spreads and index returns are negatively correlated. And the correlation level is higher in the riskier countries such as in, Greece, Italy, Portugal, and Spain. Moreover, Corzo, Gomez-Biscarri, and Lazcano (2012) investigate the relationship between sovereign credit default swaps, sovereign bonds, and equity markets for thirteen European countries for the period of 2008-2011 by using vector autoregressive model. Their study findings justify the link between the sovereign debt market and the country's stock market. The stock market incorporates new information coming into the market more quickly during the years of 2008 and 2009, whereas the credit default swap market has a leading role in 2010. Eyssell,

Fung, and Zhang (2013) determine the fluctuation in CDS spreads in the Chinese market for during the period of January 2001 to December 2010 through vector autoregressive model conducted as in the previously mentioned studies done by Corzo et al. (2012) and Coronado et al. (2012). Their model consists of the stock market index, the real interest rate and the S&P 500 stock option volatility variables. The study results present that volatilities in China's CDS spread affect stock market returns.

Narayan Sharma and Thuraisamy (2014) investigate the interaction between CDS market and stock prices from different sectors in terms of price discovery by using a panel data model. The findings of the study demonstrate that the stock market leads the price formation. Değirmenci and Pabuçcu (2016) evaluate the BIST 100- the Turkish stock exchange market- and the CDS risk premium of the country in order to determine the interaction between the variables by employing vector autoregressive and Granger causality approaches. The study outcomes indicate a bidirectional causality relation between the risk premium and the stock market index. However, Acaravcı and Karaömer (2017) could not find a strong relationship between the BIST 100 index and the CDS spread. But, the findings of the study employed by Koy (2015) suggest that both BIST 100 index and other sub-indices such as banking sector or industry equity indices could deserve attention for the investors in order to diversify the investment portfolios or to hedge with the CDS contracts as well as to make investment in a foreign country.

Mateev and Marinova (2017) evaluate the relationship between CDS spreads and the market prices of Markit iTraxx Europe index firms. They use CDS as a proxy of credit risk indicator - as parallel with the study of Berndt and Obreja (2010) in which the CDS spreads are considered as a country risk premium - and employ the Johansen cointegration test. Their analysis contains a set of 109 pairs of CDS and stock prices included in the index, over the period of January 2012 to January 2016. The result of the study shows that CDS and stock prices are cointegrated.

Based on the mentioned introduction and literature we investigate the relationship between CDS spreads and the stock market indices for the selected sample emerging economies.

3. Empirical Methodology and Data Set

3.1 Data Set

Our sample, based on the availability of data, comprises the following nine emerging countries: Brazil, Chile, Colombia, Czech Republic, Mexico, Peru, Poland, Russia, and Turkey. We obtain the emerging economies' 5-year CDS spreads and major stock market indices from Bloomberg. The major indices are Bovespa, IPSA, COLCAP, PX, S&P/BMV IPC, S&P Lima General, WIG20, MOEX, and BIST100 respectively for the sample economies. The data set is on weekly frequency for the period January 2010 through December 2017.

We first introduce the graphs of the variables to be able to give insight into the relationship between CDS spreads and stock market indices.

Figure 1: Indices and CDS Spreads

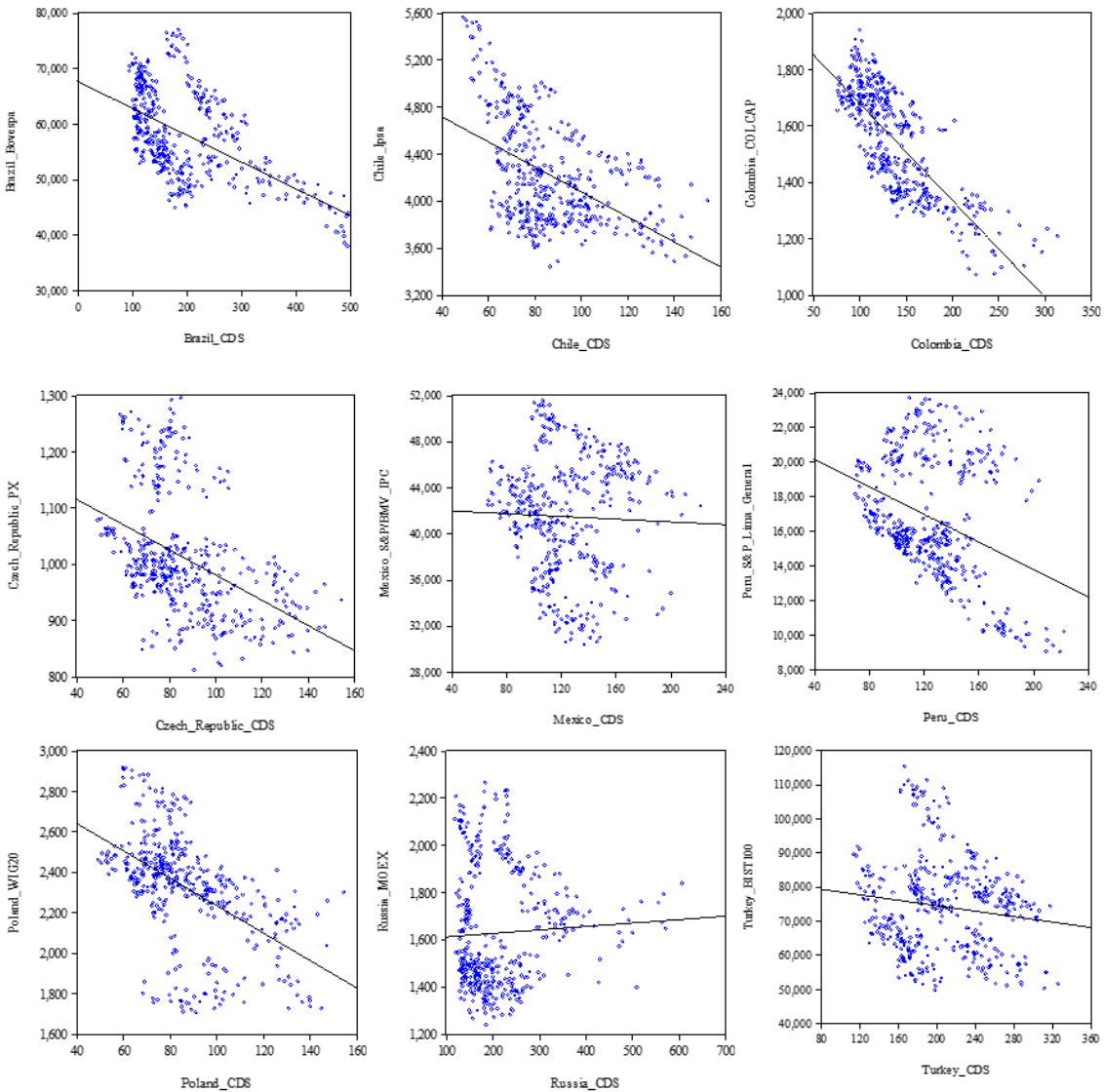


Figure 1 displays the plots of CDS on the x-axis and the plots of market indices on the y-axis. The figure provides graphical evidence of the movements during the sample period for the variables. Generally, there is an inverse relationship between the variables for all countries except Russia. This inverse relationship is parallel with the findings in many studies such as Chan et al. (2008), Trutwein et al. (2011), and Coronado et al. (2012). The correlation between the market index of Russia – Moex- and the CDS spread is almost neutral. It is clear that, as the stock indices fall- meaning an increase in market risk-, CDS rates widen- meaning an increase in credit risk- and vice versa. That is the movements in both markets are inversely correlated.

3.2 Analyses and Findings

In the empirical analysis, we follow the studies such as Logstaff et al. (2003), Norden and Weber (2009), Corzo et al. (2012), Coronado et al. (2012) and Eyssell et al. (2013) who use Vector Autoregressive Model (VAR) in their analyses. The VAR model is used to describe and predict the dynamic behavior of time series. To analyze the lead-lag relationship and to determine the intertemporal co-movement of the CDS spread changes and stock index returns we apply the variance decomposition analysis, impulse-response analysis, and Granger causality test within the scope of VAR approach.

The VAR model could be established as below.

$$VAR(p) = \Delta Index_t = \alpha_0 + \sum_{i=1}^{p} \alpha_i \Delta Index_{t\text{-}i} + \sum_{i=1}^{p} \beta_i \Delta CDS_{t\text{-}i} + e_{1t}$$

Model (1)

$$VAR(p) = \Delta CDS_t = \beta_0 + \sum_{i=1}^{p} \beta_i \Delta CDS_{t\text{-}i} + \sum_{i=1}^{p} \alpha_i \Delta Index_{t\text{-}i} + e_{2t}$$

Where p is optimal lag length; $\Delta Index_t$ is the return of stock market indices, and ΔCDS_t is the changes in CDS spreads at time *t*. the model assumes that the variables (ΔCDS_t and $\Delta Index_t$) are stationary, the residual terms (e_{1t} and e_{2t}) have white noise, and there is no correlation between the residuals. Under these assumptions, we search the stationarity characteristics of the series through Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) unit root tests.

The ADF unit root test for a series *y* is applied using the equation below.

$$\Delta y_t = \alpha + \beta y_{t\text{-}1} + \sum_{i=1}^{p} \emptyset_i \Delta y_{t\text{-}i} + e_t \qquad \text{Equation (1)}$$

where Δ is the first difference operator, p is the number of lags, and e is the error term. The null hypothesis is that b = 0 meaning that *y* is characterized by a unit root.

The PP test is carried out using the regression equation below.

$\Delta y_t = \alpha + \beta y_{t\text{-}1} + e_t$ Equation (2)

Similarly, the null hypothesis is b = 0 meaning that *y* is characterized by a unit root. We use variables in log format for the analysis. Table 1 presents the unit root tests results where all variables appear non-stationary at level but are stationary at first differences.

Table 1: Unit Root Tests

		Level				1st Difference			
		ADF		PP		ADF		PP	
Countries	Variables	t-Stat.	Prob.	Adj. t-Stat.	Prob.	t-Stat.	Prob.	Adj. t-Stat	Prob.
Brazil	Bovespa	-2.50	0.12	-2.56	0.10	-20.33	0.00	-20.33	0.00
	CDS	-2.38	0.15	-2.66	0.08	-18.68	0.00	-18.67	0.00
Chile	IPSA	-2.20	0.21	-2.12	0.24	-20.51	0.00	-20.79	0.00
	CDS	-0.94	0.31	-0.90	0.32	-17.73	0.00	-17.57	0.00
Colombia	COLCAP	-2.46	0.13	-2.45	0.13	-20.60	0.00	-20.60	0.00
	CDS	-1.06	0.26	-1.06	0.26	-17.84	0.00	-17.72	0.00
Czech Republic	PX	-0.45	0.52	-0.44	0.52	-19.82	0.00	-19.83	0.00
	CDS	-0.94	0.31	-0.93	0.31	-17.71	0.00	-17.62	0.00
Mexico	S&P/BMV IPC	-2.49	0.12	-2.49	0.12	-21.83	0.00	-21.86	0.00
	CDS	-0.89	0.33	-0.87	0.34	-18.98	0.00	-18.98	0.00
Peru	S&P Lima General	-2.18	0.21	-2.39	0.15	-19.28	0.00	-19.28	0.00
	CDS	-1.02	0.28	-1.02	0.28	-18.86	0.00	-18.82	0.00
Poland	WIG20	-0.31	0.57	-0.29	0.58	-20.45	0.00	-20.49	0.00
	CDS	-0.94	0.31	-0.90	0.32	-17.73	0.00	-17.57	0.00
Russia	MOEX	-2.13	0.23	-2.21	0.20	-19.87	0.00	-19.92	0.00
	CDS	-1.38	0.16	-1.24	0.20	-17.70	0.00	-17.69	0.00
Turkey	BIST100	-2.04	0.27	-2.01	0.28	-20.87	0.00	-21.06	0.00
	CDS	-0.46	0.52	-0.88	0.33	-10.43	0.00	-18.70	0.00

VAR approach could be applied to the stable time series. Our sample time series variables become stable in the first differences so the logarithmic differences of the series are used in the VAR analyses. After the unit root tests, we determine the VAR lag orders with five different criterions - LR: sequentially modified LR test statistic, FPE: Final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion and HQ: Hannan-Quinn information criterion. The lag structure is checked up to 8 lags.

Table 2: Lag Length Selection Test

Endogenous variables	Lag	LogL	LR	FPE	AIC	SC	HQ
Bovespa- Brazil CDS	1	1223.94	24.86*	8.63e-06*	-5.98*	-5.92*	-5.96*
IPSA- Chile CDS	2	1379.92	10.42	4.09e-06*	-6.73*	-6.63	-6.69
COLCAP- Colombia CDS	1	1376.40	19.16*	4.08e-06*	-6.73*	-6.67	-6.71*
PX- Czech Republic CDS	1	1370.97	11.67	4.19e-06*	-6.70*	-6.64	-6.68
S&P/BMV IPC- Mexico CDS	1	1352.15	11.37*	4.59e-06*	-6.61*	-6.55	-6.59
S&P Lima General- Peru CDS	1	1192.88	12.01*	1.00e-05*	-5.83*	-5.77	-5.80
WIG20- Poland CDS	2	1378.45	8.18	4.12e-06*	-6.72*	-6.62	-6.68
MOEX- Russia CDS	3	1131.18	13.27*	1.42e-05*	-5.48*	-5.35	-5.43
BIST100- Turkey CDS	1	1115.96	10.16*	1.47e-05*	-5.45*	-5.39	-5.43

** indicates lag order selected by the criterion.*

The appropriate lag orders are presented in Table 2 above. In addition, we run the Lagrange- Multiplier test to support that there is no autocorrelation between the residuals for the determined lag orders and we perform the White's test for the heteroscedasticity of residual.[2] Findings of the VAR analysis are shown in Table 3. With the corresponding optimal lags, the results serve the relationship between stock market indices and sovereign CDS spreads for the nine emerging countries.

The VAR approach formulated in Model (1) indicates a two-dimensional VAR model. The log stock index returns (ΔIndex) and the CDS spread changes (ΔCDS) are dependent variables respectively. Their lagged values, determined by optimal lag length, are the explanatory variables. The VAR result table displays the coefficients and the p-values. The p-values indicating the significance of the explanatory variable are given in the bold text for those in which the p-value is significant at a 5 percent level.

Table 3: Lead-Lag Analysis with VAR Model

	Brazil				Colombia				Turkey			
Dependent Var.	ΔIndex		ΔCDS		ΔIndex		ΔCDS		ΔIndex		ΔCDS	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
ΔIndex (-1)	-0.04	0.48	-0.45	**0.00**	-0.01	0.84	-0.47	**0.00**	-0.07	0.21	-0.16	**0.05**
ΔCDS (-1)	-0.05	0.07	-0.01	0.89	-0.01	0.67	0.03	0.53	-0.05	0.16	0.03	0.54
Obs.	414		414		414		414		414		414	
R^2	0.0080		0.0408		0.0004		0.0369		0.0061		0.0145	
	Czech Republic				Mexico				Peru			
Dependent Var.	ΔIndex		ΔCDS		ΔIndex		ΔCDS		ΔIndex		ΔCDS	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
ΔIndex (-1)	0.01	0.83	-0.25	**0.03**	-0.08	0.11	-0.26	**0.02**	0.08	0.18	-0.30	**0.00**
ΔCDS (-1)	-0.02	0.47	0.09	0.07	-0.02	0.38	0.08	0.11	-0.01	0.79	-0.01	0.90
Obs.	414		414		414		414		414		414	
R^2	0.0019		0.0287		0.0076		0.0201		0.0072		0.0298	
	Poland				Russia				Chile			
Dependent Var.	ΔIndex		ΔCDS		ΔIndex		ΔCDS		ΔIndex		ΔCDS	
	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.	Coeff.	p-val.
ΔIndex (-1)	-0.01	0.84	-0.15	0.23	0.02	0.75	-0.17	0.17	-0.04	0.39	-0.05	0.66
ΔIndex (-2)	0.10	0.08	-0.28	**0.01**	0.01	0.78	-0.44	**0.00**	-0.03	0.55	-0.33	**0.01**
ΔIndex (-3)					-0.06	0.20	-0.27	**0.02**				
ΔCDS (-1)	-0.02	0.54	0.10	0.06	0.01	0.50	0.11	**0.03**	-0.04	0.09	0.14	**0.02**
ΔCDS (-2)	0.06	**0.02**	-0.12	**0.04**	-0.01	0.70	-0.01	0.76	0.00	0.96	-0.10	**0.05**
ΔCDS (-3)					0.05	**0.02**	-0.07	0.15				
Obs.	413		413		412		412		413		413	
R^2	0.0148		0.0379		0.0188		0.0705		0.0081		0.0395	

2 The test results are available upon request.

The statistical evidence of the VAR estimations and Granger causality test results are given in Table 4 confirm the leading role of the stock market. We can recognize that changes in CDS spread mostly depend on the lags of the stock market indices whereas the index returns rarely depend on its own lags or there is no apparent direction from changes in CDS spreads to index returns. According to the VAR regression results, lagged values of index returns have negative impacts on the CDS spreads. That means worsening situation in the country's companies will affect the credit risk of that country and result in an increase in the CDS premium. For example, in Brazil, the ΔCDS spreads could be significantly explained by the first lag of changes in the index return. One unit change in index return affects up to -0.45 on the CDS spread.

On the average, one unit of change in the index returns' lagged values cause a 0.33 unit of a negative effect on the CDS spreads at a 5% significance level. Overall, we observe that stock markets took a leading role with respect to the CDS markets in all countries

We carry out the Granger causality tests for price discovery. The causality tests are the easiest method to determine whether one market has a dominant power in the price discovery process. Assume two series such as *x*, *y*, if past values of *x* series include practical clues beyond that included in the past values of *y* to be able to explain the present value of *y*, it could be claimed that the *x* Granger causes *y*. The regression form for the Granger causality is given below.

$$\Delta y_t = c_1 + \sum_{j=1}^{n} a_j \Delta y_{t\text{-}j} + \sum_{j=1}^{n} b_j \Delta x_{t\text{-}j} \qquad \text{Equation (3)}$$

where *n* is the number of lags, c_1 is a constant, Δ is the difference operator, and the coefficients inherited in the lagged values of the series *x* and *y* are b_j and a_j, *j*=1,…n, respectively. Within the framework of this equation, the null hypothesis is that *x* does not Granger causes *y*. causality tests results are presented in Table 4.

Table 4: VAR Granger Causality Test

Countries	Null Hypothesis	Chi-sq	Prob.	Result
Brazil	ΔCDS does not Granger cause ΔIndex	3.310	0.0689	ΔIndex ↔ ΔCDS
	ΔIndex does not Granger cause ΔCDS	14.206	0.0002	
Chile	ΔCDS does not Granger cause ΔIndex	2.901	0.2344	ΔIndex → ΔCDS
	ΔIndex does not Granger cause ΔCDS	7.558	0.0228	
Colombia	ΔCDS does not Granger cause ΔIndex	0.179	0.6719	ΔIndex → ΔCDS
	ΔIndex does not Granger cause ΔCDS	9.860	0.0017	
Czech Republic	ΔCDS does not Granger cause ΔIndex	0.529	0.4671	ΔIndex → ΔCDS
	ΔIndex does not Granger cause ΔCDS	4.544	0.0330	
Mexico	ΔCDS does not Granger cause ΔIndex	0.775	0.3787	ΔIndex → ΔCDS
	ΔIndex does not Granger cause ΔCDS	5.138	0.0234	
Peru	ΔCDS does not Granger cause ΔIndex	0.071	0.7900	ΔIndex → ΔCDS
	ΔIndex does not Granger cause ΔCDS	9.897	0.0017	
Poland	ΔCDS does not Granger cause ΔIndex	5.360	0.0686	ΔIndex ↔ ΔCDS
	ΔIndex does not Granger cause ΔCDS	6.872	0.0322	
Russia	ΔCDS does not Granger cause ΔIndex	5.717	0.1262	ΔIndex → ΔCDS
	ΔIndex does not Granger cause ΔCDS	19.762	0.0002	
Turkey	ΔCDS does not Granger cause ΔIndex	1.999	0.1574	ΔIndex → ΔCDS
	ΔIndex does not Granger cause ΔCDS	3.587	0.0582	

The Granger causality test results, surprisingly, show very strong evidence of the lead-lag interaction between the CDS premiums and stock market indices. The test investigates the direction of the relationship and drives in a sequential order of the movements in the variables. There is a strong and significant unidirectional causality from index returns to CDS rates' changes (ΔIndex → ΔCDS) for almost all countries at the 10% level. Additionally, Brazil and Poland display bi-directional causality. But, the significance of the causality in the opposite direction (ΔCDS → ΔIndex) is weaker than the causality from index returns to the CDS spreads. Thus, we could validly state that the changes are the index returns appear to lead the movements in CDS spreads. In other words, we can interpret the results as suggesting that any new information in the market is incorporated more quickly in the stock market than in the CDS market. The findings are consistent with the results of the studies done by Byström (2005), Fung et al. (2008), Norden and Weber (2009), and Forte and Pena (2009) in which the incorporation of new information embedded into the stock market before it is embedded into the CDS market.

