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FORECASTING HOUSE PRICES IN TURKEY: GLM, VAR AND TIME SERIES APPROACHES

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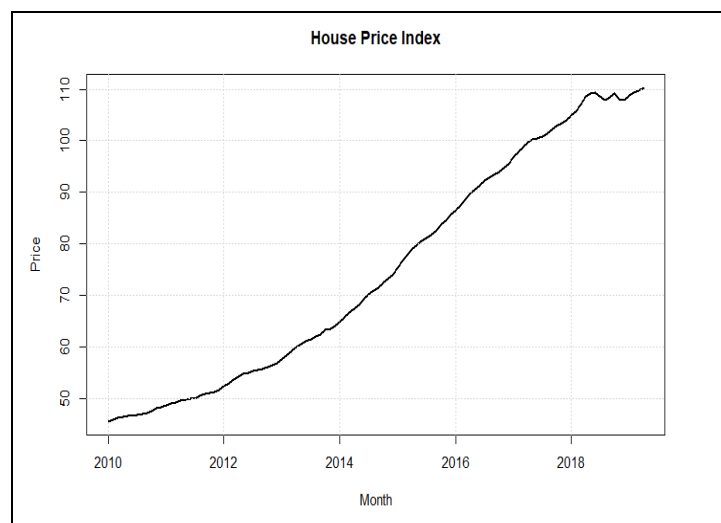
Permanent link to this document: <http://doi.org/10.17261/Pressacademia.2020.1310>**Copyright:** Published by PressAcademia and limited licensed re-use rights only.**ABSTRACT****Purpose-** A wide range of decision-makers is interested in educated forecasts for house prices. The technical analysis introduced in this study aims to estimate future (forecasted) house prices and provide sufficient evidence in support of the adequacy of the estimated models obtained from parametric and non-parametric modeling methods for Turkey's housing market.**Methodology-** We employ non-parametric and various time series methods to find appropriate fits to forecast Turkey's house price index (HPI). In our modelling, we consider macroeconomic indicators related to housing markets, such as; gold, interest rate and currencies. In this study, first using the explanatory variables, we construct two Generalized Linear Models (GLM) and a Vector Auto Regressive (VAR) model. Then, we construct two univariate time series models. HPI series inherits seasonality. Even though the HPI contains seasonality, first, we neglect the seasonal effect and come up an Autoregressive Moving Average ($ARMA(p, q)$) model among many other alternative ARMA models. Second, we consider the seasonality effect on the housing market index and construct a seasonal Autoregressive Integrated Moving Average ($ARIMA(p, d, q)(P, D, Q)$) and exponential smoothing models.**Findings-** The analysis identifies forecasts of Turkey's housing market index from both the seasonal $ARIMA(p, d, q)(P, D, Q)_m$ and Holt Winter models as accurate models compared to classical time series models, namely $ARIMA(p, d, q)$ models, based on the explanation power measure (R^2) values and out-of-sample error measures MSE, RMSE and MAE.**Conclusion-** The study has three main contributions: i) Our forecast shows Turkey's housing market's return will not increase in the following 12-months. ii) The seasonal ARIMA and exponential smoothing models forecast some negative returns within the given forecasting period, which should be considered a warning for Turkey's housing market for the future. iii) GLM and VAR models illustrate that Turkey's housing market shows a high dependence on gold, inflation, and foreign exchange rates than other well-known economic indicators.**Keywords:** Turkey's housing market, GLM, time series, forecasting, VAR.**JEL Codes:** R32, C22, C15**1. INTRODUCTION**

Analyses on house price behavior and its forecasting is a critical attempt to policymakers, investors, and individual buyers and sellers in Turkey for many reasons. To begin with, housing represents not only a substantial aggregate portion of households' wealth but also it carries out an essential part of the entire economy. Hence, Turkey's housing market directly attached to its' national economy through households' expenditures on housing and expenses related to housing. Consequently, house prices possess the potential to widely affect household consumption through the ability of housing financing-related debts. Therefore, price fluctuations in Turkey's housing market are of great concern to policymakers and market participants, and also, they have devastating implications on its' national economy.

Over the last two decades, house prices have increased regularly due to the global capital flow to Turkey's economy. Figure 1 illustrates nationwide Turkey's nominal house price evolution for all types of housing for the period from January-2010 to May-2019. In this period, overall house prices have increased by 143% in Turkey. This consecutive increase is uninterrupted even by the 2008 global economic disturbance, which is caused by the US housing market collapse.

Figure 1 also shows that even though house prices are decreased a little bit in early 2019, they start to increase in 2019 again. However, such an increase is not due to Turkey's housing market recovery. There are three fundamental reasons behind the increase: i) the severe tax and duty burden increase, ii) the dramatic increase in currencies, iii) the decrease in mortgage loans, and the consumers' desire to purchase a house based on the cultural reasons.

Figure 1: Monthly House Price Evolution in Turkey (2010:1-2019:5)



Starting from early 2000, there has been an accelerating interest in Turkey's housing market; thanks to the growth in national economy and political regulations on the economy and housing market. The literature on forecasting house prices is no different, although the majority of studies seem to focus on multivariate forecasting methods. In Turkey, many researchers have long tried to identify underlying drivers of house prices and use the price drivers to estimate house prices. To this end, an increased number of researches has focuses on house price dynamics and explore them by employing hedonic method (see Yayar and Gül, 2014; Öztürk and Fitöz, 2012; Yayar and Karaca, 2014), which uses some market-specific factors and common factors such as inflation, income, housing statistics, and demographics. Hedonic method is the most frequently used modelling approach to identify house price dynamics in Turkey.

Although the number of researches has been limited, artificial neural networks are also showing considerable potential in the field of house price prediction in Turkey (Selim, 2009; Dombaycı, 2010). On the contrary to hedonic, classical multiple regression and artificial neural networks methods, univariate time series models have been found to forecast very well over shorter periods by Crawford and Frantantoni (2003). It is because short-term factors are expected to have a slow change (Tse, 1997).

Especially, autoregressive integrated moving average (ARIMA) models have received extraordinary attention from researchers to predict and forecast house prices in many housing markets. For instance, Tse (1997) examines forecasting of house prices in Hong Kong housing market by adopting ARIMA to capture the short-term house price behavior showing that integrated models perform better than other time series model classes. In a similar study, Crawford and Frantantoni (2003), compare ARIMA models to generalized autoregressive conditional heteroskedastic (GARCH) and regime-switching models and discover that simple ARIMA models generally perform better when comparing out-of-sample forecast accuracy, while the regime-switching model performs better in-sample. Chin and Fan (2005) compare three distinct ARIMA models in an application on residential house prices in Singapore housing market. They observe an ARIMA model that contains dummy variables performs better than an ARIMA model

with ARCH errors, but only marginally better than the original model. By considering a similar argument, Hepşen and Vatanserver (2011) use a standard Box-Jenkins ARIMA modelling approach to forecast house price trends in Dubai housing market.

Nevertheless, everyone is not as enthusiastic about the forecasting strength of ARIMA models. For instance, Stevenson (2007) notifies that although ARIMA models are capable in predicting broad market trends, these models differ substantially in their forecasts obtained from various model specifications since they are sensitive to model preference biases.

There is a considerable amount of literature which attempts to determine house price dynamics in Turkey, but limited number of studies focus on the prediction of house prices. Unlike modelling house price dynamics, forecasting house prices have received limited attention and none of these focus on the univariate time series modelling, Vector autoregressive (VAR) and Generalize Linear Modelling (GLM) approaches to our best knowledge. Note also that while there are studies that using VAR to predict house prices in the literature (e.g. Hui and Yue, 2006), there is only Yilmaz (2019) contains application of GLM for housing market which analyze the US housing market. Hence, this study is the first attempt to analyze the forecastability of house prices by using univariate times series, VAR and GLM approaches in Turkey's housing market.

The objective of the study is to guide the reader to better comprehend the nature of Turkey's housing market concerning its price movement through a robust analysis of time series, exponential smoothing, VAR, and GLM methods. The analysis culminates in the development of models constructed to forecast house prices in Turkey. The major contribution of the study is to provide a critically notified analysis of the housing market and the forecastability of house prices in Turkey.

To support our argument, initially, we present an extensive literature review on the VAR, GLM, and univariate time series analysis applications to housing markets in the world and Turkey. Subsequently, we determine the related explanatory variables for VAR and GLM models and determine VAR, GLM, ARMA, seasonal ARIMA, and exponential smoothing models that best represent the log-return house price series of Turkey. Then, we made some forecasts following selected three models, among many alternatives.

All of the models accommodate to track the direction of changes in house prices. Further, the Granger causality test determines the causality of the selected explanatory variables. Additionally, GLM and VAR models identify the macroeconomic drivers of Turkey's housing market. VAR catch inflation and past values of HPI as the explanatory variables, while GLM picks gold and USD as significant explanatory variables for HPI.

The most significant practicality of the study is to suggest a way to determine the cyclical turning points in Turkey's house price series. Also, in practice, these modelling approaches are not only employed to identify the cyclical patterns and cyclical turning points of economic data sets but also to analyze the efficiency of the housing market (Tse, 1997; Gatzlaff and Tirtiroglu, 1995). Therefore, our study is expected also to lead the analysis of efficiency of Turkey's housing market.

The organization of the study is as follows. In Section 2, we summarize the previous studies that consider the time series analysis for housing markets. The formulations for the GLM, VAR, univariate time series and exponential smoothing methods are given in Section 3 and kept brief without any proof. Section 4 reviews Turkey's house price index properties and its initial analysis. Then, we introduce the best selected models chosen whose details are presented in Appendixes along with their prediction and forecasting powers in Section 5. This section also discusses models' prediction, accuracy, forecasting, and forecasting confidence intervals for the selected models. Finally, we conclude the study in Section 6.

2. RELATED STUDIES

McGough and Tsolacos (1995) utilize ARIMA models for the short-term forecasting of rental values of three commercial property sectors in the UK real estate market. The findings in this study reveal that retail, office and industrial rents are admirably fitted by ARIMA (1,2,0), ARIMA (0,2,1) and ARIMA (3,2,0) models in the UK, respectively. These models suggest that for retail and industrial rents, the past changes affect their current and future changes, while for office rents, their present and future changes are influenced by past shocks. Their findings provide a greater comprehension of the short-term dynamics of commercial rental values and the forecasting of turning points.

In a similar study, Tse (1997) develops ARIMA models to predict the office and industrial property prices in Hong Kong real estate market. This study compares the forecasting performance of ARIMA models for the two property sectors. In particular, Tse applies the proportion of the RMSE of the model forecasts to the mean value to identify cyclical turning points. Whenever the reversed change in house prices is larger than the proportion value, a turning point is anticipated to occur. However, his findings also show that the ARIMA analysis is inadequate at identifying market turning points for the longer term.

Crawford and Frantantoni (2003) accurately compares both in-sample and out-of-sample forecasting performance of three univariate time series models for house price forecasting of the US housing market. More precisely, they meaningfully compare an ARIMA model, a GARCH model and finally, a regime-switching model. It is unusual to note, however, that their findings show that the simple ARIMA model performs better in tests of out-of-sample forecastability, while the regime-switching model performs better in-sample.

Guirguis et al. (2005) present an impressive critique of house price forecasting methods. They point out that many previous studies, which attempt to forecast house prices had relied on forecasts that employ the use of constant coefficients and do not account for the sub-sample instability of house prices. To consider this instability, Guirguis et al. employ six empirical models using a rolling vector error correction model (VECM); a rolling autoregressive representation (RAR); a rolling generalized autoregressive conditional heteroskedastic (GARCH) model; a Kalman filter with a random walk (KRW); a Kalman filter with an autoregressive time variation (KAR) and finally; an Exponential smoothing with trend and seasonality (ES) model.

Partially motivated by Crawford and Frantantoni (2003), Miles (2008) come up some non-linear forecasting models including a threshold autoregression (TAR), a bilinear (BL) and a generalized autoregressive (GAR) models. After some deliberation, Miles eventually adopts a GAR model for house prices in the study since it is easily estimated by employing the ordinary least squares, and he improves forecasting power of the models for the same US states that are analyzed by Crawford and Frantantoni (2003). Miles (2008) then compares the forecasting performance to the best ARMA and GARCH forecasting models and observes GAR model produces superior out-of-sample forecasts than both the simple ARMA and GARCH models, particularly in housing markets which exposed high levels of house price volatility.

Later, Rapach and Strauss (2009) accomplish similar outcomes as outcomes of Miles (2008). Their analyses on state-level house price growth in the US housing market between 1995-2006 and comparison an autoregressive benchmark model with others including some auxiliary economic explanatory variables recommend that autoregressive model, as well as models that make use of additional economic explanatory variables, tend to provide fairly reliable forecasts for house prices. However, the accuracy of their forecasts is broadly dependent upon the strength of growth in house prices over the investigated period. More precisely, they observe that house price forecasts for the states that exhibited relatively moderate house price growth are often considerably more accurate than forecasts for states, which exhibited strong house price growth over the investigated period. The authors also suggest that the fact house price forecasts for states, which exhibits the strongest price growth are inaccurate may potentially indicate that house prices in these states are plausibly significantly out of line with economic fundamentals.

Gao et al. (2009) also addresses the issue of house price forecast performance variability across several US sub-housing markets over two large panel data of the US regional housing markets. They use the empirical evidence recommending house price exhibits a mean reversion and serial correlation to employ an autoregressive mean reversion (ARMR) model to forecast house prices. As expected, their result displays forecasting of house prices for markets which display a high level of volatility in house prices tend to result in AR coefficients, which are generally considerably larger than those found in forecasts of less volatile housing markets. Also, they discover house price forecasting for prices in uptrend periods have significantly larger AR coefficients than those made in downtrend periods. Eventually, they suggest it as evidence of downtrend period rigidity in the housing market.

3. METHOD

There are three modelling approaches in this study. First, we use a Generalized Linear Model (GLM) to determine how well the mathematical models that based on flexible generalization of ordinary linear regression captures the housing market behavior in Turkey. Second, we use a Vector Autoregressive (VAR) approach to analyze the joint behavior of important related variables on the house prices. Third, we employ univariate time series approach, which studies the within-dynamics in the price index itself.

In the GLM modelling, we follow the structure proposed by Nelder and Baker (1972) closely. Also, for VAR modelling approach Ooms (2012) offers detailed descriptions. The general model specifications for time series analysis we made in this study are similar to those outlined by Crawford and Fantantoni (2003). These models are theoretical in the sense that they are non-structural. The models simply make use of the lagged value of the dependent variable, lagged values of the error terms, and in some cases, lagged variances as well. All of the models considered in the context of the study are ubiquitous among the forecasting literature and have been employed with high degrees of success in a variety of fields. Additionally, Shumway and Stoffer (2010) is followed for the theoretical background of the univariate time series analysis.

3.1. Generalized Linear Models

Given a random variable vector $Y = (Y_1, Y_2, \dots, Y_N)$ having a mean vector μ and an explanatory variable matrix X of order $N \times p$ and a p -dimensional parameter vector β , GLM have the primary objective to investigate the link between μ and X through vector β . Here, μ represents the systematic part of the model. It may be written as the existence of covariate x_1, x_2, \dots, x_p and β_j where $j = 1, 2, \dots, p$ as

$$\mu_i = \sum_{j=1}^p \beta_j x_{ij}, \quad i = 1, 2, \dots, N. \quad (1)$$

Here, x_{ij} represents the value of observation i 's j th covariate. In this setting y is normally distributed and covariates x_1, x_2, \dots, x_p produce a linear map denoted as $\eta_i = \sum_{j=1}^p \beta_j x_{ij}$. Here, the relation among the systematic and the random components is $\eta = \mu$. Note that η and μ are identical. So, it can be expressed by the help of a link function g , as $\eta_i = g(\mu_i)$.

3.2. Vector Autoregressive Models

In this approach the vector time-series $x[n]$ is modelled as an auto regressive (AR) process given as

$$x[n] = - \sum_{i=1}^p A[i]x[n-i] + u[n], \quad (2)$$

where $u[n]$ represents a multivariate white noise, with a cross-covariance matrix denoted with $Var(u[n]) = \Sigma$, if $k = 0$, otherwise $Var(u[n]) = 0$. Here, $A[i]$ are called AR coefficients since they regress $x[n]$ onto its own past values. In this setting, p is called the order of the auto-regression and it refers to the above model, with adjustable parameters $A[i]$ and Σ to be estimated, as a $VAR(p)$ model.

There are two critical interpretations of this modelling approach: i), it can be considered to model $x[n]$ as the output of a multivariate linear filter driven by the Brownian motion input $u[n]$. Such a filter has a rational transfer function that containing $A[i]$ in the denominator matrix polynomial. The interpretation makes clear that the model captures the temporal structure of $x[n]$ since $u[n]$ has no (linear) temporal structure by its definition. All temporal structure present in $x[n]$ must be included in $A[i]$. ii) VAR model can be considered as a linear prediction model, which predicts the current value of $x[n]$ based on a linear combination of the most recent lag values p . Consequently, the current value of a component $x_i[n]$ is predicted using a linear combination of its own and the other components past values. Here, the second interpretation illustrates its value in quantifying Granger causality between (groups of) components.

3.3. ARIMA models

Univariate time series analysis is based on the straight modelling of the lagged relationships among a data series and its past. An autoregressive component (AR) indicating the number of lags of the dependent variable that is to be included, and a moving average (MA) component that captures the effect of lagged values of the error term form an ARMA process.

An $ARMA(p, q)$ process is represented by

$$y_t = \theta_0 + \phi_1 y_{t-1} + \dots + \phi_p y_{t-p} + \epsilon_t - \theta_1 \epsilon_{t-1} - \dots - \theta_q \epsilon_{t-q}. \quad (3)$$

This formula can be rearranged by using the lag operator D as follows

$$\phi(D)y_t = \theta(D)\epsilon_t. \quad (4)$$

Here, $\phi(z)$ and $\theta(z)$ are polynomials of orders p and q in z , respectively, and ϵ_t is a purely random process with mean zero and variance σ_ϵ^2 .

In practical applications, especially, most of the economic data series are non-stationary. Therefore, it is essential to remove non-stationary sources from the data by differencing the data as many as it gets into stationary form. Thus, the series can be represented by an autoregressive integrated moving average process of orders p, d, q , or an $ARIMA(p, d, q)$ process. ARIMA models do not consider any particular pattern in the observed data series to be forecasted. Here, the integrated (I) part refers to the degree of differencing (d). The Box-Jenkins method has a three-stage approach for identifying, estimating and verifying the

ARIMA models. The family of ARIMA processes provides a distinct set of models that capable of representing economic data series that may not be stationary, but are homogeneous and in statistical equilibrium (Box et al., 1994). The Box-Jenkins approach to time-series model building is a method to determine if an ARIMA model adequately represents the data-generating process.

The general $ARIMA(p, d, q)$ process is of the form:

$$\Delta^d y_t = \theta_0 + \phi_1 \Delta^d y_{t-1} + \dots + \phi_p \Delta^d y_{t-p} + \epsilon_t - \theta_1 \epsilon_{t-1} - \dots - \theta_q \epsilon_{t-q}, \quad (5)$$

where $\Delta y_t = y_t - y_{t-1} = (1 - D)y_t$. This may be compactly rewritten as

$$\phi(D)\Delta^d y_t = \theta_0 + \theta(D)\epsilon_t. \quad (6)$$

Here, $\phi(D)$, autoregressive operator, and $\theta(D)$, moving average operator, are the polynomials lag operator and $\Delta^d y_t = (1 - D)^d y_t$ is the d^{th} difference of y_t .

3.4. Seasonal ARIMA Models

In the previous subsection, we have restricted the focus to non-seasonal ARIMA models. However, in real life applications the dependence on the past tends to occur strongly at some underlying seasonal lag. The modified ARIMA models are capable of modelling a wide range of seasonal effect. A seasonal ARIMA model is classified by including additional seasonal parameters into the classical ARIMA models we introduce in the previous subsection. The seasonal ARIMA model represented with the following formula

$$ARIMA(p, d, q)(P, D, Q)_m. \quad (7)$$

We use the uppercase notation for the seasonal parts of the model, and lowercase notation for the non-seasonal parts of the model. Here, P, D, Q and m denote the number of seasonal autoregressive (SAR) terms, seasonal differences, seasonal moving average (SMA) terms, and observations per year, respectively.

3.5. Exponential Smoothing

The use of exponential smoothing in automatic forecasting (Brown, 1959; Gardner Jr, 1985; Hyndman et al., 2002) includes a variety of methods such as the simple exponential smoothing method, Holt's linear method, additive Holt-Winters method, and multiplicative Holt-Winters' method, etc. In this paper, we employ additive Holt-Winters method (Winters, 1960; Holt, 2004)) which is widely used to forecast time series that contains seasonality and it is given as

$$\hat{y}_{(t+h|t)} = l_t + hb_t + s_{t+h-m(k+1)}. \quad (8)$$

In this model the level, l_t , is defined as

$$l_t = \alpha(y_t - s_{t-m}) + (1 - \alpha)(l_{t-1} - b_{t-1}), \quad (9)$$

whereas, the trend, b_t , is

$$b_t = \beta(l_t - l_{t-1}) + (1 - \beta)b_{t-1}, \quad (10)$$

and the seasonal component, s_t , is

$$s_t = \gamma(y_t - l_{t-1} - b_{t-1}) + (1 - \gamma)s_{t-m}, \quad (11)$$

where the parameter k is the integer part of $(h - 1/m)$. Here, k guarantees that the estimates of the seasonal indices used in forecasting related to the final year of the observation. The level equation gives a weighted average among the seasonally adjusted observation $y_t - s_{t-m}$ and non-seasonal forecast $l_{t-1} + b_{t-1}$ at time t . The trend equation is identical to the classical Holt's linear method. The seasonal equation presents a weighted average between the current seasonal index, $(y_t - l_{t-1} - b_{t-1})$, and the seasonal index of the same season in the previous year. Here, α denotes the level component, β denotes the trend component, and γ denotes the seasonality component.

4. HOUSE PRICES AND THE RELATED VARIABLES

Government agencies publish various indices such as house price index, index of private housing rental prices, New Privately Owned Housing index, mortgage rate, on housing markets to design urban planning and national economic policies, and various studies aim to predict future movements based on historical indices. Among those indices the house price indices are appraised as a very valuable indicator for judging housing markets behavior accurately. These indices are basically the compilation of every possible factors which may have an influence on the house price, such as city, size, type, location, use etc. Additionally, real estate as a commodity has an influential effect on the economies, though transactions are extremely infrequent.

Perhaps the most transparent housing index for Turkey's housing market is the sales price index (HPI) provided by the Central Bank of the Republic Turkey (TCMB) which is chosen for carrying out the analyses on Turkey's housing market price evaluation. The HPI is a major tool for professionals, researchers, and policymakers to track down the general price movements and trends in Turkey's housing market. The monthly HPI values between January 2010 and May 2019 are retrieved from the online portal of TCMB, yielding adequate number of observations (113) for the analyses.

We use a variety of econometric variables, such as commodity (gold), financial indicators (USD, Euro, mortgage rate), macroeconomic indicators (unemployment, inflation, cost of living index, economic confidence index), to predict HPI values. Table 1 presents their abbreviations and the summary statistics of these variables. USD/TL and EURO/TL currencies are chosen since Turkey's economy highly relies on imports. As commodity gold prices is one of the most influential investment tools in Turkey. In many studies, it is proven that inflation and real estate markets are highly dependent on each other and investing in the real estate market may protect the capital against inflation (Yilmaz, 2019; Yilmaz and Selcuk-Kestel, 2019). Therefore, we take into account inflation and fixed-rate mortgage (FRM) since house prices require most buyers to finance through loan. On the other hand, to show the economic power of the community and to analyze the impact of trust in the economy, we consider the cost of living index (COSTL) and economic confidence index (ECONOMICCI). As in fully commutative markets, housing markets are also highly affected by the income of the community, which is rated by unemployment rate that has an influence on the markets. Here, it is worth to emphasize that the summary statistics expose the transformed data since the series are not stationary in their original form. Augmented Dickey-Fuller (ADF) -tests on the transformed variables justify that the series are stationary ($p < 0.05$; Table 2).

Table 1: The Summary of Descriptive Statistics

Variable	Abrv.	Max	Min	Mean	Std.Dev
GOLD	GOLD	0.086	-0.036	0.006	0.018
USD	USD	0.082	-0.038	0.005	0.015
EURO	EURO	0.076	-0.043	0.004	0.015
INFLATION	INF	0.027	-0.006	0.003	0.004
FRM	FRM	0.289	0.083	0.132	0.040
COSTL	CTL	0.107	-0.252	0.0004	0.046
ECONOMICCI	ECI	0.031	-0.045	-0.0004	0.012
UNEMPLOYMENT	UE	0.147	0.073	0.103	0.016
HPI	HPI	0.008	-0.005	0.003	0.002

Table 2: Stationarity of Variables (ADF-Test)

	Dickey-Fuller
GOLD	-4.507*
USD	-5.7478*
EURO	-5.3233*
INFLATION	-5.1387*
FRM	-4.3148*

COSTL	-4.7555*
ECONOMICCI	-4.4213*
UNEMPLOYMENT	-4.6518*
HPI	-3.4549**

*p<0.01; **p<0.05

The variables chosen pose strong association among each other. Table 3 illustrates that the highest correlation is between currencies (83%), which is followed by between GOLD and USD (64%) and EURO (60%). The remaining associations are relatively small. The lowest correlation is observed between GOLD and UE (2%). On the other hand, while the dependent variable has the highest and lowest correlation with FRM (-30%) and CTL (-0.3%) yielding a negative dependence to these and all others except ECI. Such a result is expected since the community prefers to invest in alternative products while they are becoming more valuable. This result might also express as the population prefers to invest in liquid assets rather than illiquid assets. Additionally, the correlation between HPI and unemployment reveals that when the number of unemployment increases, house prices are affected negatively, which might be considered as the effect of a decrease in housing demand. Also consistent with the literature, the correlation coefficients show that house prices are negatively correlated with mortgage rate (-30%). Interestingly, on the contrary to common belief, the house prices are negatively correlated with inflation (-30%) in Turkey.

Table 3: Correlation Matrix

	GOLD	USD	EURO	INF	FRM	CTL	ECI	UE
USD	0.66	1						
EURO	0.59	0.83	1					
INF	0.17	0.35	0.38	1				
FRM	0.11	0.17	0.24	0.30	1			
CTL	0.19	0.24	0.17	0.37	0.18	1		
ECI	-0.30	-0.48	-0.49	-0.40	-0.39	-0.31	1	
UE	0.02	0.06	0.08	-0.03	0.05	0.03	-0.16	1
HPI	-0.25	-0.19	-0.32	-0.15	-0.29	-0.03	0.18	-0.28

It is well known that the correlations may not be strong enough to show the direction of influence even they are very high. Therefore, we employ the Granger causality tests to capture the direction of the causality between variables. Table 4 illustrates the outcomes of Granger causalities which expose two important facts about the data set: i) Unemployment rate and cost of living do not have causal influence on house prices. Furthermore, even though these series have correlations, house prices are not causing these two variables either, ii) On the contrary to other common believes in the literature, the fixed rate mortgage rate does not cause HPI, however, house prices cause fixed rate mortgage. In this respect, we may conclude that the mortgage rate is used to adjust house prices and hence it is determined according to house prices in the market. Therefore, we include the high impact variables except FRM, and employment rate and cost of living variables.

Table 4: Granger Causality (GC) Tests

Hypothesis	F-Stat	p-value	Causality Direction
HPI do not GC GOLD GOLD do not GC HPI	0.575 4.459	0.6810 0.0018*	GOLD→HPI
HPI do not GC USD USD do not GC HPI	0.643 4.022	0.5883 0.0082*	USD→HPI
HPI do not GC EURO EURO do not GC HPI	0.823 3.206	0.4824 0.0241*	EURO→HPI
HPI do not GC INF INF do not GC HPI	1.566 2.407	0.1068 0.0069*	INF → HPI
HPI do not GC FRM FRM do not GC HPI	3.742 1.279	5.4E-05* 0.2355	HPI→FRM

HPI do not GC CTL	2.923	0.0886*	COSTL \updownarrow HPI
CTL do not GC HPI	0.048	0.8274	
HPI do not GC ECI	5.333	0.0015*	HPI \rightarrow ECI
ECI do not GC HPI	1.782	0.1517	
HPI do not GC UE	1.031	0.4219	UET \updownarrow HPI
UE do not GC HPI	0.645	0.7882	
*significant at p-val.<0.01			

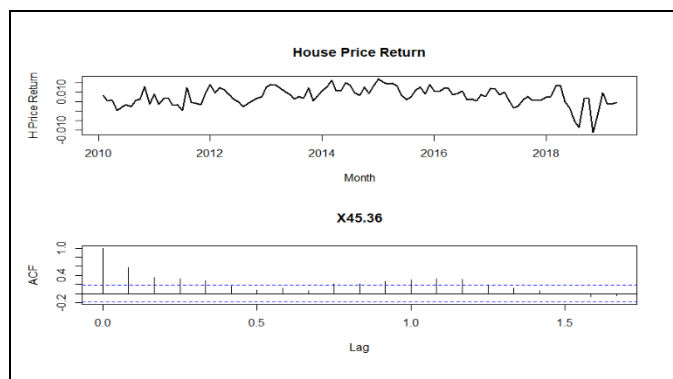
It can be seen that HPI over years (Figure 1) has an increasing trend and is not stationary. To handle this, the log-returns of the HPI series is taken and its graph, autocorrelation function (ACF) plot (Figure 2) and summary statistics together with monthly interest rate (r) are presented (Table 5). We see that the average monthly log-return of HPI (0.8%) is lower than average interest rate (9.6%) for the same period, in contrast to its volatility against interest rate ($0.48\% < 3.83\%$). Even though the return in housing investment less than the bank account, consumers prefer purchasing houses. At this point, to make a neutral interpretation, one should also consider the rental benefit since the buyer will not be paying rent anymore when they own a house. Contrary to the interest rate, the HPI log-return is right-skewed. Anderson-Darling (AD) and Shapiro-Wilk normality tests confirm that HPI log-return series do not follow normal distribution.

Table 5: Descriptive of Log>Returns and Interest Rates

	Mean	Max	Min	Std.De	Skewness	Kurtosis
HPI	0.008	0.0172	-0.011	0.0048	-0.955	5.1704
r	0.097	0.2285	0.0526	0.0383	2.0871	6.8356

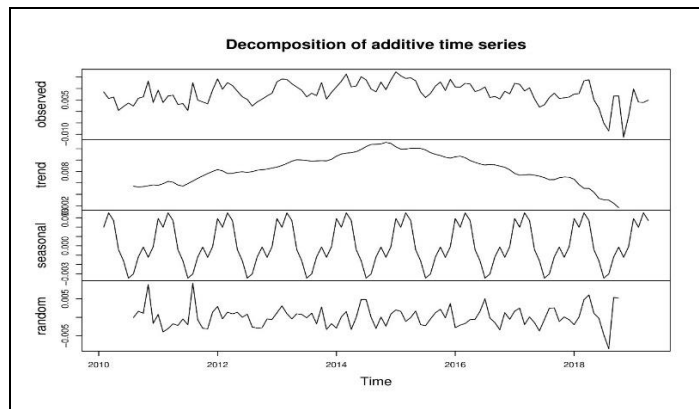
Both the ADF and Phillips-Perron (PP) tests indicate that that the log-return series of HPI is stationary ($p < 0.01$). The figure of log-return illustrates (Figure 3-top) that the return variability on housing market is increased recent years. Further, the housing market have negative returns in recent years. The single significant spike in the ACF strongly suggests that the AR part should be of order 1.