Next, we perform variance decomposition analysis to measure the effects of each individual market shocks on the changes in the index returns and credit default risk. The findings of the variance decomposition analysis are presented in Table 5 below. The table explains the effects of index prices and CDS shocks on each variable.

Table 5: Results of Variance Decomposition Analysis

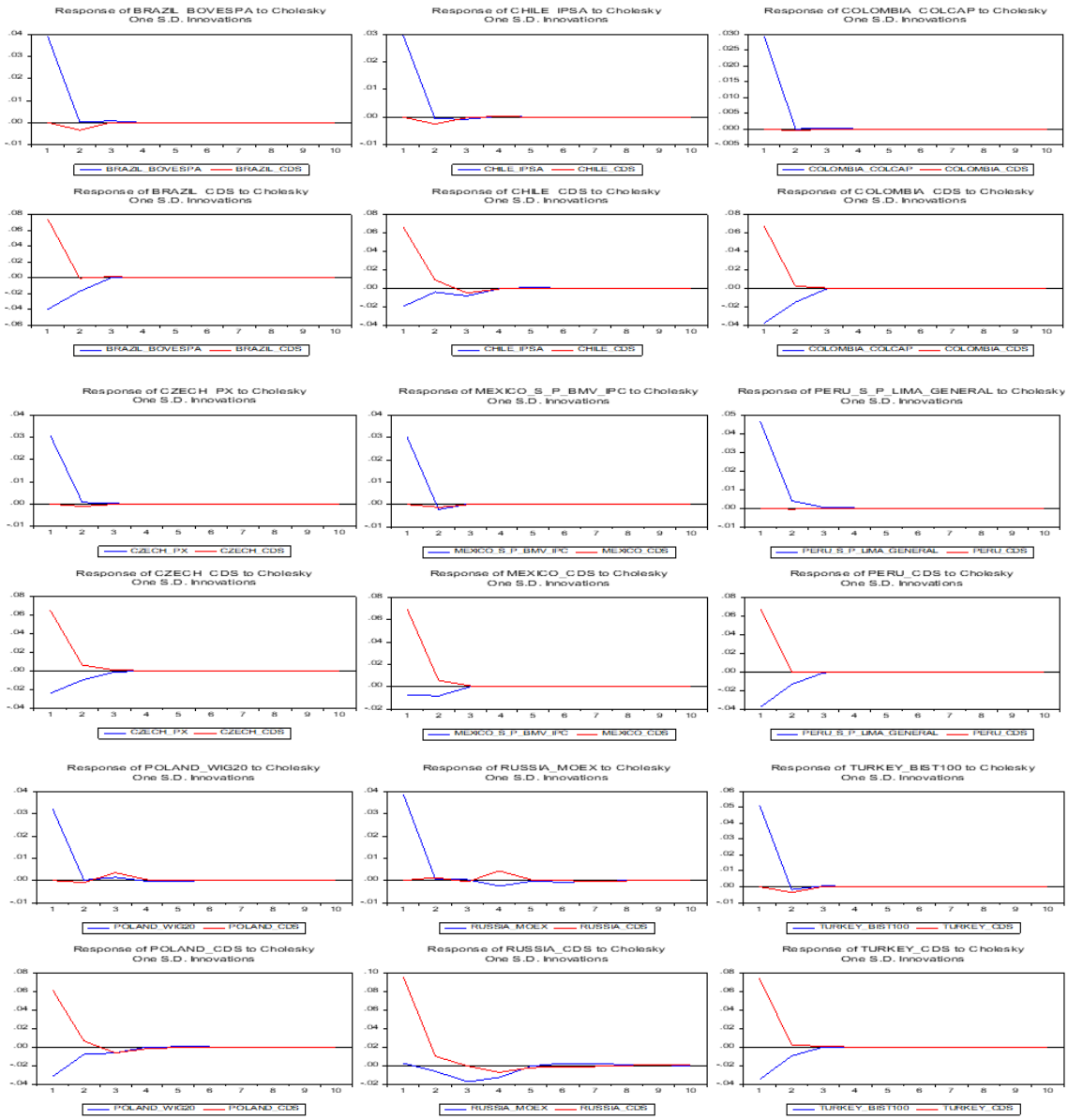
		Brazil		Chile		Colombia		Czech Republic	
	Period	ΔIndex	ΔCDS	ΔIndex	ΔCDS	ΔIndex	ΔCDS	ΔIndex	ΔCDS
Variance Decomposition of ΔIndex	1	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
	5	99.2	0.8	99.3	0.7	100.0	0.0	99.9	0.1
	10	99.2	0.8	99.3	0.7	100.0	0.0	99.9	0.1
Variance Decomposition of ΔCDS	1	22.5	77.5	8.1	91.9	23.9	76.1	12.0	88.0
	5	25.6	74.4	9.6	90.4	26.6	73.4	13.8	86.2
	10	**25.6**	74.4	**9.6**	90.4	**26.6**	73.4	**13.8**	86.2

		Mexico		Peru		Poland		Russia		Turkey	
	Period	ΔIndex	ΔCDS	ΔIndex	ΔCDS	ΔIndex	ΔCDS	ΔIndex	ΔCDS	ΔIndex	ΔCDS
Variance Decomposition of ΔIndex	1	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0	100.0	0.0
	5	99.8	0.2	100.0	0.0	98.7	1.3	98.7	1.3	99.5	0.5
	10	99.8	0.2	100.0	0.0	98.7	1.3	98.7	1.3	99.5	0.5
Variance Decomposition of ΔCDS	1	1.1	98.9	24.3	75.7	21.1	78.9	0.1	99.9	18.5	81.5
	5	2.5	97.5	26.5	73.5	22.4	77.6	5.3	94.7	19.6	80.4
	10	**2.5**	97.5	**26.5**	73.5	**22.4**	77.6	**5.4**	94.6	**19.6**	80.4

**The table shows the results of 1-week, 5-week and 10-week variance periods.*

After 10 weeks, the index values and credit default risk shocks clarify the variance of the indices' prices approximately 99% and less than 1% respectively. In other words, the variance of the index returns has been largely explained by their own shocks. On the other hand, the index values and credit default risk shocks explain the variance of the credit default swap spreads on average 16.9% and 83.1% respectively for the emerging economies. For example, 19.6 percent of the CDS variance in Turkey is explained by the changes in the BIST 100 stock market index and 80.4 percent of the variance is determined by the CDS itself. For Mexico, the variance of CDS changes only determined at a percentage of 2.5 by the changes in index return. However, on average changes on CDS premiums depend on the changes in index returns. The dependency ratio of the changes in CDS spreads on changes in index returns is obviously higher than the ratio of the changes in index returns on changes in CDS spreads. That is, it shows a leading role in the stock market as in line with the results of many studies mentioned in the literature. Following the estimation of the VAR model, we also run impulse-response analysis in order to examine the responses of other variables against the 1-unit standard deviation shock given to one variable. In other words, we shall develop an impulse-response function to determine how the variables react to each other. The analysis appraises the reaction of every single variable in the model on an exogenous shock to the model through measuring the time profile of the effect of the shocks at a given point in time on the expected values of the variables in the dynamical system of the VAR model. The impulse-response results are presented in Figure 2 below.

Figure 2: Impulse-Response Analysis



Impulse responses identify the responsiveness of the dependent variables (endogenous variable) in the VAR when a shock is put to the error terms. A unit shock is applied to each variable and its effects on the VAR system could be seen. According to the impulse-response results, the response of the variables is generally positive when a unit of shock is given to the same variable. For example, the response of changes in the index return is positive if one standard deviation shock is given to the index return. Similarly, a shock given to changes in CDS spread has a positive effect on CDS spreads. The positive response of the index return to the changes in the index lasts for 3-4

weeks on the average and then the responses die down. Exceptionally, initially these reactions are positive but after the 3rd week, the reactions are negative until the 5th -6th weeks and then they disappear in Poland, Russia, and Turkey. The effects of one unit standard deviation shock in CDS spreads on the CDS spreads are positive and these reactions lasts about 3 weeks. This effect becomes negative after the 2nd week and negative response continues till the 5th week in Poland. In addition, the positive response of CDS spread to the shocks given to the changes in CDS premium turns to negative after the 2nd week and this negative effect lasts till the end of the 7th week in Russia. And, similarly in Chile, this initial positive reaction becomes negative after 2nd week and it dwindles till 5th week.

Interestingly, the index returns do not give any response in the first week when one standard deviation positive shock is given to the CDS spreads. The response of index returns to the shocks in CDS spread is negative as it is expected. When there is a deterioration in the risk indicators stock markets are affected negatively and the index returns go down. This negative reaction starts after the first week and it goes on for almost three weeks. For the Russia, impulse-response results are mixed. If one standard deviation shock given to the CDS spread the Moex returns are affected both positively and negatively during the eight weeks. Also, this negative effect becomes positive after the 2nd week and it lasts for five weeks in Poland. On the other hand, the negative response of the CDS spread usually lasts for four weeks if one standard deviation shock is given to the index return. In the case of Russia and Turkey, these reaction periods are 5 and 2 weeks respectively. After the reactions period, the effects die out. Common results of the impulse-response analyses support the leading role of the stock market. When there is a shock in CDS spread the stock market (index return) is not affected in the first week and after the first week, the reaction period continues for two more weeks on the average. However, CDS spreads are immediately affected if a shock is given to the stock market and these reactions last more than three weeks.

4. Conclusion

This paper addresses the link between CDS spreads as a proxy for the sovereign credit risk and major equity indices as a proxy for the market risk in emerging economies with weekly periods over January 2010 to December 2017. In the analysis logarithmic series are used and they become stable at their first differences. Within the scope of the study, we employ the VAR model, variance decomposition analysis, impulse-response analysis, and Granger causality test in order to investigate the relationship between the variables.

The relationships between CDS spreads and stock market indices are investigated in various studies. The indices have the power to create more sensitive impression than the CDS spreads do. The indices react to the changes in the market more quickly and stimulate the markets in advance as approved by the studies of the researchers such as Longstaff et al. (2003), Byström (2005), Fung et al. (2008), Norden and Weber (2009), Forte and Pena (2009), and Coronado et al. (2012).

The Granger test results show unidirectional causality from the index returns to the CDS spreads. According to the VAR regression results, lagged values of index returns have negative impacts on the CDS spreads. That means worsening situation in the country's companies will affect the credit risk of that country and result in an increase in the CDS premium. On the average, one unit of change in the index returns' lagged values cause a 0.33 unit of a negative effect on the CDS spreads at a 5% significance level. The variance decomposition estimates show that the variance of the index returns has been largely explained by their own shocks. On the other hand, approximately 17 % variations in CDS spreads is accounted on average by the changes in stock market indices. The response of index returns to the shocks in CDS spread is negative as it is expected. When there is a deterioration in the risk

indicators stock markets are affected negatively and the index returns go down. This negative reaction starts after the first week and it goes on for almost three weeks.

To sum up, the study results indicate that index returns are negatively correlated with CDS spread over the sample countries. Furthermore, we observe that changes in stock market returns lead CDS spreads changes and thus, the stock indices in prior can predict the CDS spreads.

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5

MOVE ENDEKSİNİN KAMU BORÇLANMA ARAÇLARI ÜZERİNDE ETKİSİ: GELİŞMEKTE OLAN ÜLKE DEVLET TAHVİLLERİ ÜZERİNE BİR İNCELEME / THE IMPACT OF THE MOVE INDEX ON PUBLIC DEBT INSTRUMENTS: A REVIEW ON GOVERNMENT BONDS IN DEVELOPING COUNTRIES

Hakan Öner[1]

Abstract

In this study, the impact of the MOVE index, which is a measure of volatility in US government bond interest, on the interest rates on emerging market government bonds is examined. For this purpose, the data of countries 10-year benchmark government bonds variable for workdays period between 04 June 2010 - 30 December 2017 are used and then the MOVE index, Brazil, China, Indonesia, the Philippines, South Africa, India, Mexico, Russia and Turkey's 10-year benchmark government bonds are analyzed. According to the result of Granger causality test; Indonesia, the Philippines, Mexico and Turkey's 10-year benchmark government bond interest rates are effected by the MOVE index.

Keywords: MOVE Index, Devoloping Countries Bond Markets, Granger Casuality Test

1. Giriş

Kamu harcamalarının en önemli finansman kaynağı vergi gelirleridir. Hükümetler, ekonomi politikası uygulamalarında ihtiyaç duydukları finansmanı vergiye alternatif olabilecek başka kaynaklardan da giderebilmektedirler. Vergi geliri harici finansman kaynaklarının en önde geleni devlet iç borçlanma senetleri (DİBS)'dir. Devlet iç borçlanma senetleri, kamu giderlerinin yapılabilmesi için hükümetler tarafından çıkarılan borçlanma araçlarıdır.

Uluslararası piyasalarda finansal entegrasyonun her geçen gün artması yatırımcıların ve para politikası uygulayıcılarını finansal karar aşamasında sadece bulundukları ülke ekonomisini dikkate almakla kalmayıp, dünyadaki diğer ülke ekonomilerini de dikkate almak zorunda bırakmaktadır. Dolayısıyla yatırımcılar ve para politikası uygulayıcıları, yurtdışı piyasaların göstergesi olarak kabul edilen finansal endekslere yakından takip etmektedirler. Bu endekslerin en başta gelenlerinden biri MOVE endeksidir.

Merrill Lynch Yatırım Bankası tarafından hesaplanan MOVE (Merrill Lynch Treasury Option Volatility Expectations Index) endeksi, tahvil fiyatlarının volatilitesini ve dolayısıyla tahvil piyasalarındaki belirsizliği ölçen bir endekstir (Piljak, 2013, p.36). ABD tahvillerinin 30 günlük süre içerisindeki volatilitesine ilişkin tahminleri ölçen bu endeks (Dimic vd, 2016, p.44), VIX endeksi ile aynı doğrultuda çalışmaktadır. 1998 yılından beri hesap edilen endeksin artması durumunda yatırımcıların tahvillere olan güveninin azaldığını yani volatilitenin arttığını gösterirken,

1 (Nişantaşı University), onerhakan@gmail.com

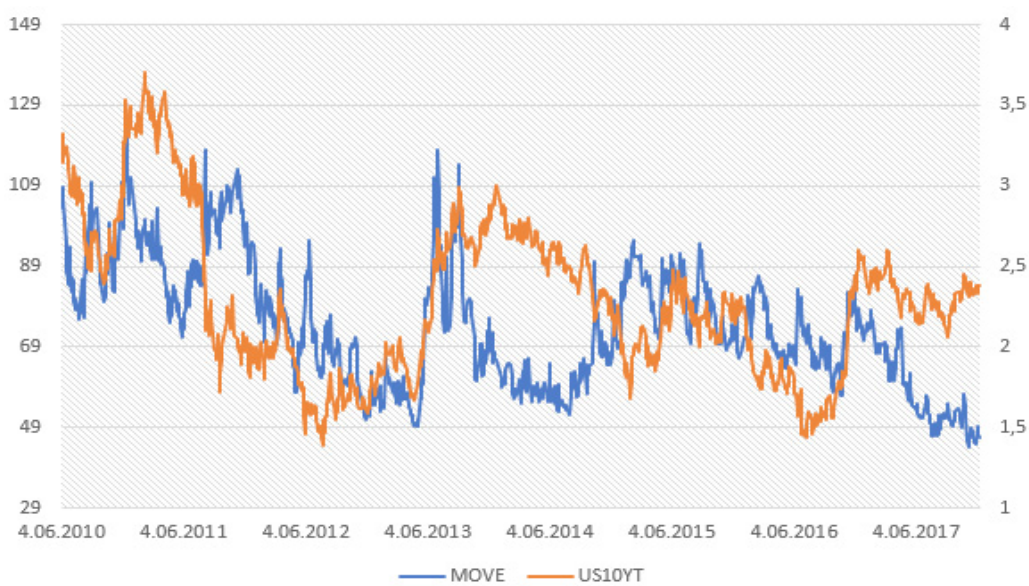
endeksin düşmesi durumunda ise tahvil piyasasında volatilitenin ve riskin azaldığını göstermektedir (Öner, İçellioğlu & Öner 2018, p.111-112).

MOVE endeksi oluşturan endeksin % 20'si 2 yıllık, %20'si 5 yıllık, % 40'ı 10 yıllık ve % 20'si 30 yıllık ABD gösterge devlet tahvili faiz oranlarından oluşmaktadır (Özmen & Yılmaz, 2017, p.176). MOVE endeksinin oluşumunda en büyük pay 10 yıllık ABD gösterge devlet tahvil faiz oluşmaktadır.

MOVE endeksi, Amerikan tahvil piyasasının en önemli gösterge-endekslerinden biri olması sebebiyle gelişmekte olan ülke finansal piyasaları tarafından yakından takip edilmektedir. 2008 yılında ABD'de başlayan küresel krizin etkilerini azaltabilmek amacıyla gelişmiş ülkeler birbiri ardına politika faizlerini düşürerek likiditenin bol olduğu bir ortam yaratmıştır. Bol likidite ortamının ne zaman azaltılmaya gidileceğini, bir başka ifadeyle "normalleşme" sürecinin ne zaman başlayacağını finans katılımcıları tarafından yakından takip edilmektedir. Dolayısıyla ABD ekonomisi normalleşme sürecine girmesi ve ardından politika faiz oranının artmaya başlaması gelişmekte olan ülke tahvil faiz oranlarını da yükseltmesi beklenmektedir.

Şekil 1, 4 Haziran 2010 - 30 Aralık 2017 tarihleri arasındaki MOVE endeks ve ABD 10 yıllık gösterge devlet tahvil faiz oranlarının seyrini göstermektedir. Grafiğin sol ekseni MOVE endeksinin oranlarını, sağ eksen ise faiz oranlarını göstermektedir. Şekil 1'de görüldüğü üzere MOVE endeksi ile ABD 10 yıllık gösterge devlet tahvili faiz oranları arasında ters ilişki vardır.

Şekil 1: MOVE Endeks ve Amerikan 10 Yıllık Gösterge Tahvil Faiz Oranları



ABD devlet tahvil faiz oranlarının yükselmesi, ABD merkez bankasının faiz artırma sürecini başlatarak küresel krizin sona ereceği ve normalleşme sürecine girileceği beklentisi oluşturmaktadır. Dolayısıyla finansal piyasalarda tedirginlik azalarak MOVE endeksi de düşmektedir. Benzer şekilde ABD devlet tahvil faiz oranlarının düşmesi ise küresel krizin normalleşme sürecinden uzaklaştığını ifade etmekte ve böylece MOVE endeksi de yükselmektedir.

Bu noktadan hareketle çalışmanın amacı, uluslararası finans piyasalarının önemli bir gösterge-endeksi olan MOVE endeksinin, örnek olarak seçilen gelişmekte olan ülkelerin 10 yıllık devlet tahvilleri üzerindeki etkileri incelemektir. Bu endeks üzerine yurtdışında yayınlanmış akademik çalışmalar incelendiğinde, hisse senetleri ve döviz kurları gibi finansal ürünler arasındaki ilişkinin yanı sıra makroekonomik değişkenlerle de arasındaki ilişkiyi analiz eden çalışmalar mevcuttur. Yurtiçinde yapılan akademik çalışmalarda ise, MOVE endeksi üzerine yapılmış akademik çalışma sayısı oldukça sınırlıdır. Bu amaçla çalışmada, öncelikle ilgili konuda literatür çalışması yapılmakta ve sonrasında Granger nedensellik testi analizi gerçekleştirilmektedir.

2. Literatür İncelemesi

MOVE endeksi üzerine yapılmış yurtiçi ve yurtdışı akademik çalışmaların sayısı oldukça sınırlıdır. Literatür incelemesinde MOVE endeksinin yanı sıra, hisse senetleri piyasasındaki volatiliteyi ölçen ve hesaplaması MOVE endeksi ile aynı olan VIX endeksi üzerine akademik çalışmalardan örneklere de yer verilmektedir.

Hartelius vd. (2008), Ocak 1991 – Şubat 2007 tarihleri arasındaki 33 gelişmekte olan ülkenin gösterge tahvil faiz oranlarını veri olarak kullandıkları çalışmalarında, gelişmiş ülkeler ile gelişmekte olan ülkelerin tahvil faiz oranları arasındaki spreadi hangi finansal değişkenlerin etkilediğini incelemişlerdir. Çalışma sonucuna göre risk iştahının göstergesi olarak analize dahil edilen VIX endeksinin tahvil spreadlerini etkilediği tespit edilmiştir.

Miyazaki vd. (2012), VIX endeksi ile altın, hisse senedi, tahvil ve döviz piyasaları arasındaki ilişkiyi, Ocak 2000 – Temmuz 2011 tarihleri arasındaki verileri kullanarak incelemiştir. Çalışma sonucuna göre VIX endeksi, altın ve S&P 500 endeksinin fiyat hareketlerini etkilediği sonucuna ulaşılmıştır.