Figure 2: HPI Log>Returns, ACF and PACF Plot



Decomposition to an additive time series model (Figure 3) illustrates top to bottom the actual plot, the overall upward and downward movement, seasonality or monthly pattern, and unexplainable part of the house price log-return series. We see that the log-return series has seasonality which is tested using the WO-test (Webel and Ollech, 2018). The WO-test supports the existence of seasonality.

In our data analyses, we consider the $ARIMA(p, d, q)$ model without and with seasonality component to have a solid base to make comparison with other models (linear GLM, taken into account). Second, we introduce a seasonal ARIMA and an exponential smoothing model that considers the seasonality in the HPI log-return series. Then, we compare the models with respect to their efficiency indicators, MAPE and MAE. Our analyses are performed using R-software.

Figure 3: The Decomposed Monthly Return Series

5. EMPIRICAL FINDINGS AND COMPARISONS

5.1. GLM Models

Due to its flexibility on normality and linearity assumptions, we construct two GLM models having linear (L-Model) and quadratic terms (Q-Model). At this point it is worth to mention that in this setting we use the stepwise method to eliminate un-significant variables. The outputs presented in Table 6 show that for both models GOLD and USD have influence on house prices, whereas the other variables are not significant. The L-Model shows that under ceteris paribus assumptions, the increase in both GOLD and USD will cause an increase in house prices in Turkey's housing market (F-stat.=33.1, p-value <0.0001, R² = 0.36916). On the other hand, a power increase such as, a quadratic increase in GOLD has dominant power on increase in the prices (F-stat. = 26.7, p-val. <0.0001, R²= 0.4171). It is also noticed that the explanatory power (R²) of Q-model is significantly better than L-model.

Table 6: The GLM model estimations

L-Model	Estimate	SE	t-stat	p-value
Intercept	0.0005	0.0003	1.6098	0.11024
GOLD	0.0897	0.0204	4.3968	2.49E-05
USD	0.0898	0.0299	2.9959	0.00336
Q-Model	Estimate	SE	t-stat	p-value
Intercept	0.0001	0.0003	0.3302	0.74184
GOLD	0.0802	0.0199	4.0223	0.00011
USD	0.0749	0.0294	2.5505	0.01211
GOLD ²	1.4604	0.4811	3.0356	0.00299

5.2. VAR(p) Model

To detect the order of VAR(p) model, we employ information criteria such as AIC, HQ, SC and FPE. All these four criteria suggest that the order of VAR to explain HPI in terms of its own lags and the other explanatory variables and their lags is $p = 1$. GOLD, USD, EURO, INF are the variables, which interact with also their first order lags (l1) to HPI. The estimates of the coefficients are summarized in Table 7.

Table 7: Parameter Estimates of VAR(1) for HPI

HPI	Estimate	Std.Er	t-stat	p-val
Constant	0.0009	0.004	2.39	0.02*
HPI.l1	0.6394	0.080	7.96	1.8E-12*
GOLD.l1	0.0127	0.011	1.103	0.27
USD.l1	-0.031	0.020	-1.58	0.12
EURO.l1	0.0228	0.020	1.124	0.26
INF.l1	0.1128	0.041	2.739	0.01*

*p.val< 0.01; F-stat= 13.96 p-val<0.0001; R²= 0.3904

Here, it should be noticed that VAR(1) considers the other equations estimated in coefficient matrix, A. The models for all explanatory variables based on this approach are presented in Table 11 given in Appendix 1.

5.3. ARIMA Models

First, we neglect the seasonality effect for a moment and attempt to construct an $ARIMA(p, q)$ model for HPI. The best selected model is chosen among many other alternatives whose Bayesian or Schwarz Information Criteria (BIC and SIC, resp.) are the smallest (Table 12 given in Appendix 2). Based on these, we choose $ARMA(1,1)$ (BIC=-897.4912) which is also supported by Ljung-Box test (p-val. = 0.1678). The estimated model is with a significant drift; however, MA coefficient is found to be irrelevant in the model (Table 8).

Table 8: ARMA(1, 1) Coefficient Estimates

	AR(1)	MA(1)	Intercept
Coefficient	0.6560	-0.1172	0.0079
Std. Error	0.1684	0.2494	0.0009
z value	3.8947	-0.4700	8.4240
p value	<0.001	0.6383	<0.001

R² =0.69345

For this reason, we improve the accuracy by incorporating the seasonality component of HPI. The plausible seasonal ARIMA models for HPI are estimated and listed in Table 13 (Appendix 3). The smallest AIC proposes that $ARIMA(1,1,3)(0,0,2)_{12}$ is the best fitting one yielding significant coefficients (p-val.<0.01) (Table 9).

Table 9: ARIMA(1, 1, 3)(0, 0, 2)₁₂ Parameter Estimates

	AR(1)	MA(1)	MA(2)	MA(3)	SMA(1)	SMA(2)
Coef.	-0.86	0.392	-0.842	-0.255	0.187	0.418
Std.	0.091	0.141	0.052	0.119	0.113	0.151
z-val.	-9.39	2.776	-14.64	-2.139	1.653	2.768
p-val	0*	0.005*	0*	0.032	0.0982*	0.0056*

R²=0.76753; *Significant at 0.01%

The lag structure of both $ARMA(1,1)$ and $ARIMA(1,1,3)(0,0,2)_{12}$ implies that the cyclical effects of Turkey's housing market produced from the past information are transferred endogenously to current house prices through its lagged variables. The error-correction terms represent the random fluctuations that lead to cover the fundamental movements of the housing market.

In case of exponential smoothing method, Holt-Winter model estimates the smoothing parameters as $\alpha = 0.034$, $\beta = 0.295$, and $\gamma = 0.385$. Such parameter values are determined by minimizing one-step-ahead MSE.

5.4. Efficiency of the Models

Even though including more explanatory variables to explain the change in HPI, the GLM and VAR(1) models yield smaller coefficient of determination (R^2) compared to the ones obtained using time series models. Also, note that since GLM and VAR models contain more than one explanatory variable, their forecasting power will decrease dramatically due to forecasting errors related to the independent variables. Therefore, we present forecasts for the time series models. To measure the fitting and forecasting performance of the time series models, we separate HPI series into two components and apply in-sample modelling. We consider the first 102 points as training period (train) and consider the remaining 12 points as validation period (test). To detect the performance, mean square error (MSE), root means square error (RMSE) and mean absolute error (MAE) are calculated. Table 10 reveals that in the training part, all three error measures are the smallest in Holt-Winter model compared to $ARMA(1,1)$ and $ARIMA(1,1,3)(0,0,2)_{12}$. On the other hand, in the validation period, $ARIMA(1,1,3)(0,0,2)_{12}$ is superior to both $ARMA(1,1)$ and Holt-winter models according to all three error measures (See Table 10).

Table 10: Performance Measures of the Models

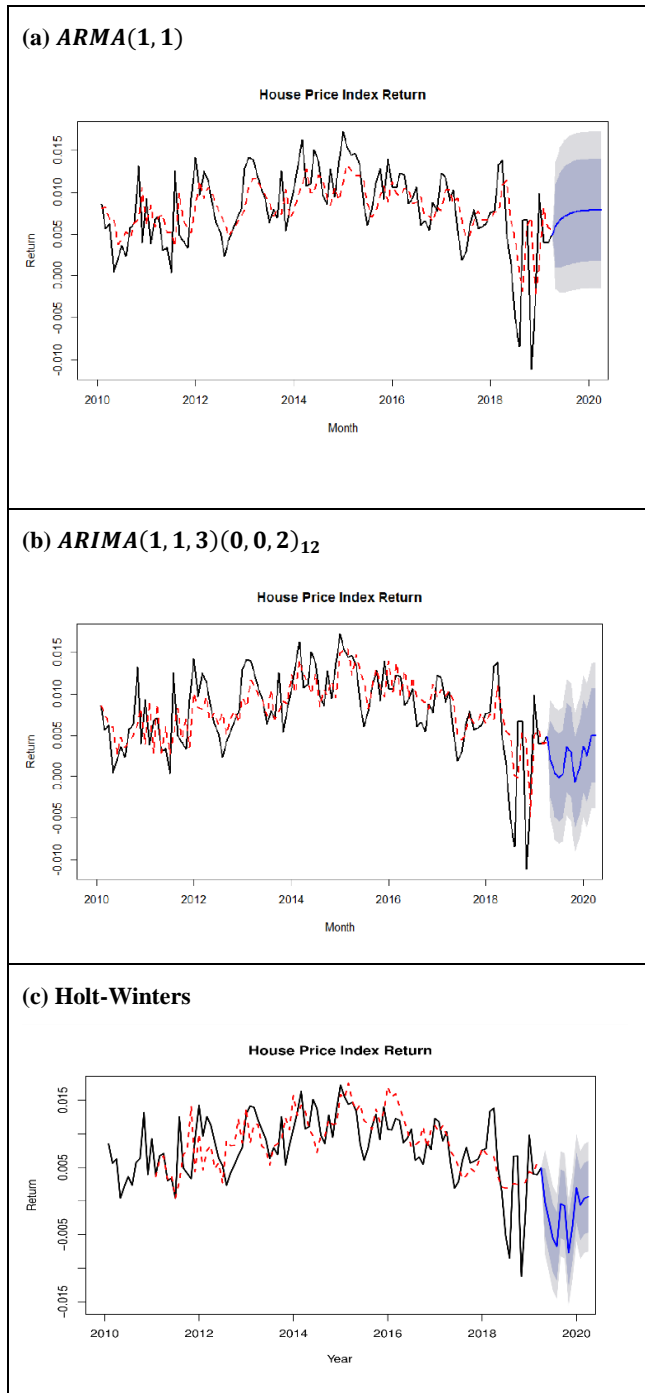
	<i>ARMA(1, 1)</i>		<i>ARIMA(1, 1, 3)(0, 0, 2)₁₂</i>		Holt-Winter	
	Train	Test	Train	Test	Train	Test
MSE	2E-05	4E-05	2E-05	2E-05	1E-05	4E-05
RMSE	0.005	0.006	0.0054	2E-05	0.004	0.007
MAE	0.004	0.006	0.0049	0.003	0.003	0.006

5.5. Forecasting

Forecasts for the following twelve months are plotted along with their 80% and 95% confidence intervals in Figures 4a-c for the time series models that fits best to the log-return series, respectively. In these figures, while the black lines represent the observed HPI log-returns, the red dashed lines represent estimated HPI log-returns from the models. More importantly, the blue lines represent forecasting results whereas the shadowed bands correspond to the confidence intervals.

Figure 4a shows that even though $ARMA(1,1)$ is not failing the Ljung-Box test, it's forecasting power is not sufficient enough since it fails to catch the seasonality in the forecasting period. With this model, the forecasted price series appear to be a smooth line for the following twelve months. On the other hand, $ARIMA(1,1,3)(0,0,2)_{12}$ (Figure 4b) and Holt-Winters exponential smoothing (Figure 4c) captures the seasonality. However, the wide and rapidly increasing prediction intervals in figures show that the housing index log-return can start increasing or decreasing at any time while the point forecasts trend downwards, the prediction intervals allow for the data to trend upwards during the forecast period. However, if we forecast further out into the future, the forecast results become less confident as it is reflected by the confidence intervals generated by the model that grow larger as we move further out through the future.

Figure 4: HPI 12-Month Log-Return Forecasts with Proposed Models



6. CONCLUSION

Univariate time series have been widely applied in most areas of finance and economy to obtain better forecasts. Housing markets, however, have rarely been modelled due to the relatively illiquid nature of housing as compared to financial markets.

The technical analysis introduced in this study aims to estimate future house prices and provides sufficient evidence in support of the adequacy of the estimated models for Turkey's housing market. We estimate and forecast Turkey's house price evaluation by using well-known models in the literature, some of which firstly applied to Turkish HPI data set. GLM, multivariate (VAR) and univariate time series models and exponential smoothing approaches are employed on Turkey's house price log-return series. Among six proposed modes, GLM and VAR contains more than one explanatory variables. However, their explanatory power is relatively small. The forecasting power of these models are relatively highly depending on the forecasts of the explanatory variables. In this respect, even though they can be used to determine the house price drivers and for house price prediction, they are not the best candidates for forecasting purposes.

Considering all plausible candidates, the actual number of models considered within the study is diverse and many-fold. Among 25 ARMA and 43 seasonal ARIMA models and Holt-Winter's exponential smoothing model, suggested models with performance accuracy can be used for forecasting Turkey's housing market price evolution. Under the same economic conditions, the forecasting results indicate that the return on Turkey's housing market will not increase in the following 12-months. As a matter of fact, the seasonal ARIMA and exponential smoothing models are forecasting some negative returns within the given forecasting period which should be considered as a warning for Turkey's housing market for the future. On the other hand, GLM and VAR models illustrate that along with the selected well-known explanatory variables, Turkish markets show dependence highly on gold, inflation and foreign exchange rate compared to other important economic indicators contrary to developed markets, such as USA which is highly dominated by mortgage rate (Yilmaz, 2019; Yilmaz and Selcuk-Kestel, 2019).

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APPENDIX 1

Table 11: VAR (1) estimates for GOLD, USD, EURO, INF

GOLD	Estimate	Std.	t-value	p-value
Intercept	0.013	0.004	3.284	0.0014*
HPI.l1	-1.280	0.851	-1.504	0.1354
GOLD.l1	0.036	0.122	0.295	0.7685
USD.l1	0.169	0.211	0.805	0.4226
EURO.l1	0.070	0.215	0.328	0.7435
Inflation.l1	-1.020	0.436	-2.340	0.0211*
*p-val.<0.001; F-stat.= 2.2048 p-val.<0.0001; R2=0.0934				
USD	Estimate	Std.	t-value	p-value
Intercept	0.005725	0.003063	1.869	0.0643
HPI.l1	0.260977	0.672620	0.388	0.6987
GOLD.l1	-0.099561	0.096123	-1.036	0.3026
USD.l1	0.534053	0.166342	3.211	0.0017*
EURO.l1	-0.018848	0.169597	-0.111	0.9117
Inflation.l1	-1.081128	0.344504	-3.138	0.0021*
*p-val.<0.001; F-stat.= 5.388 p-val.<0.0001; R2=0.1982				
EURO	Estimate	Std.	t-value	p-value
Intercept	0.0076	0.0029	2.571	0.0114 *
HPI.l1	-0.225	0.6482	-0.347	0.7294
GOLD.l1	-0.149	0.0926	-1.607	0.1110
USD.l1	0.318	0.1603	1.985	0.0496 *
EURO.l1	0.258	0.1634	1.575	0.1180
Inflation.l1	-1.300	0.3320	-3.917	0.0001*
*p-val.<0.001; F-stat.= 6.097 p-val.<0.0001; R2=0.2186				
INFLATION	Estimate	Std.	t-value	p-value
Intercept	0.003	0.0008	4.060	9.25E-05*
HPI.l1	-0.202	0.1731	-1.164	0.247
GOLD.l1	-0.002	0.0247	-0.082	0.934
USD.l1	0.066	0.0428	1.542	0.126
EURO.l1	0.067	0.0437	1.527	0.130
Inflation.l1	0.072	0.0887	0.808	0.421
*p-val.<0.001; F-stat.= 8.363 p-val.<0.0001; R2=2.0277				

APPENDIX 2

Table 12: SIC values of ARMA(p,q) models

AR\MA	1	2	3	4	5
1	-897.49	-896.73	-891.38	-888.03	-891.32
2	-896.90	-894.38	-890.70	-883.48	-887.12
3	-891.61	-891.59	-887.44	-883.27	-886.66
4	-886.86	-883.33	-882.97	-879.70	-876.81
5	-882.71	-888.06	-879.73	-878.5	-873.43

APPENDIX 3

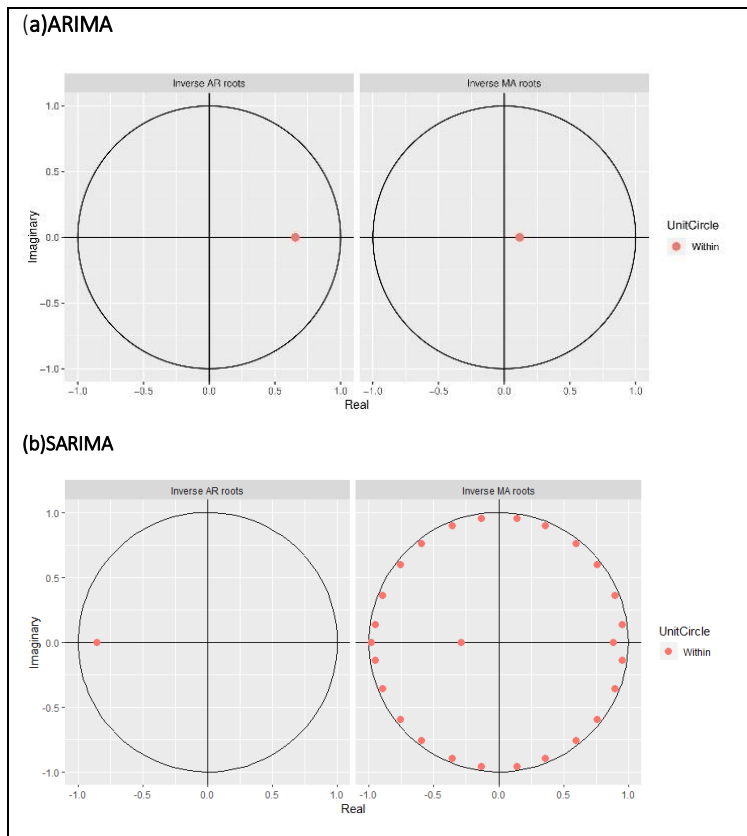
Table 13: AIC values of $ARIMA(p, d, q)(P, D, Q)$ models (*without Drift)

$(p,d,q)\backslash(P,D,Q)$	(1,0,1)	(1,0,0)	(0,0,1)	(0,0,2)	(1,0,2)
0,1,1	Inf		-891.63	-897.49	Inf
0,1,2				-908.09	
				-909.89*	
0,1,3				-906.30	
				-908.10	
(0,1,4)				-904.33	
				-906.12*	
(1,1,0)		-880.3		-881.61	
(1,1,1)	Inf		-900.84	-905.16	-903.74
				-906.31	
(1,1,2)				-908.10*	
	Inf		-898.57	-909.30	-903.11
(1,1,3)			-900.41*	-911.09*	Inf*
				-902.32	
(1,1,4)				-909.09*	
(2,1,0)				-895.59	
(2,1,1)	Inf		-900.07	-905.43	-904.36
	Inf		-902.79	-908.78	-903.16
(2,1,2)				-910.58*	
				-905.72	
(2,1,3)				-907.49*	
				Inf	
(2,1,4)				Inf*	
(3,1,1)				-904.81	
(3,1,2)				-907.31	

APPENDIX 4

To observe the stationary and invertibility of the univariate time series models we show the complex roots of the polynomials lie outside the unit circle. Therefore, for the sake of simplicity, we plot the inverse roots of the selected models instead in Figure 5. As it is observed from these figures, the complex roots of the polynomials lie within the unit circle. The red dot in the left-hand side of both plots corresponds to the root of the auto regressive part polynomials and the red dot in the right-hand side of both plots corresponds to the root of moving average part. At this point we can conclude that both models are stationary and invertible since their complex roots lie in the unit circle.

Figure 5: Inverse Characteristic Roots for ARIMA and SARIMA



THE IMPACT OF POPULATION AGING ON TURKEY'S ECONOMIC GROWTH: AN EMPIRICAL ANALYSIS WITH ARDL MODEL

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ABSTRACT

Purpose - Labor and labor productivity concepts, which have an important role in growth dynamics, have found a serious research area especially in developing countries due to the population aging. Many researchers have focused on the effect of population aging on economic growth of some developed countries like China, Japan, Malaysia and those countries where the old people share are growing fast or have a large share in total population. This condition, which causes the emphasis on production factors, labor migration and factor productivity concepts, is the main motivation of this study.

Methodology - In order to find the relationship between population aging and economic growth in Turkey, an ARDL model has been used for 1970-2018-time period. This time period was selected due to availability of data for selected variables. The long run and short run models are estimates by Eviews 10 software.

Findings- The results illustrate that the population aging negatively affect Turkey's economy in either short-run or long-run. Based on this model's results, Turkey's economy is negatively influenced by population aging 0.029 percent in long-run and 0.084 percent in short-run periods which the coefficients are significant at 0.5 and 0.1 levels respectively.

Conclusion- The rates of fertility and death both have been decreasing while the rate of life expectancy has been increasing gradually during last three decades in Turkey showing a negative effect from population aging on economic growth of Turkey. These signs are associate with this study's result.

Keywords: Population aging, population growth, economic growth, ARDL model, Turkey.

JEL Codes: J11, J13, J14, O11

1. INTRODUCTION

Population aging is an important issue in the world especially for the developed countries and also in a soon future for the developing countries. Countries like Republic of China, Republic of Korea, Singapore, and especially Japan are dealing with this issue and applying socio economic programs to change the game and Turkey as a developing country is not out of this issue and has to consider earlier.

Labor is one of the most important factors of production and many researchers are working on labor's effect on economy and it has started mainly with the theory of population by Thomas Robert Malthus (1798) and today the researchers are trying to find labor's effects on different aspects of economy. Many researchers have focused on the effect of population aging on economic growth of some developed countries like China, Japan, Malaysia and those countries where the old people share are growing fast or have a large share in total population. An economy is going toward aging as fertility rate decreases, like a decrease in death rate or an increase in life expectancy. Also, it means that the share of old people over 65 years old in total population is rising gradually. The negative sign of population aging gives an alarm to government in order to take consider changes in social and demographic programs.

Population aging influences labor society by two main forces; one is increasing life expectancy and the other one is decreasing fertility. These two determined factors of population aging have different impact on economic growth and productivity and also different policies to implement OECD (1998a). An increase in life expectancy by changing shares of young and old individuals in labor force affects economic growth and it could be helpful and positive for the economy as the labor force increases. On the other hand, declining fertility means not only a change in the share of young and elderly people but a change in total population over time which can negatively affect economic growth. Thus, the net impact of the population aging is outcome of the two forces which move at the same time. The strength of this process could be rapid as it is in China and Singapore or slowly like it is the United States.

Solow (1956) and Swan (1956) by describing the classic form of production function, which the main components are capital (K), labor (L) and productivity (A). The population aging issue affects not only on the amount of the labor supplied but also on the accumulated capital and the productivity. Skirbekk (2004) argued that population aging issue could be studied in a balanced manner if the both side of labor force; the quantity of labor input and the quality of labor input which is the productivity, being considered in the study.

Borsch-Supan (2003), by researching on the "labor market effects of population aging" determined that it is very rare that the demographically decline in labor force will be offset by improvement in capital concentration. In order to compensate the effect of demographic change in active population, labor productivity should be more focused by more or increasing the quality of trainings and education. On the other hand, population aging will bring a change in age structure and thus in goods demand which now the market needs a great employment mobility between different sectors in order to fix these structural changes.

In this paper under the section two a brief literature review and in three several important variables which had been used in more articles in order to show the signs of an aging economy, for the case of Turkey can be found. In Section four, data and method of analysis which used to show the relationship between population aging and economic growth of Turkey has introduced. In section five, the results discussed and in last section conclusion has placed.

2. LITERATURE REVIEW

Theory of economic growth indicates that stable economic growth is not achievable in an economy where the population is aging. A stable growth of the economy is possible only if the population's age structure remains unchanged. Economic growth in a country where the population is ageing, i.e. the age structure is not stable, may only be achieved through the economy's transformation to its stable state. Population aging reflects adversely on economic growth. This finding was previously shown in various simulations and models of overlapping generations but not with infinite horizon in the neoclassical growth theory (Gruescu, 2007).

Bloom and Canning (2008) argue that an individual role in economic activities differs during his or her lifetime. They indicate that youth are pure consumers and as they enter to the labor market they transform to a net saver, and after retirement they will be something between a saver and a consumer. These transformation patterns show how age structure effects the economic growth in an aging economy. Beside the effect of age structure on labor force, in another research conducted by Bloom and Williamson (1998) indicated that age transformation by affecting individuals saving and investment can have impacts on economic growth. Enriching human capital is another channel in a society which can be affected by demographic transformation Bloom et al. (2001).

Savings and capital accumulation are another channel that demographic changes can affect economic growth beside the labor market mechanism. Lee, Masson and Miller (1998), claim that the two important factors; the increase life expectancy and decrease in household members, will change the individuals' decision to save more for their extended years of retirement. This well led to a positive impact on economic growth with the support of effective policies regardless of investing in local activities or abroad. A research conducted by Masson and Lee (2006) indicated a strong relationship between Taiwanese savings with age structure.

There are many researches that have been conducted to show the effect of population aging on the economic growth with ambiguous results; which some of them indicate a negative relation while the others show a positive relationship among them. In developing and developed countries there are evidence that the demographic change plays an important role in economic growth. For instance, in a study under the title of "*Demographic Transitions and Economic Miracles in Emerging Asia*" conducted by Bloom and Williamson (1998) during 1965 to 1990, indicated that east Asia country's working population are rapidly changing and found that approximately 20% of the economic growth is associated with demographic changes. Especially developing countries where the share of young population is more than the old population have better chance to gain advantage over demographic structure. Bloom et al. (2001), showed that age structure in Asia's miracle countries has one third impact on economic growth while Cai and Wang (2006), indicates a 15-20% role of age structure on economic growth of China in recent years. However, the age structure only prepares an opportunity for countries to grow more rapidly; but it is not enough by itself.

There are many other matters which affects the economic growth of a country, the important point is where a nation can take advantage from demographic dividend by implying appropriate policies in both physical and human capital investments associate with job creation. Asia's miracles can be a good example for it.

A decade later in 2010 Wei and Hao studied demographic structure and economic growth of China and extended the equation by including age structure dynamics during 1989-2004. They argue that the decrease in fertility rate led to a decrease in youth dependency, which improved China's economic growth. The other important finding of their study is a significant relationship between demographical behavior and economic growth in the concept of life expectancy, birth rate and marriage age.

Likewise, Minh (2009) studied the "Dynamic Demographic and Economic Growth in Vietnam" and found that there is 15% contribution of demographic change on economic growth of the country based on 2002, 2004, and 2006 for 61 provinces with an OLS method. In Vietnam case a considerable increase in labor force and decrease in dependency rate has been seen. He argues that Vietnam may have suffer regarding the youth population in economic growth as he found that population have not negative impact on economic growth but youth population seem may have negative effects on economic growth in near future. It means that Vietnam's demographic dividend are changing to demographic debt and it is very important for the government to take in consideration and preparation of such this result in soon future.

Similarly, Choudhry and Elhorst (2010), conducted a research about demographic transition in China over 1961-2003 based on 70 countries data and revealed that active population and total population positively related to the GDP per capita growth while child and old dependency rates are negatively related. They found that population dynamics define economic growth 25% for Pakistan, 39% for India and 46% for China during 1961-2003 period. Also, in long run they expect a negative relationship between economic growth and population dynamics for China but positive for India and Pakistan.

Wana Ismail et al. (2015), studied the population aging effect on Malaysia's economic growth during 1970 to 2013. They have used the life expectancy, fertility rate, and old dependency ratio on behalf of population aging and found that fertility rate has a long run cointegration and a reduction in fertility rate is associated with higher economic growth. At the end they have suggested that the economic growth can be stable with more human capital investment.

The effect of population aging in non-oil economic growth of Iran has been researched by Basakha et al. (2015). According to united nation 2010 report Iran is the third country with a rapidly aging population. The researchers estimated the short run and long run cointegration and found that physical and human capitals and trade openness are significantly and positively affect per capita income on non-oil economy on Iran. They found that the aging is not a problem for Iran but in soon future the negative effect will be appeared and suggest that the government with working and retirees reform policies can stabilize population growth at an optimal rate.

Lee et al. (2013), used a panel regression for 80 countries from 1960 to 2005 and tried to find the effects of population aging on economic growth. They indicate that elderly population does not prevent economic growth in both short run and long run. They have found that higher retirement savings, immigration from developing countries and labor force participation are associated with population aging.

Zhang and Zhang (2005), studied "the effects of life expectancy on fertility, saving, schooling and economic growth". They have used cross section analyses for 76 countries and found that increase in longevity leads to a reduction in fertility but increase the saving amount, higher schooling and growth. As the estimate shows a 10% increase in life expectancy at birth increases schooling ration by 5.6% and investment rate by 2.4%, decreases fertility rate by 0.55% and rises growth rate approximately 1%. They concluded for the developed countries with higher life expectancy, may have no serious impact on economic growth and for developing countries with low life expectancy it may be a great opportunity to gain benefit for their economic growth.

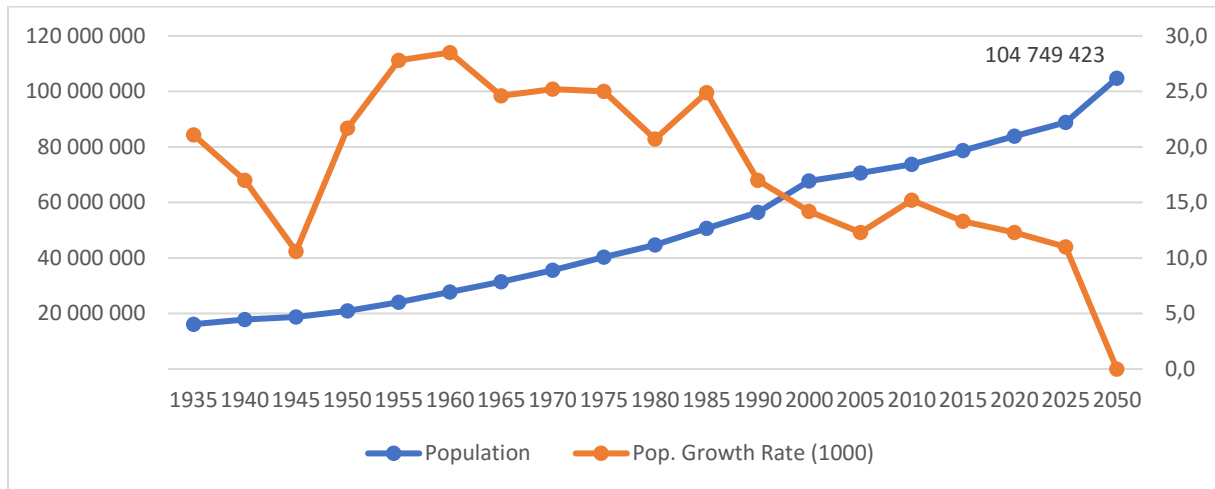
3. POPULATION AGING IN TURKEY

Towards the end of the twentieth century, birth rates decreased and life expectancy increased in the world, especially in developed countries. With this change, the proportion of the young population in the total population decreased and the proportion of the elderly population increased. After the declaration of the Republic of Turkey, in economic, social and health sectors positive developments have been observed with a significant reduction in birth rate per woman and child deaths under the age of five years old. Thus, Turkey has entered into a demographic transformation process (TUIK, 2012b: 1).

Since the first official survey conducted in 1927 with the declaration of the Turkey Republic, Turkey's population has increased more than five times. With the help of Figure 1, as can be evaluated, although there is a continuous increase in the total population, the population growth rate has been slowing over the years. In 1960 the total population in Turkey has reached the highest population growth rate with 27.754 (million), while; Estimated population growth rate in 2020 is 0.7 per thousand; the estimated population is determined as 83.900 (million). This shows that there will be a decrease in the population growth rate,

but the population is in an increasing trend. Turkey's population growth rate in steady declining and total population tends to increase continuously since the 1960s. According to TÜİK's report on population projections and forecasts, population will be approximately 95 million in 2050 but Turkey's population growth rate will be expected to reach at zero level rate (TÜİK, 2012a). It is possible to see the effect of the growth in the population and, conversely, the decrease in the population growth rate on the elderly population in figure 1.