Basher ve Sadorsky (2016), 4 Ocak 2000 – 31 Temmuz 2014 tarihleri arasındaki günlük verileri kullandıkları çalışmalarında, VIX endeksi, petrol, altın, tahvil fiyatları ile gelişmekte olan ülkelerin borsa endeksleri arasındaki ilişkiyi incelemişlerdir. Çalışmanın analizinde DCC, ADCC ve GO-GARCH ekonometrik yöntemleri uygulanmıştır. Çalışma sonucuna göre, petrol fiyatlarının, VIX endeksi, gelişmekte olan ülke borsa endeksleri ve tahvil fiyatları ile negatif ilişki olduğu tespit edilirken, petrol fiyatları ile gelişmekte olan ülke borsa endeksleri arasında pozitif ilişki bulunmuştur.

Erdoğdu ve Baykut (2016), MOVE ve VIX endeksleri ile Borsa İstanbul banka endeksi arasındaki ilişkiyi, 1998 ile 2015 tarihleri arasındaki günlük verileri kullanarak analiz etmişlerdir. ARDL/Sınır ve Granger nedensellik testleri uyguladıkları çalışmalarında, MOVE endeksinden Borsa İstanbul banka endeksi arasındaki bir ilişki tespit edilememişken, VIX endeksi ile Borsa İstanbul banka endeksi arasında nedensellik ilişkisi bulunmuştur. Çalışmanın ARDL sınır testi sonucuna göre ise, değişkenler arasında uzun dönemli bir ilişkiye rastlanılamamıştır.

Naifara, Shahzadb ve Hammoudehb (2017), 8 Ocak 2009 – 30 Haziran 2016 tarihleri arasındaki haftalık verileri kullandıkları çalışmalarında, MOVE, VIX ve petrol fiyat volatilitesinin yazarların örnek olarak seçtiği gelişmekte olan ülke CDS oranları üzerindeki etkilerini Granger nedensellik analizi ile incelemişlerdir. Çalışma sonucuna göre, MOVE, VIX ve petrol fiyat volatilitesinden CDS oranlarına doğru nedensellik ilişkisi tespit edilmiştir. CDS oranlarından MOVE endeksine doğru nedensellik ilişkisi tespit edilememişken, VIX endeksine doğru zayıf bir ilişkiye rastlanılmıştır.

Shaikh (2017), ABD başkanlık seçimlerinin VIX ve ABD dolar endeksi ile uluslararası borsalara olan etkilerini incelediği çalışmasında, değişkenlerin 01 Ocak 2016 ile 31 Ocak 2017 tarihleri arasındaki verilerini kullanmıştır.

Çalışma sonucuna göre, 2016 yılında ABD başkanlık seçimlerinin dünya genelinde finansal piyasalarda volatiliteyi artırmaktadır. ABD başkanlık seçimlerinin yaratmış olduğu belirsizlik ortamı, VIX endeksini ve ABD dolar endeksini yükseltmektedir.

3. Veri Seti Ve Analiz Yöntemi

Bu çalışmada, "MOVE endeksi gelişmekte olan ülkelerin devlet tahvil faiz oranları üzerinde etkisi var mıdır?" sorusuna yanıt bulunması amacıyla, MOVE endeks oranları ile gelişmekte olan ülkelerden örnek seçilen; Brezilya, Çin, Endonezya, Filipinler, Güney Afrika, Hindistan, Meksika, Rusya ve Türkiye'nin 10 yıllık gösterge devlet tahvil faiz oranları arasındaki nedensellik ilişkisi analiz edilmektedir. Çalışmanın analizinde, 04 Haziran 2010 ile 30 Aralık 2017 tarihleri arasındaki 1325 iş gününe ait MOVE endeks oranları ve devlet tahvil faiz oranları veri olarak kullanılmıştır. Bloomberg ve Reuters veri servisinden elde edilen veriler, E-views 8 ekonometri programı kullanılarak analiz edilmektedir.

Granger nedensellik testi uygulanan bu çalışmada değişkenlerin aynı seviyeden durağan olması gerekmektedir. Durağanlık analizleri İktisat literatüründe birim kök testi uygulanarak yapılmaktadır. Araştırmacılar, birim kök testi analizlerinde genellikle üç birim kök testi yönteminden birini kullanmaktadırlar. Bu yöntemler; Genişletilmiş Dickey Fuller (ADF) testi, Philips-Perron (PP) testi ve Dickey Fuller (DF) testleridir. Bu çalışmada, araştırmacıların en çok kullandığı yöntem olan Genişletilmiş Dickey Fuller (ADF) testi ile serilerin birim kök analizi gerçekleştirilmekte ve yorumlanmaktadır (Dickey Fuller, 1979 ve 1981).

ADF birim kök testi analizi yalın, sabit ile trend ve sabit modeller olmak üzere aşağıdaki üç model yoluyla gerçekleştirilmektedir:

Yalın Model: $\Delta Y_t = (\rho - 1)Y_{t-1} + u_t$ (1)

Sabit Model: $\Delta Y_t = \delta Y_{t\text{-}1} + u_t$ (2)

Trend ve Sabit Model: $\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t\text{-}1} + \alpha_i \sum_{i=1}^{m} \Delta Y_{t\text{-}i} + \varepsilon_t$ (3)

Yalın, sabit ile trend ve sabit modeller sonucunda elde edilen t istatistik değerleri, Mackinnon %1, %5 ve %10 kritik değerleri ile karşılaştırılmaktadır. Böylece değişkenlerin durağan olup olmadığına yönelik yorum yapılmaktadır. Bu çalışmada araştırmacıların en çok kullandığı anlamlılık değeri olan Mackinnon %5 kritik değeri kullanılmaktadır. Analiz sonuçları, durağanlık sınaması açısından sıfır ve alternatif hipoteze karşı test edilmektedir (Mackinnon 1996). Sıfır ve alternatif hipotezin tanımları aşağıdaki şekildedir:

Sıfır Hipotez (H_0): $\delta = 0$ ise, Yt durağan değildir, birim köke sahiptir. (4)

Alternatif Hipotez (H_1): $\delta < 0$ ise, Yt durağandır, birim köke sahip değildir. (5)

ADF birim kök testi analizinde t istatistik değerlerinin Mackinnon %5 kritik değerinden daha düşük olması istenilen sonuçtur. İstenilen sonucun gerçekleşmemesi durumunda, analiz sonuçlarının Mackinnon %5 kritik değerinden daha düşük olana kadar ADF birim kök testi analizi tekrar uygulanır.

Birim kök test analizi sonrasında nedensellik testi analizi için değişkenlerin gecikme uzunluğunun tespit edilmesi gerekmektedir. Bu amaçla, Akaike, Hannan-Quinn ve Schwartz bilgi kriterlerini minimum yapan gecikme uzunlukları tespit edilir.

Birim kök testi analizi ve sonrasında uygun gecikme uzunluğu bulunmasının akabinde Granger nedensellik testi analizi yapılmaktadır. Granger nedensellik testi aşağıda oluşturulan iki denklem yoluyla analiz edilmektedir:

$$y_{1t}=\alpha_{10}+\beta_{11}\,y_{1t-1}+\beta_{12}\,y_{2t-1}+\gamma_{11}\,y_{1t-1}+\gamma_{12}\,y_{2t-2}+\delta_{11}\,y_{1t-3}+\delta_{12}\,y_{2t-3}+u_{1t} \quad (6)$$

$$y_{2t}=\alpha_{20}+\beta_{21}\,y_{1t-1}+\beta_{22}\,y_{2t-1}+\gamma_{21}\,y_{1t-1}+\gamma_{22}\,y_{2t-2}+\delta_{21}\,y_{1t-3}+\delta_{22}\,y_{2t-3}+u_{2t} \quad (7)$$

(6) ve (7) numaralı denklemlerde, y_{1t} ve y_{2t} ile ifade edilen değişkenler, *t* dönemindeki y zaman serisini; α, β, γ ve δ ile ifade edilen değerler, gecikmeli y değerlerinin katsayılarını göstermektedir. u_{1t} ve u_{2t} varyansı değişmeyen, ortalaması sıfır ve ardışık bağımlı olmayan olasılıklı hata terimleridir. y_{1t} ve y_{2t} değerleri gecikmeli y değerleri ile modele sokulmaktadır.

Gecikmeli y değerlerinin denklemlerde kullanılması sonucunda y_{1t}'deki değişiklikler y_{2t}'de değişikliklere neden olmakta mıdır? sorusuna yanıt aranmaktadır. Eğer $y_{1t}$$y_{1t}$'deki değişiklikler y_{2t}'de değişikliğe neden oluyorsa, y_{1t}'in gecikmeleri y_{2t}'ye ait eşitlikte anlamlı olmalıdır. Bu anlamlılık sonucunda, y_{1t}'den y_{2t}'ye doğru Granger nedenselliği vardır sonucuna ulaşılmaktadır (Brooks, 2002, p.339-340).

Yukarıdaki iki eşitlikte y_{1t} ve y_{2t} değişkenleri yerine bu çalışmanın ana konusu olan MOVE endeksi ve gelişmekte olan ülkelerin 10 yıllık gösterge devlet tahvil faiz oranları kullanılarak nedensellik ilişkisi analizi yapılmaktadır.

4. Analiz Sonuçları

Ekonometrik analizde kullanılacak MOVE endeksi ile gelişmekte olan ülkelerin 10 yıllık gösterge devlet tahvil faiz oranları değişkenleri tablo 1'de sunulmaktadır.

Tablo 1. Çalışmada Kullanılan Değişkenler

MOVE	Merrill Lynch Opsiyon Volatilitesi Beklenti Endeksi
BR10YT	10 Yılık Brezilya gösterge tahvil faiz oranı
CN10YT	10 Yıllık Çin gösterge tahvil faiz oranı
ID10YT	10 Yıllık Endonezya gösterge tahvil faiz oranı
IN10YT	10 Yıllık Hindistan gösterge tahvil faiz oranı
MX10YT	10 Yıllık Meksika gösterge tahvil faiz oranı
PH10YT	10 Yıllık Filipinler gösterge tahvil faiz oranı
RU10YT	10 Yıllık Rusya gösterge tahvil faiz oranı
SA10YT	10 Yıllık Güney Afrika gösterge tahvil faiz oranı
TR10YT	10 Yıllık Türkiye gösterge tahvil faiz oranı

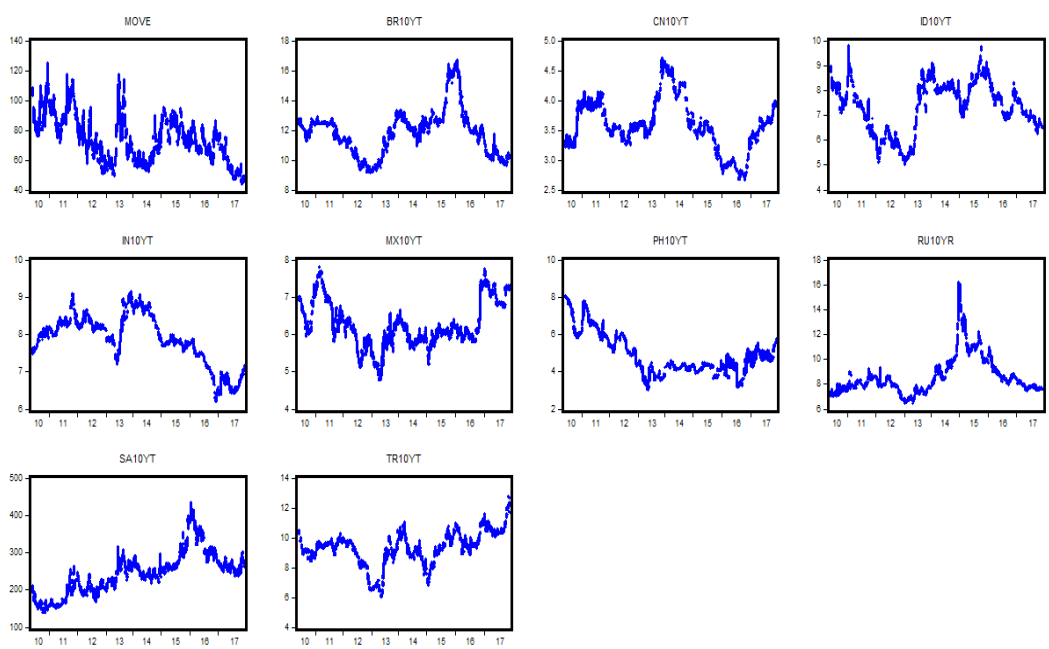
MOVE endeksi ile tahvil faiz oranları, minimum, ortalama, maksimum değerleri, medyan, standart sapma, skewness, kurtosis, jarque-bera ve olasılık değerleri gibi istatistiki bilgileri tablo 2'de sunulmaktadır.

Tablo 2: Değişkenlerin İstatistiksel Gösterimleri

	BR10YT	CN10YT	ID10YT	IN10YT	MOVE	MX10YT	PH10YT	RU10YR	SA10YT	TR10YT
Ortalama	11.8312	3.59038	7.35441	7.86282	74.1387	6.25988	4.90653	8.60650	243.879	9.30207
Medyan	11.9600	3.55200	7.52400	7.93900	72.5726	6.13000	4.49300	8.11100	245.770	9.44000
Maksimum	16.7000	4.71000	9.79800	9.17200	125.200	7.83000	8.08100	16.2400	434.420	12.7800
Minimum	9.14000	2.66000	5.01900	6.20200	43.9656	4.78600	3.04000	6.44000	139.500	6.02000
Std. Sapma	1.54980	0.43905	1.02007	0.67037	15.6986	0.61880	1.10587	1.52636	57.3903	1.13759
Skewness	0.69566	0.19218	-0.41463	-0.54609	0.40641	0.37386	0.90162	1.65192	0.47301	-0.56511
Kurtosis	3.90049	2.79599	2.31498	2.62506	2.54854	2.63758	3.15362	6.08803	3.23883	3.62115
Jarque-Bera	151.630	10.4544	63.9318	73.6205	47.7267	38.1185	180.822	1129.08	52.5600	91.8247
Olasılık	0.0000	0.0053	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Gözlem	1325	1325	1325	1325	1325	1325	1325	1325	1325	1325

Çalışmaya alt yapı hazırlanması amacıyla değişkenlerin doğal logaritmaları (Ln) alınmıştır. Aşağıdaki Şekil 2'de 04 Haziran 2010 ile 30 Aralık 2017 tarihleri arasındaki 1325 iş gününe ait doğal logarimaları alınmış MOVE endeks oranı ve devlet tahvil faiz oranlarının grafiksel gösterimi sunulmaktadır.

Şekil 2: Değişkenlerin Grafiksel Gösterimi



Yukarıda grafiksel gösterimi sunulan değişkenlerin ADF birim kök testi analizi yoluyla birim kök sınaması Tablo 3'de sunulmaktadır.

Tablo 3: Birim Kök Testi Düzey Değer Sonuçları

	Sabit Model		**Trend ve Sabit Model**		
Değişken	**t İstatistiği**	**Olasılık Değeri**	**t İstatistiği**	**Olasılık Değeri**	**Birim Kök**
MOVE	-2.470540	0.1215	-2.573358	0.3070	Birim kök vardır
BR10YT	-2.567870	0.4164	-1.719006	0.7426	Birim kök vardır
CN10YT	-1.645393	0.4590	-1.733368	0.7360	Birim kök vardır
ID10YT	-2.476544	0.1215	-2.543288	0.3070	Birim kök vardır
IN10YT	-1.300292	0.6314	-2.584300	0.2877	Birim kök vardır
MX10YT	-2.315119	0.1673	-2.405392	0.3765	Birim kök vardır
PH10YT	-2.793218	0.0595	-2.064444	0.5647	Birim kök vardır
RU10YT	-1.910238	0.3277	-1.781694	0.7133	Birim kök vardır
SA10YT	-2.395176	0.1433	-3.670409	0.0246	Birim kök vardır
TR10YT	-2.090193	0.2488	-2.797874	0.1983	Birim kök vardır

Tablo 4: MacKinnon %5 Kritik Değer Tablosu

Sabit Model		**Trend ve Sabit Model**	
Yüzde	**t istatistiği**	**Yüzde**	**t istatistiği**
%1	-3.435078	%1	-3.435082
%5	**-2.863516**	**%5**	**-2.863517**
%10	-2.567871	%10	-2.567872

Tablo 3'de yer alan MOVE endeksi ile gelişmekte olan ülkelerin 10 yıllık gösterge devlet tahvil faiz oranlarının düzey değerleri, tablo 4'te yer alan MacKinnon %5 kritik değerleri ile karşılaştırılarak birim köke sahip olup olmadığı incelenmektedir. Değişkenlerin sabit modeldeki düzey değerleri, sabit model için MacKinnon %5 kritik değeri olan 2.863516 seviyesinin, trend ve sabit model düzey değerleri ise trend ve sabit model için MacKinnon %5 kritik değeri olan -2.863517 seviyesinin üzerinde bulunmaktadır. Bu durum, tablo 3'ün en sağ sütununda sunulduğu üzere değişkenlerin birim kökleri olduğunu göstermektedir. Dolayısıyla düzey değerlerinde değişkenler için sıfır hipotezi reddedilmemiştir.

Değişkenlerin birim köke sahip olması ve dolayıısyla düzey değerlerinde sıfır hipotezinin red edilememesi nedeniyle birinci farkları alınması gerekmektedir. Bu bağlamda, değişkenlerin hem sabit hem de trend ve sabit modelleri

için tekrar ADF birim kök testi uygulanarak birinci farkları alınmıştır. ADF birim kök testi birinci fark sonuçları Tablo 5'de sunulmaktadır.

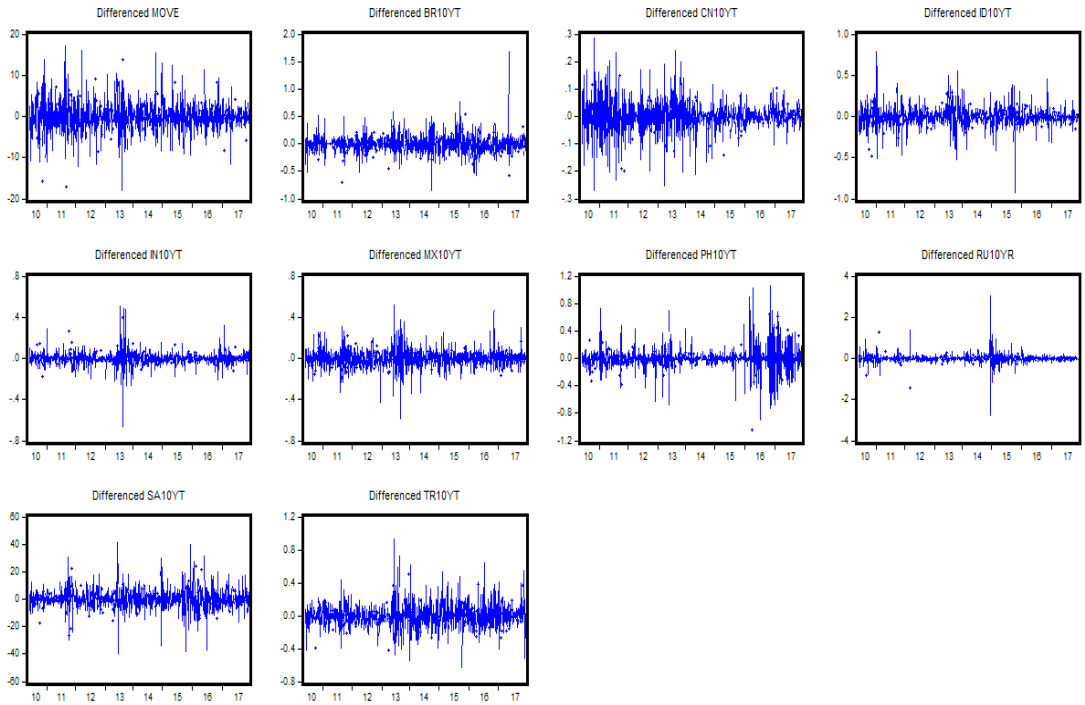
Tablo 5: Birim Kök Testi Birinci Fark Sonuçları

	Sabit		**Trend ve Sabit**		
Değişken	**t İstatistiği**	**Olasılık Değeri**	**t İstatistiği**	**Olasılık Değeri**	**Birim Kök**
MOVE	-28.03314	0.0000	-28.02284	0.0000	Birim kök yoktur
BR10YT	-36.57466	0.0000	-36.56319	0.0000	Birim kök yoktur
CN10YT	-48.55409	0.0000	-48.53567	0.0000	Birim kök yoktur
ID10YT	-32.62748	0.0000	-32.61779	0.0000	Birim kök yoktur
IN10YT	-29.43631	0.0000	-29.45262	0.0000	Birim kök yoktur
MX10YT	-36.90331	0.0000	-36.91681	0.0000	Birim kök yoktur
PH10YT	-32.70225	0.0000	-32.78769	0.0000	Birim kök yoktur
RU10YT	-30.49195	0.0000	-30.49385	0.0000	Birim kök yoktur
SA10YT	-33.18954	0.0000	-33.17714	0.0000	Birim kök yoktur
TR10YT	-32.90780	0.0000	-32.93041	0.0000	Birim kök yoktur

ADF birim kök testi analiz sonuçlarına göre, hem sabit hem de trend ve sabit modelleri için değişkenlerin birinci fark değerleri MacKinnon % 5 kritik değerlerinin altında yer almaktadır. Bu sonuçla, birinci farkları alınmış değişkenlerin sıfır hipotezleri reddedilerek ve alternatif hipotezleri kabul edilmekte ve değişkenler birinci derecede durağan hale gelmiştir. Bu durum arzu edilen sonuçtur.