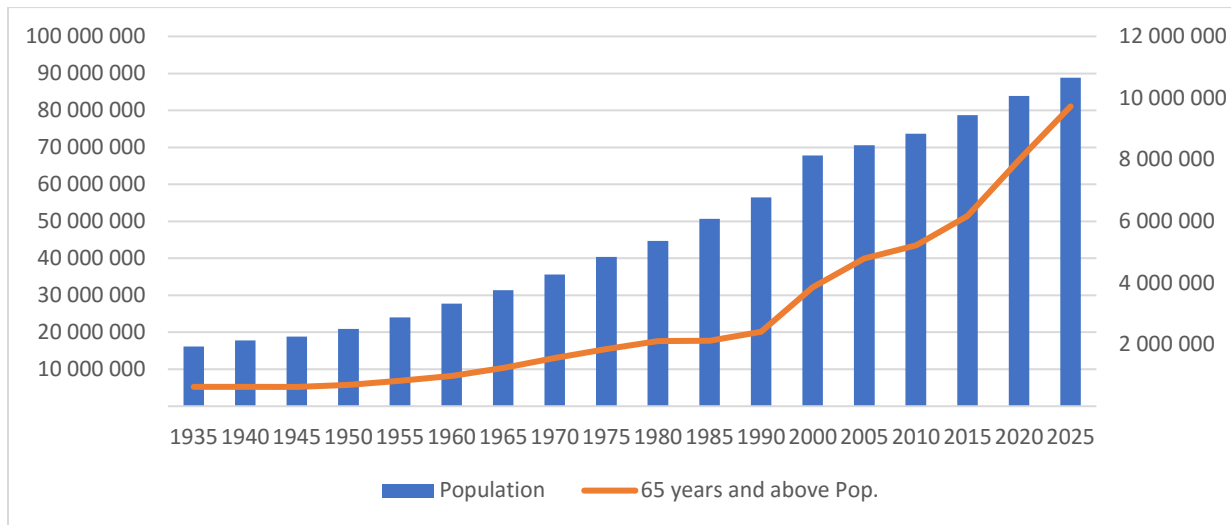
Figure 1: Total Population and Population Growth of Turkey from 1935 to 2050



Source: TÜİK, Turkish Statistical Institute

In Turkey, especially the population aged 65 and above age group are constantly increasing after 1980. Population estimates show that this increase is steeper after 2015, with the slowdown in population growth rate (Figure 2). This increase can be explained by the global with focus on Turkey's development and improvement in the economic and demographic structure. Turkey, integrated to the world with a development strategy based on import substitution, and export oriented economic structure with the aim to release the difference between turkey and developed countries. In this context, along with the transformation process, the average growth rate of the economy has been constantly increasing. The average GNP growth rate in the period 1971-1980 was 4%; this rate was realized as 5.3% in the period 1981-1990. The average growth rate of GNP was 4.8% between 1991-1997, and in 2005 the average growth rate was 5%. While the national income per capita in 1980 was 1200 dollars; it was realized as 4982 dollars in 2005. The developments in Turkish economic structure, increase in national income per capita, developments in nutrition and health services have resulted longevity and infant mortality which has been taken under control effectively. Turkey's old population in associate with the world old population group has been increased steady especially after the second half of the 20th century. It is a fact that the 20th century world population turning point in terms of the change in the age structure has a great impact on these increases. Increases in the elderly population at global level and decreases in birth rates, undoubtedly increased in economic welfare, improved nutrition and primary health care services, and the average life expectancy and decrease in infant and child mortality (DPT, 2007: 4-5).

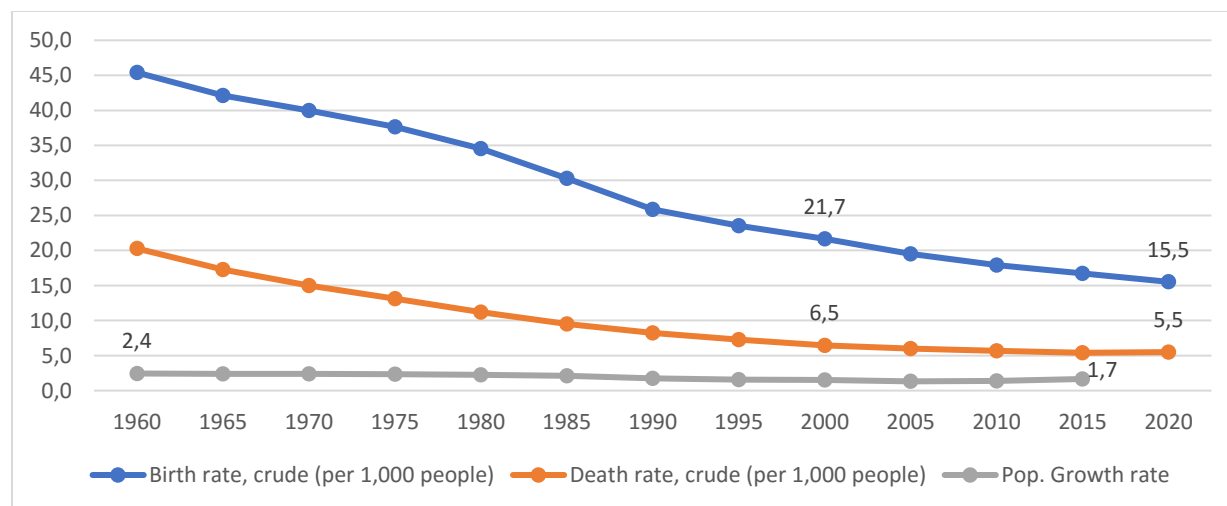
Figure 2: Annual Total Population and Elderly Population Size in Turkey (1935-2025)



Source: TÜİK, Turkish Statistical Institute

As an indication of the slowdown of the population growth rate, it is important to examine the birth rate or fertility rates. Accordingly, the total yearly fertility rate in Turkey shows a declining trend. While the fertility rate was between 5 and 3 in the period between 1977 and 1990 respectively, a decrease has been observed since the beginning of 1990 and today this rate has decreased to less than 2. This reduction in the rate of fertility in the long term is likely to slow the growth of Turkey's population. In relation to the birth rate or fertility rate, the reduction in death rate is also the main determinants of the population growth rate (TÜİK, 2012a). This reduction in the rate of fertility in the long term is likely to slow the growth rate of Turkey's population. In this regard the reduction in mortality rate is also another main reason of decreasing in population growth rate of Turkey. As it can be seen in Figure 3, the fertility rate and mortality rate decreasing more sharply between 1960 and 2000 but after 2000 very little changes in rates can be seen as the fertility rate has been reduced from 21.7 births in 1000 people to 15.5 while mortality rate reduced from 6.5 per 1000 people to 5.5.

Figure 3: The Fertility Rate, Mortality Rate and Population Growth Rate of Turkey (1960-2050)

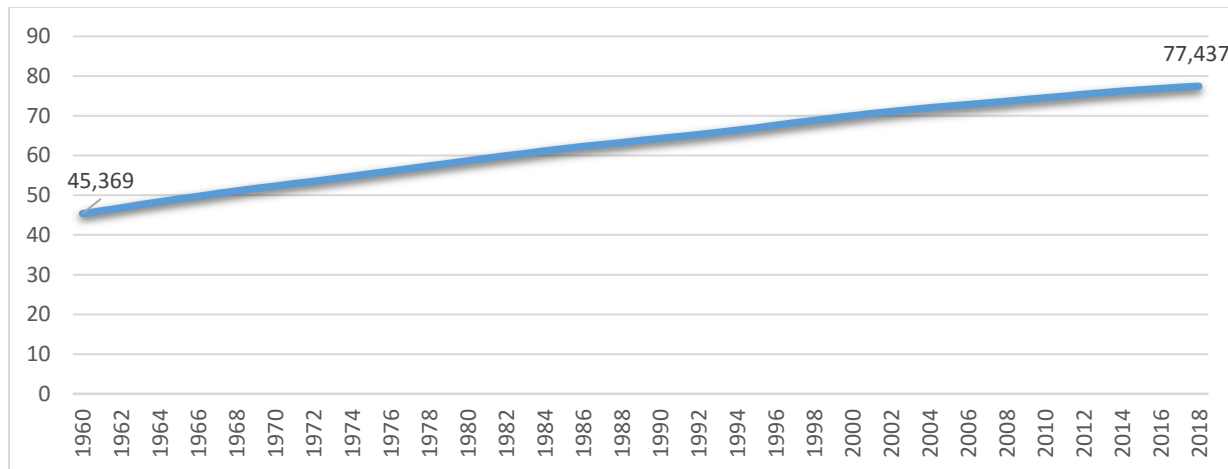


Source: TÜİK Turkish Statistical Institute

Aging of the population is associated with both an increase in life expectancy and a decrease in fertility rate or crude birth rate and a change in dependency ratio. According to Figure 4, Life expectancy in Turkey is increasing rapidly as shows in the first 10

years period in Turkey (1960-1970), while the average life expectancy is 48-49 age; especially in the last decade (2010-2020), this age range has increased to 76-77 years. According to a projection for Turkey’s population prepared by TurkStat, in 2050 the life expectancy would rise to 79 and Turkey will be placed in 99th place among 186 countries (Tuik, 2012 A).

Figure 4: Life Expectancy at Birth, Total (Years) in Turkey

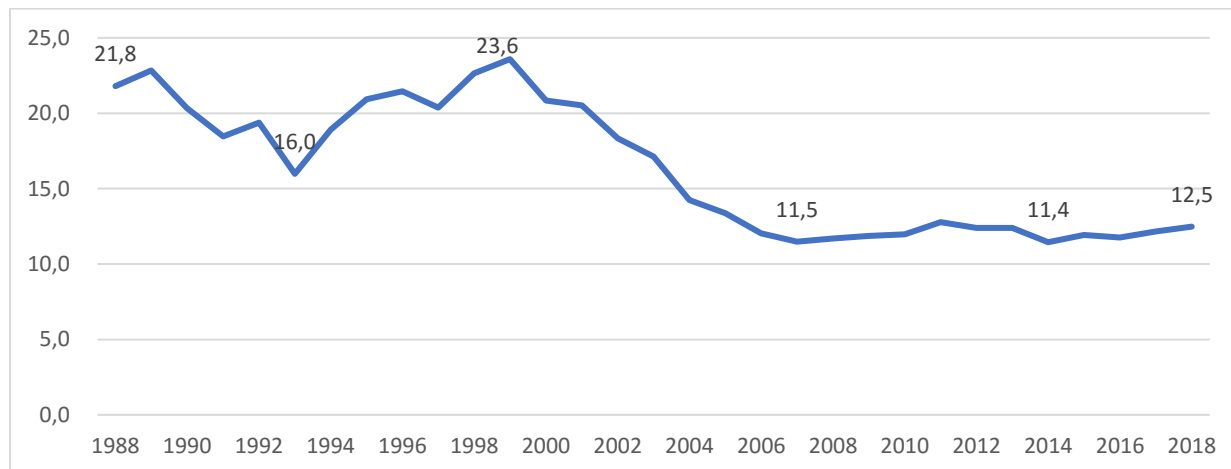


Source: World Bank DATA

The decrease in fertility rate and also increase in life expectancy leads to increase in elderly 65 ages and above group size in total population specially after 2015. Figure 4 shows that it is continuously increasing.

Employment rate of the population in the age group 65 years and above in Turkey makes it necessary to pay attention to the subject. Figure 5 shows that during 1988-2018, approximately 16% (16.37%) of the population aged 65 and above is employed. The reason for this is that the majority of individuals want to take part in the labor market at a young age. As a result of the country’s social security system, individuals are entitled to retirement in their 60s, causing them to move away from the labor market (SSGSSK, m.28). The increase in life expectancy and a reduction in the population growth rate, the population that can be employed in Turkey over the next two decades shows that very few in. Therefore, policy makers are required to take into account the population aging issue and take the necessary actions.

Figure 5: Labor Force Participation in Turkey (+65) Age Group



Source: TÜİK, Turkish Statistical Institute

4. DATA AND METHODOLOGY

In order to analyze the effect of population aging on Turkey' economy the following function has been considered. For this analysis the data were downloaded from World Bank Data and OECD Statistics.

$$\ln GDP_t = \alpha_0 + \alpha_1 \text{Aging}_t + \alpha_2 \text{LPRO}_t + \alpha_3 \text{LCAP}_t + \alpha_4 \text{LOpenness}_t + v_t \quad (1)$$

L: stands for the natural logarithmic form of the variables

GDP: is the gross domestic product of Turkey

Aging: is the growth rate of elderly population over total population

PRO: Stands for total productivity and calculated as GDP per hour worked

CAP: Stands for gross fixed capital formation (current US dollar)

Openness: stands for the degree of openness measured as trade percent of GDP

Vt= stands for white noise error term

The coefficient of Aging, α_1 , will be negative as an increase in aging associates with a decrease in economic growth. The increase in the 65 and above people is also associated with longevity or increase in life expectancy, old dependency rate and a fall in fertility rate Cervellati and Sunde (2009), Kelley and Schimidt (2005), and Barro (2008).

Productivity is one of the main components of production which measures the efficiency of labor and capital combinations in each country. Productivity may have played an important role in short-run but the more important is the long-run effect on economic growth and almost is everything Krugman (1994). In our model the α_2 shows the effect of productivity on economic growth of Turkey.

Since changes in Gross fixed capital formation have high explanatory power on economic fluctuations, is another variable which included in the model with CAP name. The sign of α_3 would be positive if the capital formation has increased the GDP per capita of Turkey.

Lastly, the degree of Turkey's economic openness is included in the model by Openness variable as it measures the trade share in GDP. Increasing the share of trade in the whole economy is always used in growth models, by increasing competitiveness among domestic enterprises, is a factor in strengthening the foundations of the national economy.

In this study the ARDL bound testing approach used in order to find the relationship between population aging and economic growth of Turkey in 1970-2018 period. The ARDL bound testing approach introduced by Pesaran and Shin (1999). The ARDL approach has more advantage in long run effects evaluation between variables than Engle-Granger (1987) and Johansen (1988, 1991) cointegration tests. In order to evaluate the long run relationship between variables with the help of Engle-Granger or Johansen, the series need to be all stationary at I(1), but under the ARDL model the series are not necessary to be stationary all at I(1) and series with I(0) and I(1) mixes can be used. It is also necessary for any series in ARDL model to not to be stationary at I(2) or above. In contrast to VAR models, the variables can have different lags in ARDL model. Another advantage of ARDL models is the possibility of estimating the short run and long run effects at the same time and can create an ECM (Error Correction Model) via a simple linear transformation Esen and Ozata (2017).

In order to use the bounds testing approach introduced by Pesaran et al. (2001), the reformulation of equation 1 is necessary as follows:

For simplicity the productivity, capital and openness variables are taken as control variables (CV).

$$\Delta \ln GDP_t = \beta_0 + \eta_1 \sum_{i=0}^p \Delta \ln GDP_{t-i} + \varphi_2 \sum_{i=0}^p \Delta \text{L Aging}_{t-i} + \xi_3 \sum_{i=0}^p \Delta \text{LCV}_{t-i} + \lambda_1 \ln GDP_{t-1} + \lambda_2 \ln \text{Aging}_{t-1} + \lambda_3 \ln \text{CV}_{t-1} + \mu_t \quad (2)$$

Where Δ shows the first difference, P shows the lag length, and white noise error term is μ_t . Long run relationship or cointegration are shown as λ_1 , λ_2 , and λ_3 . Also, the short run relationship is shown as the coefficients of the summation symbol and for simplicity in equation 2 the productivity, capital and openness variables are taken as control variable (CV).

5. FINDINGS AND DISCUSSIONS

For estimating the coefficients in equation 2, time series data from Turkey between 1970-2018 period used as logarithmic form. It is necessary to use an appropriate test for investigating the time series stationarity. Thus, Augmented Dicky Fuller – ADF test used to investigate the stationarity.

Table 1: Augmented Dickey Fuller Unit Root Test Results at Level & 1st Difference (with intercept and trend: significant level 95%)

Variable	Level		First Difference		Level
	T-Statistics	Critical Value	T-Statistics	Critical Value	
LGDP	-3.581491	-3.513075*			I(0)
Aging	-3.051079	-3.508508	-3.883776	-3.508508*	I(1)
LPRO	-3.641711	-3.506374*			I(0)
LCAP	-2.853401	-3.506374	-6.421615	-4.165756**	I(1)
LOPENNESS	-2.181078	-3.506374	-5.556026	-4.165756**	I(1)

Note: * and ** shows the significant level at 5% and 1% respectively.

Table 1 shows the augmented dickey fuller unit root test results. As it can be seen, the natural logarithmic form of productivity and GDP are stationary at level and all the other series are stationary at first difference. With other words none of the tested variables are at I(2) as it is precondition of an ARDL model.

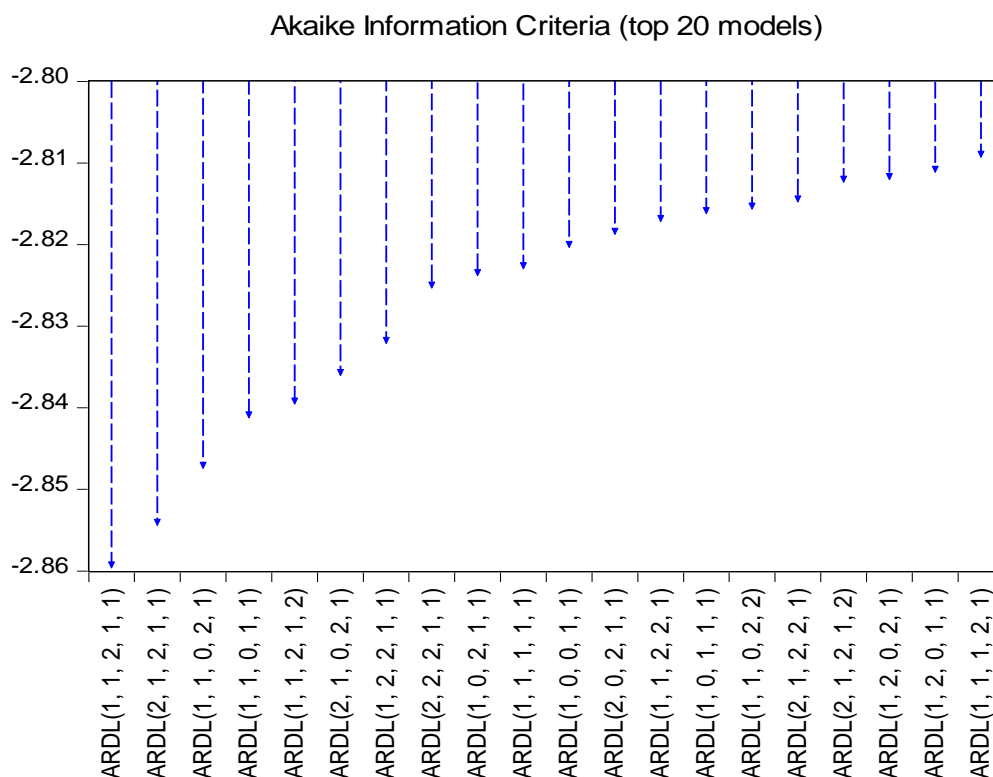
The appropriate ARDL model (1,1,2,1,1) by using Akaike Information Criteria (AIC) has been detected. It means that, one lag of LGDP, 1 lag of AGING, 2lags of LPRO, 1 lag of LCAP, and 1 lag of LOPENNESS inserted into the model. The appropriate model selection summary by Akaike Information Criteria has been shown in graph 6.

After detecting the suitable lag length for dependent and independent variables in order to find the long run relationship or cointegration the bounds testing applied. Table 2, shows the bounds test results with critic values calculated by Pesaran. As the F-statistics is 4.68 is greater than 3.97 which is significant at 0.05 significant level, the null hypothesis of bounds test which indicates that there is not any long run relationship can be rejected and alternative hypothesis accepted.

Table 2: Cointegration F-Statistics

Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	4.685733	10%	2.68	3.53
K	4	5%	3.05	3.97
		2.5%	3.4	4.36
		1%	3.81	4.92

Figure 6: Appropriate Model Selection Summary by AIC



After bounds testing and recognizing the long run relationship between variables, the long-run coefficients related to ARDL Model (1,1,2,1,1) with trend identified. Table 3 shows the long-run relationship between the dependent and independent variables. Except the first lag of LGDP and LOPENNESS which they are way insignificant, aging has a negative impact on economic growth of Turkey in long-run as 1 percent increase in growth rate of elderly people the GDP will decrease by approximately 0.02 percent.

Table 3: The Long-Run Coefficients of ARDL Model (1, 1, 2, 1, 1) (LGDP is the Dependent Variable)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.895913	1.746862	4.520056	0.0001
@TREND	0.033534	0.009829	3.411665	0.0017
LGDP(-1)*	-0.077697	0.083898	-0.926079	0.3609
AGING(-1)	-0.029491	0.011185	-2.636589	0.0125
LCAP(-1)	0.609369	0.140643	4.332721	0.0001
LPRO(-1)	-1.347483	0.423221	-3.183874	0.0031
LOPENNESS(-1)	-0.002263	0.060737	-0.037266	0.9705

The short-run coefficients related to ARDL Model (1, 1, 2, 1, 1) with the error correction result where showed at Table 4. Table 4 shows that in short-run period the coefficient of Aging is negative and statistically significant. It means that 1 percent increase in growth rate of old people leads to approximately 0.1% decrease in gross domestic product on Tukey in short-run and 0.03 percent in long-run. The short-run coefficient of LPRO is positive and statistically significant at 0.05 significance level. It means that a one percent increase in productivity leads to 0.52% increase in gross GDP of Turkey in short-run, but it will turn to negative in long-run. The reason might be in the long run the productivity was not enough to continuously increase the GDP.

Table 4: The Short-Run Coefficients of ARDL Model (1,1,2,1,1) - (LGDP is the Dependent Variable)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	7.929447	1.388815	5.709506	0.0000
D(AGING)	-0.084578	0.022849	-3.701547	0.0008
D(LCAP)	0.486156	0.114688	4.238949	0.0002
D(LCAP(-1))	-0.151892	0.071433	-2.126371	0.0408
D(LPRO)	0.520033	0.253088	2.054756	0.0477
D(LOPENNESS)	-0.733266	0.043241	-16.95763	0.0000
DUM2001	-0.090415	0.036731	-2.461558	0.0191
CointEq(-1)	-0.077697	0.013682	-5.678809	0.0000

F-Statistics= 67.21215(0.0000)

R2= 0.923452, Adjusted R2=0.909713

Serial Correlation LM Test:	0.8956	(0.8510)
JB Normality TEST:	0.874682	(0.645751)
Ramsey RESET TEST:	0.2855	(0.2855)
Heteroscedasticity Test:	0.8279	(0.8176)

The dummy variable of Dum2001 stands for the economic crisis in 2001 with negative coefficient and statistically significant at 0.05 significance level. Finally, the CointEq(-1) as it must be negative and less than 1 is negatively signed, less than 1 and strongly significant.

As Table 4, the Breusch Godfrey LM test shows that there is no autocorrelation in the model and the null hypothesis can be accepted. The Jarque Bera Normality Test result shows that the null hypothesis can be accepted and residuals are normally distributed. Also, ARCH Heteroscedasticity Test shows that the error terms are normally distributed. At the end, Ramsey RESET TEST, shows that the model is generally well designed and it is not mis specified.

Finally, to test whether the coefficients in the model are stable, the CUSUM Test and CUSUM of Squares were done. Figures 7 and 8 show the result of CUSUM and CUSUM of Squares Tests. Thus, the CUSUM and CUSUM of Squares lines are between the 0.05 significance level, the coefficients in the model are stable.

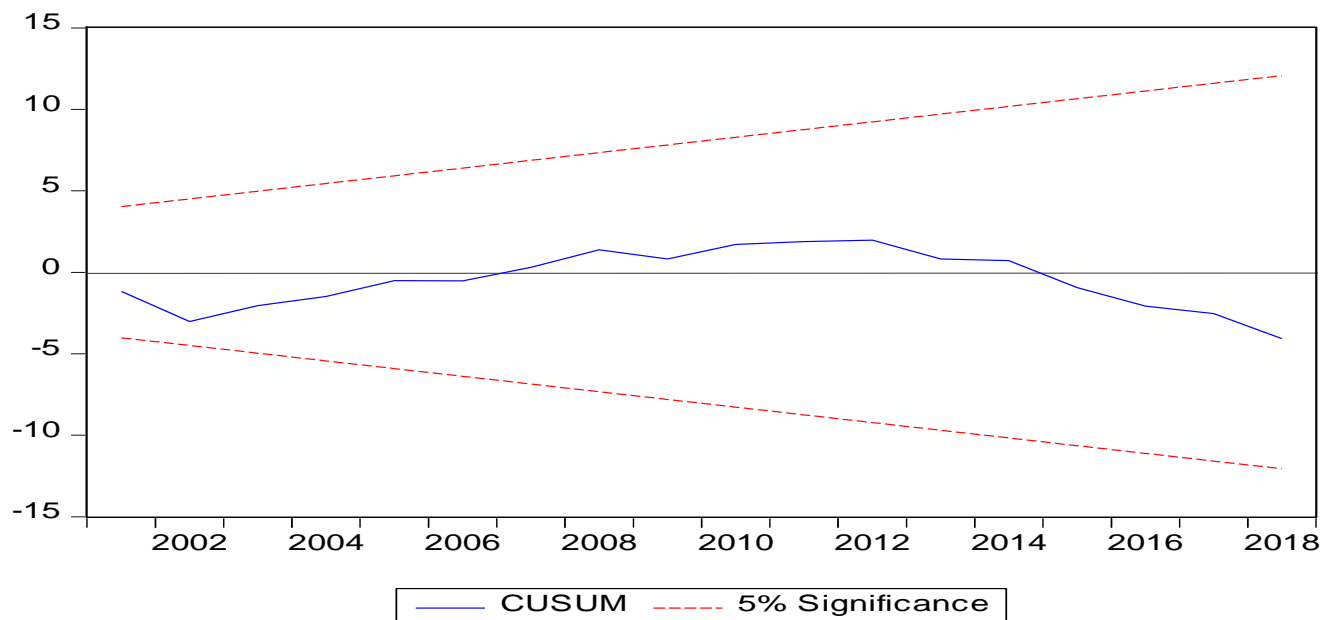
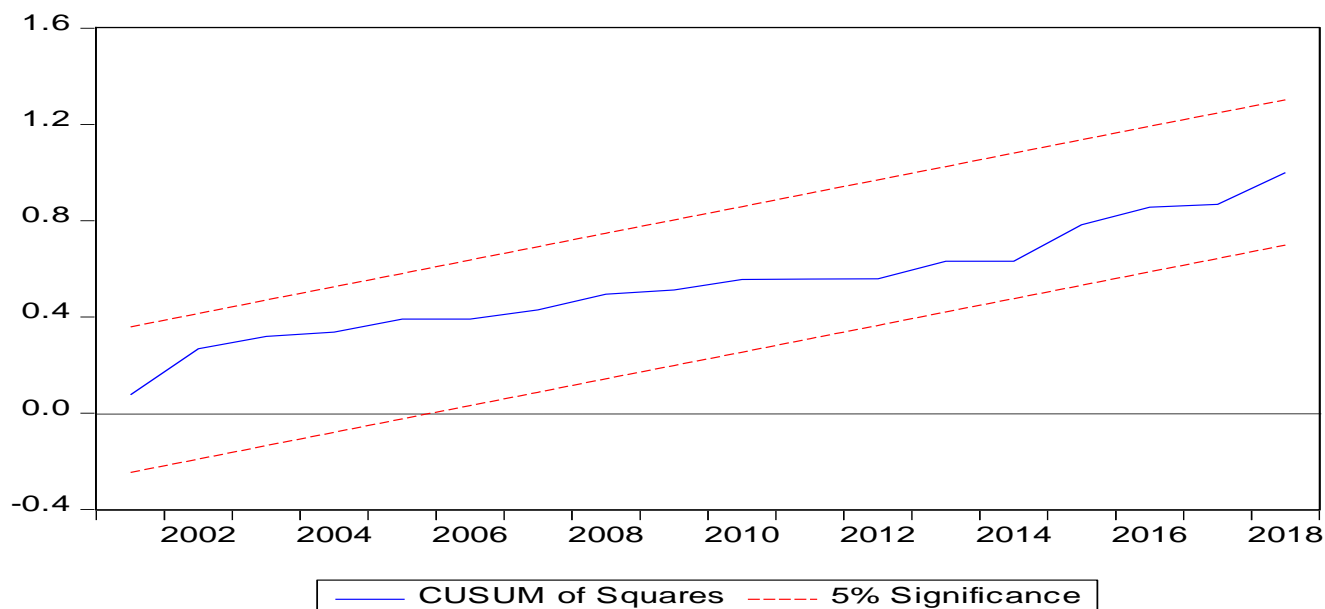
Figure 7: CUSUM TEST

Figure 8: CUSUM of Squares Test

6. CONCLUSION

The population aging is going to be an important subject in the soon future. An economy is going toward aging as the rate of fertility decreases, like a decrease in death rate or increase in life expectancy. Also, it means that the share of old people over 65 years old in total population is rising gradually. Turkey's population growth rate was about 28.5 per 1000, in higher rate in 1960 and after that gradually decreased to 10.9 per 1000, in 2020 and as predicted will be 0 in 2050. On the other hand, life expectancy is gradually increasing from 45 years old in 1960 to 74 years old in 2018. The same as an increase in life expectancy, old population share is raising more rapidly specially after 1990 from approximately 2.5 million persons to near 8 million persons in 2018. These numbers are just signs of aging in Turkey, this study was conducted to find the relationship between population aging and economic growth of Turkey. For this reason, time series data set has been used for an ARDL model to find either short and long run relationship between 1970-2018 period. The evidences show, that the aging negatively affect Turkey's economy but this condition should not be a major concern for Turkish government, as population ages through reducing fertility rate it not only means a greater opportunity for women to participate in the labor market but also increases labor productivity and economic growth. Policies like change in retirement age, reform of work and retirement benefits, planning to invest more on capital intensive production in coming decades, planning for the health and medical expenses of the elderly and policies related to balancing population growth should be considered as most important preventive policies in this field.

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ANALYSIS OF THE RELATIONSHIP BETWEEN EXCHANGE RATE CHANGES AND PROFITABILITY IN TURKEY: EXAMPLE OF BIST MANUFACTURING SECTOR¹

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ABSTRACT

Purpose- The aim of this study is to empirically investigate the relationship between the change in exchange rates and the profitability of firms in Turkey. The changes in real effective exchange rate as the change in exchange rates criteria and return on assets as well as return on equity are considered for measuring profitability.

Methodology- The sample of the research consists of 37 companies that are listed in BIST 100, operating in the manufacturing sector and whose data can be accessed completely. The data of the companies within the scope of the research were obtained from the official websites of Borsa Istanbul, Public Disclosure Platform, and Finnet and made ready for analysis. For the purpose of the research, panel data analysis, panel unit root tests, panel regression analysis, causality analysis, and moderating effect analysis were carried out.

Findings- Changes in foreign exchange rates, foreign sales and asset size of the companies do not have any significant impacts on the return on assets and return on equity during the period between 1999-2019 in Turkey. It has also been found that asset size, foreign sales, and change in exchange rates are the reasons for the return on assets and similarly, asset size, foreign sales, and change in exchange rate are the reasons for the return on equity. Finally, changes in the foreign exchange rate and export sales have a short-term causal relationship with both return on assets and return on equity, and changes in the foreign exchange rate and total assets have a moderating effect on return on assets.

Conclusion- As a result of the research, it has been revealed that firms are affected by changes in foreign exchange rates with a delay. It means firms were likely be affected by the changes in exchange rates with a lag, and similarly, the changes in exchange rates affected financial performance with a lag. It has also been revealed from the research that firms effectively use internal and external hedging methods that help reduce the adverse impacts of the changes in foreign exchange rates.

Keywords: Exchange rates, changes in exchange rates, profitability, return on assets, return on equity.

JEL Codes: F31, M49, L60.

1.INTRODUCTION

Due to the rising globalization in the world, trade potential has developed and the impact of the change in foreign exchange rates on economic performance has gained importance. Along with the de-escalated importance of the Bretton Woods system, many developed and developing countries have made adopted the free-floating exchange rate system and Turkey has also joined these countries as of 2001. Countries that have adopted the free-floating exchange rate system have begun to experience changes in the value of their national currencies. The appreciation or depreciation of the national currencies is expressed as a change in

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foreign exchange rates. Even companies that do not operate internationally have been exposed to the impacts of foreign exchange rates due to the fluctuations in exchange rates and improved international trade. The change in exchange rates affects not only the economic activities of countries but also the overall profitability of companies.

This study aims to determine the level of association between the change in exchange rates and profitability ratios of the companies operating in Turkey. In this context; the foreign exchange rate, the change in exchange rates, profitability, and profitability ratios are firstly considered in the study. Then, the profitability ratios of 37 companies with accessible data operating in the manufacturing sector based on the Borsa Istanbul 100 index are calculated utilizing the financial statements and annual reports over the years 1999-2019. The association between the change in exchange rates and profitability ratios, which is the subject of the study, is examined using the panel data analysis method; the findings are evaluated and recommendations are made with reference to future studies.

2. CONCEPTUAL FRAMEWORK

In this part of the study, exchange rate, changes in the exchange rate, profitability and profitability ratios are explained.

2.1. Exchange Rate and Exchange Rate Change

As a result of the economic activities of a country, payments are made in the form of cash (banknote) and bank money (check, bill, money order), as well as in international payments, financing relationships are also made in both cash and bank money (Yıldız, 1988: 5).

Expressed as the name given to foreign currencies, foreign currency is defined as "all kinds of accounts, documents, and instruments that enable payment in foreign currency" pursuant to the Decree No. 32 on the Protection of the Value of Turkish Currency (Doğukanlı, 2001: 55). The exchange rate, however, is a price that differs from the price of any commodity. For instance, the change in the price of a good creates changes in the supply and demand for the good and the price of the substitute good, whereas the change in the exchange rate first leads to the global changes in the economy that affect the goods and services subject to international trade, and then other markets (Karluk, 2003: 371 - 372).

Unexpected fluctuations in the exchange rate, by causing changes of the foreign currency-dependent receivables, debt, income, and expenditure flows of companies dealing with foreign trade and monetary transactions in terms of the domestic currency, create changes in the market value of firms along with their net profitability. Unexpected foreign exchange rate fluctuations affect, not only the participants in the foreign market but also those who operate in the domestic market. Foreign currency price changes are intertwined with the production costs and sales prices of firms, as the reasons for overall price increases in the country. Furthermore, exchange rate fluctuations affect domestic firms by making domestic goods more expensive or cheaper than competing goods (Seyidoğlu, 2003: 246).

Exchange rate movements may also have an impact on financial performance and firm value since they affect the cash flows of internationally-operating firms (Madura, 2012: 311). Firms use several instruments and strategies to protect themselves against exchange rate impacts. These instruments and strategies are categorized under two groups such as internal and external (Doğanay, 2016: 152). Protection with in-house methods includes minimizing the exchange rate risk by utilizing the resources of the firm. Techniques such as selecting the currency type in the invoices, and determining the foreign currency inputs and outputs from the same currency type can be considered among the in-house methods. Firms tend to utilize some protection instruments to protect their asset-liability structures against the impacts of the exchange rate. These instruments, namely; forward and futures contracts, options, and swaps can be considered as external hedging methods (Karluk, 2009: 508-509).

2.2. Profitability and Profitability Ratios

Profit, which constitutes the first step toward the set of economic targets, is a type of attempt to the necessity of rational business decisions. Profit is the most crucial motive that stimulates company owners, managers, and other employees. Because, as long as the company makes more profit; the company owner would increase its capital, and the employees would increase their incomes (Akkuş, 2010: 24). Profit, which represents the most important success criterion for the company, is defined as the difference between sales revenue and cost (Müftüoğlu, 2010: 229).

Firms can boost their profitability by improving their efficiency or increasing their sales. However, the increase in profitability to be achieved with productivity increase is more effective than increasing sales. The ratios that are used to evaluate the profit can be separated into two such as profitability ratios according to sales and profitability ratios according to investment. The firm efficiency occurs upon evaluated along with these rates (Bolat, 2009: 10).

Profitability ratios according to sales are divided into two as gross profit margin and net profit margin. The gross profit margin is calculated by dividing gross sales profit by net sales. Gross sales profit arises from the positive difference between net sales and cost of goods sold. After a firm's gross sales profit meets its operating expenses and other expenses, it is required to provide the shareholders with a sufficient amount of profit (Büker et al., 2014: 106). The net profit margin gives an idea of the net profitability of the firm's operations. The net profit margin is calculated by dividing the net profit for the period by the net sales amount (Düzakın, 2013: 88).

Profitability ratios according to investment are divided into two as the ratio of net profit to equity and the ratio of net profit to total assets. The associations between profit and capital are called "financial profitability". Since the purpose of the investment is to make a profit, it can be claimed that the relationship between the capital put into a company's business by its partners and profit is a crucial indicator in profitability analysis. Return on equity is calculated by dividing net profit, that is, profit after taxation, by equity. The ratio expresses the amount of profit per unit of the capital provided by the company's partners (Büker et al., 2014: 104). Return on assets indicates the extent to which the company becomes profitable concerning its total assets, and is calculated by dividing net profit by total assets. The higher the coefficient resulting from this calculation, the more successful the firm is considered in making profits. The ratio of net profit to total assets is also known as the rate of return on assets and refers to the gains from investment capital (<https://businessht.bloomberght.com/piyasalar/haber/1583151-aktif-karlilik-nedir>).

3. LITERATURE REVIEW

Adler and Dumas (1984) asserted that even companies without foreign currency assets and debts that neither engaged in foreign trade activities nor conducted trading transactions would have been exposed to foreign exchange risks. They subjected the exchange rate risk exposure to regression by associating it with the stock returns. They also claimed that the concept of regression coefficient openness was a unique and comprehensive measurement model that summarizes a firm's sensitivity in various aspects that could affect the change in exchange rates until sometime in the future.

Jorion (1990) tried to measure the relationship between the value of multinational companies operating in America and the foreign exchange rate. In the study, the data of 287 firms over the period 1971-1987 were analyzed using the OLS method with a two-model approach to measuring the foreign exchange risk exposure of the companies. In the first model, the impact of the change in exchange rates and market return on the stock returns of companies was investigated, and it was concluded that 15 out of 287 firms were statistically significantly and negatively affected. In the second model, the relationship between the foreign sales of companies and the change in exchange rates achieved in the first model was considered and it was concluded that the change in exchange rates positively affected the returns of the companies as well as the foreign sales of the companies.

Bartov and Bodnar (1994), upon considering the limited success of previous studies in documenting significant foreign exchange rate risks, investigated the extent to which firms were affected by exchange rate fluctuations by analyzing the relationship between US Dollar and equity value. The departure point in their studies had been the assumption that firms being affected by exchange rate fluctuations with a lag. The data used in their study covered the period between 1978-1989. In the first model they generated, they examined the impacts and lagged impacts within the same period. Upon examining the relationships within the same period, they could not draw a significant conclusion.

Therefore; upon considering the possibility of lagged impacts of the change in exchange rates, the researcher included the coefficients obtained from the first model as dependent variables in the second model. In the second model, it was also concluded that the change in exchange rates had lagged impacts on the firm's stock performance.

Bodnar and Wong (2003) generated a model by using income, profit, and expenditure percentages in terms of foreign currency to investigate US companies' exposure to exchange rate risks. In the generated model utilizing the data obtained over the period between 1977-1996; they concluded that firms that engaged in import and export activities had higher exchange rate risk elasticity, whereas smaller firms were more prone to exchange rate risks.

Doidge et al. (2006) investigated the sensitivity of 17,929 companies operating in 18 countries including Turkey to the change in exchange rates. They performed the panel data analysis utilizing the financial data of the companies selected for the study over the period between 1975-1999. According to the analysis results, it was detected that 8.2% of all companies and 4.5% of Turkish companies exhibited sensitivity to the change in exchange rates. It was concluded that the companies with no international sales exhibited lower sensitivity to the change in exchange rates.

Baggs et al. (2009) explicated the impacts of exchange rate volatility on the survival and sales of companies. Within the scope of the study, the data of the companies operating in Canada over the period between 1986-1997 were utilized. The researchers

stated that the selection of the study period, during which the Canadian Dollar appreciated 30% in the first 6 years and depreciated 30% in the later 6 years, was not accidental. As a result of the research, they stated that the appreciated Canadian Dollar had an adverse relationship with the survival and sales of the firms. Nonetheless; they found that the change in exchange rates had less impact on the survival skills of more productive companies than others.

Fung and Liu (2009) examined the extent to which 188 firms that traded on the Taiwanese stock exchange were affected by the change in exchange rates using the data obtained over the period 1992-2000 via panel data analysis method. As a result of the study, it was being determined that the actual depreciation of the New Taiwan Dollar caused an increase in exports, domestic sales, and total sales values. Nevertheless; they stated that such real depreciation caused an increase in firm productivity.

Tomlin and Fung (2010) investigated the impact of real exchange rate movements on the productivity distribution of 128 manufacturing companies in Canada. Within the scope of the research study, they performed quantile regression analysis utilizing the data of the Canadian manufacturing sector (firm scale) over the period 1984-1997. As a result of the analysis; they found that quantile regression curves indicating the relationship between exchange rates and productivity followed a downward trend in some industries (feed, plastic bags, canvas products, wooden furniture, basic equipment, industrial fasteners, agricultural tools, signs and electronic markers). They concluded that the change in exchange rates had an impact on the firm productivity distribution, however; such a situation differs according to industry branches.

Dhasmana (2013) examined the impact of the real effective exchange rate on manufacturing firms in India. In the research study, the data of 250 manufacturing companies in the Bombay stock exchange 500 indexes over the period 2000-2012 were utilized. As a result of the research study; market power was emphasized as the most important determinant of financial performance in terms of exchange rate movements. Noting that there was an inverse relationship between currency appreciation and financial performance; the researcher suggested that large firms with sufficient financing opportunities might have reduced their sales volumes while preserving their profit margins.

Hanagaki and Hori (2015) investigated the extent to which the change in exchange rates affected the performance of Japanese firms and made evaluations using a large dataset of 360,000 Japanese firms over the period 1990-2003. The findings of the study claimed that Japanese firms, especially export-based firms, and the performances of medium-sized firms were positively affected by the depreciated Yen. However, such a positive effect was not found quite strong; they concluded that the relationship between Yen value and financial performance has not varied much throughout the last 20 years.

Kelilume (2016) explicated the extent to which the performances of the 20 most active firms in the Nigerian stock market were affected by the exchange rate volatility. Within the scope of the study, using Arrelano - Bond dynamic panel data and Arrelano - Bover generalized moments method; return on assets, asset turnover ratio, and portfolio activity, as well as elasticity variables, were discussed. In the research study, it was concluded that the exchange rate volatility over the period 2004-2013 caused a negative impact on all three variables and adversely affected the performances of companies in Nigeria.

Williams (2018) investigated the impacts of the change in exchange rates on the financial performances of companies in Nigeria. In the study, the panel data were utilized over the period 2012-2016. As a result of the research, the existence of a positive relationship between the change in exchange rates and investment efficiency was detected.

Yücel and Kurt (2003) investigated the data of 152 firms whose stocks traded on the BIST over the period 2000-2002 utilizing models used by Adler and Dumas (1984), and Jorion (1990). Within the scope of the study, they selected the real effective exchange rate and the ISE 100 index as the control (market) variables. After performing their first analysis, they investigated the impacts of firms in terms of their exporting status on their sensitivity to exchange rates. They emphasized that, for a firm to become an exporter, the share of its foreign sales in total sales should have been higher than 20%. According to the results of the research, they detected significant relationships in 11 of the firms that were under investigation in the Adler and Dumas model. 9 of those with significant relationships were among the exporting firms. According to the Jorion model, a significant relationship was found in 15 of the firms within the scope of the research, and it was emphasized that 14 out of those 15 firms were exporters. Based on the results they obtained from the two models, the researchers concluded that non-exporting firms were less affected by exchange rate movements rather than exporting firms.

Kızıl and Erdal (2012) investigated the extent to which the real exchange rate movements affected financial performance and whether or not they differed in each sector. Within the scope of the study, the data of 102 companies were utilized. They paid attention to the fact that the selected companies were in the manufacturing sector and had an average annual sales amount of approximately 83.5 trillion TL in the ISE. The study concluded that real exchange rates, which gained value, had positive impacts on foreign, domestic, and total sales and added values that were used to measure financial performance.

Mutluay and Turaboğlu (2013) aimed at measuring the extent to which the exchange rate movements affected companies, based on the data obtained from 55 companies traded on the ISE. They analyzed the relationship between financial performance and exchange rate utilizing a regression model on the data of firms over the period 1997-2007. As a result of the research, they concluded that the changes in the exchange rate affected their financial performance with a lag and there was an opposite relationship between such level of influence and exports.

Akalın and Uzgören (2016) investigated the long-term relationship among firms' value-added, exchange rate, capital ratio, export volume, domestic sales, total sales, and profitability using econometric models. In the study, the Durbin - Hausman cointegration test and the Common Correlated Effect were used for the data obtained over the period 1993–2009. As a result of the study; the Durbin - Hausman test detected a long-term relationship among the variables. According to the Common Correlated Effect, they found that the increases in the exchange rate negatively affected the total sales and exports, and the added value created by the companies positively affected domestic sales, export amount, total sales, and profitability. They concluded that the increase in the capital/labor ratio also affected profitability positively.

Boyacıoğlu and Çürük (2016) investigated the extent to which the change in exchange rates affected stock returns. Within the scope of the study, they benefited from the data of 42 companies traded in the ISE 100 index and operated in the manufacturing and trade sectors over the period 2006-2014. Within the scope of the study, they conducted the panel data analysis to make predictions by calculating the changes in annual real exchange rates and stock returns. As a result of the study, they determined that changes in real exchange rates had positive impacts on the stock returns.

4. DATA AND METHODOLOGY

Studies in the literature reveal the existence of a relationship, which is less simultaneous than expected, between the change in exchange rates and firm profitability. There are three complementary explanations for such a weak relationship. The first involves the fact that investors tend to run late in learning about the exchange rate risks to which companies have been exposed. The second involves the fact that companies become insensitive to the change in exchange rates by successfully using financial derivatives and internal hedging methods to mitigate the adverse impacts of the change in exchange rates. The third involves the fact that data limitations and methodological weaknesses of empirical studies hamper the research studies' power (Dewenter et al., 2005: 120-122).

In this study, it was investigated whether a relationship existed between the change in exchange rates and firm profitability. In this context, the profitability ratios of 37 companies in the Borsa Istanbul (BIST) 100 index, operating in the manufacturing sector were calculated over the period between 1999 and 2019, and the relationship between the real exchange rate index changes and the profitability ratios was analyzed.

The scope of the research study consists of 42 companies that are listed on BIST 100 and operating in the manufacturing sector. However, the research is limited to 37 companies, whose whole dataset is accessed over the years 1999-2019. In order to draw more significant conclusions, the interval of the study period is determined as 1999-2019.

The manufacturing sector, which is a leading sector in many aspects within the economic system, is selected for the research study. Manufacturing companies play an important role in a modern economy and provide many crucial benefits for economic growth. The manufacturing sector increases productivity by contributing to import substitution and the expansion of exports, and provides foreign exchange earning capacity by encouraging the growth of investments at a faster pace than any other sector within the economy.

The annual change in real exchange rate index data obtained by means of the electronic data distribution system of the Central Bank of the Republic of Turkey is considered in the research for the change in the exchange rate. Moreover, the data regarding 37 companies trading in BIST 100 on total assets, total equity, net profit, current assets, fixed assets, and foreign sales are obtained from the financial statements published on websites such as www.borsaistanbul.com, www.kap.org.tr, and www.finet.com.tr. Upon utilizing these data, the variables of "return on assets" and "return on equity", as the determinants in measuring the profitability of companies, are calculated.

In the study, the impacts of the change in foreign exchange rates (FOREX) (independent variable) on return on assets (ROA) and return on equity (ROE) (dependent variables) are analyzed via the panel data analysis method. Then, to examine whether or not the impact of the change in exchange rates on profitability is affected by foreign sales and asset size variables, asset size (ASSETS) and foreign sales (FORES) variables are determined as moderators.

Total assets indicate the asset size of companies and are among the factors that affect profitability rates. Foreign sales represent the exporting potential of companies. Exporting companies are usually associated with high levels of productivity and profitability, and foreign sales are also factors that affect firm profitability. In the research study, the moderator effect of "asset size" and "foreign sales" variables on the relationship of "the change in exchange rates" with "return on assets" and "return on equity" is analyzed using regression analysis.

5. FINDINGS

The research study, which is conducted in the panel data position, examines the impact of the independent variables such as "change in exchange rates", "asset size" and "foreign sales" on the dependent variables such as "return on assets" and "return on equity". In the estimation of research models (panel data models), there are two approaches such as fixed effect and random effect. First of all, it is necessary to determine which of the fixed effect and random effect approaches would be appropriate for panel regression models. The following two models are tested within the scope of the research study:

$$ROA_{it} = C + \beta_{it}ASSETS + \beta_{it}FOREX + \beta_{it}FORES + U_{it} \quad (1)$$

$$ROE_{it} = C + \beta_{it}ASSETS + \beta_{it}FOREX + \beta_{it}FORES + U_{it} \quad (2)$$

After considering the fixed and random effect regression models in the selection of the appropriate model in the research study, the Hausman test was performed to make the decision. The hypotheses of the Hausman test statistic are established as follows:

H_0 : The random effect is more appropriate.

H_1 : The fixed effect is more appropriate.

Firstly, the fixed effect regression model is tested for Model 1 in the research study, and the obtained result are presented in Table 1. Model 1 is tested first in the research. According to the Hausman Test, since the P-Value for the Cross-section random value is higher than 0.05, the null hypothesis is accepted and it is determined that the appropriate model for panel regression regarding the model in Equation 1 is based on the random effect. The Hausman test results are presented in Table 3.1.

Table 1: Hausman Test Results for Equation 1

		Chi-square Statistic	Degree of Freedom	P-Value
Hausman Test		0.000000	3	1.0000
Cross-Section Random Effect Test Comparisons				
Variables	Constant	Random	Difference	P-Value
FOREX	-0.000544	-0.000540	0.000000	0.8899
ASSETS	-0.000000	-0.000000	0.000000	0.9363
FORES	0.000000	0.000000	0.000000	0.8051

In the panel regression equation where the dependent variable is ROA, it was determined that the variables ASSETS, FOREX and FORES are not statistically significant and had no significant impact on the ROA variable. The obtained results are presented in Table 2.

Table 2: Random Effects Regression Results for Model 1

Method: Panel EGLS (Cross-Section Random Effects)				
Dependent Variable: ROA				
Variables	Coefficients	Standard Error	T statistic	P-Value
C	0.120259	0.025229	4.766765	0.0000
ASSETS	-4.16E-13	8.24E-13	-0.504295	0.6142
FOREX	-0.000540	0.000225	-2.398978	0.0167
FORES	6.03E-13	1.70E-12	0.354463	0.7231

In the regression model where the dependent variable is ROE, the Hausman Test is performed to determine the estimation method. According to the Hausman Test, since the P-Value for the Cross-section random value is higher than 0.05, the null hypothesis is accepted and it is determined that the appropriate model for panel regression regarding the model in Equation 2 is based on the random effect. The Hausman test results are presented in Table 3.

Table 3: Hausman Test Results for Equation 2

	Chi-square Statistic	Degree of Freedom	P-Value	
Hausman Test	0.000000	3	1.0000	
Cross-Section Random Effect Test Comparisons				
Variables	Constant	Random	Difference	P-Value
ASSETS	-0.000000	-0.000000	0.000000	0.8190
FOREX	-0.002588	-0.002424	0.000000	0.4599
FORES	0.000000	0.000000	0.000000	0.6305

It is determined that the variables ASSETS, FOREX and FORES are not statistically significant and have no significant impact on the ROE variable for the panel regression equation in which the dependent variable is ROE. The obtained results are presented in Table 4.

Table 4: Regression Results for Model 2 According to Random Effect

Method: Panel EGLS (Cross-Section Random Effects)				
Dependent Variable: ROE				
Variables	Coefficients	Standard	T-statistic	P-Value
C	0.349106	0.114896	3.038444	0.0025
ASSETS	-4.13E-13	3.61E-12	-0.114349	0.9090
FOREX	-0.002424	0.001069	-2.267617	0.00236
FORES	8.91E-12	7.49E-12	1.189864	0.2345

5.1. Unit Root Test

In econometric time-series, for the econometric model to yield significant results, the stationarity of the time-series must first be tested. In the case of stationarity, there should be no symmetrical change in the variance and mean of the series and the covariances of all observation values of the series should be equal to a constant value (Göktaş et al., 2019: 159). If the variance and mean of the series are independent of time and the covariance is based on intertemporal differences, the series is said to be stationary. Stationary series are series that do not contain unit roots (Sarıkovanlık et al., 2019: 185). In the model estimated with non-stationary time-series, parameter values and statistics are calculated incorrectly, and in this case, econometrically inconsistent results are obtained (Göktaş et al., 2019: 159). The hypotheses established for the research variables are as follows:

H_0 : The series does not contain any unit roots. The series is not stationary ($\rho_i = \rho = 1$)

H_1 : The series does not contain any unit roots. The series is stationary ($\rho_i = \rho < 1$).

In determining whether the panel data is stationary over time, both the panel data applied to the balanced panel and the panel unit root tests used for the series that are not sought to be a balanced panel are taken into consideration together. Panel unit root tests are performed separately for each variable. Among the panel unit root tests, the main reference is the results of the Levin, Lin and Chu t-test (Sarıkovanlık et al., 2019: 193). According to the unit root tests, it is determined that ROA and ROE dependent variables are stationary at the level, whereas ASSETS, FOREX, and FORES variables are not stationary at the level, and upon taking the second differences of the series, they are determined as stationary. Since the series are stationary, they do not contain any unit roots and no long-term relationship is determined. The obtained results are presented in Table.5.

Table 5: Panel Units Root Tests

Methods	ROA (0)		ROE (0)		ASSETS (2)		FOREX (2)		FORES (2)	
	Statistic	P-Value	Statistic	P-Value	Statistic	P-Value	Statistic	P-Value	Statistic	P-Value
Levin, Lin and Chu t	-7.3576	0.0000	-7.8042	0.0000	-12.2558	0.0000	-8.99255	0.0000	-9.63503	0.0000
PP – Fisher Chi-square	304.955	0.0000	310.008	0.0000	2261.39	0.0000	9745.96	0.0000	1350.07	0.0000

5.2. Panel Cointegration Test

In the time-series regarding the panel data, the approach that was developed to examine the long-term relationship is called the cointegration approach in panel data analysis as in time-series (Guriş, 2015: 269). In cases where the economic time-series contain unit roots, the linear combinations of these series can be stationary, and the series can be related in the long-run (Tatoğlu, 2012: 233). Cointegration tests are performed to test this relationship. The prerequisite of the panel cointegration test requires that the variables should not be stationary in level values and the first difference of all variables should be stationary (Sarıkovanlık et al., 2019: 196). Since the ROA and ROE variables are determined to be stationary at the level, whereas the variables ASSETS, FOREX, and FORES are determined to be stationary at the second differences according to the Levin, Lin and Chu t-test, it is decided to perform causality analysis without the necessity of performing cointegration test.

5.3. Panel Causality Test

In time-series analysis, causal relationships between variables are tested with causality analysis. In the causality analysis, the direction of the relationship between two variables is investigated by the Granger causality-based causality analyses. As in time-series, the investigation of causal relationships in panel data models is based on the Granger causality logic. In the Granger causality analysis, if the value of a current Y variable is predicted better than the current value of the other variable X than the past values; it can be mentioned that there is a causal relationship running from variable X to variable Y (Güriş, 2015: 295).

It is possible to mention four different tests, namely Panel VECM (2008), Coing and Pedroni (2008), Emirmahmutoğlu, and Köse (2011), and Dumitrescu and Hurlin (2012), which influence the panel causality literature. In accordance with the aim of the study, the method developed by Dumitrescu and Hurlin (2012) is used to test the presence of a causal relationship among the series. This method is used advantageously by taking both cross-sectional dependence and heterogeneity among the countries that constitute the panel into account, regardless of the comparison between time dimension (T) and the cross-section dimension (N), and it can produce efficient results in unbalanced panel datasets (Dumitrescu and Hurlin, 2012). Another feature of the Dumitrescu and Hurlin test involves the fact that it can analyze both in the presence of a cointegrated relationship and in the absence of such a relationship. Therefore, the Dumitrescu-Hurlin panel causality test is performed for causality analysis utilizing this dataset in which there is no cointegrated relationship.

In the Dumitrescu-Hurlin panel causality test, when X and Y represent two stationary processes observed during T period for N units, for each unit (i) at time t , it considers the linear heterogeneous model in Equation 3;

$$y_{it} = \alpha_i + \sum_{k=1}^k \gamma^{(k)} y_{it-k} + \sum_{k=1}^k \beta^{(k)} x_{it-k} + \varepsilon_{it} \quad (3)$$

In Equation 3, the firm-specific impacts of α_i , $\gamma^{(k)}$ and $\beta^{(k)}$ are assumed to be the same for all firms. Since the study aims to determine the possible impacts of changes in exchange rates, asset size, and foreign sales of 37 firms on the company's return on assets and return on equity, the study has two dependent variables. These variables are the return on assets and return on equity of the firms. Other variables are independent variables, and unilateral causality running from causal variables to consequential variables are examined.

The VEC Granger Causality / Dumitrescu Hurlin Test is used as the method in the study. When the return on assets (ROA) is the dependent variable, it is determined that variables that are causal with one lag are causes of return on assets.

Accordingly, the following would be stated regarding the activities of 37 companies:

- Firm size is a short-term cause of the return on assets in the Granger-Dumitrescu Hurlin sense (Prob. = 0.0000).
- Changes in exchange rates for firms is a short-term cause of the return on assets in the Granger-Dumitrescu Hurlin sense (Prob. = 0.0006).
- Foreign sales of firms are a short-term cause of the return on assets in the Granger-Dumitrescu Hurlin sense (Prob. = 0.0008). The obtained results are presented in Table 6.

Table 6: Panel Causality Test Results Regarding Return on Assets

Method: Pairwise Dumitrescu Hurlin Panel Causality Tests			
Dependent Variable: (ROA)			
Variables	Coefficient of Concordance	Normal Distribution	P-Value
ASSETS	2.44920	4.50146	7.E-06
FOREX	2.14010	3.44405	0.0006
FORES	2.11848	3.37007	0.0008

The Dumitrescu Hurlin Panel causality test is conducted to investigate whether or not the independent variables have a possible causal relationship with equity. According to the Dumitrescu Hurlin Panel causality test:

- Asset sizes of firms Granger-Dumitrescu Hurlin cause return on equity in the short-run (Prob. = 0.0000).
- The change in exchange rates for firms Granger-Dumitrescu Hurlin causes the return on equity in the short-run (Prob. = 0.0001).
- Foreign sales of firms are short-term causes of the return on equity in the Granger-Dumitrescu Hurlin sense (Prob. = 0.0000). The obtained results are presented in Table.7.

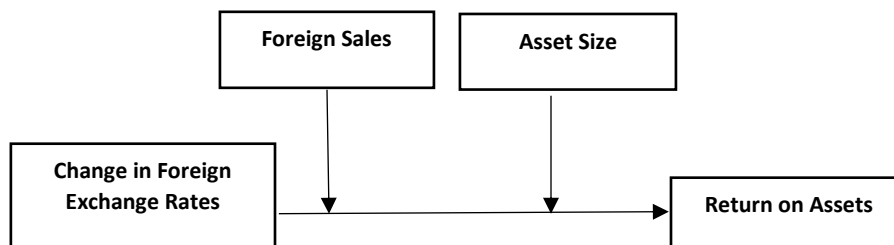
Table 7: Panel Causality Testi Results Regarding Return on Equity

Method: Pairwise Dumitrescu Hurlin Panel Causality Tests			
Dependent Variable: (ROE)			
Variables	Coefficient of Concordance	Normal Distribution	P-Value
ASSETS	3.09457	6.70919	2.E-11
FOREX	2.26318	3.86510	0.0001
FORES	2.44750	4.49563	7.E-06

5.4. Moderating Effect

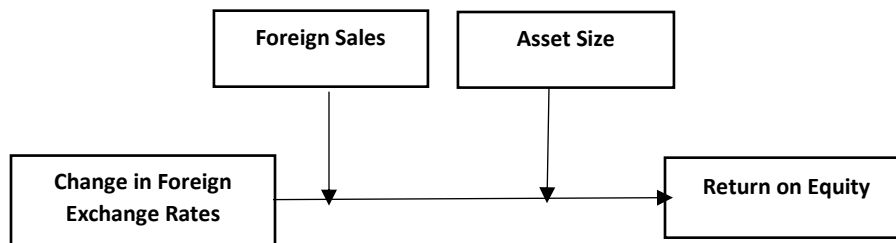
In the study, it is also investigated whether or not a moderating effect of asset size and foreign sales exists between the change in exchange rates and the profitability variables, which are the dependent variables of the research. Since the moderating effect analysis is based on regression analysis, firstly the extreme values in the dataset are investigated by multivariate outlier analysis. The feature of multivariate outlier analysis is that all variables used in the research can be taken into account together. In multivariate outlier analysis, the variables are not single but based on a multivariate approach with the Mahalanobis Distances. High values in the Mahalanobis Distances can be extreme values and values with probability $P < 0.01$ in the study are accepted as multivariate outliers and are excluded from the dataset. The existence of the moderating effect is realized with the help of the Process Macro application developed by A. F. HAYES in IBM SPSS 25.0 software.

The moderator effect examines whether or not the impact of an influencing variable X on the affected variable Y is affected depending on a variable such as W. In the moderator effect, it is examined that the impact of X on Y is determined and moderated by W variable. In other words, X is the moderating variable that indicates in which situations the impact of the variable on the Y variable would increase or decrease or on what such impact depends (Gürbüz, 2019: 81-88). The research model in which foreign sales and asset size are moderator variables and return on assets is the dependent variable is illustrated in Figure 1.

Figure 1: Moderating Model Regarding the Return on Assets

The research model in which foreign sales and asset size are moderator variables and return on equity is the dependent variable is presented in Figure 2.