Birinci farkları alınarak durağan hale getirilen MOVE endeksi ile gelişmekte olan ülkelerin 10 yıllık gösterge devlet tahvil faiz oranlarının grafiksel sunumu Şekil 3'de sunulmaktadır. Şekil 3'de takip edilebileceği üzere; ortalaması, varyansı ve iki dönem arasındaki kovaryansı zamana bağlı olarak değişmemektedir.

Şekil 3: Değişkenlerin Birinci Farklarının Grafiksel Gösterimi



Birinci farkları alınarak durağan hale getirilen MOVE endeksi ile gelişmekte olan ülkelerin 10 yıllık gösterge devlet tahvil faiz oranları arasındaki Granger nedensellik analizi yapılmasından önce değişkenlerin gecikme uzunluklarının bulunması gerekmektedir.

Tablo 6: Gecikme Uzunlukları

Lag	LogL	LR	FPE	AIC	SC	HQ
0	894.0947	NA	1.24e-13	-1.343609	**-1.304229***	-1.328843
1	1199.894	606.4867	9.03e-14	-1.656374	-1.223199	**-1.493944***
2	1310.248	217.1857	**8.89e-14***	**-1.672109***	-0.845138	-1.362016
3	1387.241	150.3585	9.21e-14	-1.637144	-0.416377	-1.179387
4	1453.464	128.3194	9.70e-14	-1.585811	0.028751	-0.980390
5	1521.781	131.3394	1.02e-13	-1.537661	0.470697	-0.784576
6	1592.834	135.5183	1.06e-13	-1.493668	0.908486	-0.592920
7	1652.920	113.6886	1.13e-13	-1.433009	1.362941	-0.384597
8	1719.899	**125.7142***	1.19e-13	-1.382826	1.806920	-0.186750

** Tabloda, Lag gecikme kat sayısını, LR: Test İstatistiği, FPE: Son Tahmin Hata Kriteri, AIC: Akaike Bilgi Kriteri, HQ: Hannan-Quinn Bilgi Kriteri, SC: Schwarz Bilgi Kriterini göstermektedir.*

Tablo 6'da sunulan gecikme uzunluğu analizi sonuçlarına göre yanında (*) işareti bulunan rakamlar ilgili bilgi kriterinin gecikme uzunluğunu göstermektedir. Schwarz bilgi kriteri 1, ve Hannan-Quinn bilgi kriterleri 2, son tahmin hata kriteri ve Akaike bilgi kriteri 2 ve test istatistiği ise 8 gecikme uzunluğunu göstermektedir. Ekonometrik analizlerde en çok kullanılan bilgi kriteri olan Akaike bilgi kriterinin (Akaike, 1974) işaret ettiği gecikme uzunluğu bu çalışmada tercih edilmiştir.

Gecikme uzunluklarının Granger nedensellik testinde kullanılması sonrasında aşağıdaki Granger nedensellik testi hipotezleri oluşturulmaktadır:

Sıfır Hipotez (H_0): MOVE endeksi oran değişimi, bağımlı değişkenin nedeni değildir. (8)

Alternatif Hipotez (H_1): MOVE endeksi oran değişimi, bağımlı değişkenin nedenidir. (9)

Bağımsız değişkenin MOVE endeksi ve bağımlı değişkenlerin 10 yıllık gösterge tahvil faiz oranları olan çalışmanın Granger nedensellik testi sonuçlarının olasılık değerleri önem kazanmaktadır. Nedensellik testi sonucunda bağımlı değişkenlerin olasılık değerlerinin 0.05'in üzerinde olması durumunda sıfır hipotezi (H_0) kabul edilmekte ve alternatif hipotez (H_1) reddedilmektedir. Bağımlı değişkenlerin olasılık değerlerinin 0.05'in altında olması durumunda sıfır hipotezi (H_0) reddedilmekte ve alternatif hipotez (H_1) kabul edilmektedir. Alternatif hipotezin kabul edilmesi, bağımsız değişken ile bağımlı değişken arasında bir Granger nedenselliği olduğunu göstermektedir.

Tablo 7. Bağımsız Değişken MOVE Endeksinin Granger Nedensellik Testi Sonuçları

	Bağımlı Değişken: **BR10YT**	
Bağımsız Değişken	Ki-Kare	Olasılık Değeri
MOVE	1.909123	0.3850
	Bağımlı Değişken: **CN10YT**	
Bağımsız Değişken	Ki-Kare	Olasılık Değeri
MOVE	1.823535	0.4018
	Bağımlı Değişken: **ID10YT**	
Bağımsız Değişken	Ki-Kare	Olasılık Değeri
MOVE	6.014032	0.0494
	Bağımlı Değişken: **IN10YT**	
Bağımsız Değişken	Ki-Kare	Olasılık Değeri
MOVE	0.908516	0.6349
	Bağımlı Değişken: **MX10YT**	
Bağımsız Değişken	Ki-Kare	Olasılık Değeri
MOVE	24.68217	0.0000
	Bağımlı Değişken: **PH10YT**	
Bağımsız Değişken	Ki-Kare	Olasılık Değeri
MOVE	3.674662	0.0500
	Bağımlı Değişken: **RU10YT**	
Bağımsız Değişken	Ki-Kare	Olasılık Değeri
MOVE	1.364646	0.5054
	Bağımlı Değişken: **SA10YT**	
Bağımsız Değişken	Ki-Kare	Olasılık Değeri
MOVE	0.536214	0.7648
	Bağımlı Değişken: **TR10YT**	
Bağımsız Değişken	Ki-Kare	Olasılık Değeri
MOVE	3.656007	0.0499

Tablo 7'de gösterilmekte olan Granger nedensellik testi sonuçlarına göre, MOVE endeksinin bağımsız değişken ve 9 gelişmekte olan ülkenin 10 yıllık gösterge tahvil faiz oranlarının bağımlı değişken olması durumunda, 4 tane gelişmekte olan ülke tahvil faiz oranlarının MOVE endeksinden etkilendiği sonucu tespit edilmiştir. Başka bir ifade ile Move endeksi, Endonezya, Filipinler, Meksika ve Türkiye 10 yıllık gösterge devlet tahvili faiz oranlarının Granger nedeni olduğu sonucuna ulaşılmıştır. Bu sonuca göre bu dört ülke tahvil piyasalarına yatırım yapmayı düşünen yatırımcıların mutlaka MOVE endeksini dikkate alması gerekmektedir.

5. Sonuç

Yatırımcıların ve para politikası uygulayıcılarının tahvil piyasaları ile ilgili kararlarını etkileyen finansal göstergelerin en başında MOVE endeksi gelmektedir. MOVE endeksi, 2 yıllık, 5 yıllık, 10 yıllık ve 30 yıllık Amerikan devlet

tahvili faiz oranlarının ağırlıklandırılmış ortalaması üzerinden geleceğe yönelik volatilite beklentisini ölçmektedir. Bu hesaplama içerisinde 10 yıllık Amerikan devlet tahvilinin ağırlığı nispeten daha fazladır.

Bu çalışmada, uluslararası finans piyasalarının yakından takip ettiği MOVE endeksi ile gelişmekte olan ülkelerden örnek olarak seçilen; Brezilya, Çin, Endonezya, Filipinler, Güney Afrika, Hindistan, Meksika, Rusya ve Türkiye'nin 10 yıllık gösterge devlet tahvili faiz oranları arasındaki nedensellik ilişkisi analiz edilmiştir. Bu amaçla değişkenlerin 04 Haziran 2010 ile 30 Aralık 2017 tarihleri arasındaki 1325 adet günlük veri alınarak Granger nedensellik testi uygulaması yapılmıştır. Analiz sonucuna göre; MOVE endeksi, Endonezya, Filipinler, Meksika ve Türkiye 10 yıllık gösterge devlet tahvili faiz oranlarının Granger nedeni olduğu tespit edilmiştir.

Bu çalışma sonucuna göre, yatırımcıların ve para politikası uygulayıcılarının, bu dört ülke tahvil faiz oranlarını incelerken mutlaka MOVE endeksinin değişimlerini de göz önünde bulundurmaları önem arz etmektedir.

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6

BİTCOİNİN FİYAT DALGALANMALARININ NEDENLERİ ÜZERİNE BİR LİTERATÜR İNCELEMESİ / A LITERATURE REVIEW ON THE CAUSES OF BITCOIN PRICE RIPPLES

Filiz Yıldız Contuk[1]

Abstract

Bitcoin, which is the most known crypto currency in the world in recent years and has a very high population, attracts very different types of users and its price is constantly fluctuating. By the end of 2017, the value of this crypto-money over the value of 20 thousand dollars and back to 12 thousand dollars in a short period of time, the factors affecting the price formation attracts attention of the researchers. For this purpose, studies on the factors affecting the price formation of Bitcoin in the study; the data analyzed, the method used and the results obtained are presented.

Keywords: Bitcoin, Volatility, Popularity

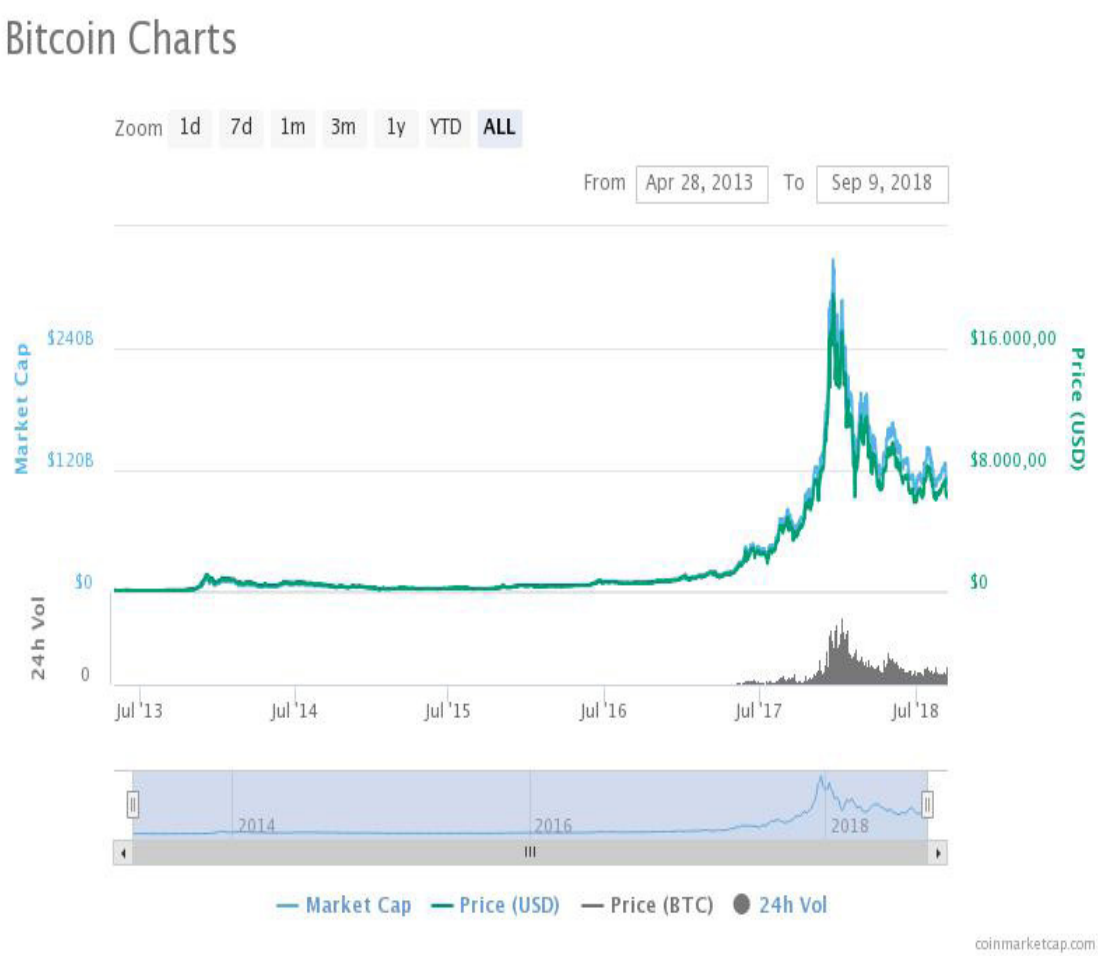
1.Giriş

2008'de Amerika Birleşik Devletleri'nde Lehman Brothers şirketinin iflasını açıklamasıyla başlayan ve hızla tüm dünyada etkisini gösteren küresel finansal kriz tüm dünya ülkelerini derinden etkilemiştir. Ülke borsaları çökerken kredi derecelendirme kuruluşları itibar kaybetmiş, finans kuruluşları ve şirketler iflasın eşiğine gelmiş, büyük bankalar batmıştır. Ancak tüm bunların ötesinde bankalara duydukları güven duygusunu kaybeden bireylerin, finans sistemine bakış açıları değişmiştir. Finans piyasalarının çöküşü sonrası ortaya çıkan Bitcoin, finansal sistemin başarısızlığına ve güçlü rezerv para birimlerine (dolar ve euro) alternatif olarak sunulmuştur (Dilek, 2018, s. 10).

Son zamanlardaki en trend ekonomik ve finansal konulardan biri haline gelen Bitcoin, "Satoshi Nakamoto" takma adı altında 2008 yılında yayınlanan "Bitcoin: A Peer-to-Peer Elec-tronic Cash System" isimli bir makale ile ortaya çıktı (Berentsen ve *Schär,* 2018, s.1). Merkezi olmayan bir elektronik para birimi sistemi olan Bitcoin, finansal sistemlerde radikal bir değişimi temsil etmekte, çok sayıda kullanıcının ve medyanın ilgisini çekmektedir. Geçtiğimiz yıllarda piyasadaki en popüler ve kabul edilen sanal para haline gelen Bitcoin, üçüncü bir kişiden faydalanmadan, dünyadaki herhangi bir kullanıcı ile anonim işlem yapma yeteneği gibi çeşitli avantajlara sahiptir. Bununla birlikte, rekabetten dolayı hacklenme veya daraltılma riski gibi bazı dezavantajları da vardır, aynı zamanda bu sanal para biriminin volatilitesi ve bir hesap birimi haline getirilmesini zorlaştıran deflasyonist niteliğide mevcuttur. En önemli husus, Bitcoin'in gittikçe daha popüler hale gelmesi ve dolayısıyla hükümet düzenlemelerine yüksek düzeyde maruz kalmasıdır (Malik, 2016, s. 40).

1 (Mugla Sitki Koçman University), fcontuk@mu.edu.tr

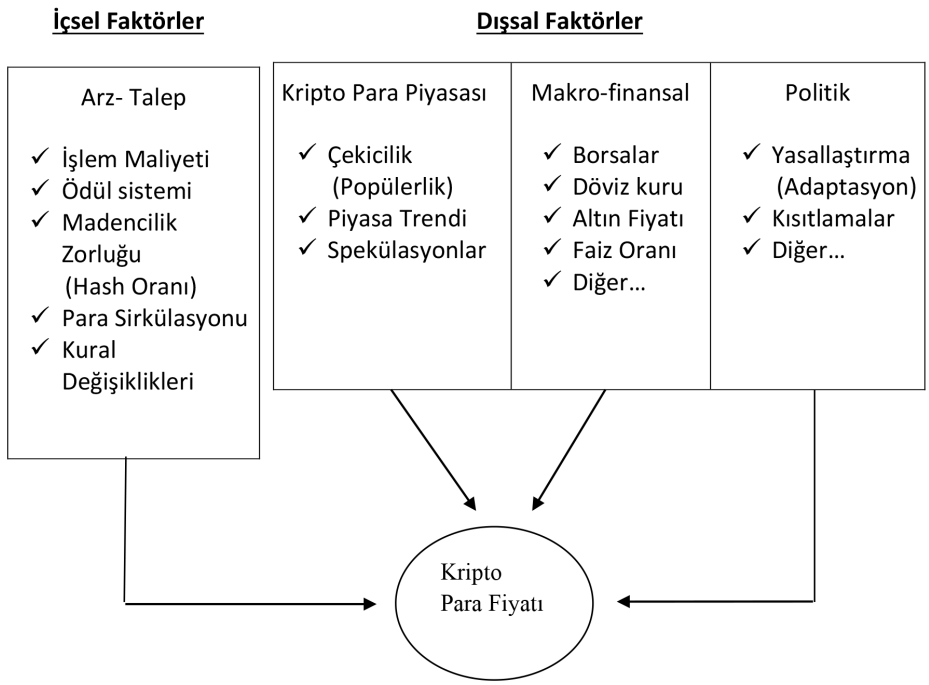
Bugün itibariyle sanal para birimlerinin dünya üzerindeki 13.731 borsada ulaştığı piyasa değeri yaklaşık 200 milyar $'dır. Mevcut sanal para birimi sayısı ise 1926'dır. (www.coinmarketcap.com, 09.09.2018). Bunun her gün ve saatte değiştiği gerçeği unutulmamalıdır. 2018'in ilk yarısı Bitcoin fiyatı için son derece değişken olmuştur. Aralık 2017'de yaklaşık 20.000 $ gibi çok büyük rakamlardan, 2018 Şubat ayında 7.000 $ 'a düşmüştür. Takip eden süreçte Mart ayında 11.500 $' a yükselirken, Nisan ayında 6.600 $ 'a gerilemiş ve Mayıs ayında tekrar 9.800 $' a yükselmiştir. Haziran (6.084 $) ve Temmuz (8.380$) aylarında fiyat artış ve azalışları devam eden Bitcoin'in değeri, Ağustosta 6.185 $ kadar düşerek dalgalanmasını sürdürmüştür. Grafik 1'de 2013-2018 yılları arasında Bitcoin fiyat hareketleri gösterilmiştir.



Grafik 1: 2013-2018 Yılları Bitcoin Fiyat Hareketleri
Kaynak: www.coinmarketcap.com

Popülerliğine ve dünya çapında kabul görmesine rağmen, çoğu insanın Bitcoin'in gerçekte ne olduğu konusunda hala kafası karışıktır. Alternatif para birimi, işlem aracı veya spekülatif bir balon olarak Bitcoin durumu hala

devam eden tartışmaya tabidir (Bouoiyour ve diğ., 2015, s. 1) Dijital para birimi Bitcoin yaklaşık on yılı aşkın bir süredir varlığını sürdürmektedir, ancak hala önemli miktarda günlük işlemlerde kullanılmamaktadır. Bunun ana nedeni, değişken fiyat davranışında yatmaktadır. Bitcoin standart para birimleri ile karşılaştırıldığında analiz edilen tüm özellikleri arasında, en net şekilde aşırı fiyat volatilitesi ön plana çıkmaktadır (Ciaian ve diğ., 2016, s. 883). Bu nedenle Bitcoin fiyat belirleyicilerinin daha geniş bir perspektiften gözden geçirilmesi gerekmektedir. Literatürdeki mevcut çalışmalar BitCoin fiyat oluşumunu belirleyen faktörleri 3 gruba ayırmışlardır: (1) BitCoin arz ve talebi, (2) BitCoin çekiciliği ve (3) küresel makroekonomik ve finansal gelişmeler (Ciaian ve diğ., 2016, s. 896). Kripto-para birimi fiyatlarını etkileyen bu faktörler Şekil 1'de gösterilmiştir.



Şekil 1.Kripto-para birimi fiyatlarını etkileyen faktörler

Kaynak: Sovbetov, 2018:7

Bitcoin sistemindeki mevcut gelişmeler ve diğer dijital para birimleriyle rekabet edebilirliği, bu teknolojinin gelecekteki başarısı üzerinde önemli bir etkiye sahip olabilir. Fiyatındaki aşırı dalgalanmalar nedeniyle, standart para birimlerine göre daha spekülatif bir yatım aracı olarak görülen Bitcoin'in, fiyat dalgalanmalarının nedenlerinin belirlenmesi ve bunların ortadan kaldırılması, gelecekte bir değişim ve değer birimi olarak standart para birimleri gibi kullanılmasını sağlamak açısından önemlidir. Bu amaçla çalışmada bugün kripto para piyasasının %55,5 hakim olan Bitcoin'in (www.coinmarketcap.com), fiyat dalgalanmalarının nedenleri üzerine yapılan çalışmalar bir araya toplanarak sunulmuştur.

2. Literatür Taraması

Aşırı fiyat volatilitesi ile ön plana çıkın Bitcoin'in fyat oluşumunun nedenleri üzerine yapılan çalışmalar kullanıcılara kolaylık sağlaması amacıyla ilgili başlıklar altında sırasıyla verilmiştir.