Figure 2: Moderating Model Regarding the Return on Equity



The independent variables included in the moderating regression analysis explain 6.8% of the change in the return on assets ($F = 7.575$, $P = 0.000$). As a result of the regression analysis, the significance of β_i of the independent variable is examined and the change in the exchange rate and foreign sales are found to be significant. The asset size coefficient is not found to be statistically significant. The moderating effects for the model are examined, and the interactional effect of the change in exchange rates and the foreign sales variables are not found statistically significant ($t = -1.175$, $P = 0.241$). The interactional effect of the change in exchange rates and the asset size variables are found to be statistically significant ($t = 2.378$, $P = 0.018$). Also, if the confidence interval (LLCI-ULCI) includes a value of zero, the regression coefficient is not found to be statistically significant. The obtained results are presented in Table 8.

Table 8: Summary and Coefficients Regarding Moderator Role of Foreign Sales and Asset Size

	β_i	Standard Error	t	p	LLCI	ULCI
Constant	0.015	0.043	0.343	0.732	-0.069	0.099
FOREX	-0.176	0.043	-4.075	0.000	-0.260	-0.091
FORES	-0.142	0.068	-2.093	0.037	-0.275	-0.009
Int_1	-0.079	0.067	-1.175	0.241	-0.210	0.053
ASSETS	-0.033	0.068	-0.482	0.630	-0.167	0.101
Int_2	0.160	0.067	2.378	0.018	0.028	0.293
Interactional Effect		Int_1	FOREX × FORES			
		Int_2	FOREX × ASSETS			

$R=0.261$, $R^2=0.068$, $F=7.757$, $P=0.000$

For Int_1 $\Delta R^2=0.025$, $F=1.3797$, $P=0.2407$

For Int_2 $\Delta R^2=0.0102$, $F=5.6549$, $P=0.0178$

In the study, without determining the moderating effect for the foreign sales variable, the foreign sales variable in Figure 1 is excluded from the model, and the analysis is repeated.

The independent variables included in the repeated analysis explain 5.9% of the changes in the return on assets variable ($F = 10.827$, $P = 0.000$). Parameter values for all independent variables in the regression equation are found to be statistically significant. The change in the exchange rates decreases the return on assets significantly ($t = -4.064$, $P = 0.000$). Similarly, the increase in asset size variable significantly decreases the return on assets ($t = -3.074$, $P = 0.002$). It is examined whether or not the asset size variable has a moderating effect and the value of $\beta = 0.104$ for the interactional effect (Int_1) variable is found to be significant ($t = 2.457$, $P = 0.014$). Also, the confidence interval (LLCI-ULCI) does not include the value zero as in the independent variables. Moreover, upon including the asset size variable in the analysis, the existence of a change of 0.0109 units in the ΔR^2

value is determined, and the value of R^2 increases ($F = 6.0363$, $P = 0.0143$). Therefore, the asset size variable has a moderator effect. The obtained results are presented in Table 9.

Table 9: Summary and Coefficients Regarding Moderator Role of Asset Size

	β_i	Standard Error	t	p	LLCI	ULCI
Constant	0.015	0.043	0.354	0.724	-0.069	0.100
FOREX	-0.176	0.043	-4.064	0.000	-0.260	-0.091
ASSETS	-0.138	0.045	-3.074	0.002	-0.226	-0.050
Int_1	0.104	0.043	2.457	0.014	0.021	0.188
Interactional Effect		Int_1	FOREX \times ASSETS			

$R=0.243$, $R^2=0.059$, $F=10.82$, $P=0.000$

$\Delta R^2=0.0109$, $F=6.0363$, $P=0.0143$

After determining the impacts of the moderator variable, the situational effects of the moderator variable should be examined. Three different regression statistics are obtained regarding whether or not the effects of change in exchange rates on return on assets are significant when the moderator variable asset size is low (-0.769), medium (-0.384), and high (0.964). Regression values obtained according to three different conditions are presented in Table 10.

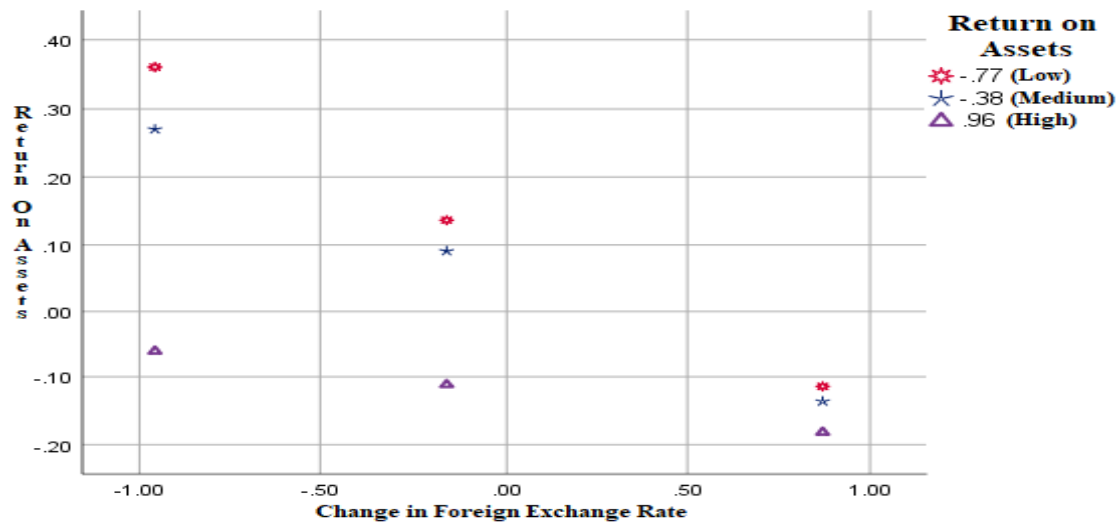
Table 10: Situational Effect of Asset Size as the Moderator Variable

ASSETS	Effect	Standard Error	t	P	LLCI	ULCI
-0.769	-0.256	0.056	-4.535	0.000	-0.367	-0.145
-0.384	-0.216	0.048	-4.539	0.000	-0.309	-0.122
0.964	-0.075	0.057	-1.317	0.188	-0.187	0.037

According to Table 10, if the asset size assumes low and medium values, the impact of the changes in foreign exchange on the return on assets is significant, whereas there is no significant relationship when the asset size is high ($t = -1.317$, $P = 0.188$). Moreover, if the asset size is high, the confidence interval includes zero value [-0.187; 0.037].

Therefore, asset size does not have a moderating effect upon assuming high values. When asset size as the moderator variable assumes a low value, its impact on the dependent variable is significant and determined as -0.256 ($t = -4.535$, $P = 0.000$). Similarly, if it assumes a medium value, its significant impact on the dependent variable becomes -0.216 ($t = -4.535$, $P = 0.000$). In order to perceive the moderating effects better, one should examine the moderating effect chart illustrated in Figure.3 utilizing the Slope test analysis method developed by Aiken et al. (1991). Since there is no slope in the slope analysis illustrated in the figure for the high-level moderating effect of the asset size variable, it cannot be said to have a significant moderating effect. Graphical illustration of the moderator variable effects is shown in Figure 3.

Figure 3: Graphical Illustration of Moderator Variable Effects



According to Figure 3, the opposite relationship between return on assets and exchange rate strengthens it, even more, when the moderator variable asset size assumes high or medium values. Therefore, the change in exchange rates increases, and asset size values decrease, while the return on assets decreases. When the moderator variable asset size assumes high values, it has no impact on the relationship between the change in exchange rates and returns on assets. When the asset size variable assumes low values, the change in exchange rates ranges between 0.3695 and -0.1110. When it assumes medium values, the change in exchange rates ranges between 0.2773 and -0.1276. The moderator effects of asset size according to its different values are presented in Table 11.

Table 11: Moderator Effects According to Different Values of Asset Size

FOREX	ASSETS	ROA
-0.9702 (Low)	-0.7689 (Low)	0.3695
-0.1172 (Medium)	-0.7689 (Low)	0.1512
0.9076 (High)	-0.7689 (Low)	-0.1110
-0.9702 (Low)	-0.3836 (Medium)	0.2773
-0.1172 (Medium)	-0.3836 (Medium)	0.0934
0.9076 (High)	-0.3836 (Medium)	-0.1276
-0.9702 (Low)	0.9640 (High)	-0.0450
-0.1172 (Medium)	0.9640 (High)	-0.1089
0.9076 (High)	0.9640 (High)	-0.1857

The research model is illustrated in Figure 2. where foreign sales and asset size are moderating, and return on equity is the dependent variable, is carried out using Process Macro. Summary and coefficients regarding the moderator role of foreign sales and asset size are presented in Table 12.

Table 12: Summary and Coefficients Regarding Moderator Role of Foreign Sales and Asset Size

	β_i	Standard Error	t	p	LLCI	ULCI
Constant	0.011	0.043	0.248	0.804	0.074	0.096
FOREX	-0.198	0.043	-4.547	0.000	-0.283	-0.112
ASSETS	-0.016	0.069	-0.226	0.821	-0.151	0.120
Interaction 1	0.094	0.068	1.386	0.166	-0.039	0.228
FORES	-0.088	0.068	-1.284	0.200	-0.222	0.047
Interaction 2	-0.027	0.068	-0.404	0.686	-0.160	0.106
Interactional Effect		Int_1	FOREX \times ASSETS			
		Int_2	FOREX \times FORES			

$R=0.225$, $R^2=0.051$, $F=5.511$, $P=0.000$

$\Delta R^2=0.0035$, $F=1.9211$, $P=0.1663$

The affecting variables included in the moderating regression analysis explain 5.1% of the change on the return on equity ($F = 5.511$, $P = 0.000$). As a result of the regression analysis, the significance of β_i of the independent variables is examined and the parameter of the change in the exchange rates ($\beta = -0.198$) is found to be statistically significant ($t = -4.547$, $P = 0.000$). Foreign sales ($\beta = -0.088$) and asset size ($\beta = -0.016$) parameters are not found significant. The moderating effects for the model are examined and the change in the exchange rate and the parameter value for the interactional effect of the asset size ($\beta = 0.094$) variable are not found to be statistically significant ($t = 1.386$, $P = 0.166$). Similarly, the parameter value for the interactional effect of the change in exchange rate and foreign sales ($\beta = -0.027$) variables is found to be statistically insignificant ($t = -0.404$, $P = 0.686$). A similar situation is observed in the confidence interval. The confidence interval of all variables, except for the change in exchange rates, includes the zero value. Therefore, no moderator effect is detected in the model illustrated in Figure 2. Furthermore, upon including the variables of asset size and foreign sales in the analysis, it is determined that there is a change of 0.0035 units in the R^2 value, and that it does not significantly increase the R^2 value ($F = 1.9211$, $P = 0.1663$).

6. DISCUSSIONS AND CONCLUSION

Changes in the exchange rates may affect the profitability of firms by providing economic dynamism in the presence of matters such as the cost of imported inputs, the price of export products or the cost of foreign borrowing. The relationship between the change in exchange rates and profitability has a crucial impact on economic growth. Exporting companies are more prone to be affected by the changes in exchange rates. These firms pay more attention to profitability ratios since they are often associated with high levels of productivity and profitability.

The aim of this study is to empirically investigate the relationship between the change in exchange rates and the profitability of firms in Turkey. The changes in real effective exchange rate as the change in exchange rates criteria and return on assets as well as return on equity are considered for measuring profitability. In the research study, the variables of changes in exchange rate, asset size and foreign sales are in the position of reasons, whereas the return on assets and return on equity are the results. The data of 37 firms within the scope of the research study over the period 1999-2019 are analyzed using the panel data and regression analysis methods. In the study, two distinct models are tested using the panel data analysis method. In the first model, the impact of changes in exchange rates, asset size, and foreign sales variables on profitability are analyzed; whereas the impacts of the change in exchange rates, asset size, and foreign sales variables on return on equity are examined in the second model.

Two hypotheses such as "random effect is more appropriate" and "fixed effect is more appropriate" are established in selecting which of the estimation method the panel data models would be suitable. In the study, firstly, the fixed effect regression model for the first model is subjected to the Hausman test and the hypothesis claiming that "the random effect is more appropriate" is accepted since the P-Value becomes higher greater than 0.05 according to the Cross-Section Random test. In the panel regression equation where the dependent variable is return on assets, it is determined that asset size, change in exchange rates, and foreign sales variables do not have a significant impact on return on assets.

The second model, in which return on equity is selected as the dependent variable, employs the Hausman test and the hypothesis claiming that "Random effect is appropriate since the P-Value is higher than 0.05." is accepted. The second model, in which return on equity is selected as the dependent variable, is subjected to panel regression analysis and it is determined that the variables of asset size, the change in exchange rates and foreign sales do not have a significant impact on return on equity.

Following the panel regression analysis in the study, unit root tests are conducted to determine whether or not the variables within the scope of the study are stationary. According to panel unit root test results, it is determined that return on assets and return on equity are stationary; the variables of asset size, the change in exchange rates and foreign sales are not stationary, and the series become stationary upon taking the second differences. As a result; since the application condition of the cointegration test performed to examine the long-term relationship in time-series is not fulfilled, the causal relationship is examined without conducting the cointegration test.

The VEC Granger Causality / Dumitrescu-Hurlin test is used as a means for causality analysis. Since the return on assets is the dependent variable, it is determined that the independent variables such as asset size, foreign sales, and change in exchange rates are the reasons for the return on assets. The asset size of the companies, the change in exchange rate for the companies, and the foreign sales of the companies emerge as the short-term causes of the return on assets in the Granger-Dumitrescu Hurlin sense. According to the causality test result regarding the other dependent variable; it is determined that the variables such as asset size, foreign sales, and change in exchange rate are the reasons for the return on equity. The asset size of the companies, the change in exchange rates for the companies, and the foreign sales of the companies emerge as the short-term causes of the return on equity in the Granger-Dumitrescu Hurlin sense.

In the last part of the study, the moderating effect between asset size / foreign sales variables and the change in exchange rate / return on assets / return on equity is examined by regression analysis. According to the analysis results, it is determined that the change in exchange rates and the asset size variables have a moderating effect on the return on assets. In this case, return on assets decreases along with the increase in asset size variable, and similarly, return on assets decreases along with the change in exchange rates. Upon examining the situational effect of asset size, which is a moderator variable, on the change in exchange rates; it is determined that there is no significant relationship in the case of asset size with high values, although the asset size with low and medium values, the impact of the change in exchange rate on return on assets is significant. This means that if the asset size gets high values, there is no moderator effect. Also, it is determined that foreign sales and changes in exchange rates do not have a moderating effect on return on assets. Likewise, it is concluded that foreign sales and asset size variables do not have moderating effect between changes in exchange rates and return on equity.

As a result, it is determined that changes in foreign exchange rates, foreign sales and asset size of the companies do not have any significant impacts on the return on assets and return on equity during the period between 1999-2019 in Turkey. Companies' successful use of financial derivatives and in-house hedging methods to minimize the exchange rate exposure ensure that they are insensitive to changes in exchange rates (Dewenter et al. 2005: 120-122). It can be said that companies effectively use internal and external hedging methods that help reduce the adverse impacts of the changes in foreign exchange rates. In the literature, Bartov and Bodnar (1994) indicated that firms were likely be affected by the changes in exchange rates with a lag, and similarly, Mutluay and Turaboğlu (2013) also indicated that the changes in exchange rates affected financial performance with a lag. The results of the study comply with these studies in the literature.

The study also finds that asset size and foreign sales do not have a moderating effect on return on equity and return on assets of foreign sales although asset size has a moderating effect on return on assets. Accordingly, as asset size which has a moderating effect increases if there is no change in profit, the return on assets ratio would decrease. Such an inverse moderating effect may occur between asset size and return on assets. Moreover, as the increase in exchange rates affect costs negatively, profit would decrease, and return on assets may be adversely affected.

The present study focuses on large-sized companies with publicly offered stock shares operating in public and manufacturing sectors in Turkey. Therefore, the indicators obtained from the published data determined the limit of the study. It should be taken into consideration that firms with smaller firm size, poorer access to external finance, and not listed on the stock exchange may also be more affected by exchange rate volatility. It is suggested that a study with broader data limitation, in which multivariate statistical estimation methods would be applied for different sectors, and by utilizing various independent variables, can be a source of motivation for future researchers. Consequently, performing similar studies on firms operating in countries other than Turkey would be useful for drawing general conclusions that may apply more broadly.

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FINANCIAL REGULATIONS AND RISK IN THE CONTEXT OF THE GLOBAL RECESSION

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ABSTRACT

Purpose- The purpose of this paper is to examine the effects of regulations on the risk during the 2008 financial crisis. In other words, the causes of the 2008 financial crisis are presented and the main reforms made in the field of international banking after the financial crisis and their effects are offered.

Methodology- This study is a comparative situation analysis by using the data of Germany, United Kingdom, United States, EU Area and World.

Findings- In order to cope with the effects of the crisis, the United States, Europe and other major economies, which constitute the basis of international financial architecture, have started to take measures rapidly. Priority has been given to eliminating the effects of the crisis on financial markets, and measures have been taken to create a new and strong financial architecture and restore financial stability. This study analyzes these measures and their effects on the economy.

Conclusion- After extensive arrangements, the banking sector recorded a significant increase in the amount and quality of capital. This success was mostly achieved with capital increases. The same positive situation is true for liquidity. This is seen not only in the improvement of the main liquidity ratios but also in the reduction of the simple ratio between loans and deposits. The obligation to provide bail for the liabilities of banks reduces the possibility that the banks will be supported by the government through bail in a future crisis.

Key words: Global recession, financial regulations, financial risk, financial markets

JEL Codes: G01, G21, G18

1. INTRODUCTION

The 2008 financial crisis was a great experience for the banking sector globally. The sector has become more cautious by introducing models on important issues such as excessive risk taking, insufficient capital and liquidity buffers in industry (Cull, Martínez-Pería 2013). Regulators responded to the crisis with more capital, standardization in liquidity, stronger supervision and more specific solutions. Along with the changes in the globalization tendency of the real economy, due to the weak economic growth and low interest rates in most developed economies, the working area of the banks has changed significantly. Technology has found external powers, while banks' stakeholder scrutiny has increased. Thus, competitive pressure began to emerge in the market.

Costs of the financial crisis were huge. The International Monetary Fund (2009) states that covering the results of the global financial crisis has costed 11.9 trillion dollars in total (Merrouche, Nier, 2010, 4). Consequently, a relatively new research conducted by Atkinson et al. (2013) demonstrates a cost equivalent to 14 trillion dollars for the USA only after considering the amounts regarding the production, richness, the effects caused by national trauma and exceptional precautions taken by government (Choi, 2013, 362). Sanders explains that the Congressional Budget Office (CBO) made an estimation in January 2012, which shows the cumulative difference between the real GDP and presumed potential GDP after the crisis would cost \$5.7 trillion towards 2018 (Sanders, 2013, 16).

According to Cull and Martinez-Peria (2013) immediately after the crisis, the banks began to respond to the financial crisis and the post-crisis market environment. In this context, banks went globally to reorganize and evaluate their growth plans, balance sheet positions, cost principles, organizational structures, scope of operations and geographical presence.

Risk is a fact that is inherent in the life of the financial sector as particular. The business world often grows by taking risks, and the greater the risk, the higher the profit naturally. Therefore, the business world needs to take risks for growth. Lessons are learned from past financial crises and new ways are opened for banks. However, this situation brings new risks. Banks should take these risks and take measures to overcome them.

In addition to this, Shaikh (2011) mentioned that an innate irresolvable conflict exists between capitalism's predisposition to discharge finance and its requirement to control the following instabilities. This innate conflict emerges in the regulation debate starting among unorthodox economics after the beginning of the late worldwide crisis. The 2007-2008 crisis has correctly been labeled as the very first major depression of the millennium. According to Sing (2011) there are three main risk categories: credit risk, market risk and operational risk. The techniques and tools necessary to manage these risks are discussed in detail.

A significant characteristic of the neoliberal reconstructing policies was nonintervention and freed internationalization of finance. This functioned to be preventing tendency towards the decreasing profit rate. Additionally, with the expanded labor exploitation, it gave way to reestablishment of the profit rate for duration of time. Yet, usage of finance to handle the problems resulted by capital accumulation while ignoring the essential reasons (emerging from the sphere of production) included important costs. It caused an increasing distance between finance and real accumulation. According to Mavroudeas and Papadatos (2012), hence, the financial increase in 2018 caused the emergence of the long-coming very first major depression of the millennium.

This study examines the effects of regulations on the risk during the 2008 financial crisis. In order to cope with the effects of the crisis, the United States, Europe and other major economies, which constitute the basis of international financial architecture, have started to take measures rapidly. Priority has been given to eliminating the effects of the crisis on financial markets, and measures have been taken to create a new and strong financial architecture and restore financial stability. In addition to the measures taken to combat the crisis, it is important to be able to foresee and prevent future crises before they occur.

In this context, the first part of the study examines the preliminary and comprehensive regulations that emerged at the beginning of the subprime mortgage crisis. The first of these frameworks is the adoption of a shift into a macro prudential policy approach. Dodd Frank and Basel III, which aim to manage financial institutions within the framework of more effective regulation and have a stronger capital and liquidity structure, are also examined under the chapter.

Since those initial responses to the financial crisis include number of target areas in financial system to adopt more resilient regulation frameworks, the second part of this study aims to evaluate the pillars of regulatory efforts under four headings. In the second chapter, the four pillars of the regulation against risk examined in terms of building resilient financial institutions, ending Too-Big-To-Fail (TbTF) issue, making derivatives markets safer and transforming shadow banking into resilient market-based finance. The first section of this chapter analyzes the changes in risk parameters before, during and after the crisis for given economies in order to evaluate the effects of regulations over risk parameters of financial system.

2. REGULATIONS DURING CRISIS

2.1. The Initial Responses to the 2008 Financial Crisis

Significantly dramatic events took place during the period of 2007-2008, such collapse of asset values, drying up of the liquidity and freezing of the credit markets, that interbank lending markets stopped, that some financial institutions crashed and many more of them called for public economical support of different descriptions to be able to trade (Claessens, Kodres, 2014, 7).

The pressure and imperative were constantly demanding for an action to be taken as fast as possible. Noticeably, forging a link between financial distress' symptoms, broken banking systems and freezing interbank markets to the destabilizing the financial market's congenital dynamics and the fall of current methods to regulate finance appealed to a great degree. Contrarily, Baker (2015) explained that associating the crisis to macroeconomic causes by underlying world-wide instabilities, the borders of limited take on inflation, the massive injustice and/or malfunctioning increase model are a lot more complicated intellectual ideas which need specifying a longer and detailed random link and a less urgent emotional mass appeal.

Evaluating the merits and demerits of these different reactions (a possible way to deal with the upcoming crises) and unraveling the lasting damages to the financial system are significant momentary duties. Meanwhile, Siron (2018) demonstrated that world-wide financial crisis has an important effect on the consideration of the ideal way to regulate finance, as well. Furthermore, Davis

(2009) states that the world-wide financial crisis, in others' opinion, mirrors mainly the unsuccessful attempts to regulate and implement it, which indicates a demand for much better – yet not bigger – options to implement and regulate. Those who are in the same opinion of both views would possibly be in agreement with the fact that regulating finance withstands a much harder assignment in the area of financial innovation, in which advanced financial products and approaches are set up in at a rapid speed to negotiate regulations that disallows profit opportunities and under-supported regulatory agencies are, on a regular basis, try to play 'catchup' while handling those improvements (Beck et al., 2016, 29). As Davis explains (2009), they would most probably acknowledge that governance, incentive arrangements and the ways risk is managed have not been the best possible options and are in need of reformation.

Deregulation was perceived to mirror an increasing sense of security about risks, which as the increase of adequate markets, was another reason for regulatory failure. Stöhr (2015) made a declaration that as a result of decades without experiencing an extensive crisis, it is far too easy to dream that they have built a structure that is impenetrable against risks. Regulators must have forgotten that almost all of the regulation was to prevent the increase of speculative bubbles or signs of overconfidence and overjoy. Thus, Shiller (2010) pointed out that the indirect impacts of the adequate markets theory were meant that regulators should concentrate on hindrance of micro- mismanagement, as though it were not possible for anything to be wrong with the whole market.

During the financial crisis, a new approach to market regulation appeared and shaped by three significant phenomena. In the following section these three phenomena - a shift into a macroprudential policy framework the Dodd-Frank Wall Street Reform and implementation of Basel III standards will be evaluated with regard to their impacts on new wave financial regulation perspective.

2.2. A Shift into a Macro Prudential Policy Framework

The late financial chaos has caught the public and governmental attention from a market regulation, which is about a neoclassical, market-centered, self-regulating and a sort of laissez-faire style, to a much more state-based idea of compulsory legal rules that limit the leeway usually given to the market participants (Rubio, Carrasco-Gallego, 2016: 7). As reported by Seibt and Schwarz (2011), this generally agreed change of mind is most likely owing to (1) the dramatic losses in finance that have been made in the financial industry, and, furthermore, influenced the 'real' economy causing costs to be burden for the all society (social costs), (2) the astounding demand and shortage of another option that national state feel to save the financial intuitions of systemic relevance (i.e. some type of 'blackmail situation'), in addition to (3) the lack of confidence in the ethical behavior that all financial market participants do feel.

Following the crisis, differentiating further between supervising the individual financial firms in the micro-prudential level and guiding the systemic risks to the whole financial system (macro-prudential regulation). Gilad (2015) expressed that the idea behind the basic difference between these three functions – micro-prudential, macro-prudential and business-conduct regulation – is provide each task with an adequate thought. On the contrary, the goal of a strengthened regulatory structure is to aid regulatory consistency, collaboration, and information exchange.

The limited consideration of prudential regulation structured on capital requirements for banks fell short to hinder the big chaos towards the end of 2008. As United Nation report demonstrates (2016), of course, the subprime crisis and its results disabled a lot of the world's biggest banks which totally satisfied the Basel II standards in 2008, which caused government to create highly expensive bailout packages, leading the public debt and social costs to increase to a very importantly high degree.

Following 2009, the era during which affirmation of macroprudential policy scheme was included in different G20 communique's, there have emerged new policy committees for implementation of macroprudential policy in the USA (Financial Stability Oversight Council), the European Union (EU) (European Systemic Risk Board) and in the UK (FPC). Moreover, Glivanos (2014) inferred that the Basel III agreement took actions for countercyclical capital buffers, as a macroprudential policy instrument.

The macroprudential approach changes most of the assumptions regarding the efficient markets position as it denies that self-interested investment strategies that are individually rational could provide financial stability and equilibrium by noticing the innate procyclical tendencies of finance, the tendency of investors for herd behavior and financial complexity's destabilizing impacts. Baker (2015) claimed that macroprudential policy includes benefiting from prudential cautions (a range of capital requirements, both fee-related and amount-related instruments) either to meet macroeconomic ends or to seek for protection of the actual economy against instability and financial excess. Additionally, Ennis (2009) described that these involve countercyclical capital demands, dynamic preparation for loan loss, demands of countercyclical liquidity, administrative limits on

aggregate lending, reserve demands, caps on leverage regarding asset purchases, loan to income ratios, the lowest margins on secured lending, limits on currency mismatches, controls of capital and regulation of host country.

Krosner (2010) explained that micro prudential regulation, aimed to protect consumer, ought to apply every financial institution, particular attention challenged to protect unsophisticated, “vulnerable” in other words, consumers. Macroprudential regulation ought to be concentrated on main elements of systemic risk: the breakdown of big, inter-connected intuitions, leverage systematically significant behavior and instruments, and how they interact with the economic cycle. Furthermore, Lothian (2012) stated both macroprudential and micro prudential regulation ought to give specific consideration to possible risks the government undertakes via operating implicit or explicit deposit insurances. In addition, Gudumndsson (2015) said that macroprudential regulation has the goal of cutting down the finance’s pro-cyclicality and its impacts on the actual economy. It achieves it through explicit incorporation of the macroeconomic variable’s influences, which are exchange rate, interest rate movements and growth, on financial risk, particularly hindering the systemic risks accumulation and changing fundamental regulatory variables in a counter-cyclical style in order not to encourage lending booms and hindering credit crunches.

2.3. The Reform of the Dodd-Frank Wall Street

The second significant improvement that has been associated with the Dodd-Frank is the Dodd-Frank Act or Wall Street Reform. Although a lot of aspects caused the crisis and the possible effect of these aspects are questionable, the weaknesses and irregularities of the way the U.S. financial system is supervised and regulated made a significant contribution. To deal with such defects, the Reform of Dodd-Frank Wall Street and Consumer Protection Act (the Dodd-Frank Act) were enacted by Congress.

As the Senate Banking Committee’s website summarizes, Schultz (2014) brought out that act aims to (1) deal with risks to the U.S. financial system’s stability, partially by creating the Financial Stability Oversight Council (FSOC), (2) put a stop too-great-fall bailouts of big, complicated financial institutions, (3) expand transparency and regulation for particular complicated financial instruments, finally (4) intensify the ways consumers and investors are protected. Sanders (2013) said that the Dodd-Frank Act is going to be instrumental for the reduction of possibility or harshness of a future financial crisis. These preparations involve as it follows:

- Formation of FSOC (Financial Stability Oversight Council) and OFR (Office of Financial Research).
- Increased prudential standards for systemically signiant financial institutions (SIFI).
- Orderly Liquidation Authority.
- Swamps regulation.
- Reforms in mortgage-related and other areas.

The rules of US Dodd-Frank competition are particularly focused on the swamp market. Europe’s Markets in Financial Instruments Directive (MiFID II) and suggested enforcing regulations are more earnest in capacity than reforms of the U.S. However, they are operated in a much slower way. Duffie (2016) said that enforcement of the most significant rules of trade-competition has been sent back to the beginning of 2018.

3. ENFORCEMENT OF BASEL III STANDARDS

In November 2020, these capital reforms, along with the emergence of two international liquidity standards, reacted to the essence of world-wide financial reform agenda, which was presented to the Seoul G20 Leaders summit. The Committee, following the early comprehensive quantitative influence study that was published in December 2020, keeps on guiding and assessing the influence of these leverage, capital and liquidity requirements (abbreviated as “Basel III”) semi-yearly (BIS, 2011). The third part of the Basel Accords was progressed as an answer to the defects of financial regulation illustrated by the 2007-2008 financial crisis. The aim of Basel III is to support requirements of bank capital by reducing bank leverage and expanding bank liquidity (BIS, 2017).

The first demand is about the capital. Further, the rule of Basel III called banks for self-funding themselves with 4.5% of common equity, which was 2% higher than Basel II, of risk-weighted advantages (RWAs). The research by Hessou and Lai shows that a minimum Common Equity TIER 1 (CET1) ratio of 4.5% always have to be provided by the bank since 2015. The minimum Tier 1 capital expands from 4% to 6%, appropriate to 2015, over RWAs. The 6% is made up of 4.5% of CET1, as well as an additional 1.5% of Additional Tier 1 (AT1).

What is more, Basel III brought two more capital buffers (BIS, 2017):

- A compulsory “capital conservation buffer”, which is equal to 2.5% of risk-weighted advantages. Taking into account the 4.5% CET1 demanded by capital ratio, starting in 2019, banks have to have a total of 7 percent CET1 capital ratio.
- A “discretionary counter-cyclical buffer”, which makes it possible for national regulators to ask for up to an extra 2.5% of capital in times of increase of high credit. The amount of this buffer changes from 0% to 2.5% of RWA and have to be satisfied by CET1 capital.