2.1. Sosyal Medya Verilerine Göre Yapılmış Çalışmalar

McAteer (2014) Bitcoin Fiyat Endeksi ve twitter verilerini kullanarak yaptığı çalışmasında, Bitcoin ile ilişkilendirilen tweetlerin ve bu tweet'lerde bulunan kullanıcı duyarlılığının Bitcoin'in fiyatına yansıyıp yansımadığını belirlemeye çalışmıştır. Üç haftalık süre boyunca yaklaşık 700.000 tweet zaman serileri ile analiz edilmiştir. Analiz sonucunda, Twitter duyguları ile bitcoin kuru arasında pozitif bir ilişki olduğu ve bu durumun 24 saatlik bir gecikme süresinin ardından fiyatlara yansıdığı görülmüştür. Bu bulgu, Bitcoin yatırımcılarının duyarlı olmaya eğilimli olduğunu ve duygu değişimine tepki verdiğini göstermiştir. Yani twitler olumsuz olduğunda Bitcoin'lerin satıldığı, olumlu olduğunda ise satın alındığı belirlenmiştir.

Matta vd. (2015) Bitcoin'in fiyat artışının tweet veya web araması sonuçlarıyla ilişkili olup olmadığını araştırdıkları çalışmalarında, Ocak 2015 ile Mart 2015 arasında 60 günlük bir süreyi kapsayan verilerle Bitcoin fiyatının tweet hacmine, pozitif duygu durum hacmine sahip tweet'lere ve Google Trend verilerine göre varyasyonlarını karşılaştıran bir analiz yapmışlardır. Sonuç olarak, pozitif tweet'lerin birkaç gün içinde Bitcoin'in fiyat hareketini tahmin etmeye katkıda bulunabileceğini tespit etmişlerdir. Ayrıca Bitcoin fiyatı ve Google Trend verileri arasında önemli bir çapraz korelasyon belirlemişlerdir.

Pryzmont (2016) tarafından yapılan bir çalışmada Bitcoin ile ilgili olayların fiyat volatilitesini nasıl etkilediği belirlenmeye çalışılmıştır. Bu amaçla 1 Ocak 2011 ve 17 Ağustos 2016 yılları arasındaki günlük Bitcoin fiyat endeksi ve bu yıllar arasında Bitcoin piyasasında meydana gelen olaylar incelenmiştir. Bitcoin ile ilgili olaylar dergi makaleleri, internet tabanlı haberler ve Bitcoin topluluk forumlarındaki gönderilerden elde edilmiştir. Bitcoin ile ilgili aramalarda "Bitcoin olayı", "Bitcoin güvenlik ihlali" ve "Bitcoin felaketi" ifadeleri kullanılmıştır. Sonuç olarak Bitcoin ekosisteminde meydana gelen bu olumsuz olayların Bitcoin fiyatındaki dalgalanmalar üzerinde hiçbir etkisinin olmadığı tespit edilmiştir.

Bouoiyour ve Selmi (2016) tarafından yapılan bir çalışmada iki ana dönem için Bitcoin fiyatlatıının volatilitesi tahmin edilmiştir.1 Aralık 2010 ve 31 Aralık 2014 arasında başlayan ilk dönem ve 01 Ocak 2015 ile 22 Temmuz 2016 tarihleri arasındaki ikinci dönem de Bitcoin ile ilgili veriler GARCH (General Autoregressive Conditional Heteroskedasticity) modeliyle analiz edilmiştir. İlk dönemde Bitcoin'in fiyatının çok değişken olduğu, ikinci dönemde ise fiyat oynaklığının daha az olduğu belirlenmiştir. Ayrıca Bitcoin fiyatlarının genellikle olumlu haberlerden ziyade, olumsuz haberlere daha fazla tepki gösterdiği tespit edilmiştir.

Kutlu vd.(2017) tarafından yapılan çalışmada Google'de "Bitcoin" aramalarına bakılarak Bitcoin'in fiyatlarınının tahmin edilebilirliği ve Bitcoin'in geçmişteki fiyatlarının, bugünün fiyatları üzerinde etkisi olup olmadığı araştırılmıştır. Çalışmada 2011-2016 yılları arasında Türkiye ve Amerika'daki Google üzerinden yapılan "Bitcoin" aramaları ve Bitcoin'in haftalık fiyatlarından elde edilen veriler, model seçimi için ARIMA yöntemi ve değişkenlerin anlamlılığını belirlemek için en küçük kareler yöntemiyle analiz edilmiştir. Sonuç olarak Türkiye'de Bitcoin'in geçmişteki fiyatlarıyla, bugünün fiyatlarının tahmin edilemeyeceğini belirlemişlerdir. İnsanların bu sanal para birimi hakkında fazla bilgisinin olmadığı ve Bitcoin'i Googe'da aramadığı, bu sebeple bitcoin aramalarının artış veya azalış göstermesinin Bitcoin

fiyatları üzerinde herhangi bir etkiye neden olmadığı tespit edilmiştir. Ayrıca; Amerika'da Gooole aramaları ile Bitcoin fiyatları arasında negatif bir ilişki olduğu, yani aramalar arttığında Bitcoin'in fiyatlarının düştüğü görülmüştür. Yasadışı sorunlar, hırsızlık ve aniden gelişen olayların Bitcoin'e olan ilgiyi arttırdığı ve insanların bu terimi defalarca araştırdığı ve bu durumun Bitcoin'in fiyatını olumsuz yönde etkilediğini belirlemişlerdir.

Dulupçu vd.(2017) tarafından Bitcoin'in fiyat artışı ile popülaritesi arasındaki ilişkiyi araştırmak üzere Bitcoin'in fiyatı, dolaşımdaki Bitcoin miktarı ve popülarite için Google'da yapılan "Bitcoin" aramalarının aylık verileri kullanılarak VAR Modeline dayalı Varyans Ayrıştırma ve Granger Nedensellik analizleri yapılmıştır. Sonuç olarak Bitcoin'in fiyat hareketlerinin popülerliğe neden olmadığı, aksine popülerliğin Bitcoin'in fiyat hareketliğine neden olduğunu belirlemişlerdir. Yani insanların Bitcoin'e olan ilgisi arttıkça Bitcoin'in fiyatının arttığı tespit edilmiştir. Bitcoin'in fiyatı ile popülaritesi arasındaki güçlü ilişkinin yanı sıra nedenselliğin yönünün popülariteden Bitcoin'in fiyatına doğru olduğu belirlenmiştir. Bitcoin'in şu anki fiyatının gerçek değerinden değil, spekülatif hareketlerden kaynaklandığı sonucuna ulaşılmıştır.

Mai vd.(2018), sosyal medya ile Bitcoin'in parasal değeri arasındaki dinamik ilişkiyi belirlemeye yönelik yaptıkları çalışmalarında 1 Ocak 2012 ve 31 Aralık 2014 dönemleri arasındaki verileri metinsel analiz ve VECM modeliyle incelemişlerdir. Analizlerinde Bitcoin'in piyasa fiyatı, işlem hacmi verileri, sosyal medya için Twitter ve internet forum sitesinden elde edilen veriler ile finansal olarak S & P 500 endeksi, borsadaki oynaklık (Chicago Board Options Exchange'den VIX endeksi), COMEX altın fiyatı ve AAII yatırımcı duyarlılığı anketini veri olarak kullanmışlardır. Sonuç olarak, sosyal medya duyarlılığının gelecekteki Bitcoin fiyatlarındaki dalgalanmaların önemli bir öncü göstergesi olduğu (sosyal medyanın Bitcoin üzerindeki etkileri esas olarak sessiz çoğunluktan yani daha az aktif olan ve toplam mesajların yüzde 40'ından daha azına katkıda bulunan kullanıcılardan kaynaklandığını) ancak tüm sosyal medya mesajlarının etkisinin eşit olmadığını saptamışlardır. Ayrıca, internet forumundaki mesajların tweet'lere göre gelecekteki Bitcoin değeri üzerinde daha güçlü bir etkisi olduğu sonucuna ulaşılmıştır.

McWharter (2018) Bitcoin'in yüksek fiyat volatilitesine sahip olmasına neden olan faktörleri analiz ettiği çalışmasında, medyanın Bitcoin'in fiyat dalgalanması üzerinde bir rol oynayıp oynamadığını belirlemeyi amaçlamıştır. Bu amaçla Temmuz 2010 ve Mart 2018 dönemleri arası aylık veliler ile 92 gözlemden oluşan veri setini en küçük kareler yöntemi ile analiz etmiştir. Çalışmasında Finansal Stres indeksi, Tüketici güven indeksi, işsizlik oranı, faiz oranı, Google Bitcoin arama verileri, altın fiyatı, haber göstergeleri, günlük Bitcoin işlem hacmi değişkenlerini kullanmıştır. Yapılan analiz sonucunda Google'de Bitcoin terimini arayan kişi sayısının ve olumsuz haberlerin fiyat volatilitesi üzerinde önemli bir etkisinin olduğu saptanmıştır. Ayrıca fiyat değişkenliğini belirlemede ekonomik gösterge değişkenlerinin önemsiz olduğu gözlemlenmiştir. Bitcoin'in öngörülemeyen fiyat değişimleri nedeniyle hâlihazırda akıllıca bir yatırım aracı olmadığı tespit edilmiştir.

2.2. Makro-Ekonomik Faktörlere Göre Yapılmış Çalışmalar

Wijk (2013) Bitcoin fiyatının belirlenmesinde makro ekonomik değişkenlerin rolünü incelediği çalışmasında, en küçük kareler yöntemini uygulayarak çeşitli borsa endekslerini, döviz kurlarını ve petrol fiyatlarını veri olarak kullanarak 19 Temmuz 2010-13 Haziran 2013 dönemini kapsayan günlük verilerden oluşan 759 gözlemi analiz etmiştir. Çalışmada kullanılan veriler Çalışma sonucunda Dow -Jones endeksi, euro-dolar kuru ve WTI petrol fiyatı dahil olmak üzere birçok finansal göstergenin, uzun vadede Bitcoin'in fiyatı üzerinde önemli bir etkisi olduğu sonucuna ulaşılmıştır.

Zhu vd.(2017) Bitcoin'in VEC modeline dayalı fiyatlandırma etki faktörlerini 2011'den 2016'ya kadar aylık verileri kullanarak analiz etmişlerdir. Analizlerinde özel fiyat endeksi, ABD doları endeksi, Dow-Jones sanayi ortalaması, federal fon oranı ve altın fiyatı gibi ekonomik faktörlerin Bitcoin fiyatını nasıl etkilediğini incelemişlerdir. Sonuç olarak tüm bu değişkenlerin uzun vadeli etkisinin olduğunu tespit etmişlerdir. ABD doları endeksi, Bitcoin fiyatında en büyük etkiye sahipken, altın fiyatının en az etkiye sahip olduğunu belirlemişlerdir. Kısacası, Bitcoin fiyatının makroekonomik endeks ve önemli varlıkların fiyat endeksinden etkilenebileceğini, diğer bir deyişle Bitcoin'in fiyatının sadece kendi talebi ve arzından kaynaklanmadığını tespit etmişlerdir. Bunun sonucu olarak da, Bitcoin'in spekülatif bir varlık olduğu ve gerçek bir para birimi olmaktan çok uzak olduğunu belirtmişlerdir.

Güleç vd. (2018) yaptıkları çalışmada kripto para birimlerinden Bitcoin'in döviz, altın, hisse senedi ve faiz piyasalarıyla olan ilişkisini zaman serisi yöntemlerinden Johansen Eşbütünleşme ve Granger Nedensellik analizleri ile incelemişlerdir. Çalışmada Türkiye'ye özgü değişkenler ele alınmış olup, Bitcoin'in Türk Lirası cinsinden kapanış fiyatları, dolar kuru, altın fiyatları, BİST 100 endeksi ve faiz oranlarının Mart 2012 ile Mayıs-2018 dönemini kapsayan aylık verileri kullanılmıştır. Çalışma sonucuna göre, Bitcoin fiyatlarının artan bir trende ve yüksek bir volatiliteye sahip olduğu tespit edilmiştir. Bitcoin fiyatlarının kendine özgü dinamiklerinin fiyatların oluşumunda ve hareketinde daha belirleyici olduğu saptanmıştır.

2.3. Duygu Analizine Göre Yapılmış Çalışmalar

Rakovská(2018) Sentix anketi ile ölçülen yatırımcı duyarlılığı ve Bitcoin'in fiyatı arasındaki dinamik ilişkiyi Aralık 2013'ten Nisan 2018'e kadar olan sürede aylık zaman serisi verilerini kullanarak incelemiştir. Çalışmasında Bitcoin fiyatları üzerinde bireysel ve kurumsal duyarlılığın etkisini ayrı ayrı belirlemeye çalışmıştır. Analiz sonucunda yatırımcıların inançlarının, kripto para biriminin fiyatını etkilediğini ayrıca bireysel ve kurumsal yatırımcıların duygularının etkisinin farklı olduğunu belirlemiştir. Bitcoin'e yönelik bireysel yatırımcıların artan duyarlılık etkisi söz konusu olduğunda yani bireysel yatırımcılar aşırı iyimser olduklarında kripto para biriminin fiyatının hemen arttığı ve fiyatların sonraki aylarda da olumlu olduğu tespit edilmiştir. Öte yandan, kurumsal duyarlılık arttığında, Bitcoin fiyatlarının, değişimden üç ay sonra düşüşe geçme eğiliminde olduğu saptanmıştır.

Carrera (2018) duyguların Bitcoin fiyat oluşumuna etkisini inceleyen çalışmasında; Bitcoin ile ilgili verileri, Twitter tweetlerini (500.000'den fazla tweet) ve geçerli finansal verileri VADER yöntemini (Valence Aware Dictionary and sEntiment Reasoner) kullanarak analiz etmiştir. 1 Aralık 2017 ile 31 Aralık 2017 arasında günlük olarak yayınlanan verilerin kullanıldığı çalışmada, seçilen zaman aralığı, tüm zamanların en yüksek seviyesi olan büyük fiyat artışını ve iki haftalık bir süre boyunca% 28'lik bir kayıpla sonuçlanan devasa bir satışın tamamını kapsamaktaydı. Sonuç olarak, hem altın futures'ların hem de piyasa volatilitesinin Bitcoin fiyatı ile negatif ilişkili olduğu, duyguların ise pozitif ilişkili olduğu saptanmıştır.

Stenqvist ve Lönnö (2017) Twitter'da duygu analizini kullanarak Bitcoin fiyatlarındaki dalgalanmaları (yukarı / aşağı) 11 Mayıs - 11 Haziran 2017 arası bir aylık 2.27 milyon tweeti kullanarak tahmin etmeye çalışmışlardır. Duygu dalgalanmalarının yoğunluğuna göre bir zaman aralığından diğerine olan naif bir tahmin modeli sunmuşlardır. VADER duyarlılık analizi sonuçlarına göre, 30 dakikalık bir süre zarfında duyguların ve buna bağlı olarak 2 saat sonra Bitcoin'in fiyatının değiştiği belirlenmiştir.

2.4. Bitcoin'in Arz-Talebi, Çekiciliği ve Makro-Ekonomik Değişkenlere Göre Yapılmış Çalışmalar

Georgoula vd.(2015) Bitcoin fiyatlarının belirleyicilerini tespit etmek için; Bitcoin fiyatları ile temel ekonomik değişkenler, teknolojik faktörler, Twitter gönderileri, Wikipedia ve Google'da "Bitcoin" arama sorgularından oluşan on bir değişkene ait 27 Ekim 2014'ten 12 Ocak 2015'e kadar olan günlük verileri Zaman Serileri ve Duyarlılık Analizini kullanarak incelemişlerdir. Analiz sonucunda, Twitter duygu oranının Bitcoin fiyatları ile pozitif korelasyona sahip olduğu, Wikipedi arama sorgularının ve Hash oranının Bitcoin'lerin fiyatı üzerinde olumlu bir etkisinin olduğu ortaya koyulmuştur. Yani Bitcoin'e olan ilginin piyasa fiyatlarının artmasında etkili olduğu saptanmıştır. Ayrıca, Bitcoin'in değerinin dolar ve euro arasındaki döviz kurundan ve S & P 500 endeksinden olumsuz yönde etkilendiği tespit edilmiştir.

Kristoufek(2015) Bitcoin'in fiyat oluşumu ve gelişimi üzerine 2011-2014 yıllarını kapsayan bir çalışma yapmıştır. Çalışmada bitcoin fiyat indeksi, dolaşımdaki toplam bitcoinler, bitcoin işlem sayısı ve işlem hacmi, arama motorlarındaki "Bitcoin" terimi, finansal sıkıntı endeksi ve altın fiyatları veri olarak kullanılmıştır. Sonuç olarak, Bitcoin spekülatif bir varlık olarak görülse de, ticarette kullanım, para arzı ve fiyat seviyesi gibi standart temel ekonomik faktörlerin uzun vadede Bitcoin fiyatında rol oynadığını, Bitcoin'in artan fiyatının kullanıcıları madenci olmaya motive ettiğini ancak madenciliğin zorlukları nedeniyle bu etkinin zamanla kaybolduğunu belirlemiştir. Ayrıca Bitcoin'lerin fiyat hareketlerinin yatırımcının ilgisinden kaynaklandığını ve ilişkinin uzun vadede daha belirgin olduğu ve Bitcoin'in güvenli bir yatırım aracı olmadığını tespit etmiştir.

Vockathaler (2015) tarafından yapılan çalışmada Bitcoin'in fiyatını etkileyen uzun vadeli faktörler araştırılmıştır. 2010-2015 dönemleri arasındaki günlük verilerden oluşan 1743 gözlem ve 16 bağımsız değişkene ait verilerin zamana bağlı değişkenliğini hesaba katabilecek bir GARCH modeli uygulanmıştır. Altın fiyatları, S&P 500 vb. makroekonomik değişkenlerin yanı sıra finansal sıkıntı endeksi, Google trend dizisi (Bitcoin terimi sonuçları) veri setine dahil edilmiştir. Sonuç olarak, Bitcoin'lerin fiyatındaki dalgalanmaların çoğunun, içsel bir süreç tarafından modellenen bilinmeyen şoklar tarafından açıklanabileceğini ve bu beklenmedik şokların Bitcoin'lerin fiyat dalgalanmalarına önemli bir etkisinin olduğu tespit edilmiştir. Ayrıca talep tarafındaki faktörlerin, Bitcoin'in fiyatı ile pozitif ilişkili olduğu belirlenmiştir.

Seys (2016) yaptığı çalışmasında Bitcoin'in fiyat dalgalanmalarını anlamak için Temmuz-2011 ve Aralık-2015 dönemini kapsayan 1645 gözlemden oluşan günlük verilerden yararlanarak bir analiz yapmıştır. Analizinde ticaret değişim oranı, Wikipedia verileri(Bitcoin terimi araması), altın fiyatları, ham petrol fiyatları, *MSCI* World endeksi(gelişmiş piyasalar endeksi), Dolar/Çin Yuanı döviz kuru, finansal sıkıntı endeksi, Bitcoin madenciliğinin zorluğu ve dolaşımdaki toplam Bitcoin miktarını kullanmıştır. Sonuç olarak, Bitcoin'e özgü ve makro ekonomik olayların Bitcoin fiyatı üzerindeki etkisini kanıtlamıştır. Özellikle ham petrol fiyatı, Dolar/Çin Yuanı döviz kuru ve Bitcoin madenciliğinin zorluğunun Bitcoin fiyat seviyesinde önemli bir etkiye sahip olduğunu belirlemiştir.

Ciaian vd.(2016) artan pazar payı, hızla yükselen fiyatı ve yüksek fiyat volatilitesi ile kullanıcıların, yatırımcıların ve ekonomistlerin yoğun ilgisini çeken Bitcoin'in kısa ve uzun vadede fiyatının belirleyicileri üzerine bir çalışma yapmışlardır. Çalışmada Bitcoin fiyat oluşumunu makro ekonomik faktörler, Bitcoin'in arz-talep durumu ve Bitcoin'in çekiciliği olmak üzere üç açıdan ele almışlardır. 2009-2014 dönemi için Bitcoin'in fiyatı, miktarı, işlem sayısı, adres sayısı, döviz kuru, borsadaki satın alımlar, Wikipedia'daki görüşler, yeni üyeler ve yeni mesajlara(bitcointalk.org) ait günlük verileri zaman serisi analizleri ile test etmişlerdir. Sonuç olarak, Bitcoin arz ve talebinin Bitcoin

fiyatı üzerinde önemli bir etkiye sahip olduğunu doğrulamışlardır. Özellikle Bitcoin ekonomisinin büyüklüğü gibi talep taraflı etkilerin, Bitcoin'in fiyatı üzerinde güçlü bir etkiye sahip olduğunu belirlemişlerdir. Ayrıca yatırımcı spekülasyonlarının Bitcoinin fiyatını olumlu veya olumsuz etkilediğini tespit etmişlerdir. Bitcoin fiyatının ağırlıklı olarak spekülatif yatırımlar tarafından yönlendirildiği sürece, Bitcoin'in standart para birimleriyle rekabet edemeyeceğini vurgulamışlardır. Son olarak küresel makro finansal gelişmelerin Bitcoin'in fiyatını kısa vadede etkilediği, uzun vadede ise bir etkisinin olmadığı sonucuna ulaşmışlardır.

Puri (2016) Bitcoin fiyat oluşumunu ulusal ve uluslarası düzeyde analiz ettiği çalışmasında; Ocak 2011 ile Mart 2016 dönemleri arasında Bitcoin fiyatını, Google'da "Bitcoin" aramalarını, makroekonomik gösterge olarak enflasyon oranı, işsizlik oranı, endüstriyel üretim, para arzı, ticaret ağırlıklı ABD endeksi (TWEXB) ve ABD hazine bonusunu veri olarak kullanarak analiz etmiştir. Analiz sonucunda beş yıllık (2011 - 2016) aylık zaman serileri verilerini kullanarak, Google tarafından ölçülmüş olan ve "Bitcoin" için yapılan aramaların artmasının Bitcoin fiyatlarında pozitif ve önemli bir etkisi olduğunu belirlemiştir. Ayrıca enflasyon haricinde, geleneksel olarak kullanılan makroekonomik belirleyicilerin döviz kuru fiyatlarının eşzamanlı değerlerinin Bitcoin fiyatları üzerinde önemli bir etkisi olmadığını tespit etmiştir.

Poyser (2017) Bitcoin'in fiyat belirleyicilerini araştırdığı çalışmasında Ocak 2013-Mayıs 2017 dönemleri arasında Bitcoinin arz-talebi, çekiciliği ve makro ekonomik değişkenleri Bayes Yapısal Zaman Serileri yaklaşımını kullanarak analiz etmiştir. Analiz sonucunda, Bitcoin fiyatının altın fiyatı, Yuan-ABD döviz kuru ve tarafsız bir yatırımcının duyarlılığı ile negatif ilişkili olduğu; borsa endeksi, ABD-Euro döviz kuru ve farklı ülkelerin arama trendleri arasında pozitif ilişki olduğu görülmüştür. Bu yüzden, Bitcoin'in karışık özelliklere sahip, spekülatif bir yatırım aracı olduğu kanısına varılmıştır.

Bouoiyour ve Selmi (2017) yaptıkları çalışmalarında makroekonomik, finansal, spekülatif ve teknik belirleyicilerin yanı sıra 2016 olaylarının Bitcoin fiyat oluşumuna etkisini analiz etmişlerdir. Bu amaçla 01 Ocak 2015'ten 30 Aralık 2016'ya kadar olan toplamda 729 gözlemden oluşan Bitcoin fiyat endeksi, makro ekonomik ve finansal belirleyiciler (bitcoin hızı, döviz ticaret oranı, altın fiyatları), google'de (Hindistan ve Venezuela'da) Bitcoin terimi aramaları, Hash oranı ve 2016 olaylarını veri olarak kullanmışlardır. Çalışmalarında Bayes kuantum regresyon modelini uygulamışlardır. Sonuç olarak piyasa düşüşe geçtiğinde dolaşımdaki bitcoinlerin hızı, altın fiyatı, Venezüella para biriminin tedavülden kaldırılmasının ve hash oranının Bitcoin'in fiyatını etkileyen temel unsurlar olduğunu belirlemişlerdir. Ayrıca Bitcoin'in fiyat belirleyicilerini analiz ederken piyasa eğilimlerinin (boğa, normal veya ayı piyasası) göz önünde bulundurulması gerektiğini belirtmişlerdir.

Sukamulja ve Sikora(2018) tarafından yapılan bir çalışmada Bitcoin'in fiyat hareketlerini etkileyen faktörler incelenmiştir. Çalışmada Bitcoin'in fiyatı, altın fiyatı, Bitcoin'in talebi(toplam cüzdan kullanıcısı sayısı), Bitcoin'in arzı(çıkarılmış olan bitcoinlerin toplam sayısı) ve makro ekonomik göstergeyi temsilen Dow Jones Endüstriyel Ortalaması (DJIA) veri olarak kullanılmıştır. Vektör Hata Düzeltme Modelini (VECM) kullanarak, kısa ve uzun vadeli etkileri analiz etmişlerdir. Sonuç olarak, Dow Jones Endüstriyel Ortalaması (DJIA) tarafından temsil edilen makroekonomik göstergenin, Bitcoin'in talebinin ve altın fiyatının kısa ve uzun vadede Bitcoin'in fiyat dalgalanmalarını etkilediğini belirlemişlerdir. Ayrıca Bitcoin'in arzının fiyat dalgalanmasını kısa vadede etkilediğini, uzun vade de ise etkilemediğini tespit etmişlerdir.

Sovbetov (2018), haftalık verileri kullanarak 2010-2018 dönemi boyunca en yaygın beş kripto paranın (Bitcoin, Ethereum, Dash, Litecoin ve Monero) fiyatını etkileyen faktörleri ARDL tekniğini kullanarak incelemiştir. Çalışmasında

kripto paraların piyasa değeri, işlem hacmi, açılış-kapanış fiyatları, döviz kurları, ABD faiz oranları, altın fiyatı, SP500 endeksinin fiyatı, kripto paraların popülerliği için Google arama sıklığı ile ilgili verileri kullanmıştır. Sonuç olarak toplam piyasa fiyatları, ticaret hacmi ve kripto para birimleri üzerindeki volatilite gibi kripto piyasası ile ilgili faktörlerin, hem kısa hem de uzun vadede beş kripto-paranın tamamında önemli belirleyici olduğunu belirlemiştir. Ayrıca kripto paranın popülaritesinin uzun vadede fiyat üzerinde etkili olduğunu ve bu durumun kripto paranın çekiciliğinin oluşmasının zaman faktörüne bağlı olduğunu belirtmiştir.

Sonuç

2009 yılından bu yana, sektörün lider kripto parası olan ve geleneksel ekonomi ve bankacılık sistemlerine tamamen zıt bir sistemle çalışan Bitcoin, 2017 yılının sonlarına doğru rekor bir artış yaşamış ancak çok hızlı kazandığı bu değeri çok daha hızlı bir şekilde kaybetmiştir. Bitcoin fiyatlarının aşırı oynaklığı medyadan ve akademik çevreden ciddi bir ilgi toplamıştır. Akademisyenler kripto para birimine akın etmişler ve ampirik analizler yapmışlardır. Ne yazık ki, bu ampirik çalışmaların sonuçları tutarsız olmuştur, bu da Bitcoin'in fiyat dalgalanmalarını etkileyen faktörler hakkında kesin sonuçlar çıkarmayı zorlaştırmıştır. Çalışmalarda farklı değişkenler farklı sonuçlar verebiliyorken, aynı değişkeni kullanan çalışmalarında farklı sonuçlara ulaştığı görülmüştür. Bu durum Bitcoin'in yeni olduğu için stabilleşmediğini, fiyatının oturması için zaman ihtiyacı olduğunu göstermektedir.

Son yaşanan ekonomik gelişmelere baktığımızda Amerikan'ın baskı aracı olarak doları kullanması, gelişmiş ve gelişmekte olan ülkeleri önemli derecede rahatsız etmiştir. Özellikle Amerika'nın Türkiye'ye uygulamış olduğu ekonomik ambargo, küresel boyutta tepki çekmiş ve doların artık uluslararası ticarette ne kadar güvenilir bir döviz olduğu sorgulanmaya başlanmıştır. Bu durum ülkeleri uluslararası ticarette dolardan farklı bir para birimine yönelmeye sevk etmiştir. Buradan hareketle bugün aşırı fiyat dalgalanmaları ve arkasında merkezi bir otoritenin olmaması nedeniyle kripto para biriminin ülkeler arası ticarette bir değişim aracı olarak kullanılmaması, gelecekte uluslararası piyasalarda dolara alternatif bir para birimi olarak kullanılmayacağı anlamına gelmemektedir.

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REEXAMINING THE RETURNS TO EDUCATION AND WAGES IN TURKEY: SUPERVISED MACHINE LEARNING METHODS

Ebru Çağlayan Akay[1], Melek Astar[2], Kadriye Hilal Topal[3]

Abstract

Wage and its determinants have been widely examined in the empirical economics. One of most popular wage equation is called standard Mincer wage equation which plays a central part in the literature devoted to the returns to education. Standard Mincer wage equation explains wage income as a function of education (schooling) and experience. Some researchers have extended this equation by adding new variables in their analysis. The question of which variables are included in the equation is very important. Aim of the study is to examine how the supervised machine learning methods help us to select the relevant variables and to achieve a better performance in predicting wages. For this aim, variables of extended Mincer equation were reanalyzed and the prediction performance of the wages were examined using several supervised machine learning methods such as Least Absolute Shrinkage and Selection Operator, Elastic Net, Regression Trees and Support Vector Regression beside classical regression. In the study, all these machine learning methods were applied for both Turkish men and women employees, separately.

Supervised machine learning methods are not yet commonly used in empirical economics and econometrics. This study may give us an example how the machine learning algorithms work in microeconomic data. The findings of the study indicate that Support Vector Regression outperforms other methods apparently.

Keywords: *Machine learning, econometrics, wage, education, SVR, Lasso, Regression Tree*

Introduction

The theoretical approach underpinning most human-capital oriented empirical studies to analyse wage determinants were put forward by Mincer (1974). This approach is called Mincer wage equation. The logarithm of wages is modelled as the sum of years of education and quadratic function of years of potential work experience in standard Mincer wage equation. Standard Mincer equation has a limited number of variables: wages, education and experience. This equation has been diversified by some researchers with many different variables that may affect wages. The question of which variables enter in wage equation is very important. Variable selection plays an important role in analysis. Because of adding too many redundant variables into the regression model can lower the prediction accuracy.

1 (Marmara University), ecaglayan@marmara.edu.tr
2 (Fatih Sultan Mehmet Vakif University), mastar@fsm.edu.tr
3 (Nisantasi University), hilal.topal@nisantasi.edu.tr

This study examines how the machine learning methods help us to select the relevant variables and to achieve a better performance in predicting wages. It is supported by The Scientific and Technological Research Council of Turkey (TUBITAK, Project No: 1059B191601450).

The machine learning methods can improve the prediction performance of the build model and reduce the model complexity. Up until the last few years, machine learning has not been very popular among applied economists and econometricians. But nowadays, many researchers are more interested in machine learning algorithms and data-driven approaches in econometrics, even if the scope and purpose in machine learning are different. Using the Turkish Household Labor Force data, we reanalyzed extended Mincer Wage Equation and examines the prediction performance of the wages. We used several supervised machine learning methods such as Least Absolute Shrinkage and Selection Operator (hereafter LASSO), Elastic Net, Regression Trees and Support Vector Regression (hereafter SVR) beside Linear Regression.

In recent years, it has been observed that there is some interesting and new literature available about machine learning in empirical economics and econometrics. Beside the developing literature, meeting and conferences organized during the last few years signal sparked interest in machine learning in the field of econometrics. In the literature, there are many studies which examine the determinants of the Mincer wage equation using different econometric methods. However, there are only a few studies which analyze the wage equations using machine learning methods. For example; Zambrano et al. (2015), Yonas et al.(2017), Abadie and Kasy (2017), Barbosa and Guimaraes (2015), Alatrista-Salas et al. (2017), Jiang et al. (2017) among others. Some of the papers are still work-in-progress.

This paper is organised as follows. Section 2 introduces the Mincer wage equation and machine learning methods, and Section 3 describes the data. Section 4 presents all estimation results and interpretations and Section 5 concludes.

Mincer Wage Equation and Machine Learning Methods

The Mincer wage equation explains wage income as a function of education and experience. The Mincer (1958, 1974) model specifies as follows:

$$y = f(s,e) = \alpha_0 + \rho_s s_i + \beta_0 e_i + \beta_1 e_i^2 + \varepsilon_i \qquad (1)$$

where y denotes wages, s is years of schooling, e is years of work experience and ε is a mean zero residual with $E(\varepsilon|s,e) = 0$. ρ_s is the rate of return to education. β_0 and $\beta_1$can be interpreted as the returns to experience. It is common way is to estimate the parameters of equation (1) by using ordinary least squares (OLS) method. The OLS model estimates are obtained by minimizing the residual sum of squares ($RSS(\beta)$),

$$\min_{\beta \epsilon \mathbb{R}^p} \sum_{i=1}^{n} (y_i - x_i^T \beta)^2 \iff \min_{\beta \epsilon \mathbb{R}^p} \|y - x\beta\|_2^2 \qquad (2)$$

where $x \epsilon \mathbb{R}^{nxp}$ denotes the regressors matrix, and $y \epsilon \mathbb{R}^n$ the outcome vector. The value that minimizes this function $\hat{\beta}$, is often a good estimator of β. OLS often does poorly in both prediction and interpretation. Thus, penalized techniques have been proposed to improve the performance of OLS. Penalized techniques applied to linear regression help us to select the most relevant regressors, x, to predict an outcome y. Penalization is used to prevent overfitting the model to training data. Popular penalized methods of machine learning algorithms are LASSO and elastic net. In the recent years, these methods are becoming particulary popular in empirical economics.

LASSO which was first introduced by Tibshirani (1996) creates a regression model that is penalized with the L1-norm which is the sum of the absolute coefficients. The Lasso shrinks the OLS estimator $\hat{\beta}_{OLS}$ towards zero and potentially sets $\hat{\beta}_j = 0$ for some j. Thus it performs as a variable selection operator (Fu,1998). The Lasso coefficients, $\hat{\beta}_{lasso}$, minimize the quantity $\left(RSS + \lambda \sum_{j=1}^{p} |\beta_j|\right)$ as follows:

$$\min_{\beta \in \mathbb{R}^p} \sum_{i=1}^{n} (y_i - x_i^T \beta)^2 + \lambda \sum_{j=1}^{p} |\beta_j| \Leftrightarrow \quad \min_{\beta \in \mathbb{R}^p} \|y - x\beta\|_2^2 + \lambda \|\beta\|_1 \qquad (3)$$

where λ is a tuning (penalty) parameter and $|\boldsymbol{\beta_j}|$ is a ℓ_1 Lasso penalty. The first term is the usual error sum of squares and would be minimized at the OLS estimator for β in the absence of the second term. The second term is a term that imposes a penalty for differences between the estimated coefficients and zero. The use of the ℓ_1 penalty causes a subset of the solution coefficient $\hat{\beta}_j$ to be exactly zero, for sufficienty large value of the tuning parameter λ.

The Elastic Net method bridges the LASSO method and ridge regression and creates a regression model that is utilized with both the L1 and L2 penalties of LASSO and Ridge, respectively. This method proposed by Zou and Hastie (2005) is a regularization procedure for linear regression that also performs variable selection. This Elastic net solves the following optimization problem:

$$\min_{\beta} \{ \|Y - X\beta\|_2^2 + \lambda_2 \|\beta\|_2^2 + \lambda_1 \|\beta\|_1 \} \qquad (4)$$

Elastic net has two parameters λ and α. The regularization parameter, λ, functions the same as with Ridge and Lasso. The parameter α bridges between Ridge and Lasso. If $\alpha = 1$, the equation equals to Lasso, and if $\alpha = 0$ the equation equals to ridge.

There are also different machine learning algorithms to determine the relevant variables and to predict the wages. In the study, we also applied Regression Trees and SVR which are less known in the econometrics literature.

Regression Tree is a tree where each node represents a feature, each branch represents a decision and each leaf represents an outcome (continues value). It is commonly used with the objective of creating a model that predicts the value of a dependent variable based on the values of several variables to represent conditional hierarchy of a given system. Regression Tree is well established model that not only offers good predictive performance, but also provides rich regressors importance information. There are many methodologies for constructing regression tree but one of the oldest is known as the **C**lassification **A**nd **R**egression **T**ree (CART) approach developed by Breiman et al. (1984). *Regression tree* partitions a data set into smaller groups and then fit a simple model for each subgroup

Support Vector Regression (SVR) was developed by Vapnik (1995) is a version of Support Vector Machine. In SVR, the goal is to find a function $f(x_i)$ that has at most ϵ deviation from the actually obtained targets y_i for all the training data x_i, and at the same time as flat as possible. The case of linear function f has been described in the form as,

$$f(\boldsymbol{x}) = \langle \boldsymbol{w}, \boldsymbol{x} \rangle + b$$

where $\boldsymbol{w}, \boldsymbol{x} \in \mathbb{X}$ and $b \in \mathbb{R}$. For flatness, one way is to minimize $\boldsymbol{w}$ by minimizing $\frac{1}{2}\|\boldsymbol{w}\|^2$. This can be written as a convex optimization problem as follows:

$$\text{minimizing} \quad \frac{1}{2}\|\boldsymbol{w}\|^2$$
$$\text{subject to} \quad |y_i - f(x_i)| \leq \epsilon \Leftrightarrow \begin{cases} y_i - \langle \boldsymbol{w}, \boldsymbol{x}_i \rangle - b \leq \epsilon + \xi \\ \langle \boldsymbol{w}, \boldsymbol{x}_i \rangle + b - y_i \leq \epsilon + \xi^* \end{cases} \quad (5)$$

SVR seeks to minimize the ϵ-insensitivity loss function, which tolerates data points that have error within ϵ. The use of ϵ will directly affect the number of data points used to build the function. ξ and ξ^* denote the slack variables to be on wrong side of marjin boundered by ϵ. SVR relies on kernel functions to construct the model. One of the advantages of SVR is that its computational complexity does not depend on the dimensionality of the input space. The other one is that it has excellent generalization capability, with high prediction accuracy.

Data and Variables

In the study, determinants of the Mincer equation in Turkey were analyzed for both men and women employees separately. The data was obtained from Turkish Household Labor Force contacted by Turkish Statiscal Institute in the year 2016. The employees who did not work in the survey year were deleted. So data on 28613 men and 11613 women employees were analysed and 56 different variables are examined using Machine learning methods. All of the methods used are supported in the open source software package R.

The observations were randomly split into training and test data sets with the conventional ratio of 80:20. The training data was used for model construction, and the test data was for model evaluation and generalization. We applied repeated k-fold cross validation to estimate performance of the learned model from available data using one algorithm and to compare the performance of different algorithms and find out the best algorithm for the available data.

Results of the Analysis

In our analysis, four different supervised machine learning techniques (Lasso Regression, Elastic Net, Tree Regression and Support Vector Regression) are used beside linear regression to fitted the data in the training data set and then out-of-sample predictions are made on the validate set. Finally, fitted models are used to predict in the test data set, and use the weights from validate set to prediction. In the study, the results were performed by using "5" repeated "k=10" fold cross validation and different hyperparameter values were examined for these models. Lambda value for Lasso Regression, lambda and alpha value for Elastic Net Regression, number of trees for Random Forest Regression, epsilon value for Support Vector Regression were determined as hyperparameter values. We also used standard error measures like the Mean Square Error (MSE), Mean Absolute Error (MAE), and R-squared for model comparison. The selected variables as relevant and important in the all models were listed in an Appendix. We were not able to present the all of our findings because of the restricted pages. All the results are available from authors upon request.

Linear regression is a typical approach to estimate wage equations. Table 1 shows the results of linear regression model (for both men and women employees) where only statistically significant coefficient are displayed.

Table 1: Estimation Results of Linear Regression

	MEN		WOMEN	
Variable	*Coefficient*	*Std. Error*	*Coefficient*	*Std. Error*
Education	0.1901	0.0034***	0.2340	0.0054***
Experience	0.0650	0.0031***	0.2489	0.0138***
Experience Square	0.0268	0.0038***	-0.1456	0.0132***
Working Hours	0.0221	0.0029***	0.0641	0.0132***
Zone	0.0601	0.0050***	0.0355	0.0087***
Birth Place	0.0573	0.0172***		
Dwelling Birth Place	-0.0960	0.0051***	-0.1237	0.0088***
Proximity	0.0906	0.0086***	0.1629	0.0138***
Continue Education	-0.1028	0.0080***	-0.1087	0.0121***
Course	-0.1006	0.0211***	-0.1045	0.0267***
Marital Status	0.0750	0.0087***	0.1229	0.0099***
Sector	-0.2496	0.0070***	-0.2532	0.0103***
Company Scale	-0.1051	0.0052***	-0.0754	0.0091***
Administrative Resposibility	0.2439	0.0094***	0.2788	0.0192***
Insurance	0.3292	0.0075***	0.4356	0.0140***
Manner of Work	0.6838	0.0160***	0.5912	0.0191***
Extra Work	-0.0850	0.0112***		
Extra working Hours	-0.0272	0.0131***		
Wishing for Extra Work	-0.0671	0.0153***	-0.1607	0.0302***
Freelance	-0.1101	0.0425***	-0.2043	0.0212***
Adjusted R-Squared	0.6014		0.6653	

We estimated LASSO and Elastic Net regression by cross validation method to avoid overfitting problems. We limited the maximum number of steps to 100 for the purpose of demonstration because it takes significantly longer to converge if the number of steps is larger. The results of Lasso and Elastic Net Regression are given in Table 2.