As argued by Teixeira et al (2014), another demand is related to ratio of minimum leverage that is a risk-free grounded leverage ratio and its calculation is performed with division of Tier 1 capital by the bank’ average total consolidated advantages (total of the exposures of all advantages and sheet items that are not balanced). Just as the Bank for International Settlement exposed, its definition is “the capital measure over exposure measure”. Whereas Tier 1 is the capital measure, accounting values (the total of on-balance sheet exposures, derivative exposures, non-balance sheet exposures and transaction exposures financed by securities) make up the exposure measure. It is expected from banks to provide a leverage more than 3 percent as ruled by Basel III. The U.S. Federal Reserve made an announcement in July 2013 that the minimum Basel III leverage ratio was going to be 6 percent for 8 systemically important financial institution (SIFI) banks and for their secured companies that hold bank.

The last one is related to the liquidity ratios that are divided into two groups. The “Liquidity Coverage Ratio” was expected to demand a bank to have adequate high-quality liquid advantages to compensate its total cash discharges during 30 days. Rubio and Carrasco-Gallego (2016) stated that it was expected from “The Net Stable Funding Ratio” to demand the accessible sum of stable funding to go beyond the demanded sum of stable during a one-year duration of extended stress.

4. THE CAUSES OF THE FINANCIAL CRISIS AND REGULATION AGAINST RISK

The crisis that occurred in 2007 is one of the biggest crises of recent years. The occurrence and causes of this crisis has caused new concerns to be raised by policy makers, practitioners and academics. According to many researchers, the crisis started with the deterioration in the credit quality of high-interest housing mortgages, especially those with adjustable interest rates. After this deterioration, specialized mortgage companies experienced fund pressures and many of them failed.

One of the most crucial causes leading to the financial crisis was the instant expansion of wealth in a lot of countries throughout the World. A few years prior to crisis, a huge upsurge in the number of advantages accessible to invents for those who seek for both profitable and safe returns. In this chapter, the reasons that caused the crisis and the precautions to avoid these reasons will be considered.

4.1. Shadow Banking and Dodd-Frank Act

Financial entities that borrow short-term and lend long-term are called shadow banking. However, unlike traditional banks, they are not covered by the banking regulations. Therefore, the shadow banking system has had more impact on the outbreak of the 2008 crisis compared to the traditional banking system. So, the shock caused by the burst of the housing bubble and the major crisis has more affected shadow banking than the traditional banking system.

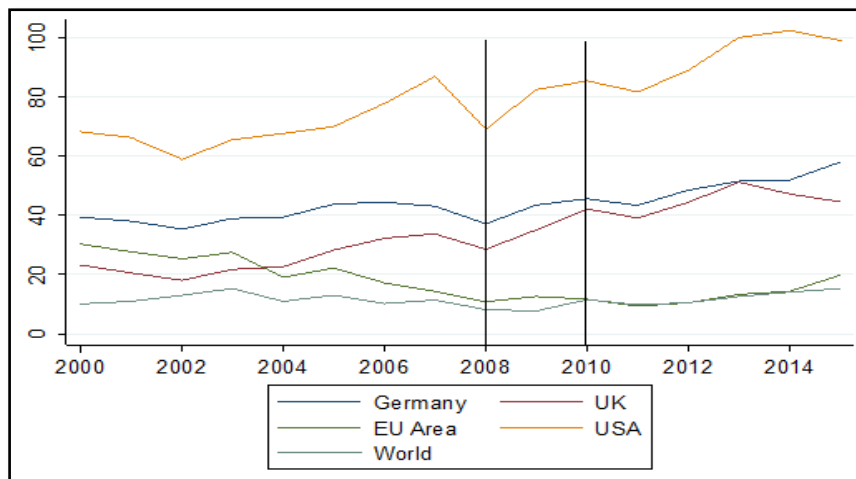
Regulations on bank capital have always been the subject of debate by politicians and researchers (Admati, Hellwig, 2014). In addition to these challenges, regulators had to deal with the encounters that emerged after the 2008 financial crisis. As an example, Angeloni and Faia (2013) inserted that systematic banking crises can be prevented and concerns about financial crises need to be taken into consideration when preparing bank capital requirements. Moreover, the emergence of financial intermediaries other than the traditional banking sector, also known as shadow banks, causes problems such as legal arbitrage in the regulations regarding traditional banks. This situation identifies a very important problem. Because, financial instability during the 2008 financial crisis, shadow banking has led to a large extent.

Friedman and Kraus (2011) explained that shadow banking system is made of financial entities beside thrifts and commercial banks. Mortgage specialists, off-balance sheet entities, along with structured investment vehicles (SIVs) as well as conduits for advantage-backed commercial paper (ABCP); and investments banks that are free-standing (independent from commercial banks), Goldman Sachs, Bear Stearns, Morgan Stanley, Lehmen Brothers and Merrill Lynch for instance, and the BHCs’ investment-bank arms like Citigroup are also included. Kim et al (2012), meanwhile, investigated that the shadow banking system, believed

to took a crucial part in the late crisis, is made up of investment banks, hedge funds and VC/PE ¹. Even though shadow-banking system might increase the possibility of risk and vulnerabilities, it is also functional to give benefit of varied funding to the actual economy. The greatest success in the field of shadow-banking is the advanced set of codes to govern money market mutual funds. The type of the constant-net-asset-value's (CNAV) money fund could sometimes be limited to a fixed value, in spite of fluctuations happening in time in the actual market of value of their advantages. Duffie (2016) illustrated that a lot of those who invest, consequently, took CNAV funds for bank deposits, hence subject to a run whenever the redeemed value of the funds could decrease. It is absolutely what occurred on a big scale in the U.S the moment Lehman Brothers fell short.

Money Market Funds (MMFs), the part of the shadow-banking sector in question, are reciprocal funds that are most of the time invested in the short-time debts banks, (local governments) and/or corporations. The tools in which the funds invest consist of commercial loans, government treasury bills or certificates of deposit as explained by Finance-Watch (2017). Shadow banking is characterized as one of the factors leading to the 2007-2008 financial crisis, while at the same time causing the financial sector to grow further. The risks of shadow banking arise from the lack of control and check systems in the sector. In Germany, mutual funds rose to 58.2 percent in 2015 from 37.2 percent of GDP in 2008. Similarly, in the UK it increased from 28.6 percent to 44.6 percent, in the euro area from 10.7 percent to 19.8 percent, in the United States from 82.5 percent to 99.2 percent respective to GDP (Figure 1).

Figure 1: Mutual Fund Assets to GDP



Source: World Bank. 2018. Mutual Fund Assets (% Of GDP).

The international reform agenda under FSB (Financial Stability Board) tutelage executed a few initiatives, such as Dodd-Frank Act and suggestions to develop supervision of activities by shadow banking. Plus, G20 countries came to an agreement to gradually include the new standards in their regulatory work grounds (United Nations, 2015: 89). Stated by Dodd Frank, in case of improvement in market discipline, shorter discount for size on yield spreads, especially for banks associated as too-big-to fail (TBTF) or systemically significant (SIFI) can be inspected. In 2014, Balasubramnian and Cyree explained that commission that used secondary market subordinated debt transactions, discovered that size discount is lowered to 47 percent and TBTF discount is lowered to 94 percent, following the DFA. The DFA has influenced the reducing, while has not taken part in the elimination of size and TBTF discounts on yield spreads. It is observed that banks' market discipline has been improved further, following the changes in rating criteria by Moody's.

Kroszner (2010) said the Dodd-Frank Act builds a contemporary work frame that highly promoted the movement of OTC derivatives to platforms cleansed in the center and expands disclosure and exposures. It also maintains a new work frame to regulate, observe and govern the clearinghouses. Powerful incentives via differential capital charges for centrally cleared vs OTC

¹ Venture capital and private equity (VC/PE), providing new-comer companies with support of capital and managements, are gradually though as the new kind of institution in the field of finance.

derivatives might be appointed to the big players in derivatives markets in order to transfer the current contracts, to the most possible degree, to other platforms and create contracts with adequate standardization that is possible to cleanse in the center.

The financial crisis has fully demonstrated how shadow banking adversely affects the financial system. Consequently, the Dodd-Frank Wall Street Reform and Consumer Protection Act established the Financial Stability Oversight Council and the Financial Research Office to assess emerging risks and monitor the shadow banking system.

4.2. Bank Capital and Basel III Standards

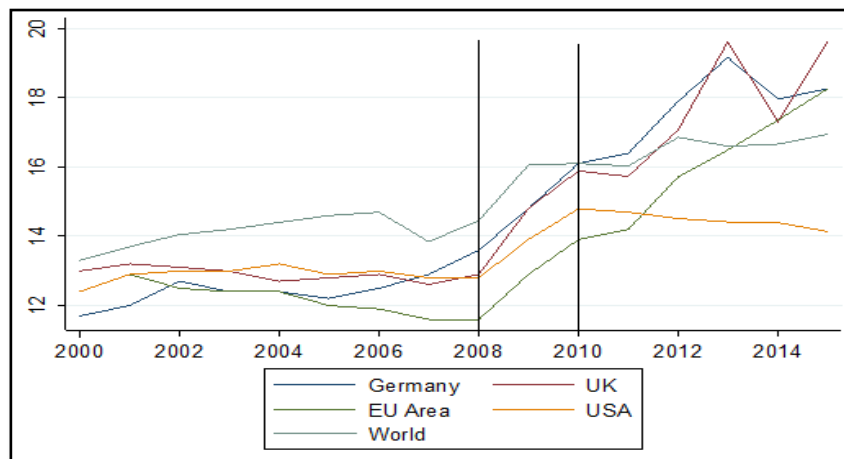
This section analyses the changes of bank capital structure before, during and after the crisis through bank regulatory capital to risk-weighted assets, bank capital to total assets and measures taken within this framework.

Risk weighted assets is an important measure method at both macro and micro level (Lesle, Avramova, 2012). According to the study of these researchers, risk weights assets have three important functions for banks. (1) Provide a common measure for the risks of the bank; (2) ensure that capital is proportionate to risks, (3) potentially emphasizes where instability entity class bubbles occur. According to the study of Berger and Bouwman (2013), two main results emerge. First, capital always helps small banks (including periods of crisis) to survive and increase their market share. Second, capital helps medium and large banks, particularly those with limited government intervention during banking crises.

The aim of the Basel III² criteria established after the 2008 crisis is to increase the flexibility of the banking and to promote financial stability against unexpected shocks. The most important purpose of Basel III standards is higher and better quality capital. Sanders (2013) explained that one regulator detected the leverage ratio as well as the higher demands of common equity and tier 1 capital required within standards of the Basel III, reflects an important fastening of capital regulation combined with capital's better quality and a few higher risk weights imposition. Further, Cohen (2013) discovered that a lot of national authorities have had publications of figures on bank capital sufficiency. They do not make use of the shared definitions either the numerator, which is capital, or denominator, which is assets, though. They have the tendency to approve a picture that reflects rise of capital ratios in the world-wide banking system.

Regulatory capital to risk weighted assets ratios for large, internationally active banks in world rose from 14.5 % at the end of 2008 to 17% at the end of 2018 while banks in Euro area from 11.6% to 18.3 percent. Even though the figures showing risk-weighted capital ratios are not suitable for a full comparison for the chosen countries because of particular banking legislations, differences in the example banks, quality of data and several relevant descriptions, the guidance and the size of the real expansion is possible to have been generally in league with the results described as it follows (Figure 2).

Figure 2: Bank Regulatory Capital to Risk-Weighted Assets



Source: World Bank. 2018. Bank Regulatory Capital to Risk-Weighted Assets

² Basel III is an internationally consented set of precautions created by the Basel Committee on Banking Supervision in as a reaction to the financial crisis of 2007-09. The precautions have the goal of strengthening the regulation, supervising and managing risks of banks.

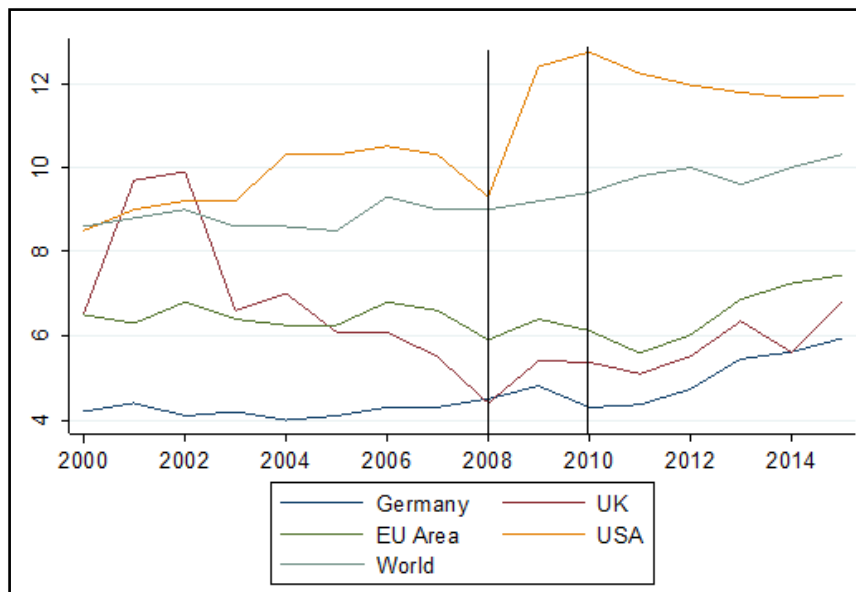
The more the assets of regulatory capital banks, the more resistant they are to the negative shocks. However, due to differences between countries in policy and accounting, it is not healthy to compare data with countries. When analyzing European Union Area, towards the beginning of 2011, it is observed that EU-centered banks possessed a Tier 1 capital ratio of 10.42 percent, a big increase when it is compared to 2007, when Tier 1 capital ratio was estimated as 7.7%.

In the USA's case, The Federal Reserve structured its unchanged regulatory capital standards, partially, on Basel's perspective that is viewed as limited by many experts. It is acknowledged that Basel III standards take into account several of the limitations brought out by the financial crisis in the regulatory work frame, but provide that Basel III goes on placing a great amount of reliance on risk-grounded perspectives while detecting the capital sufficiency (Tian, 2017, 15). Therefore, during and after the crisis period, risk weighted assets to bank capital for US banks slightly reduced but still remained above the pre-crisis periods.

Following the world-wide financial crisis, tightening the capital ratios is a significant improvement in the field of banking. In league with this, the bank capital to total evaluates how much banks could possibly handle losses which is rated among the biggest functions of risk. The bank capital to total assets restrain banks' capacity to leverage up their sheets of balance and could be considered naturally countercyclical, particularly owing to the leverage procyclicality (Giordana, Schumacher, 2013, 635).

The capital ratio to total assets for US commercial banks increased from 9.30 percent to 11.7 percent from 2008 to 2015. The Euro area monetary financial intuitions' ratio, evaluated on a consolidated period, rose to 7.5 percent from 5.9 during the same amount of time and date. However, being 10.3 percent, it is much lower than average of the world. Similarly, although there is a tendency to increase after the 2008 financial crisis, the capital to assets ratios of banks in UK and Germany are lower than the World and Euro zone averages (Figure 3).

Figure 3: Bank Capital to Total Assets



Source: World Bank. 2018. Bank Capital to Total Assets

During the crisis of 2007-2009, a few banks suffered from capital shortages, partially as they experienced big losses on assets which Basel's standard assigned low risk weights yet posed much bigger risk than risk weights. The Basel III scheme is going to expand risk weight for particular advantage classes – and consisting of a leverage ratio as a defense against irregular risk weights – but specialist notified that the possibility is sustained for financial institutions for “gaming” the Basel risk weights with expanding holdings of advantages that have risk-weights that are not greater than the actual risks. Additionally, in 2013, Quaglia expresses that some specialists sustain their idea that Basel standards generally could not give an adequate buffer for protection of firms in stressed times. This approach is embodied in the given table for each samples of economy during the crisis, however, the extended impact of regulations has started to shown their effects after the crisis period.

Regulations on bank capital have always been the subject of debate by politicians and researchers (Admati, Hellwig, 2014). In addition to these challenges, regulators had to deal with the encounters that emerged after the 2008 financial crisis. As an example, Angeloni and Faia (2013) inserted that systematic banking crises can be prevented and concerns about financial crises need to be taken into consideration when preparing bank capital requirements.

4.3. Bank Liquidity and Basel III Liquidity Standards

The aim of this section is to explore the liquidity and crisis issues in the academic literature to understand the role of liquidity in the 2008 crisis. In 2007, problems started to occur in the interbank funding markets in USA, UK, Germany and other European countries. Therefore, banks, especially for long-term liquidities, have started to be reluctant to provide liquidity to other banks. In 2007, problems started to occur in the interbank funding markets in USA, UK, Germany and other European countries. Therefore, banks, especially for long-term liquidities, have started to be reluctant to provide liquidity to other banks. As a result, Libor rose significantly.

There are two obvious reasons for this liquidity-hoarding situation. On the one hand, banks need to protect themselves against greater potentials than expected, thus they need deriving from commercial paper markets, syndicated loans and disruptions in the mortgage. On the other hand, uncertainties increased as banks could not fully assess the exposure of their counterparties to securities of high interest and other interrupted markets.

In December 2010, the Basel Committee on Banking Supervision determined the introduction of liquidity standards for banks in addition to the measures taken in Basel II. In addition to the strengthened capital requirements, Basel III introduced a risk-weighted leverage ratio to the markets to ensure adequate funding in crisis situations.

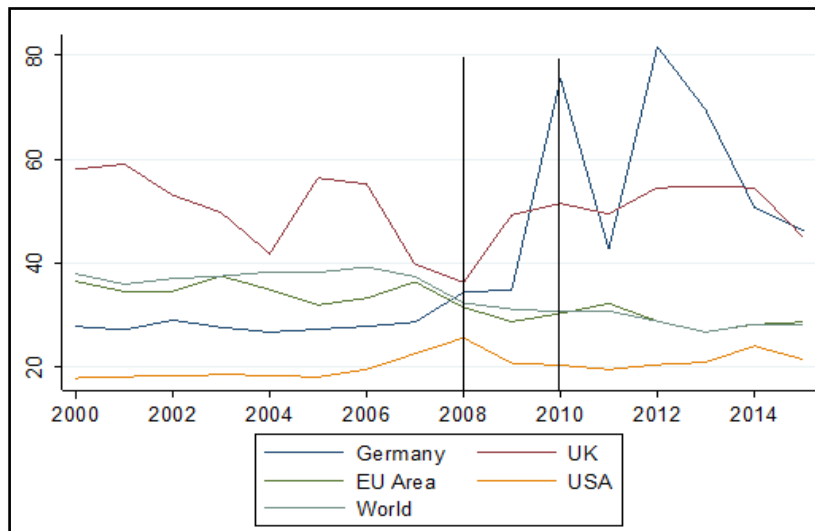
In addition, Basel III criteria developed two measures for liquidity crisis. The first is Liquidity Coverage Ratio, which aims to ensure that banks have sufficient liquid assets to withstand liquidity stress in the short term. The second is the Net Stable Fund Ratio, which aims to encourage banks to be more stable against their liquid assets and to hold long-term funding sources. These measures are aimed to reduce the risk of maturity conversion.

Basel III liquidity standards have undergone significant changes since their first issued in 2010. These changes include further differentiation to allow identification of banks with excessive maturity mismatches and more fragile funding structures (BCBS, 2014). These strategies are likely to affect the liquidity management function of banks if a stronger emphasis is placed on the retention of assets, particularly government securities. Allen et al. (2012) in their study discussed, especially the restructuring of banks' balance sheets for more liquid assets and as a result of the impact on the availability of the loan. Covas and Driscoll (2014) developed a balance to examine the macroeconomic impact of introducing a minimum liquidity standard on existing capital adequacy requirements for banks.

In the case of equilibrium, they have developed, the minimum liquidity requirement recommends a 3 percent decrease in loans and a 6 percent increase in securities. While this liquidity regulation prevents banks from using all their profits, the bank reduces the credit supply and increases the cost of funds. Despite the resulting costs, the main purpose of the new regulations is to ensure the stability of banks. According to Farag et al. (2013), although capital and liquidity sources are important for the security and soundness of banks, much is not known about newly established liquidity standards.

It was mentioned by Cerrato et al (2012) because it is an alternate standing for what sum of customer deposits and short term funding could be covered were they to be withdrawn instantly, Short Term Funding ratio and Liquid Assets to Deposits could possibly function as a deposit run off ratio. As the ratio gets greater, the bank becomes more liquid and and it becomes less vulnerable against a classic run on the bank.

In the era prior to crisis, domestic banks showed thicker capital cushions than global banks and stronger signs of structural liquidity. The liabilities of global bank are structured in a way more predominantly dependent on non-deposit funding and built as short-term (Vazquez, Federico, 2012, 11). However, during and after the crisis, the roles of short-term funding on risks are more significantly pointed out by regulating bodies. The world average ratio is 25 percent and the Euro area average is 28.7 percent by the end of 2015, both of which are lower than the values during the 2008 crisis (Figure 4).

Figure 4: Liquid Assets to Deposits and Short Term Funding

Source: World Bank. 2019. Liquid Assets to Deposits and Short Term Funding

When the Figure 4 is examined in detail, the rates of short-term debt borrowing by German and the UK banks are higher than the crisis period, above the world and Eurozone averages. The US banks, on the contrary, tend to fall short-term borrowing rates and move away from the world average. This can be linked with one of the major risk approaches of Dodd-Frank and Basel III applies to liquidity requirements of banks to mitigate risks.

On the other hand, Cihak et al. (2015) revealed that liquid liabilities are the total of central bank's deposits and currency, and electronic currency and deposits additionally (M1), also saving deposits and time, certificates of deposit, foreign currency transferable deposits, agreements on securities purchase, also checks for travelers, time deposits for foreign currency, commercial paper, and shares of common funds or residents' market funds.

4.4. Bank Profitability and Z-Score

As mentioned in the above sections, the financial crisis has a negative impact on the financial system and financial stability. In this context, profitability is affected by this process as well as by the bank's unique characteristics and macroeconomic conditions.

In the early stages of the financial crisis, many banks experienced problems due to the discrepancy in their funding of loans. For years, banks have been financing most of the long-term lending through short-term borrowing. Long-term low inflation and low interest rates led to a decline in profit margins for banks. This has affected the risk appetite in seeking higher returns.

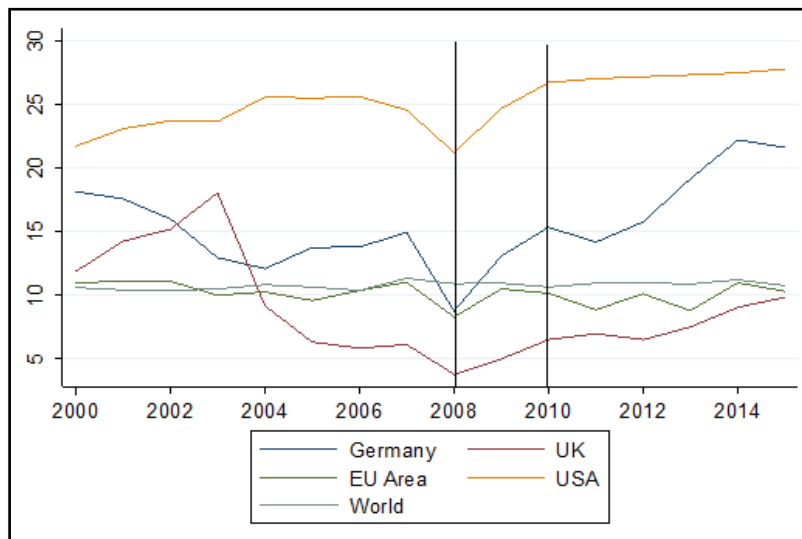
In the course of the late financial crisis, the probability of bank has gained a strong attention from policymakers and regulators. Actually, research by Rossi et al (2018) shows that both capital expansions and strategies to self-finance – needed to maintain a bigger level of capitalization – depends on a bank's capacity to produce profits. Yet, the factors determining profitability of bank, which is observed to be certainly defined by preceding literature, seem to have undergone a change, affected by regulatory and competitive dynamics.

A lot of bank-specific variables that are accounting and/or marked give hints about the health of bank and evaluate its risk. The main alternative for a bank error risk is the z-score, which is the equivalent sum of the return on advantages (ROA) and the capital asset ratio separated by the standard deviation by ROA after Balasubramnian and Cyree (2015, 160). A well-known risk handling measure z-score was structured by Roy (1952) and improved by Graham (1986). Lacteacru in 2016 said that the major result of the measure z-score is a bank of low-risk is going to possess a big value of z-core, signing that a great number of basic deviations of a bank's advantage return must lower to be called insolvent. The opposite is a very low value of z-score suggests bigger risk for the bank.

In 2007, the credit ratings of securities were rated more than they should have. In this context, the Altman z-score showed that the risks of companies increase significantly and they tend to go bankrupt. Altman calculated the average z-score of the companies in 2007 as 1.81. The credit ratings of these companies correspond to B. The fact that about half of the firms have low grades means that these firms are highly distressed and the probability of bankruptcy is high. Altman's calculations show that there will be a meltdown in the credit market and as a result there will be a crisis.

In the charts below, it is seen that in each of the sample economies, following the 2008 crisis, the bank z-scores were first severely declining, followed by a restoration process. Compared with the respective figures in 2008-2009 and 2015, the average of German banks' z-score rose from 8.75 to 21.6%; as banks in the UK from 3.79 to 9.83; banks in Euro area from 8.31 to 10.31; US banks from 21.2 to 27.75; and the average of world banks from 10.9 to 11.2 (Figure 5).

Figure 5: Bank Z-Score



Source: World Bank. 2019. Bank Z-Score

The regulations of liquidity cause a shortening in average possibilities of error. It was found by Giordana and Schumacher (2017, 3) that the regulation of liquidity that concentrates on maturity mismatches cause a decrease to happen in average possibilities of error. Interchangeably, the influence on profitability of bank is less obvious, what appears to be significant is funding structure of bank, instead of the features of assets' portfolio. Likewise, it might be expected that greater ROA causes to decrease risk of default and that as it expands the possibility for equity to fall short of losses, the standard deviation on the return on assets decreases the z-score. Basically, the mutually adopted regulatory groundworks and the common monetary system such as Dodd-Frank and Basel have gradually supported these combinations in areas of Euro, the US and the UK.

Yet, contrasting results might be found out the moment ROA is considered along with the simultaneity of CAR. Strictly speaking, as explained by Giordana and Schumacher (2013), the leverage's level influences the ROA and the latter affects the former, which change the dynamics between its components and z-score. For instance, if a bank's ROA is developed by expanding its leverage, it is totally likely that the boost in ROA makes this bank closer to error. In this sense, macroprudential efforts in regulatory frameworks after the crisis aimed at improving the banking systems' ROA in order to increase its leverage and thus to drop overall risk of the system.

In our analysis of the sample countries, the figures of the normalized ROA for the five economies show a cyclical pattern especially between the period 2006 and 2014. In the case of Euro area, the UK and Germany, it appears that ROA is still lower than the pre-crisis period while the cyclical character of the industry replaces to a rather stable form. In the case of US banks, the recovery period for the US banks is still in progress while their counterparts in Germany, pursue a downwards trend since 2011. The ROA trends in world averages and Euro area showed a similar pattern. It is also seen that there is a similarity between these scales graphically, as the ROA is examined in accordance with the z-scores presented above.

4.5. Too Big to Fail (TBTF) and Living Wills as a Potential Solution

Under Dodd-Frank, created after the 2008 financial crisis, the Financial Stability Oversight Council and Orderly Liquidation Authority supervise big major financial firms' financial stability whose fail could cause seriously negative effects on the economy of the U.S (firms labelled as "too big to fail"). Higher loss absorbency implementation, TLAC (Total Loss-Absorbing Capacity) and more thorough oversight is improving in a good level for worldwide systemically significant banks (G-SIBs). Meanwhile, as reported by Financial Stability Board (2017), advance has not been faster on other reforms regarding resolution for the past year and substantial work requires to structure influencing regimes of resolution and for operationalization of resolution plans for cross-border firms.

The main is the elimination of the too-big-to-fail approach and the moral hazard/excessive risk-taking movements elicited by it thanks forcing SIFIs to bigger capital demands and tightened prudential standards. The alleged "SIFI Project" was significant in the work plan recommendations of the FSB. Due to the apparent global significance of SIFIs with a big international existence, in Seoul, the G20 consented that FSB concentrates primarily on the "worldwide" systemically significant institutions of finance. The FSB had agreed on three interrelated ways to deal with prudential standards, oversight and resolution, respectively. Nolle (2012) stated that those criteria consist of leverage, size (considering on and off-balance sheet exposures and extension of credit), maturity mismatch and liquidity risk, interconnectedness, degree of current regulatory scrutiny and lack of substitutes.

It is expressed in Dodd-Frank Act that should market discipline be bettered, shorter discount for size on yield spreads, especially for banks labelled as too-big-to-fail (TBTF) or systemically important (SIFI) is possible to be mirrored. Commission, which used secondary market subordinated transactions, discovered that whereas TBTF discount is lowered by 94 percent as a result of the DFA, the size discount falls down by 47 percent. The DFA has taken an influential part in lowering the size and TBTF discounts on yield spreads, while it did not affect their elimination. Balasubramnian (2014) persistently claim that the changes in the rating criteria by Moody's seem to improve the market discipline of banks.

The Dodd-Frank Act, implemented plans to solve the TBTF problems. According to Article 165 (d) of the Dodd-Frank Act, banks with assets above \$ 50 billion are required to submit annual resolution plans. This requirement includes banks as well as financial institutions designated by the Financial Stability Monitoring Council. This arrangement, commonly known as living will, develops detailed strategies to reach a solution while experiencing financial distress or failure. The act obliges all large-scale financial institutions to organize a "living will" to explain how to get out of this situation when they are in distress. An effective living will probably create favorable conditions for regular liquidation. Thus, it protects the banks from the danger in the first place and saves them time. Therefore, the reform should lead to lower TBTF subsidies, thus leading to higher capital costs.

In this context, Federal Reserve regulators may approve living will or refuse until the bank develops a sound strategy. Living wills provides a theoretical solution to TBTF, both by reducing systematic externalities and by increasing regulatory commitment. Therefore, from the beginning, regulators have issued specific instructions both to reduce the likelihood of living will in distress and to intensify systematic externalities. These efforts are first initiatives in order to call for bailouts. Furthermore, if these attempts as living wills can be seen as credible, then they come up to the time inconsistency problem which is confronted by the regulator by falling the possible agency costs which can be a cause a bank failure. Consequently, there might be a rise the bargaining power of the regulator in guiding financial distress of a bank because of the downward pressure on the hidden failure cost of uncertainty. There are also rising political costs to bailing out a bank because the regulator signalized publicly that it would not be so. Because of the cost of regulation, it is hard to believe banks differentiated considerable before execution. In addition, Acharya et al. (2016) state that since the TBTF firms are not listed explicitly, TBTF cannot apparently specify the treated group.