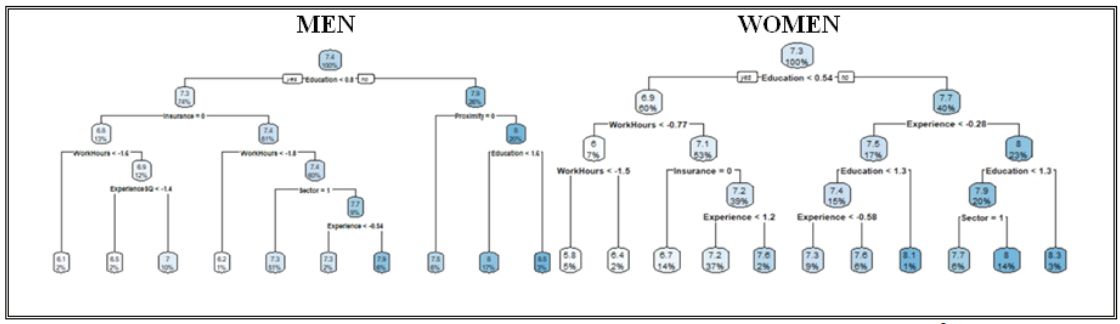
Table 2: Non-zero Coefficients in LASSO and Elastic Net Regression

VARIABLES	MEN		WOMEN	
	LASSO	Elastic Net	LASSO	Elastic Net
(Intercept)	6.5939	6.5953	6.5466	6.5466
Education	0.1888	0.1876	0.2340	0.2340
Experience	0.0655	0.0658	0.2383	0.2383
Experience Square	0.0253	0.0246	-0.1348	-0.1348
Working Hours	0.0206	0.0208	0.0629	0.0629
Zone	0.0584	0.0587	0.0344	0.0344
Birth Place	0.0510	0.0535	0.0085	0.0085
Dwelling birth Place	-0.0952	-0.0958	-0.1234	-0.1234
Proximity	0.0913	0.0917	0.1614	0.1614
Continue Education	-0.1016	-0.1021	-0.1079	-0.1079
Course	-0.0947	-0.0966	-0.1025	-0.1025
Marital Status	0.0748	0.0751	0.1227	0.1227
Sector	-0.2476	-0.2476	-0.2520	-0.2520
Company Scale	-0.1041	-0.1045	-0.0752	-0.0752
Administrative Resposibility	0.2421	0.2428	0.2775	0.2775
Insurance	0.3285	0.3278	0.4361	0.4361
Manner of Work	0.6853	0.6821	0.5930	0.5930
Extra Work	-0.0815	-0.0826	0.0220	0.0220
Extra working Hours	-0.0246	-0.0262	-0.0350	-0.0350
Wishing for Extra Work	-0.0633	-0.0650	-0.1593	-0.1593
Freelance	-0.0948	-0.1000	-0.1990	-0.1990

(i) In Elastic Net Regression α=0.11 and λ=0.0001 for men; α=1 and λ=0.0001 for women.
(ii) α=1 for LASSO Model.

In the Table 2. non-zero coeffcients were presented for both regressions. According to the table, we can see that LASSO and Elastic Net did not differ much for select the variables. Since the optimal lambda value was optained equal to 1 in the Elastic net regression, the results of both LASSO and Elastic net regression were found same for the wage equation of women.

Prediction trees use the tree to represent the recursive partition. Each of the terminal nodes, or leaves, of the tree represents a cell of the partition, and has attached to it a simple model which applies in that cell only. Figure 1 shows results of regression trees which predict the logaritmic wages.



Notes: Tree hyper-parameter was selected using three different criteria: RMSE, MAE and R^2. The results are: minRMSE=0.372, minMAE=0.263, maxR^2=0.573 and Cp=0.01038933 (for men); minRMSE=0.412, minMAE=0.261, maxR^2=0.638 and Cp=0.0066123 (for women).

Figure 1: Results of Regression Tree

The complexity parameter (Cp) is important to selecting the optimal tree size and controlling the size of the regression tree. The repeated 10-Fold cross validation method were used to obtain the Cp. The Cp values were 0.01038 and 0.006612 for men and women, respectively. RMSE, MAE and R-squared were used to select the optimal model. The prediction function takes the form of a tree that splits in two at every node. The interior nodes are labeled with questions, and the edges or branches between them labelled by the answers.

When we analyzed the importance of the variables, expecially education, work hours, experience, insurance and sector variables were found as important variables in determining logarithmic wages of both male and female employees. But, proximity variable was found as important variable only for wages of women.

The goal of SVR is to obtain a function with a maximum margin value that encompasses the maximum point. This method relies on kernel functions to construct the model. In the study four different kernel functions (Linear Kernel, Radial Kernel, Sigmoid Kernel and Polynomial Kernel) were examined for optimization and RMSE, MAE and R-squared values were used to select the optimal function. As result, radial kernel function (gamma=0.05) selected in the analysis. Thus, SVR models with radial kernel and C sets to 2 have the highest R-square score which are 0.71 (0.65) for men and 0.78 (0.72) for women. Two error rates are lowest with using radial SVR for both men and women employees. The lowest RMSE values are 0.304(0.326) and 0.321(0.348) and MAE values are 0.212 (0.227) and 0.202 (0.221) for men and women, respectively. Paranthesis shows the value of test data samples and others are the value of training data sample. The Figure 2 shows the performance of SVR with radial kernel function.

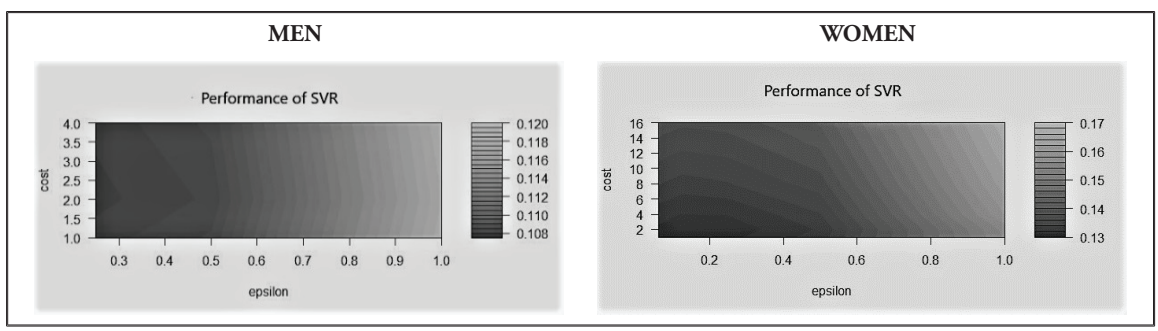


Figure 2: Performance of SVR (Radial Kernel Function)

When the parameter graph of the kernel function is examined, it is necessary to evaluate the most intense region of the graph in the cost and epsilon values of the function. Because of the darkest region where the lowest MSE obtained in, epsilon=0.25 and cost=2 are selected optimum parameters of men and epsilon= 0.125 and cost=2 selected optimum parameters of women for Radial SVR model. Typically only a partial set of the variables are assigned a non-zero value in SVR.

The comparison of all these five models (one of them is linear regression and four of them are in the context of supervised machine learning) are examined in the study were tabulated in Table 3.

Table 3: Model Comparison: Different Algorithms in Predicting Wages

MEN						
	Training Sample			*Test Sample*		
Method	*RMSE*	*MAE*	*R-squared*	*RMSE*	*MAE*	*R-squared*
Linear Regression	0.3594041	0.2594767	0.6009941	0.3530162	0.2558262	0.5971368
LASSO	0.3594150	0.2593005	0.6009736	0.3530150	0.2556537	0.5971397
Elastic Net	0.3594129	0.2592928	0.6009842	0.3529953	0.2556292	0.5971845
SVR	0.3042737	0.2120893	0.7140033	0.3263986	0.2271173	0.6555986
Regression Tree	0.3715627	0.2628168	0.5733133	0.3767182	0.2658100	0.5412233
WOMEN						
	Training Sample			*Test Sample*		
Method	*RMSE*	*MAE*	*R-squared*	*RMSE*	*MAE*	*R-squared*
Linear Regression	0.3970486	0.2799047	0.6649352	0.3865323	0.2726522	0.6597341
LASSO	0.3971676	0.2797767	0.6647352	0.3864723	0.2723858	0.6598398
Elastic Net	0.3971676	0.2797767	0.6647352	0.3864723	0.2723858	0.6598398
SVR	0.3219410	0.2019392	0.7795204	0.3482663	0.2212096	0.7237707
Regression Tree	0.4124218	0.2607588	0.6382014	0.3767593	0.2375329	0.6767230

Notes: (i) In the LASSO and Elastic Net Methods, penalty parameters, λ, were optained by k-fold cross validation; k was chosen as 10.
(ii) In the SVR model kernel function is was chosen as a radial kernel.

According to measures of RMSE, MAE and R-squared, we could see that the proposed SVR method outperforms other method apparently. The results, SVR produced better out-of-sample fits than other models. Regression trees had the worst performance to predict the wages, while Elastic Net Regressions revealed a good performance after the SVR.

Conclusion

The Mincer wage equation is a genuinely valuable tool for a wide-ranging group of researchers and policymakers. The standard Mincer wage equation uses a limited number of variables which are wages, education and experience. Researchers generally want to add many other variables in their models for determining educational return estimates and for prediction of wages. Machine learning methods can help us to select the relevant variables and to achieve a better performance in predicting wages. In the study, we found that return to education and return to experience are key parameters in wage equations. Beside these variables, other relevant variables was also selected using Lasso, Elastic Net, Regression Tree and SVR. The finding of this study indicates that SVR method has been proposed to build a stable and accuracy wage regression model via variable selection. It also shows that Elastic Net Regression has a good performance for prediction of wages.

Machine learning methods are not yet commonly used in empirical economics and econometrics. However, these methods can be useful in preprocessing and imputing in analyzing of economic data even if the scope and purpose in machine learning are different from econometrics.

Appendix

VARIABLE	DEFINITION
Log(wages)	Natural logarithm of monthly wage
Education	The number of years spent at school
Experience	Difference between current and commencement of employment year
Experience Square	Square of the difference between current and commencement of employment
Working Hours	Weekly working hours
Zone	1 if dwelling region is in Marmara, otherwise 0
Birth Place	1 if birth place in Turkey, otherwise 0
Dwelling Birth Place	1 if birth place and home city are the same, otherwise 0
Proximity	1 if head of household, otherwise 0
Continue Education	1 if ongoing to the education , otherwise 0
Course	1 if participant of a course, otherwise 0
Marital Status	1 if married, otherwise 0
Sector	1 if private sector, otherwise 0
Company Scale	1 if small/medium scale, otherwise 0
Administrative Responsibility	1 if has an administrative responsibility, otherwise 0
Insurance	1 if has a social insurance, otherwise 0
Manner of Work	1 if working full time, otherwise 0
Extra Work	1 if has an extra work, otherwise 0
Extra working Hours	1 if wishing to work longer than weekly working hours, otherwise 0
Wishing for Extra Work	1 if looking for a extra work, otherwise 0
Freelance	1 if working full time, otherwise 0

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8

STOCK MARKET INTEGRATION: EVIDENCE FROM BRICS COUNTRIES

Merve Karacaer-Ulusoy[1], Seda Ekmen Özçelik[2]

Abstract

In this paper we investigate both the long-run and short-run relations between the share prices of BRICS countries (Brazil, Russia, India, China and South Africa) for the period January 1999 to August 2018. We employ unit root tests; the Augmented Dickey–Fuller (ADF) and the Philips–Perron (PP), Johansen cointegration test, and Pair-wise Granger causality test in order to analyze both the long-run and short-run relations between the related variables. Our empirical results indicate that there is a uni-directional causality from Brazil to Russia and India, from China to Brazil, from Russia to India and China, from South Africa to Russia and India, where as there is a bi-directional causality only between China and South Africa. We do not find any causal relationship between Brazil- South Africa.

Keywords: stock markets, cointegration, pair-wise granger causality, international portfolio diversification, BRICS countries

1. Introduction

According to the finance theory; it is possible to obtain potential gains from international portfolio diversification if the returns of different national stock markets are not perfectly correlated with each other. As a result, many academicians and investors study the correlation structure and interdependencies among international share price indexes (Chen et al., 2002). Many studies have focused on the integration or segmentation of major world stock markets. This study differs from earlier studies since it focuses on the examination of stock market linkages in 5 emerging markets. In this regard, we investigate the extent to which index returns are independent of one another in BRICS countries.

BRICS is an abbreviation derived from the first letters of the five important emerging market economies (Brazil, Russia, India, China and South Africa). We choose BRICS countries because those countries play a leading role in the global economy in the sense that they are all fast-growing emerging market economies that are rapidly industrializing and also, they have significant impacts on regional and global relations. The common features of these five countries are (1) they are emerging, fast-growing economies in the path of industrialization among the emerging market economies, (2) have significant impacts on regional and global relations, (3) they are all G20 members. BRICS countries are world's fastest growing economies in terms of GDP growth. They represent more than 40% of the world's population and roughly 20% of the global economy. It is unquestionably considered by many sectors that these five countries will have a growing share in the world economy, and thus the position of these five countries in the direction of the economy is important.

1 (Ankara Yildirim Beyazit University), mkaracaer@ybu.edu.tr
2 (Ankara Yildirim Beyazit University), sekmen@ybu.edu.tr

The remainder of this paper is organized as follows. First, we give a brief review about the previous studies. In Section 3, we introduce our data and methodology. Section 4 reports some preliminary statistical analyses including autocorrelation and correlation analysis, the unit root, Johansen multivariate cointegration and Pairwise Granger causality tests. Section 5 provides the main empirical findings of our analysis. Section 6 concludes the paper.

2. Literature Review

Previous studies analyze the interrelationship between the stock market prices of many countries or country groups. The empirical findings of these studies indicate multidirectional relationships due to the different market structures, the sample period chosen, the frequency of the variables and the methodologies chosen. For example, Huang, Yang and Hu (2000) investigated both short and long-run relationships among USA, Japan, China, Hong Kong and Taiwan stock markets for the period 1992-1997. They did not find any long-run relationship among these markets. Click and Plummer (2005) investigate the stock market integration among ASEAN-5 countries by using cointegration method and find that the stock market of ASEAN-5 countries are integrated. The authors indicate that investors can reduce risks with diversification but cannot eliminate all the risks. Voronkova (2004) examines whether there are long-run relations between the stock markets of emerging Central European and the stock markets of Europe and the United States. The author concludes that the Central European stock markets are integrated with each other and have become more integrated with global markets. Rajiv et al. (2009) investigate whether stock markets of India have any relation with the stock markets of China, Singapore, America and Hong-Kong by using Engle-Granger test of cointegration. Their results suggest that there is no cointegaration between Indian and American stock markets, no cointegration between Indian and Hong Kong stock markets, but there is cointegration between Indian and Singapore stock markets and also between Indian and China stock markets. Chittedi (2010) examines the integration of the wstock market indices among the BRIC countries and also their integration with three developed countries, which are the United States, the United Kingdom and Japan by using Granger causality test. The results support the cointegration relationship between the BRIC countries and the three developed countries. Fahami (2011) also investigates the linkages and the causality between BRIC and three developed countries; the United States, the United Kingdom and Japan by using Johansen Juselius cointegration and Granger causality tests. The findings suggest that all the stock markets under study are cointegrated in pre-crisis, during crisis and post crisis period. Gupta and Guidi (2012) analyze the link among the Indian stock market and three developed Asian markets, which are Hong Kong, Japan and Singapore by using cointegration analysis. Their results support a short-run relationship while they do not support any long-run relationship among these markets. Sharma et al. (2013) study the linkages among the stock markets of BRICS countries by using Granger causality and impulse response techniques. Their results suggest that stock markets of BRICS countries are integrated by each other but not a great extent; which means diversification opportunities exist.

3. Data and Methodology

The conducted empirical study uses the monthly time series data among stock market indices of BRICS countries. Depending on the availability of data, monthly data are collected for the period from January 1999 to August 2018. The data on stock markets of BRICS countries have been collected from OECD database. The stock market indices that are used in this study are BOVESPA for Brazil, MICEX for Russia, SENSEX for India, SHANGHAI for China and KOSPI for South Korea.

In the first step of our analysis we performed two commonly used unit root tests; Augmented Dickey Fuller (ADF, 1979) and Phillips-Perron (PP, 1998) in order to test the stationary of variables. Once the unit root test results show that all variables are integrated at first degree I(1), we proceed to our second step; the cointegration test. We apply the Johansen (1988) cointegration test where results are determined by both the and trace and Max-Eigenvalue statistics. Since the method is sensitive to the lag length we use the Akaike Information Criterion (AIC) to determine the appropriate number of lag which is commonly used in the literature (Table 3). Furthermore, in order to check for the autocorrelation of the variables the Lagrange Multiplier (LM) test is performed. Results of trace and max-eigenvalue statistics generally support each other and produce little contradiction. However, we give more importance to trace statistic as the trace statistic considers all of the smallest eigenvalues, it holds more power than the max-eigen value statistic. (Kasa, 1992; Serletis and King, 1997). Moreover, Johansen and Juselius (1990) suggest the use of trace statistic when the results of two test provide contradiction.

The evidence of a co-integrating relationship implies causality in at least one direction. We evaluate Granger (Engle and Granger, 1987) causality through a pairwise Granger causality test as short-run causal relationship to implement the direction of the casual relationship between any two variables that are stationary.

4. Empirical Results

4.1. Correlation

Table 1 presents the correlation matrix of stock market indices of the BRICS countries. According to the table nearly all the BRICS countries' pairwise correlations seem to be high. For example, the correlation is 0.9795 for India-South Africa, 0.9261 for Brazil-Russia, 0.9179 for Russia-India, 0.8987 for Russia-South Africa, 0.8716 for Brazil-India, 0.8264 for Brazil-South Africa, 0.7221 for Russia-China, 0.7040 for Brazil-China and 0.6285 for China-South Africa. While India-South Africa and Brazil-Russia tend to have very high correlations, China-South Africa tend to have relatively low correlations.

Table 1. Correlation matrix

	BRA	RUS	IND	CHN	ZAF
BRA	1				
RUS	0.9261	1			
IND	0.8716	0.9179	1		
CHN	0.7040	0.7221	0.6734	1	
ZAF	0.8264	0.8987	0.9795	0.6285	1

Note: Bra, Rus, Ind, Chn and Zaf represent the stock market indices of Brazil, Russia, India, China and South Africa respectively.

4.2. Unit root test

Table 2 shows the results of the both ADF and PP tests. Both of the test results indicate that all variables are integrated at order 1, I(1), which means they become stationary after first differencing.

Table 2. ADF and PP unit root test results

Variables	**ADF test (level)**		**PP test (level)**	
	intercept	trend and intercept	intercept	trend and intercept
lnbra	-1.574 [0.4940]	-1.916 [0.6425]	-2.197 [0.2079]	-2.341 [0.4097]
lnrus	-2.963 [0.0399]**	-3.178 [0.0912]*	-3.505 [0.0086]***	-3.474 [0.0446]**
lnind	-2.249 [0.1893]	-2.052 [0.5702]	-2.225 [0.1977]	-2.059 [0.5664]
lnchn	-2.978 [0.0384]	-3.542 [0.0373]	-2.405 [0.1414]	-2.762 [0.2129]
lnzaf	-1.168 [0.6883]	-2.244 [0.4621]	-1.269 [0.6439]	-2.088 [0.5490]
Variables	**ADF test (first difference)**		**PP test (first difference)**	
	intercept	trend and intercept	intercept	trend and intercept
lnbra	-10.295 [0.000]***	-10.301 [0.000]***	-10.975 [0.000] ***	-10.964 [0.000] ***
lnrus	-10.641 [0.000] ***	-10.793 [0.000] ***	-10.561 [0.000] ***	-10.761 [0.000] ***
lnind	-17.287 [0.000] ***	-17.332 [0.000] ***	-17.436 [0.000] ***	-17.463 [0.000] ***
lnchn	-10.208 [0.000] ***	-10.213 [0.000] ***	-10.482 [0.000] ***	-10.488 [0.000] ***
lnzaf	-11.558 [0.000] ***	-11.562 [0.000] ***	-11.508 [0.000] ***	-11.513 [0.000] ***

,,*** represent the statistical significance levels of 10%, 5% and 1% respectively.*
[ ] MacKinnon (1996) one-sided p values.

4.3. Cointegration test

The results of trace and max-eigenvalue tests presented in Table 4 and display that there exists a two-way co-integration vector between the stock market indices of Brazil-Russia and Russia-China, where as a single co-integration vector between Brazil-China, Russia-India, Russia-South Africa, India-China and China-South Africa. There is no long-run relationship between Brazil-India, Brazil-South Africa, and India-South Africa.