5. DISCUSSIONS AND CONCLUSION

In this study, the causes of the 2008 financial crisis are presented and the main reforms made in the field of international banking after the financial crisis and their effects are offered. In particular, the US government took immediate action to stabilize the financial system in the crisis. Emergency measures for the financial crisis have created an opportunity for new financial arrangements. In this sense, the Dodd-Frank Act has been the most comprehensive revision of financial regulation in the United States since the 1930s. The law stipulated mandatory regulations to improve transparency on certain issues. In this context, it authorized the Federal Reserve for surveillance. It also established the Consumer Financial Protection Bureau to reduce consumer benefit practices. These regulations significantly increased the capital requirements, increased the quality of the goods calculated as capital, and introduced new liquidity and leverage requirements. It also reduced the possibility that banks would use their own internal models to calculate their capital needs and increased the need for large banks to reduce losses. Furthermore, the Dodd-Frank Act, implemented plans to solve the TBTF problems. According to Dodd-Frank Act, banks with assets above \$ 50 billion are

required to submit annual resolution plans. This requirement includes banks as well as financial institutions designated by the Financial Stability Monitoring Council. This arrangement, commonly known as living will, develops detailed strategies to reach a solution while experiencing financial distress or failure. The act obliges all large-scale financial institutions to organize a “living will” to explain how to get out of this situation when they are in distress.

As mentioned in the above section, Dodd Frank and Basel III, which aim to manage financial institutions within the framework of more effective regulation and have a stronger capital and liquidity structure, are also examined. Therefore, important efforts under Basel III are also important in order to move away from the effects of the crisis and make new arrangements. Basel III criteria are applicable to all financial institutions in the world. The USA, Europe and many other countries have changed their laws according to Basel III. This is an important step towards financial crises. Basel III has tried to acknowledge pro-cyclicality via measures, whose goal is to maintain stability during the course of time. These consist of counter cyclical capital fees and provisions that are forward-looking, rules of capital protection for powerful capital buffers, systematic-based financial institutions and their systemic capital charges. Dodd-Frank Wall Street Reform and implementation of Basel III standards evaluated regarding their impacts on new wave financial regulation perspective.

Another important regulation is living will. Recently, aftermath of the financial crisis in 2008, regulators are globally calling for alleged living will. It is an incident scheme for financial institutions such as banks that is shelf-depending if the asset should be resulted in bankruptcy, closing, selling or shattering. At first glance, banks may see living will as regulations made by external force to the living will requirements. Banks and other financial institutions are affected by these regulations, however, if they look at compliance requirements and develop more strategic plans, they will get real benefits. One of the frequently discussed aspects of such a plan is that it can be used to simplify institutional structures. If so, restructure financial institutions that will facilitate their profitability to reduce their financial strength.

Too big to fall is a vital to an economy that it would be disastrous if they went bankrupt. Therefore, urgent arrangements had to be made on this issue. Too big to fall practices reflect the government's perception that large financial firms serve the public good. This situation necessitated a legal regulation. In this context, the Dodd-Frank Wall Street Reform and Consumer Protection Act have introduced practices to eliminate too big to fall practices. The main ones were to prevent excessive financial companies from taking excessive risks and to increase regulation and audits.

After extensive arrangements, the banking sector recorded a significant increase in the amount and quality of capital. This success was mostly achieved with capital increases. In the latest report of the International Monetary Fund (2017), it was shown that the 30 largest banks in the world obtained capital of approximately 1 trillion dollars from 2009 to 2016. As a result, the average ratio between capital and total assets increased from 5% to 7%. Great success has been achieved in these practices.

The same positive situation is true for liquidity. This is seen not only in the improvement of the main liquidity ratios (see figure 5) but also in the reduction of the simple ratio between loans and deposits. In the sample of the 30 largest banks mentioned above, this ratio decreased from 90% to 75% from 2006 to 2016. Increases in the amount of bank capital and liquidity have reduced the likelihood of large banks defaulting and taking greater risks in the future. In addition, the obligation to provide bail for the liabilities of banks reduces the possibility that the banks will be supported by the government through bail in a future crisis.

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A COMPARISON OF THE IMPACTS BETWEEN TURKEY AND FIVE SELECTED DEVELOPING ECONOMIES DURING THE GLOBAL FINANCIAL CRISIS

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ABSTRACT

Purpose- We would like to examine the impacts of the global economic crisis on the Turkish economy and compare it with some other developing economies like Brazil, Russian Federation, India, China, and South Africa, namely the BRICS countries. We chose these countries because they are well-known developing countries in the world.

Methodology- We compared the economic variables of unemployment rates, current deficit, GDP growth, and foreign direct investments for each country. Therefore, we obtained statistics from the World Bank and analyzed them.

Findings- The banking and financial sector showed a similar trend in all countries. Developing countries did not take a direct hit to the banking sector because of robust regulations in the banking sector, relatively low toxic assets, and fiscal & monetary measures taken in developing countries. Consequently, country-specific factors played an essential role in some countries. Especially for South Africa, the FIFA World Cup held in 2010 was influential in offsetting the crisis's adverse effects. Also, for the Russian Federation, Georgia's occupation in 2008 led to the protest against Russian goods, and therefore demand for Russian goods decreased

Conclusion- As a result, it is concluded that Turkey and the Russian Federation were directly hit by the crisis with substantial reductions in economic growth and unemployment rates. In China, India, Brazil, and South Africa, GDP growth and unemployment rates did not change greatly. Except for Turkey and the Russian Federation, other countries were not primarily affected by the global financial crisis. For the current account balance, there is a whole different scenario. Commodity and oil exporter countries like Russia were severely affected by decreasing oil prices in terms of the current account. Meanwhile, oil and commodity importer countries like Turkey were less damaged and had their lowest current account deficit in this era

Keywords: Crisis, economic growth, unemployment, BRICS, economic indicators

JEL Codes: B26, G01, E00

1. INTRODUCTION

The global financial crisis was one of the best-known economic events in the world. It had severe effects on the world economy as a whole. These impacts are effective even today. The EU Banks' excessive risk-taking behavior and the US housing bubble led to an economic disaster. Most economists regard it as the worst economic crisis after the Great Depression. The European debt crisis followed the great recession. This study will examine the effects of the global financial crisis on some selected economies, namely Turkey, the Russian Federation, China, South Africa, and Brazil.

Before 2009, the subprime mortgage market disruptions led to a crisis in the real estate sector and housing. Stock prices of subprime mortgage lender companies began to fall rapidly. The most obvious examples are the Lehman Brothers and City Group. Additionally, the global financial system has been affected by this situation as well. ECB injected more than 200 billion dollars to be able to control the financial crisis. In September 2008, US President George Bush decided to inject more than 700 billion dollars into the US Economy (Gotham, 2008).

Banks used to lend mortgage funds only to creditworthy customers before 2000. New technological and statistical achievements led to giving credit to riskier consumers. Banks have taken advantage of this situation. They made enormous profits through subprime mortgage loans. Subprime mortgage means the type of loan granted to individuals with poor credit histories or a lack of covering loan payments. Computer technology has also decreased the transaction cost, making mortgage funds more reachable for the consumer.

Subprime mortgage loans have taken off after liquidity aids by countries such as India and China after the recession happened in 2001. Politicians and economists advocated developing subprime mortgages because it led to justice for mortgage credits, and U.S homeownership rates increased. An increase in subprime mortgages resulted in a demand increase in housing. Then, a rise in demands affected the prices of houses significantly. As long as house prices increase in the USA, profitability for mortgage investors and lenders was high. Thus, riskier borrowers had the opportunity to take a mortgage more and more because that mortgage relative to the house's value had increased.

After a peak in 2006, house prices began to decline sharply. When it peaked, many borrowers realized that their home value was below the value of the mortgage. Therefore, the motivation for borrowers to leave their homes greatly increased. This situation led to more than 1 million mortgages in foreclosure. This bubble burst in 2008 and caused a significant crisis not just in the USA but globally. Especially in the USA, banks held a massive amount of mortgage-backed securities and credit default swap agreements in their balance sheets. When they experienced the burst in 2008, most of the banks were affected negatively, and some of them became insolvent and went into bankruptcy like the Lehman Brothers.

Besides, as the banks had weak financial conditions, they began to give much fewer loans to the economy. Thus, the US economy and then the global economy has started to experience a recession. Between 2008 and 2009, GDP growth reduced from 4.31% to -1.78%, which means over one year, there was a 5% decline in the world economic growth. Foreign Direct Investment decreased substantially net inflows of FDI to GDP ratio. It had been increasing since 2003, and it was almost 5% in 2007, but it could not return to this level after 2008. The balance sheets of many financial intermediaries, notably the banks, deteriorated sharply due to the USA's house prices, and the value of mortgage-backed securities and Collateralized Debt Obligation collapsed. Because of the weaker balance sheets, banks began to sell assets. They limited credit availability to the firms and individual consumers (Mishkin, 2007).

In this study, we aim to examine the effects of the global financial crisis on emerging economies. Therefore, we try to analyze five developing countries, including Turkey, Russia, China, India, and South Africa, also known as the BRICS. Our conceptual analysis investigates the changes in GDP growth, foreign direct investment, unemployment rate, inflation rate, tax revenues, and non-performing loans in these countries. As a result, we aim to compare these economic indicators across countries and analyze which country was affected more than others. In our comparisons, we used the World Bank Data.

It can be considered that Turkey and the Russian Federation have suffered the greatest loses from the and their economic activities have been greatly reduced. From current account perspective, commodity and oil exporter countries like Russia have been severely affected by falling oil prices. At the same time, oil and commodity importer countries like Turkey have suffered less damage and experienced the lowest current account deficit in this era. Due to large stimulus plan, China was a less affected country by the global financial crisis. Therefore, GDP growth has not decrease much in China.

In the next chapter, we will review the impacts of the 2008 crisis on the Turkish economy. In the third chapter, we will focus on the Russian economy. In the fourth chapter, we will look into the effects of the Chinese economy's mortgage crisis. In the fifth chapter, we will examine the effects of the subprime mortgage crisis on the South African economy. The sixth and seventh chapters will be about Brazilian and Indian economies. Lastly, the results will be discussed in the final chapter.

2. IMPACTS ON TURKISH ECONOMY

The crisis in 2008 has relatively the same as the other crises but somewhat different from them. Precautions that aim to reduce the budget and current account deficit existed in the previous crisis. However, there was only a decrease in interest rates and inflation in the recent crisis, and economic stimulus packages were put into effect to raise the budget deficit (Uygur, 2010). It can be seen that GDP growth reduced from 7% in 2007 to -4.7% in 2009 in this case, which shows that there is some amount of reduction in crisis in both 1994 and 2001. Notably, the consumption part decreased by 1% between the years 2007 and 2009. However, the main reason for this reduction is that foreign direct investment decreased between the same period.

Foreign direct investments were increasing between 2003 and 2007, and this situation suddenly turned negative worldwide in 2008. Turkey has also experienced this abundance of foreign capital. Foreign direct investments shrank from 22.04 billion dollars

in 2007 to 8.6 billion dollars in 2009, which is almost a 60% decrease. Portfolio investments have shown a sharp decrease from 5.138 billion US dollars to 716 billion US dollars. These two factors together are one of the reasons that caused GDP growth to decrease. An unsustainable budget deficit with very high-interest rates and very high inflation led to a sudden financial reversal resulting in the collapse of the Turkish Lira. Turkish Lira depreciated by 30% against the US dollars between August 2008 and November 2008 (Cömert & Çolak, 2014).

Since 1991, Turkey's average rate of unemployment has been 10.0% per annum. Turkey experienced a record unemployment rate in 2009 by 12.55%. The unemployment rate in the young population (aged 15-24) is 24%, and both males and females have the same figures. This situation is also true for the young population. Trade is an important aspect. The Turkish economy was affected mainly in this sector, mostly when two-thirds of Turkey's external trade was done with the EU countries. The EU's demand declined almost by half, and fortunately, this loss was almost compensated by eastern countries, but merchandise trade still decreased by 5% (Rodrik, 2009).

For the current account, there is a different case. Turkey is an oil and natural gas importer country. Since the oil prices declined and the appreciation of the Turkish Lira was observed, it can be said that the current account deficit contracted between 2006 and 2009. The peak for the current account to GDP ratio was nearly 2% in this period. Besides, the current account deficit was always at high levels in Turkey. While we could not see many contractions between 2008 and 2009 in exports, there was a reduction in imports. Also, there was a 4% reduction in imports to GDP ratio between 2008 and 2009. Moreover, this is suggested to be an actual reason for the contradiction of the current account deficit through a depreciation of the Turkish Lira.

The inflation rate did not change after 2003 in Turkey. This rate based on consumer prices increased by 2% between 2007 and 2008 in the world and Turkey. However, a decline is observed in inflation by 5% both in the world and in Turkey. Additionally, inflation rates increased from 8.7% to 10.4% between 2007 and 2008. Thus, it can be claimed that there was not much difference after the expansionary policies in Turkey. There is also an essential aspect of the loan ratios here. Non-performing loans can be defined as the loans either defaulted or close to being defaulted. Share of non-performing loans in the total bank loans can give us an idea about a country's banking system and economy.

The share of the banks' capital in total assets was higher in Turkey than in the world and the United States. In risky periods, banks prefer to hold more capital to avoid the risk of being insolvent. Turkish banks preferred 3% more to hold capital than the others. Also, the share of banks' capital to total assets increased by 1%. Basel Requirements indicates that 8% of the capital must be held as a reserve requirement, but it is 4% higher than the Basel Requirements in Turkey. Furthermore, no bank went bankrupt in Turkey. Because of the strong regulations and rules in the banking sector applied by the Savings Deposit Insurance Fund (SDIF), the banking sector did not take as much damage as in the crisis in 2001. There were 18 banks to be transferred to the SDIF, and a state bank had gone bankrupt in 2001, but there was no bank transferred to SDIF in 2008 (Babacan, 2009).

It is also important to note that Turkish Banks were not holding Mortgage-Backed Securities and Collateralized Debt Obligations as much as the US banks. This preventive attitude helped most of the banks survive in Turkey alongside strong regulations. It can be seen that that ratio is not as high as it is in the banking crisis of 2001. The ratio of bank non-performing loans to total gross loans was 3.5 in 2008. Especially in 2009, even though non-performing loans share in total bank loan ratios increased slightly but quickly recovered until 2010 and remained under the global levels up until now. In Turkey, we may remark that the ratio of bad loans in total loans stood below the global levels after the global crisis. In this context, non-performing loans had increased by almost 20% during the banking crisis in 2001.

There is also an essential fact about tax revenues. Government revenues increased between 2008 and 2010 in Turkey, precisely by 2% relative to GDP; however, the tax revenues decreased worldwide in the same period, and they could only return normal levels in 2012. Due to the lack of data, we cannot say much about tax revenues between 1998 and 2007. It is essential to express that government expenditures increased in Turkey more than the world average in this period. While the government expenditures increased by 6%, government expenditures increased by 2% only for the world average. We believe that there are two reasons behind that. The first one is tax incentives due to incoming local elections, and the second one is the peace of the asset (reporting assets previously unrecorded and paying taxes based on that assets) by the Ministry of Finance.

Table 1 reflects that Turkey's GDP growth decreased until 2009, and it reached its lowest level in 2009. GDP growth was much higher in 2010 and 2011. In 2008 and 2009, net FDI inflows were at the lowest levels, as can be seen in Table 1. Unemployment rates were around 9% and stable between 2005 and 2012. We can also say that the same for the inflation rate. According to Table 1, the current account deficit fell during the crisis, but later, it increased.

Table 1: Economic Indicators for Turkey

Year	GDP Growth	Net FDI Inflow	Unemployment Rate	Inflation Rate	Current Account to GDP
2005	% 9.01	10.03 Bn USD	%10.63	%8.17	%-4,18
2006	% 7.11	20.18 Bn USD	%8.78	%9.59	%-5.64
2007	% 5.03	22.04 Bn USD	%8.68	%8.75	%-5.46
2008	% 0.845	19.85 Bn USD	%9.71	%10.44	%-5.15
2009	% -4.74	8.58 Bn USD	%12.55	%6.25	%-1,76
2010	% 8.48	9.09 Bn USD	%10.66	%8.56	%-5,78
2011	%11.13	16.18 Bn USD	%8.79	%6.47	%-8.93
2012	% 4.79	13.74 Bn USD	%8.14	%8.89	%-5,48

Source: World Bank Data

3. IMPACTS ON RUSSIAN ECONOMY

When the economic crisis hit Russia, it affected the country on three main channels: a drop in export prices, a decline in some export volumes, and a withdrawal of capital (Sutela, 2010). Like Turkey, Russia has also experienced rapid growth between 2003 and 2007. However, the main difference was that Russian economic growth depended on rising oil prices, and, similar to Turkey, economic growth depended on capital inflows from abroad. Unlike Turkey, Russia experienced a commodity price shock, which means oil prices have fallen (Conrad et. Al, 2009).

We must point it out that after the collapse of the Soviet Union, Russia's growth rate was the lowest. When the Soviet Union collapsed, a reduction in annual growth rates was about 13% between 1991 and 1994, but during the global financial crisis, the Russian economy experienced a -7,821 % growth rate in 2007. This can be seen as a decline in GDP growth from 8.535 in 2007 to -7.821. It is a reduction of nearly 15%.

As we stated before, declining oil prices had a considerable role in this reduction for Russia and decreased FDI levels. Another aspect was military operations in Georgia, which negatively affected the Russian economy due to protests against Russian goods. Russia was not so different from other countries in the world in the case of FDI. Capital inflows increased continuously between 2001 and 2007. However, in a year, from 2007 to 2008, foreign direct investment decreased almost by half. This situation was one of the main factors behind the decrease in Russian growth rates.

Portfolio investments, which are the indirect investment made via bonds and equities, decreased in that period. Net portfolio inflows decreased from 18 billion US dollars to -15 billion dollars. Russia had the sharpest reduction in this category after India, with 33 billion dollars lost. Russian Federation was successful in reducing the unemployment rate. They managed to decrease the unemployment rate from 13.3% in 1998 to 6% in 2007. According to our observation, this situation happened continuously, and there were a few points that unemployment rose by a small percentage or leveled. Nevertheless, unemployment levels suddenly rose to 8.3 %. However, the Russian Federation managed to sustain this low unemployment rate performance after the crisis.

We also noticed that there was a 1% difference between male and female unemployment levels in 2009. In regular times, it was mostly less than 1%. The woman's unemployment rate was only 7.7%, but it was 8.9% for the man. We can clearly say that unemployment affected males slightly more than the females during the crisis in Russia. Before the global crisis between 1999 and 2006, a massive current account was observed in the Russian Federation. The ratio of the current account to GDP was 10% in this period. We also see that this current account surplus decreased sharply during the global economic crisis with the effect of decreasing oil prices, and Russia was one of the biggest oil and natural gas exporters in the world.

In Russia, exports decreased by almost 20% between 2006 and 2009. We think that it is due to the decreasing oil prices in general. This situation also partly led to more fossil fuel use. Imports also decreased by 7% in Russia.

Between 2002 and 2008, the exchange rate of the ruble against dollar appreciated by 36%. Therefore, it encouraged foreign borrowing and exports. However, as the crisis progressed, the devaluations became more frequent. Gradual devaluations allowed consumers to protect their savings and help the banking system stabilize. We should also note that gradual devolutions made foreign exchange speculation very profitable. To solve this problem, the Bank of Russia increased interest rates to stabilize devaluation expectations (Barannik, 2010).

International investors cashed out their investment on Russian holdings (half of the Russian stock market at that time) to create cash and cover their obligations, so we observe a sharp decrease in Russian money markets' investment. The dollar-denominated RTS and ruble-denominated MICEX (Russian stock markets) fell by 20% on September 16, 2008. In order to make up for the loss, the Russian government formulated a rescue plan of 130-billion-dollar. (Barannik, 2010).

After the Soviet Union collapsed, Russia experienced hyperinflation, but the inflation rate was stabilized around 10% after 2000. The inflation rate increased during these years. In 2007, the inflation rate was 8.9 %, but in 2008 it rose to 14.1 %. We see a 5 % increase in inflation during that period. However, in 2015, we see a sharper increase by a 15% inflation rate in Russia with stimulus packages. In terms of the bad credits in Russia, it can be seen that 10% of the total loans defaulted, or they were close to being the default. This case resulted in a huge increase in non-performing loans to total gross loans ratio after 2003. This ratio was almost stable, with 3%. This ratio was higher than the world level, almost 6% higher.

Like Turkish Banks, Russian Banks preferred to hold more of their capital in total assets. Unlike Turkey, we see a sharp reduction (from 13.3% to 10% between 2007 and 2008) and a sharp increase (from 10% to 13%). We also see a sharp decline in tax revenues in Russia by almost 6%. Furthermore, in the world, tax revenues decreased by only 2% on average. This indicates that the Russian government could experience losses on collecting taxes more than other governments. Besides, Russia effectively used fiscal policy in the global financial crisis. Government expenditures increased by almost 20% between 2008 and 2009. The Russian Federation's Government successfully liquidated the Russian Economy via direct support to stock markets and banking sector and fiscal support to maintain the exchange rate system (Barannik, 2010).

As Table 2 indicates, Russian's GDP growth was stable until 2009, and it reached its lowest level in 2009. After 2009, the GDP growth was around 4%. In 2009, net FDI inflows were at the lowest levels in Russia except for 2005. The unemployment rate reached a peak in 2009, but it decreased after 2009. In Russia, the inflation rate was quite high in 2008 but decreased after that. According to Table 2, Russia had a current account surplus before the crisis. After the crisis, the amount of current account surplus decreased.

Table 2: Economic Indicators for Russia

Year	GDP Growth	Net FDI Inflow	Unemployment Rate	Inflation Rate	Current Account to GDP
2005	%6.4	15.50 Bn USD	%7.12	%12.68	%11.04
2006	%8.2	37.59 Bn USD	%7.05	%9.69	%9.32
2007	%8.5	55.87 Bn USD	%6.00	%9.00	%5.55
2008	%5.2	74.78 Bn USD	%6.20	%14.11	%6.25
2009	%-7.8	36.58 Bn USD	%8.30	%11.64	%4.12
2010	%4.5	43.16 Bn USD	%7.36	%6.84	%4.42
2011	%4.3	55.08 Bn USD	%6.53	%8.44	%4.75
2012	%4.02	50.58 Bn USD	%5.43	%5.07	%3.28

Source: World Bank Data

4. IMPACTS ON CHINESE ECONOMY

The Chinese economy was affected in many ways by the global financial crisis. Perhaps the most crucial channel was the trade for the Chinese economy. Exports and imports decreased by almost 30% in China between 2007 and 2009 (Whalley, 2011). It can be said that steel exports have one of the primary roles in reducing trade decrease. The reduction in steel exports was the most affected part of the exports. This reduction was due to the overall production of steel in China. We can explain fifty-four percent of the decrease in steel exports with a decrease in steel production. Moreover, a decrease in demand in the steel-related industries was substantially significant (Yongding, 2010).

Growth levels in China steadily increased between 2003 and 2007, and it had a peak of 14% in 2007. Besides, the average GDP growth in China between 2001 and 2007 was 10%. Growth rates decreased between 2007 and 2009, but unlike the other countries we analyzed before (Turkey and Russia), it did not have negative values, nor were there significant changes. Chinese economy did not contract thanks to the Chinese economy's immediate intervention, and the growth rate decreased by 5% in two years. The Chinese government launched a stimulus package amounted to 580 billion dollars, equal to 15% of Chinese GDP in November 2008 for 2008 and 2009. Half of this stimulus package went into infrastructure services, and the Chinese government used a quarter of the stimulus package for the reconstruction due to the Sichuan earthquake (Yongding, 2010).

This stimulus package compensated for the adverse effects of the global crisis on the Chinese Economy. It mainly included housing, rural infrastructure, transportation, health and education, environment, industry, disaster rebuilding, incomes, taxes, and finance. We think that the answer to how China continued to grow by 8% is behind this stimulus package. This stimulus package explained why the unemployment rates stood at low levels during the global crisis.

China experienced a sharp increase in FDI until 2008, but a decline was seen between 2008 and 2009. After global economic crisis, net FDI inflows increased almost 30%. We cannot see such a sharp increase in other countries. Portfolio investments increased after 2001, and we observed a peak in 2006, which has a total amount of 42 billion dollars. However, after 2006, this case changed. Portfolio investments from the rest of the world gradually decreased in China. The total amount of portfolio decreased to nearly 8 billion US dollars.

In China, unemployment decreased as of 1999 and stood below 5% after 1991. Unemployment increased from 3.8 to 4.4 between 2007 and 2009. Compared with the countries analyzed previously, this change is insignificant. In addition, the decline in the male unemployment rate was significantly greater than the decline in the female unemployment rate. The share of the current account in GDP continuously increased between 2002 and 2007, and it peaked in 2007, which indicates the share of the current account surplus in GDP was equal to 10%. However, after 2008 it began to decrease, and China could not reach pre-crisis levels in current account surplus. The country barely reached 5% level after the global crisis occurred. The average share of the current account in GDP was about seven percent between 2004 and 2008. However, nowadays, especially after 2010, China could not keep up with the pre-crisis levels in this category.

In China, a decrease in exports and imports began before the global financial crisis, and during the financial crisis, the magnitude got even higher. So, it can be seen that they both decreased by almost 30% between 2007 and 2009. The main reduction occurs in EU-China and EU-US Trade because EU and US shares in Chinese trade are thirty percent together. During the global crisis, they both decreased by approximately 6%. There is no doubt that China was affected by the global crisis in the sense of export and import during the global crisis (Bai, 2012). We also observe a sharp increase in RMB. Between 1992 and 2008, the US dollar depreciated by 21%, but it suffered by 6% in the first eight months of 2008. This situation also caused the export values to decrease in China (Sun, 2009).

Non-performing loans to total loans ratio was above 10% between 1999 and 2004. These ratio was getting lower and lower, and during the crisis, it continued to decrease. On the other hand, it can be seen that non-performing loans to total loan ratios were increasing worldwide. This situation was an outstanding aspect of China in such a financial crisis. Only three banks in China did not decide to hold mortgage-backed assets, and their share in total assets was limited. Due to this situation, we observe that there was not much problem in the Chinese financial sector, but in the Chinese stock market, these banks' market share had reduced significantly by 40%. This was mainly because investors had lost their confidence in what would happen in the future (Sun, 2009). Banks decided to hold the same amount of their capital to total assets in China. The bank capital to asset ratio was almost stable at 6%. Between 2007 and 2008, there was a reduction of 0.3 points. This reduction was relatively smaller than that of Turkey and Russia. There was also little increase in tax revenues during the global financial crisis. It was a good sign for China because there was a downward trend worldwide in this case. We think that the Chinese Government's policies were relatively successful in tax collecting issues despite not as much as Turkey.

As seen in Table 3, Chinese GDP growth was quite high in 2005, 2006, and 2007, and it reached the lowest level in 2009. After 2009, the GDP growth was around 9%. In 2009, net FDI inflows were at the lowest levels in China. After this year, net FDI inflows had the highest levels. Unemployment rates were stable and around 4% during the mentioned period. In China, the inflation rate was quite low until 2007, and it increased to a 5% level before the crisis. After the crisis, the inflation rate was around 3%. Table 3 also suggests that China had a current account surplus before the crisis. After the crisis, the amount of current account surplus decreased.

Table 3: Economic Indicators for China

Year	GDP Growth	Net FDI Inflow	Unemployment Rate	Inflation Rate	Current Account to GDP
2005	%11.93	104.10 Bn USD	%4.2	%1.77	%5.79
2006	%12.71	124.08 Bn USD	%4.1	%1.64	%8.42
2007	%14.23	156.24 Bn USD	%4.0	%4.81	%9.94
2008	%9.65	171.53 Bn USD	%4.2	%5.92	%9.15
2009	%9.4	131.05 Bn USD	%4.3	%-0.72	%4.76

2010	%10.63	243.70 Bn USD	%4.1	%3.17	%3.9
2011	%9.55	280.07 Bn USD	%4.1	%3.55	%1.82
2012	%7.86	241.21 Bn USD	%4.1	%2.62	%2.5

Source: World Bank Data

5. IMPACTS ON SOUTH AFRICA ECONOMY

Unlike the rest of the world, South Africa has not experienced net foreign direct investment inflows. We see only a three percent rise between 2006 and 2008. During the global economic crisis, FDI levels decreased. South Africa experienced the same patterns as China between 2001 and 2009 for portfolio investments. The only difference is that portfolio investment levels were not as high as in China. South Africa had a peak in 2006 with 14.5 billion dollars. After 2006, it began to decrease, and portfolio investment inflows turned negative, and there were 4.7 billion dollars of net capital outflow in 2008. Pre-crisis era (indicating between 2003 and 2007) South African economy had a growth of 3-5% points every year. Behind this growth, commodities, especially coal, iron, and demand, played a crucial role. The decline in commodity prices also affected the South African economy's growth levels via decreasing merchandise trade. In this era, South Africa experienced a sharp decrease (almost 20%) in merchandise trade (Baxter, 2009).

For South Africa, the current account balance was weaved after the 1960s. There was continually increasing current account deficit in the pre-crisis period; however, this trend reversed during the crisis, and the ratio of current account deficit to gross domestic product stood at -1,53% in 2009. Exports of South Africa were affected mainly by decreasing commodity prices and lower demand in the developed countries. Some fiscal policy decisions nearly balanced the situation, but many of the firms turned to survival mode, and it was essential to keep up with unemployment levels. Although the unemployment rate was at high levels, around 28% before the crisis, the unemployment rate changed during the global financial crisis. We think the restructuring of mineral firms helped to reduce these costs. Increase in unemployment was also relatively limited because of the FIFA 2010 World Cup held in South Africa. This event created job opportunities and counteracted the adverse effects of the crisis in terms of employment.

Only Investec took direct shock from the mortgage crisis. Investec reported 36 million pounds' subprime hit and a sharp fall in their share price, but this was a relatively small loss compared to the UK and the US Banks. Also, the leverage rate was highly low when we compared it to the US and the EU banks. While we observe a 50-60% leverage rate globally, it was only 16% in South Africa. These details reflect the limited effect of the global financial crisis on South Africa's banking sector (Padayachee, 2010). Regulations of the banking sector were strict in South Africa, like in Turkey. South African banks were not allowed to use hybrid structures like in the US and EU, and they did not rely on the secondary structures on funding. Banks were also required to increase their capital adequacy ratios in standard times (Padayachee, 2010).

Thanks to these regulations, non-performing loans to the total loan ratio increased only slightly above compared to the rest of the world and the Russian Federation. Non-performing loans to total loans ratio showed a 2% rise between 2008 and 2009. That means loans defaulted or close to default showed a little increase in South Africa during the crisis. In the same period, tax revenues also showed a downward trend. Between 2007 and 2009, it decreased by nearly 3% in South Africa. If we look at the world averages, in this case, it can be said that tax revenues showed a 2% decrease in average. Government expenditures increased by 3% between 2007 and 2009. It can be said that the stimulus package of government and preparations for the 2010 World Cup were influential in the increase of government expenditures.

The GDP growth rate of South Africa was around 5% before the crisis, but after the crisis, it decreased to a 3% level. According to Table 4, net FDI inflows were rising until 2008, but after 2009, net FDI inflows to South Africa decreased due to the financial crisis. The unemployment rate was around 26% before the crisis, yet the unemployment rate decreased 24% after the crisis. As seen in Table 4, the inflation rate was around 2 or 3% before the financial crisis. During the crisis, it reached 10%. After the financial crisis, the average inflation rate was 5%. Like in Turkey, the current account deficit was low during the crisis.