Table 3. The lag order selection criteria for VAR model

Endogenous Variables	**LM-Stat**	**Prob**	**Lag**	**LogL**	**LR**	**FPE**	**AIC**	**SC**	**HQ**
lnbra lnrus	2.360	0.6697	3	631.9126	15.13292	1.38e-05*	-5.517077*	-5.303849	-5.431008*
lnbra lnind	4.896	0.2981	2	704.9004	36.70446*	6.93e-06	-6.204468	-6.052162*	-6.142990*
lnbra lnchn	3.333	0.5037	5	656.2562	20.65082*	1.19e-05*	-5.663002*	-5.327929	-5.527750
lnbra lnzaf	6.135	0.1892	2	793.6132	38.65751*	3.14e-06*	-6.996546*	-6.844240*	-6.935068*
lnrus lnind	2.296	0.6814	5	648.6859	9.274277	1.27e-05*	-5.595410*	-5.260337	-5.460158
lnrus lnchn	6.615	0.1576	5	608.7014	23.37102	1.82e-05*	-5.238405*	-4.903333	-5.103154
lnrus lnzaf	7.376	0.1173	3	730.2174	11.65261	5.73e-06*	-6.394798*	-6.181570	-6.308729
lnind lnchn	4.700	0.3195	5	674.9585	19.98042*	1.01e-05*	-5.829986*	-5.494914	-5.694735
lnind lnzaf	3.673	0.4266	2	807.0511	37.64794	2.78e-06*	-7.116528*	-6.964222*	-7.055050*
lnchn lnzaf	3.277	0.5125	5	754.2342	23.46459*	4.96e-06*	-6.537805*	-6.202733	-6.402554

*Notes: * indicates lag order selection by criterion, LR: sequential modified LR test statistic, FPE: final prediction error, AIC: Akaike information criterion, SC: Schwarz information criterion, HQ: Hannan-Quinn information criterion*

Table 4. Johansen Cointegration Test Results

	Hypothesis	Eigen Value	Trace statistics	Prob	Max-Eigen Value	Prob
lnbra-lnrus [3]	H_o: r=0	0.043076	15.74597**	0.0458	10.21537	0.1982
	H_1: r≤1	0.023557	5.530598**	0.0187	5.530598**	0.0187
lnbra-lnind [2]	H_o: r=0	0.031576	7.778237	0.4894	7.475828	0.4345
	H_1: r≤1	0.001297	0.302409	0.5824	0.302409	0.5824
lnbra-lnchn [5]	H_o: r=0	0.053117	14.96074*	0.0600	12.55328*	0.0916
	H_1: r≤1	0.010413	2.407463	0.1208	2.407463	0.1208
lnbra-lnzaf [2]	H_o: r=0	0.020970	6.462009	0.6409	4.938026	0.7496
	H_1: r≤1	0.006519	1.523983	0.2170	1.523983	0.2170
lnrus-lnind [5]	H_o: r=0	0.055912	14.59172*	0.0681	13.23332*	0.0723
	H_1: r≤1	0.006274	1.358398	0.2438	1.358398	0.2438
lnrus-lnchn [5]	H_o: r=0	0.059261	19.70034**	0.0109	14.05070*	0.0540
	H_1: r≤1	0.024264	5.649636**	0.0175	5.649636**	0.0175
lnrus-lnzaf [3	H_o: r=0	0.057297	15.82090**	0.0447	13.68903*	0.0615
	H_1: r≤1	0.009147	2.131871	0.1443	2.131871	0.1443
lnind-lnchn [5]	H_o: r=0	0.065811	16.01334**	0.0418	15.65758**	0.0299
	H_1: r≤1	0.001546	0.355765	0.5509	0.355765	0.5509
lnind-lnzaf [2]	H_o: r=0	0.040450	10.02252	0.2790	9.620711	0.2381
	H_1: r≤1	0.001723	0.401808	0.5262	0.401808	0.5262
lnchn-lnzaf [5]	H_o: r=0	0.070641	17.68549**	0.0230	16.84981**	0.0191
	H_1: r≤1	0.003627	0.835687	0.3606	0.835687	0.3606

*Notes: MacKinnon-Haug-Michelis (1999) p-values [ ] Lag Length. ***, ** and * denote statistical significance at 1%, 5% and 10% level of respectively.*

4.4. Causality testing

The results of the Pair-wise Granger causality test, which is carried out to determine the direction of causality are presented in Table 5. Our results suggest that there is a uni-directional causality from Brazil to Russia and India, from China to Brazil, from Russia to India and China, from South Africa to Russia and India, where as there is a bi-directional causality only between China and South Africa. There is no causal relationship between Brazil- South Africa.

Table 5. Pairwise Granger Causality Tests Results

Null Hypothesis	F-Statistic	Prob.	Lags	Causal Relation
lnrus does not granger cause lnbra lnbra does not granger cause lnrus	1.016 3.869***	0.3862 0.0100	3	BRA→RUS
lnind does not granger cause lnbra lnbra does not granger cause lnind	1.993 4.305**	0.1385 0.0146	2	BRA→IND
lnchn does not granger cause lnbra lnbra does not granger cause lnchn	2.280** 1.067	0.0477 0.3795	5	CHN → BRA
lnzaf does not granger cause lnbra lnbra does not granger cause lnzaf	0.528 0.640	0.5903 0.5278	2	no causal relationship
lnind does not granger cause lnrus lnrus does not granger cause lnind	1.614 2.208*	0.1572 0.0545	5	RUS→IND
lnchn does not granger cause lnrus lnrus does not granger cause lnchn	0.799 2.412**	0.5513 0.0373	5	RUS→CHN
lnzaf does not granger cause lnrus lnrus does not granger cause lnzaf	2.783** 2.106	0.0417 0.1002	3	ZAF→RUS
lnchn does not granger cause lnind lnind does not granger cause lnchn	1.626 1.911*	0.1541 0.0935	5	IND→CHN
lnzaf does not granger cause lnind lnind does not granger cause lnzaf	2.679* 1.116	0.0707 0.3291	2	ZAF→IND
lnchn does not granger cause lnzaf lnzaf does not granger cause lnchn	2.013* 2.012*	0.0778 0.0780	5	ZAF↔CHN

*Note: ***, ** and * denote statistical significance at 1%, 5% and 10% level of significance respectively.*

5. Conclusion

This study analyzes both the long-run and short-run interactions among the stock market indices of BRICS countries covering the period from 1999.01 to 2018.08 by employing unit root, Johansen cointegration and Pair-wise Granger causality tests. The empirical findings indicate that there are multidirectional relationships. First of all, there exists a long-run relationship between the stock market indices of Brazil-Russia, Russia-China, Brazil-China, Russia-India, Russia-South Africa, India-China, China-South Africa, where as there is no long-run relationship between Brazil-India, Brazil-South Africa, and India-South Africa. Secondly, there is a uni-directional causality from Brazil to Russia and India, from China to Brazil, from Russia to India and China, from South Africa to Russia and India, where as there is a bi-directional causality only between China and South Africa. We do not find any causal relationship between Brazil- South Africa.

The existence of the cointegration relationship would prevent the acquisition of arbitrage and portfolio diversification. As a result, we believe that the findings of this study would guide to investors that would like to invest in stock markets of BRICS countries. In general, our results suggest that investing in BRICS countries' stock markets offers limited risk diversification as the economic structure of these five countries have enough common features that asset pricing across these nations has commonalities. From the perspective of the international portfolio investor,

benefits of international portfolio diversification across the BRICS countries are reduced but not eliminated. As a result, investors wishing to hold diversified portfolios should be careful not to hold shares in all BRICS countries.

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9

DETERMINANTS OF CUSTOMER CHURN IN REAL ESTATE MARKETPLACES

Ozan Senturk[1], Volkan Iset[2]

Abstract

Investments in Turkish real estate market has boosted right after the 2001 financial crisis. With the support of governments, suitable conditions for cheap funding and thus increased demand for housing, the real estate market has expanded considerably. To ease housing transactions, real estate marketplaces such as Sahibinden.com, Hurriyetemlak.com, and Zingat.com have emerged, and they have become important market players in a very short period of time. On one hand, with a subscription-based business model, these marketplaces offer a unique service to real estate offices to exhibit their listings inventory using detailed information about the listing and a lot of photos and attract customers. On the other hand, customers have the chance to check different listings in one place easily. Gathering the supply and demand side around the same table allows the number of housing transactions and the market volume increase at the same time. Market research shows that apart from using these marketplaces, people rarely choose to find suitable housing with traditional means nowadays. Thus, understanding the dynamics and determinants of the relationship between real estate offices and such marketplaces become an important research topic. In this paper we analyze the determinants of customer churns from one of the biggest marketplaces in Turkey. Our results indicate that factors such as intensity of website use, unpaid payments, number of listings, the site's effectiveness for the real estate agents, and some other factors affect the likelihood of churning from the real estate marketplaces.

Keywords: Real Estate Economics, Business Economics, Entrepreneurship, Small Business Economics, Turkish Economy.

Introduction

After the 2001 financial crisis, Turkey's housing sector expanded dramatically due to stable macroeconomic conditions in addition to easy lending opportunities and government support. (Yalciner and Coskun, 2014). It has become one of the major forces behind the Turkish growth. Since the 2000s the share of the construction sector in GDP has continued to increase, and it has increased from the 5% to 7,5% level. Increased levels of real estate activity led to an emergence of another sector i.e. online marketplaces for people to conduct transactions related to real estate. First company in this area was Sahibinden.com which was followed by Hurriyetemlak.com, Milliyetemlak.com, Emlakjet.com and finally Zingat.com. These online marketplaces serve real estate sellers and buyers at the same time by connecting them online. Nowadays, all of the housing transactions happen on these online marketplaces and it is essential to analyze their inner dynamics and their relationships to other marketplace actors such as real estate offices, agents etc.

1 (Zingat.com Research Division), ozan.senturk@zingat.com
2 (Zingat.com Research Division), volkan.iset@zingat.com

Churn management is one of the prioritized issues for most businesses. Retaining an existing customer is usually cheaper than acquiring new ones, thus managing churns is directly linked to profitability of businesses. In various sectors, firms have already developed predictive models to understand the dynamics of customer churn and they can effectively target customers who are more likely to churn. Using this information, they can persuade such customers to stay, and protect their customer base and increase their profitability. Controlling for customer churn is particularly important for subscription-based companies because continuous satisfaction is required to receive monthly payments. The value of company in the eyes of investors also relies on several different metrics including the churn rate because the primary source of income in the future is its customers itself.

In an array of different sectors extensive research has been conducted about churn management. Some examples in the literature that estimate the propensity of churn for customers are: Kisioglu and Topcu (2011), Hung et al. (2006) on telecommunication; Meinzer et al. (2016) on automotive; Gencer et al. (2014) on gaming; Joong et al. (2017) on TV; Moeyersoms and Martens (2015) on energy; Ahn et al. (2006) on banking.

In the literature many different statistical techniques have been used to estimate customer propensity to churn including but not limited to SVMs, Random Forest, Neural Networks, Logistic Regression etc. However, no statistical method is significantly superior to logistic regression. Especially in the corporate world, most of the churn models have been developed using Logistic Regression. Some examples are banking, retail, and e-commerce. Since it is easy to develop models and interpret the results, logistic regression is also used in this research.

Data

The data used in this research is obtained from Zingat.com. According to the number of subscribers, Zingat.com is the third largest marketplace in Turkey right now and it serves nearly to one-fifth of all real estate offices in Turkey. It has been established in 2015 and has sustained continuous growth in the last 3 years. Dataset includes observations between January 2016 and June 2018 and it covers 2.5 years of the firm's history. Observations from 2015 are excluded because a large number of real estate offices were offered free contracts during the first 6 months of the company's creation as part of a marketing strategy. Data includes variables on real estate offices' usage such as number of listings, number of days from the last listing, unpaid payment plans, number of complaints in addition to the effectiveness of Zingat subscription to real estate offices such as the lead per listing ratios which shows the directed traffic from the website to the real estate offices. These indicators show if the subscription is profitable for the offices. High numbers indicate that many people contact these offices and as a result the possibility of housing transaction increases for these offices. If this number is high that shows the website works efficiently for these offices.

All estimations include these variables: *Days with Listing* showing the level of intensity that the real estate office puts listings to marketplace; *Unpaid Payments* showing the number of unpaid payments; *Tenure* showing the number of months that the real estate office has been a subscriber; *Months after Peak* showing the number of months passed from the highest number of listings on the marketplace; *Last Month's # of Listing* showing the number of listings put on the marketplace in the last month; *Days from Last Listing* showing the number of days passed from the last listing on the marketplace; *This Month Lead/Listing* showing the ratio of leads that have been created on the website for the real estate office divided by the number of listings in a given month; *Last 3 Month Lead/Listing* showing the same ratio calculated for the last 3 months; *# of Complaints* showing the number of complaints that have been received by the customer satisfaction center of the marketplace; *# Listing Growth Rate* showing the

growth rate of listings between last month and the current month; and *Lead/Listing Growth Rate* showing the same rate for the Lead/Listings. Table 1 shows the descriptive statistics of variables in the data.

Methodology

We use logistic regression as the main statistical method for the estimations in this paper. The dependent variable is a dummy variable showing whether a firm churn from the marketplace. Independent variables are the behavioral variables of real estate offices that might affect churn decisions. There are several other methods in the literature that could be used to estimate binary dependent variables. However, logistic regression is easy to implement and interpret in addition to its prevalence in various industries. To have real life comparisons we choose to use logistic regression as the main tool of statistical analysis. These variables are listed in Table 1. Statistically, logistic regression estimates a multiple linear function defined as:

$$logit(p) = \log\left(\frac{p(y=1)}{p(y=0)}\right) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 \ldots . + \beta_n x_n + \epsilon_i$$

Since the coefficients are transformed, to understand the effect on the outcome we also estimate marginal effects. The marginal effects show the change in probability when a given variable changes by one unit holding all other variables at their mean values. These results are given in Table 4.

Results

Table 2 shows the main results of the estimation with different specifications. It includes estimation results with the time fixed effects only in Column (1); results with city and time fixed effects in Column (2); results with county and time fixed effects in Column (3); results only for Istanbul in Column (4); results for other cities in Column (5). Results indicate that days with listing, last month's number of listings, lead per listing ratio in the given month, and the growth rate of listings negatively correlated with the churn decision of real estate offices. The effects are statistically and economically significant and they all point out the same latent factor i.e. the intensity of marketplace use. When real estate offices use the marketplace more often, then their likelihood of churn decreases. More they use the marketplace, more they benefit from it and they continue using the marketplace. Results also show that number of unpaid payments and days from last listing on the marketplace are positively correlated with the churn decision in a statistically significant way. Real estate offices who are disinterested in the service anymore tend not to make their payments and they prepare for an exit. Moreover, such disinterest shows itself in the way that they stop using the website. Both of these effects signal the possibility of churn. Other factors such as tenure, months after the peak, last 3-month lead per listing ratio, number of complaints and the growth rate for lead per listings are statistically insignificant in explaining the churn decision of the offices. Some of these effects are more profound in Istanbul such as the listing intensity or days from lasting while some of them have little to no effect for Istanbul such as number of unpaid payments or the growth rate for listings.

Table 3 shows the results for some additional specifications. Column (1) shows the estimation results for big cities i.e. Istanbul, Ankara and Izmir; Column (2) shows the results for other cities. Results in all specifications are consistent with Table 2. Magnitude of coefficients are larger for small cities mostly regardless of their signs. This suggests that aside from the factors that we include in the regressions, unexpected factors that cause real estate offices to churn are relatively in smaller numbers compared to the ones in big cities. Comparing the results for

Istanbul to the Big Cities, one could see that other big cities create a counter effect to Istanbul. This result lead us to believe that Istanbul works as an outlier in the estimations.

Table 4 shows the results for the marginal effects. Assuming that other variables take their means, results indicate the change in the probability of churn due to a change in that specific variable. Column (1) shows the results for the main estimation; column (2) shows the results for Istanbul while column (3) shows them for other cities; column (4) shows the marginal effects for Big Cities i.e. Istanbul, Ankara, and Izmir while column (5) shows them for Small cities. Consistent across specifications, days with listing has the largest marginal effect on churn decision. One unit increase in the listing intensity decrease the probability of churn in the range of 0.19-0.31. Such big effect pinpoints this variable as the most important determinant in churn decision of real estate offices. In addition, days from the last listing and last month's number of listings have also significant effect on the propensity to churn. Finally, one more unpaid payment also increases the probability to churn by 5 percent.

Conclusion

Real estate market in Turkey experienced a boom right after the 2001 financial crisis. Suitable factors that support such boom also caused the emergence of many other subsectors. Online marketplaces became a market player in a very short time period to serve both real estate sellers and buyers. In this research, we examine one of the big online marketplaces, Zingat.com, to see which factors affect the churn decision of their customers. Our results indicate that factors such as intensity of website use, unpaid payments, number of listings, the site's effectiveness for the real estate agents, and some other factors affect the likelihood of churning from the real estate marketplaces. Results mostly support the business understanding that the customers of subscription businesses who start using the service with lower frequencies tend to cancel their subscriptions. To prevent such loss of customers, firm need to track the usage of their customers closely and target such customers who do not use the service efficiently.

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Table 1. *Descriptive Statistics*

Name	**N**	**Mean**	**Std.Dev**	**Min**	**Max**
Days with Listing	61,233	0.1	0.2	0	1
This Month's Lead/Listing	61,233	7.7	13	0	70
Unpaid Payments	61,233	0.6	1.1	0	4
Tenure	61,233	9.9	4.6	4	18
Months after Peak	61,233	5.9	5.4	0	18
Last Month's # of Listing	61,233	10.7	14.6	0	60
Days from Last Listing	61,233	22.2	33.2	0	120
Last 3 Months Lead/Listing	61,233	6	15.7	0	1
# of Complaints	61,233	2	2.7	0	10
Lead/Listing Growth Rate	61,233	0.6	1.4	-1	5
# of Listing Growth Rate	61,233	0.4	1.4	-1	7

Table 2. *Determinants of Customer Churn for Real Estate Offices*

	(1) With Time Effects	(2) With City and Time Effects	(3) With County and Time Effects	(4) Istanbul	(5) Not-Istanbul
Days with Listing	-1.461***	-1.438***	-1.460***	-1.672***	-1.291***
	(0.195)	(0.193)	(0.195)	(0.226)	(0.293)
Unpaid Payments	0.280***	0.274***	0.266***	0.253***	0.296***
	(0.020)	(0.020)	(0.021)	(0.029)	(0.026)
Tenure	0.007	0.002	0.007	-0.001	0.008
	(0.005)	(0.005)	(0.006)	(0.009)	(0.007)
Months after Peak	0.008	0.007	0.006	-0.007	0.020***
	(0.005)	(0.005)	(0.005)	(0.007)	(0.006)
Last Month's # of Listings	-0.007***	-0.008***	-0.009***	-0.007***	-0.006**
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
Days from Last Listing	0.004***	0.004***	0.005***	0.005***	0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Last 3 Month Lead/ Listing	-0.001	-0.001	-0.000	0.000	-0.002
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
# of Complaints	0.003	-0.002	-0.006	0.008	-0.012
	(0.010)	(0.010)	(0.010)	(0.014)	(0.012)
This Month Lead/ Listings	-0.006***	-0.005**	-0.005**	-0.005*	-0.006**
	(0.002)	(0.002)	(0.002)	(0.003)	(0.002)
Lead/Listing Growth Rate	0.018	0.013	0.010	-0.012	0.039**
# Listing Growth Rate	-0.036***	-0.037***	-0.041***	0.022	-0.045***
	(0.011)	(0.011)	(0.011)	(0.018)	(0.015)
R-squared					
N	61233	61233	61233	22757	38464

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Table 3. *Sensitivity Tests*

	(1) **Big Cities**	(2) **Small Cities**
Days with Listing	-1.430*** (0.217)	-1.567*** (0.374)
Unpaid Payments	0.255*** (0.027)	0.317*** (0.027)
Tenure	0.002 (0.007)	0.005 (0.008)
Months after Peak	0.000 (0.006)	0.022** (0.009)
Last Month's # of Listings	-0.007*** (0.002)	-0.006 (0.004)
Days from Last Listing	0.005*** (0.001)	0.004*** (0.001)
Last 3 Month Lead/Listing	-0.000 (0.001)	-0.002 (0.002)
# of Complaints	0.003 (0.013)	-0.003 (0.013)
This Month Lead/Listings	-0.005** (0.002)	-0.006** (0.003)
Lead/Listing Growth Rate	0.019 (0.019)	0.013 (0.020)
# Listing Growth Rate	-0.033** (0.015)	-0.040** (0.018)
R-squared		
N	34762	26466

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Table 4. *Marginal Effects*

	(1)	(2)	(3)	(4)	(5)
	Basic ME	**Istanbul ME**	**Others ME**	**Big Cities ME**	**Small Cities ME**
Days with Listing	-0.226***	-0.216***	-0.229***	-0.193***	-0.311***
	(0.030)	(0.029)	(0.052)	(0.030)	(0.078)
Unpaid Payments	0.043***	0.033***	0.052***	0.034***	0.063***
	(0.003)	(0.004)	(0.005)	(0.004)	(0.007)
Tenure	0.001	-0.000	0.001	0.000	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Months after Peak	0.001	-0.001	0.004***	0.000	0.004**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Last Month's # of Listings	-0.001***	-0.001***	-0.001**	-0.001***	-0.001*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Days from Last Listing	0.001***	0.001***	0.001***	0.001***	0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Last 3 Month Lead/ Listing	-0.000	0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
# of Complaints	0.000	0.001	-0.002	0.000	-0.001
	(0.002)	(0.002)	(0.002)	(0.002)	(0.003)
This Month Lead/ Listings	-0.001***	-0.001*	-0.001**	-0.001**	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Lead/Listing Growth Rate	0.003	-0.002	0.007**	0.003	0.003
	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)
# Listing Growth Rate	-0.006***	-0.003	-0.008***	-0.004**	-0.008**
	(0.002)	(0.002)	(0.003)	(0.002)	(0.003)
R-squared					
N	61233	22757	38464	34762	26466

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

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