Table 4: Economic Indicators for South Africa

Year	GDP Growth	Net FDI Inflow	Unemployment Rate	Inflation Rate	Current Account to GDP
2005	%5.27	6.52 Bn USD	%29.25	%2.06	%-3.10
2006	%5.60	6.23 Bn USD	%28.48	%3.24	%-4.44
2007	%5.36	6.88 Bn USD	%26.66	%6.17	%-5,40

2008	%3.19	9.88 Bn USD	%22.43	%10.05	%-5.72
2009	%-1.53	7.69 Bn USD	%23.53	%7.26	%-2.62
2010	%3.04	3.69 Bn USD	%24.69	%4.06	%-1.46
2011	%3.28	4.13 Bn USD	%24.65	%5.01	%-2.23
2012	%2.21	4.62 Bn USD	%24.32	%5.72	%-5.12

Source: World Bank Data

6. IMPACTS ON INDIAN ECONOMY

The GDP of India grew in the four years before the crisis. India had the second-highest growth rate after China among the countries we examined. Also, contracting in credit markets in advanced economies made it more difficult for Indian firms to take credits. When the firms could not reach the credit from external markets, they had to turn to domestic markets. Moreover, this caused the depreciation of the Rupee.

Indian Central Bank had to intervene in the foreign exchange markets. India's foreign exchange reserves reduced from 309 billion US dollars to 252 Billion US dollars to prevent Rupee's further depreciation and allow appreciation. Even though foreign direct investments did not decrease much in India, net portfolio investments inflow turned into an outflow, which means approximately 48 billion US dollars in 2008. This situation had a reflection on equity prices in India, and the BSE Index had 37.94 %. India experienced a quick recovery in the case of portfolio investments. In 2010 portfolio investments turned to the pre-crisis level.

Tight regulations in the banking sector prevented complex derivatives in bank balance sheets and off-balance sheet activities. The effect of swap and subprime credit markets was relatively limited on the Indian economy. Foreign Banks' share in Indian Banks did not exceed 5% (Viswanathan, 2010). Before the crisis, there were not many non-performing loans relative to GDP in India, thanks to the measures we stated in the previous part. After 1999, non-performing loans were decreasing relative to GDP, and during the financial crisis, it stood at a 2-3% level in India.

In the second half of 2008, Indian exports decreased by 15%, mainly due to lower demand from European Countries and the United States. Notably, the United States was effective in India's export because of the share of the United States in software and IT technology export of India. Imports were also on the rise because of the high prices of oil and fertilizers, and thus current account deficit grew more significant in 2008 by -2.58 CA/GDP ratio.

Investors in the EU and the US became timider in 2008 during the crisis. Moreover, most of the investors had withdrawals from financial markets. Also, uncertainties about the future led to the consumption cut in India. In India, with the beginning of the global recession, inflation rates rose to 10.877% in 2009, with fiscal expansion from 6% in 2006. An increase in food prices played a significant role in this case since food prices increased by more than 10%.

Food prices increased by more than 10% until March 2009. This rise in food prices, in turn, affected the budget of the household. Rising food prices caused problems in the agricultural sector and rural areas. This situation affected mainly farmers, migrant workers, and home-based women workers in India (Kumar et al., 2009). Unemployment rates did not change much during the global financial crisis, and there was a 0.4% difference between 2007 and 2008.

According to Table 5, GDP growth was around 8% before the crisis in India. After 2010, GDP growth lost its momentum, and the Indian economy started to grow more slowly. During the crisis, net FDI inflows peaked. The unemployment rate was mostly stable, around 5% during the mentioned years. Inflation rates were low before 2007 in India, but after 2009, increasing to higher levels. Before the global financial crisis, India had lower current account deficits. As seen in Table 5, the current account deficit had increased.

Table 5: Economic Indicators for India

Year	GDP Growth	Net FDI Inflow	Unemployment Rate	Inflation Rate	Current Account to GDP
2005	%7.92	7.26 Bn USD	%5.59	%4.24	%-1.25
2006	%8.06	20.02 Bn USD	%5.45	%5.79	%-0.98
2007	%7.66	25.22 Bn USD	%5.32	%6.37	%-0.66
2008	%3.08	43.40 Bn USD	%5.28	%8.34	%-2.58
2009	%7.86	35.58 Bn USD	%5.56	%10.88	%-1.95
2010	%8.49	27.39 Bn USD	%5.63	%11.98	%-3.25

2011	%5.24	36.49 Bn USD	%5.63	%8.85	%-3.42
2012	%5.49	23.99 Bn USD	%5.65	%9.31	%-5.00

Source: World Bank Data

7. IMPACTS ON BRAZILIAN ECONOMY

Like most developing countries, Brazil also benefited from rising commodity prices, which led to a significant amount of current account surplus and economic growth. According to a study conducted by (Ferrari Filho, 2011), Brazilian growth rates were about 6% annually (Ferrari Filho, 2011). We see a decrease in exports from Brazil. Roughly half of the exports belonged to raw material exports for Brazil, and the other half consisted of manufacturing goods roughly. Because of the decline in demand from and decreasing commodity prices, Brazilian exports diminished (Williamson, 2009).

Parallel to the increase in domestic consumer demand, exports also increased in 2009. This rise in exports was mainly because of the steady recovery of the Chinese economy, and China became the primary trade partner of Brazil. Sao Paulo Stock Exchange Index had one of the most significant increases in value. The current account turned to negative values after 2008 with the effect of decreasing commodity prices. Also, growth rates turned negative with the effect of commodity negative in 2009, but recovery was quick thanks to the Brazilian Government's monetary and fiscal measures.

Fiscal measures were taken in two ways. The first of them was increasing the public sector payroll, and the second one is increasing social security payment and direct transfers to the private sector. The Brazilian economy began to improve in the second quarter of 2009 because of the fiscal, monetary, and soundness of intuitions. Before the crisis, unemployment rates were about 8% in Brazil, and the crisis's adverse effects seemed to be not valid for Brazil's unemployment rates. Unemployment rates stood at the same levels as previous rates, like China and India.

Similar to other countries, we cannot see a continuous increase in FDI in Brazil. In 2009, foreign direct investment decreased by 40%, but it recovered quickly thereafter, and foreign direct investment increased by 166%. The decrease in portfolio investment challenged the Brazilian economy during the crisis rather than FDI outflows. We see an increasing pattern for Brazil's portfolio investment between 2003 and 2007, but portfolio investment sharply decreased in 2008. Based on this figure, we can clearly say that we see a portfolio outflow of 34 billion US dollars.

The decrease in portfolio investment hit the real economy too. Because of scarcity in liquidation, many existing firms decreased their production level and canceled or postponed their investment options. However, in the service sector, the story was different. Because of the steady expansion of government expenditure, the crisis's effects in this sector were limited (Mendonça, 2010). In 1995, a banking crisis occurred in Brazil, similar to the one that occurred in Turkey. Many banks had troubles with solvency issues, and the Brazilian government had to take preventive measures to strengthen the banking system. Thanks to this protective measure, the Basel ratio for minimum capital requirement ratio was higher than in other countries in Brazil, with 11%. In Brazilian banks, these rates were applied as 16% in general. Besides, the Brazilian banks did not buy toxic foreign certificates, and thus Brazilian banks were not affected much (Hoffman, 2011).

According to Table 6, Brazilian GDP grew until 2007, but after the crisis, it had quick restoration, and the GDP growth rate was about 7.52 in 2010. Net FDI inflows to Brazil were low before the global financial crisis, but net FDI inflows were much better after the financial crisis. Unemployment rates were high before 2008. After the crisis, the unemployment rates were lower compared to the pre-crisis levels. Inflation rates decreased until 2007, but after this year, it was around 5%. Brazil had a current account surplus until the crisis, but they had a current account deficit after the crisis.

Table 6: Economic Indicators for Brazil

Year	GDP Growth	Net FDI Inflow	Unemployment Rate	Inflation Rate	Current Account to GDP
2005	%3.20	15.46 Bn USD	%9.56	%6.85	%1.56
2006	%3.96	19.37 Bn USD	%8.63	%4.18	%1.23
2007	%6.07	44.57 Bn USD	%8.32	%3.64	%0.11
2008	%5.09	50.71 Bn USD	%7.34	%5.67	%-1.66
2009	%-0.12	31.48 Bn USD	%8.52	%4.88	%-1.45
2010	%7.52	82.39 Bn USD	%7.73	%5.03	%-3.57
2011	%3.97	102.42 Bn USD	%6.91	%6.63	%-2.91
2012	%1.92	92.56 Bn USD	%7.18	%5.40	%-3.39

Source: World Bank Data

8. CONCLUSION

Except for Turkey and the Russian Federation, other countries were not primarily affected by the global financial crisis. In China, India, Brazil, and South Africa, GDP growth and unemployment rates did not change greatly. The difference between unemployment rates was limited to the previous rate in China, India, Brazil, and South Africa. In Russia and Turkey, we see significant differences with previous rates. For the current account balance, there is a whole different scenario. Commodity and oil exporter countries like Russia were severely affected by decreasing oil prices in terms of the current account. Meanwhile, oil and commodity importer countries like Turkey were less damaged and had their lowest current account deficit in this era. Another point we must add regarding Turkey is that tax revenues increased during the crisis because of the reasons analyzed in the second chapter. This is important because tax revenues decreased all over the world during the crisis.

In all countries, the banking and the financial sector showing similar trends. Developing countries did not take a direct hit to the banking sector because of robust regulations in the banking sector, relatively low toxic assets, and fiscal & monetary measures taken in developing countries. However, in all countries, the stock exchange market was severely affected, especially in Russia, in this case, because investors had lost confidence and cashed out their money from the developing stock markets. In South Africa and Russia, it can be said that non-performing loans in total assets increased at least 4% during the crisis.

The biggest decline in portfolio equity was in Russia and Brazil with 33 billion US dollars. In China and Turkey, portfolio equity net outflow was limited. For example, in Turkey, portfolio equity investment decreased by 4 billion US dollars. For foreign direct investment, the most significant damage was taken in the Russian Federation and China. For both of the countries, we saw a sharp decrease of 40 billion US dollars. In other countries, foreign direct investments did not decrease sharply, but they lost 10 billion US dollars' worth of foreign direct investment during the global financial crisis.

Consequently, country-specific factors played an essential role in some countries. Especially for South Africa, the FIFA World Cup held in 2010 was influential in offsetting the crisis's adverse effects. Also, for the Russian Federation, Georgia's occupation in 2008 led to the protest against Russian goods, and therefore demand for Russian goods decreased. Another factor was the Sichuan earthquake in 2008, and most of the government stimulus package went reconstructing for the earthquake area in China. As a result, it can be said that Turkey and the Russian Federation took a direct hit from the crisis with substantial reductions in economic growth and unemployment rates. The probably less affected country is China from the global financial crisis thanks to the massive stimulus package. Therefore, GDP growth did not decrease much in China. Other countries (South Africa, Brazil, and India) were affected by the crisis, but it was not as big as a shock in Turkey and Russia, yet it was not as slight as in China (Leuing, 2006).

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THE EFFECTS OF LIABILITY DOLLARIZATION ON MANUFACTURING COMPETITIVENESS¹

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ABSTRACT

Purpose- This study aims to investigate the effect of liability dollarization on competitiveness of sub-sectors operating in Turkish manufacturing industry. Within the scope of the NACE Rev-2 classification, the study used annual data covering the 2008-2016 period for the sub-sectors of the manufacturing industry.

Methodology- A group of econometric tests; fixed effects and random effects approaches have been estimated from panel data methods.

Findings- Variables affecting the manufacturing industry competitiveness were found to be liability dollarization, economic globalization index, energy prices, economic crisis, trade openness, and basket exchange rate. The variable to be used as the "measure of competitiveness" to represent the dependent variable is the ratio of net exports to foreign trade volume. The estimation results show that increase in liability dollarization rate, presence of the economic crisis, and change in energy prices negatively affect competitiveness of sectors, whereas economic globalization index and trade openness have a positive effect on the competitiveness. There is no statistical significant impact of basket exchange rate on competitiveness.

Conclusion- The results of this study indicate that to increase sectoral competitiveness of Turkish manufacturing sector should be increased openness effect and decreased debt dollarization ratio. While sectors increase openness, they can reach new markets and so they can increase their trade activities. But, to increase sectoral economic activity strongly, their fund problems should be solved.

Keywords: Competition, liability dollarization, manufacturing industry, panel data analysis

JEL Codes: D00, E00, L60,

1. INTRODUCTION

Dollarization, one of the common problems of economies suffering from macroeconomic instability, is a financial phenomenon that occurs when economic units make foreign currency transactions. Liability dollarization refers to foreign currency liabilities of key sectors operating in an economy (Incekara, Mutlugün and Yılmaz, 2017). Especially in cases where the domestic funds are insufficient and the economic units called "original sin" cannot borrow in domestic currency in the international arena (Eichengreen and Hausmann, 1999), firms that need funding are directed towards foreign currency funds to meet these needs. They prefer to take the risk posed by the exchange rate instead of taking the interest risk due to the debt instruments in local currency. Liability dollarization affects balance sheets through exchange rate volatility and maturity mismatch (Taşseven and Çınar, 2015). In particular, developing country economies with insufficient domestic capital shortage turn to international markets to finance domestic production (Metin-Özcan and Us, 2009). The private sector, to meet the funding needs due to the insufficient domestic savings, has to seek external sources and borrow foreign currency. Thus, the liability dollarization rate increases (Serdengeçti, 2005).

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According to Calvo and Reinhart (2002), the floating exchange rate regime may have a shock-generating feature in the event that firms with mainly domestic currency income have unsecured foreign currency debts. Increases in the real exchange rate affect general financial situation and foreign currency debt sustainability of firms with high foreign currency debt and having income predominantly in domestic currency (Özmen and Yalçın, 2007). In the event that the foreign currency rate on the liability side of the firms' balance sheets is higher than that of the asset side, the firms lose their wealth when the value of domestic currency decreases (Aklan and Nargeleçekenler, 2010). In Turkey, companies mostly prefer foreign currency and short-term debt instruments, which makes them vulnerable to shocks due to exchange and interest rates caused by both currency and maturity mismatch (Kesriyeli, Özmen and Yiğit, 2005). Incekara et al. (2017) state that declines in real exchange rate provide an international competitive advantage and increase the sector income. However, in the case of high liability dollarization in the sector balance sheet, the decrease in real exchange rate may have a negative effect on the balance sheet and this negative effect can outweigh the competitive advantage obtained thanks to the decrease in exchange rate.

Ranciere, Tornell and Vamvakidis (2009) argue that foreign currency borrowing poses systemic risks, but it may also support firms that need funding to meet their needs. "Increases in real exchange rates support the competitiveness of companies in foreign markets within the scope of the influence of competition. However, companies with high liability dollarization in the balance sheet may experience increases in their debt liability, deterioration of their balance sheets, and have payment difficulties" (Alp, 2013).

In this study, how the foreign currency debt that is needed to maintain the economic activities of the sub-sectors playing an active role in the manufacturing industry affects the competitiveness in terms of the developments in exchange rates is investigated. The study is important in terms of examining the competitiveness of the sectors operating in the Turkish manufacturing industry, determining the riskiest sub-sectors due to dollarization, and highlighting the impact of the increases in the dollarization level on the competitiveness of the sector. In the second part of the study, the summary of the relevant literature is included. In the third section, the method, data set, model and estimation results are included. In the last section, results and policy suggestions are presented.

2. LITERATURE REVIEW

Bleakley and Cowan (2005) conducted a study including 450 firms operating in chosen Latin American countries (Brazil, Argentina, Chile, Mexico and Colombia) and examined whether exporters with foreign currency borrowing were adversely affected by real exchange rate changes during the period of 1990-1999. In the study, panel data was preferred as the estimation method. The results show that the positive competitive effect balances the negative balance effect caused by the dollar liability.

In a study conducted on Chile, Cowan, Hansen and Herrera (2005) examined the composition of the currency in the assets and liabilities of non-financial companies and the determinants and results of currency mismatches. The results indicate that the balance sheet effect is important, the derivative products isolate firm investments from exchange rate shocks and companies operating in Chile have a tendency to match currency.

Kesriyeli, Ozmen and Yigit (2005) investigated the effects of balance sheet and the causes of the currency composition of the non-financial sector in Turkey. Data belonging to 1992-2003 and EGLS and GMM panel data estimators were used in the study. The findings demonstrate that the variables specific to the real sector and the macroeconomic status variables (such as inflation rate and real exchange rate) significantly explain dollarization liabilities of the real sector.

Ozmen and Yalçın (2007) discussed financial structure and liability dollarization-induced fragility of the real sector companies in the global financial dollarization risks in Turkey. The results show that the size of the company is inversely correlated to the financing constraint, small and medium-sized firms are facing more financing constraints, and large-scale firms have high indebtedness levels.

Aklan and Nargeleçeken (2010) investigated the balance sheet effect results of the liability dollarization according to the data of 14 manufacturing industry sub-sectors for the period of 1998-2007, using a dynamic panel data estimator. Findings display that the investments of firms decrease during the periods when the domestic money depreciates, but the investments of firms increase during the periods when the local money appreciates. The other result is that the balance sheet effect is valid in Turkey.

In their studies, Kesriyeli, Ozmen and Yigit (2011) examined the causes, balance sheet effect, and results of liability dollarization of non-financial sector in Turkey. Dynamic panel data method and 1992-2003 period data of 26 non-financial main sectors were used. Findings show that both industry and macroeconomic variables are important in explaining the liability dollarization of the sectors. In addition, it is shown that the liability dollarization and export have a positive correlation and the real exchange rate depreciation has a narrowing effect on investment and profitability for the sectors with a high level of liability dollarization. The

other result obtained from the study is that the negative balance sheet effect suppresses the positive competitive effect and the liabilities of firms are partially matched with the export income in currency.

In the study of Alp (2013), the effects of the firm-specific and macroeconomic determinants of the liability dollarization of real sector firms and the liability dollarization rate in terms of investments were investigated. The findings show that both firm-specific variables such as “leverage ratio, net tangible assets ratio, export rate, and scale size”, and macroeconomic variables such as “inflation, change in real exchange rate, global risk appetite, and share of public sector borrowing in GDP” are significant in explaining liability dollarization.

In their studies including the data of the manufacturing and non-manufacturing sector obtained from balance sheet records of the Central Bank of the Republic of Turkey between 1996 and 2010 and using dynamic panel estimators, Alp and Yalçın (2015) found that liability dollarization positively affects overall company sales and employment growth. However, it is observed that companies with a high liability dollarization rate have a significant decrease in net profit margins in crisis periods.

Gonzales, Micco and Montoya (2015) investigated the relationship between foreign bank penetration and dollarization in the banking sector for the period of 1995-2008 in Latin American countries using unbalanced panel data analysis. The results demonstrate that the dollarization or monetary board reduces transaction costs and facilitates financial integration. Therefore, dollarization has a positive relationship with competition.

Using panel data estimator, Taşseven and Çınar (2015) examined the determinants of the liability dollarization in the real sector in Turkey and its effects on investment during the period of 1996-2013. The results show that the changes in the previous period's liability dollarization rate, leverage ratio, inflation rate, foreign sales, public debt, tangible assets and real effective exchange rates affect the liability dollarization in the long run in an increasing direction, while increases in the firm size and stock market fluctuations affect the dollarization in a decreasing way. It is also seen that the liability dollarization rate affects real investments positively.

Using the data set and panel data GMM estimator, Aydın, Ekinci and Tüzün (2017) investigated the determinants of the liability dollarization and balance sheet status of the Turkish manufacturing sectors between 2008 and 2015. The aim of the study was to discuss the profitability of the real sector in terms of political instability and exchange rate changes within the framework of international competitive advantage and balance sheet effect. The study concludes that the variable defined as the competitive effect positively affects the active profitability.

In another study investigating the effects of liability dollarization on the growth of the manufacturing industry, Incekara, Mutlugun and Yılmaz (2017) discussed the effects of real exchange rate changes on the balance sheets and growth of firms operating in the sector. In the study covering 15 manufacturing sub-sector data from 1998-2013, panel data estimation method was used. The results indicated that real exchange rate declines have a positive effect on firm competition and the effect of liability dollarization may change either positively or negatively depending on the firm structure. It is concluded that in the intervals in which the liability dollarization coefficient is positive up to 34%, sales and growth of the manufacturing industry increase, and in the intervals with 34-85%, the net sales growth rate of firms' decrease, and the growth of the firms is positively affected when the liability dollarization is greater than 85%.

Yolcu-Karadam (2018) evaluated the liability dollarization and export performances of the Turkish manufacturing sub-sectors against the developments in the exchange rate within the scope of the ISIC Rev. 3 classification. As a result of the examinations, it is observed that intermediate goods are both among the low export sectors and the riskiest sectors due to the high dollarization of liabilities.

Karamollaoğlu and Yalçın (2019) examined the relationship between real exchange rates and export share of manufacturing firms in Turkey between 2002 and 2010 using data and panel data estimators. The results show that the depreciation of the Turkish Lira supports the foreign competitiveness of the companies.

3. METHOD, DATA AND MODEL

In this study, fixed and random effects estimators of panel data estimators were used due to a large number of units and multiple time dimensions. Since the panel data method has both time and section data features, panel data estimation results yield more information compared to time series and section data analysis. Panel data consists of N units and T observations. The panel data set used in this study includes 23 manufacturing sub-sectors and 9-year time dimensions.

Data sets regarding the Turkish manufacturing industry sub-sectors, covering the annual data between 2008 and 2016, were obtained from sectoral balance sheet information of Central Bank of the Republic of Turkey (CBRT) and Turkey Statistical Institute

(TSI). The reason for choosing the review period as 2008-2016 was that the data set related to foreign currency use was accessible for this period within the scope of the NACE Rev-2 classification. All statistical outputs in the study were obtained through the STATA 15.0 package program.

Table 1: Liability Dollarization Rate and Competitiveness Index of the Manufacturing Industry Sub-Sectors (2016)

Manufacturing Sub-Sectors	Liability Dollarization	Competitiveness Index
Food Industry	0.47	0.33
Beverage Industry	0.45	-0.19
Tobacco Industry	0.29	0.58
Textile Industry	0.7	0.41
Clothing Industry	0.65	0.71
Leather Industry	0.44	-0.04
Wood, Wood Products and Mushroom Industry	0.69	-0.25
Paper Industry	0.65	-0.29
Printing And Reproduction Of Registered Media	0.30	-0.41
Coking Coal And Refined Petroleum Industry	0.66	-0.5
Chemicals and Chemical Products Industry	0.73	-0.6
Basic Pharmaceutical Products and Pharmaceutical Related Materials Industry	0.47	-0.69
Rubber and Plastic Products Industry	0.65	0.13
Other Non-Metallic Mineral Products Industry	0.54	0.33
Basic Metal Industry	0.87	-0.11
Fabricated Metal Products Manufacturing (Except Machinery and Equipment) Industry	0.59	0.14
Manufacture of Computers, Electronic and Optical Products Industry	0.78	-0.75
Electrical Equipment Industry	0.64	0.06
Machinery and Equipment (Not Classified Elsewhere) Industry	0.69	-0.44
Motorized Land Vehicle, Trailer And Semi-Trailer Industry	0.81	-0.01
Other Transportation Vehicles Industry	0.92	-0.45
Furniture Industry	0.45	0.60
Others	0.68	0.14

Source: Prepared with the data obtained from CBRT and TSI.

Table 1 shows the liability dollarization rate and competitiveness index information of the manufacturing industry sub-sectors in 2016. The top three sectors with the highest liability dollarization rate are other transportation vehicles industry with 92%, the basic metal industry with 87%, and motor vehicles, trailers (trailers) and semi-trailer manufacturing sub-sectors with 81%. The three sectors with the lowest dollarization rate are the manufacturing of tobacco products with 29%, printing and reproduction of registered media with 30%, and the production of leather and related products with 44%.

Variables used in the study:

Competitiveness index (C) was used as a dependent variable in models. Sectoral export and import data (in dollars) used to calculate the index were obtained from Turkey Statistical Institute (TSI) and converted into the Turkish Lira at the foreign exchange rate. This index value was calculated as shown in equation number 1, inspired by Kılıçaslan and Temurov (2016).

$$C = \frac{\text{Total Exports of Sectors} - \text{Total Imports of Sectors}}{\text{Total Exports of Sectors} + \text{Total Imports of Sectors}} \quad (1)$$

Liability dollarization rate (DD) was calculated as shown in equation 2. The ratio of cash loans used by the sectors in foreign currency to total loans was calculated following the studies of Taşseven and Çınar (2015), Alp and Yalçın (2015), and İncekara and Mutlugün and Yılmaz (2017). The liability dollarization rate is expected to have a negative impact on the sector's competitiveness. The data used in calculating the dollarization rate was obtained from the CBRT Real Sector Statistics archive.

$$DD = \frac{\text{Cash Loans Used by Sectors in Foreign Currency}}{\text{Total Cash Loans Used by Sectors}} \quad (2)$$

Economic globalization index (EGI) is a data published by the KOF Swiss Economic Institute for Turkey. Yurttaçıkmaç, Kabadayı and Emsen (2014), examining the growth effects of the globalization index and the competitiveness index, used the globalization index variable. It includes two globalization indices as commercial and financial globalization. Commercial globalization includes trade in goods and services and commercial partner diversification. Financial globalization includes foreign direct investments, portfolio investment, international debt, international reserves and international income payments. The expected impact of the globalization index on competitiveness is positive.

The variable was calculated as *the ratio of sectoral exports to country income (XGDP)*. Data of the manufacturing sector sub-sectors (in dollars) were obtained from TSI. Data regarding the gross domestic products (current prices, US Dollars) were obtained from the World Bank. The variable was calculated as in equation 3.

$$XGDP = \frac{\text{Export of Manufacturing Sector Sub-Sectors}}{\text{Gross Domestic Product}} \quad (3)$$

This rate shows the rate of joining and benefiting from the division of labor, which is formed in the world economy in the production of goods and subject to commercial activities. However, since the sector is calculated using export values, there is a rate of participation and utilization in the division of labor across the country. It is expected that the ratio of exports to GDP exerts a positive effect on competitiveness.

The exchange rate (REER) represents the basket exchange rate. It is calculated by taking the arithmetic mean of Dollar / Turkish Lira and Euro / Turkish Lira exchange rates. The equation is shown below

$$REER = \frac{(1 \text{ USD/TL} + 1 \text{ Euro/TL})}{2} \quad (4)$$

Exchange rate may have a positive or negative effect on competitiveness. A high level of exchange rates increases the competitiveness of the firms with exporter structure and ensures the balance of payments to surplus. Another effect is that for companies using imported inputs mainly, provided that the exchange rate is high, the cost of imported goods increases and therefore, the high exchange rate decreases the competitiveness of the sectors (Yurttaçıkmaç, 2014).

Energy Price (OIL) data, obtained from the CBRT, are the crude oil and natural gas price (Domestic Producer Prices) (2003 = 100) (TSI) (NACE REV.2)) percentage change rate. The increase in energy prices is expected to weaken the sector's competitiveness.

CRISIS is a dummy variable added to the model to measure the impact of the 2008 crisis. It became "1" in 2008, 2009, 2010, 2011 and 2012 and "0" in other years. The expected impact of the crisis impact on the sector's competitiveness is negative.

Various models have been developed to measure the effect of the liability dollarization of the sectors on competitiveness. These models are:

$$C_{i,t} = \beta_1 + \beta_2 DD_{i,t} + \beta_3 EGI_{i,t} + \beta_4 XGDP_{i,t} + \beta_5 CRISIS_{i,t} + u_{i,t} \quad (5)$$

$$C_{i,t} = \beta_1 + \beta_2 DD_{i,t} + \beta_3 OIL_{i,t} + \beta_4 XGDP_{i,t} + u_{i,t} \quad (6)$$

$$C_{i,t} = \beta_1 + \beta_2 DD_{i,t} + \beta_3 REER_{i,t} + \beta_4 XGDP_{i,t} + u_{i,t} \quad (7)$$

In these models, *i* indicates the horizontal section as the sub-sector and *t* indicates the time dimension. β coefficients are the parameters to be estimated. *U* is the error term. The competitiveness index variable is the dependent variable of the models. All variables except this are independent variables.

4.FINDINGS

Models 5, 6 and 7 were created to investigate the effect of liability dollarization on competitiveness. Descriptive statistics for the variables used in these models are shown in table 2 and the econometric estimation results of the models are shown in table 3.

Table 2: Summary Statistics

Variables	Observation	Mean	Standard Deviation	Minimum	Maximum
Year	207	-	-	2008	2016
C	207	-0.07868	0.39303	-0.8185	0.72783
DD	207	0.6199	0.1689	0.0867	0.9755
OIL	207	8.4911	27.0766	-34.5	48.96
EGI	207	54.0666	1.1766	52.5	56.3
REER	207	2.2377	0.5050	1.6	3.19
XGDP	207	0.0066	0.0064	5.72e-06	0.0333
CRISIS	207	0.5555	0.4981	0	1

In table 2, information regarding the number of observations of the data set, the year interval, the mean, minimum and maximum values of the variables and standard deviation are given. Used total observation number is 207 and examined period is from 2008 to 2016. Other statistics shows individually statistics of each variables.

Table 3: Effect of Liability Dollarization on Manufacturing Sector Competitiveness (2008-2016)

Models	Dependent Variable: Competitiveness Index					
	Model 1		Model 2		Model 3	
	FE (Robust)	RE (Robust)	FE (Robust)	RE (Robust)	FE (Robust)	RE (Robust)
DD	-0.1488* (0.008)	-0.1541* (0.002)	-0.1392** (0.011)	-0.1455* (0.003)	-0.1482* (0.004)	-0.1542* (0.001)
EGI	0.0146** (0.015)	0.0146* (0.009)	-	-	-	-
OIL	-	-	-0.0006** (0.014)	-0.0006* (0.008)	-	-
XGDP	24.779* (0.002)	24.281* (0.000)	26.296* (0.004)	25.581* (0.001)	25.902* (0.003)	25.240* (0.001)
REER	-	-	-	-	0.0258 (0.216)	0.0258 (0.203)
CRISIS	-0.0319 (0.120)	-0.0319 (0.106)	-	-	-	-
Fixed Term	-0.9243* (0.006)	-0.9150* (0.006)	-0.1599** (0.038)	-0.1477 (0.108)	-0.2150* (0.018)	- 0.2033*** (0.054)
Probability Value	0.0001	0.0000	0.0001	0.0000	0.000	0.000

Note: FE represents fixed effects and RE represents random effects models. The probability value shows the F probability for the FE model and the Wald test probability for the RE model. * 1%, ** 5% and *** 10% express statistical significance.

In all three models estimated using fixed and random effects estimators, all independent variables are statistically significant. According to model 1, both the dollarization rate and the crisis dummy variable, which shows the effect of the 2008 crisis, negatively affect the competitiveness index. The ratio of exports to GDP, which represents the economic globalization index and foreign openness, is statistically significant and has a positive effect on competitiveness. According to model 2, both the dollarization rate and the percentage change in energy prices negatively affect the competitiveness index, while the ratio of exports to GDP positively affects the competitiveness index. According to model 3, the dollarization rate negatively affects the competitiveness index, but the ratio of exports to GDP positively affect the competitiveness index. The basket exchange rate doesn't have statistically significant effect on the competitiveness index.

The estimation gives consistent results with the expected signs of the effect of variables on competitiveness. The liability dollarization rate weakens the competitiveness of the manufacturing industry sub-sector due to exchange rate, interest payments, and balance sheet mismatch. Basket exchange rate has a positive effect on the competitiveness of the manufacturing industry

sub-sectors. This positive effect is thought to be due to the dominant effect of exporters from the sub-sectors of the manufacturing industry.

Porter (1990) argues that economic crises, which are considered as luck factors among the factors affecting national competitiveness, have a negative effect on competitiveness as they are a cost increasing factor for firms. The estimation results support this view of Porter. It was observed that the 2008 crisis had a weakening effect on competitiveness in the manufacturing industry sub-sector. As an oil importing country, a rise in energy prices in Turkey creates an additional cost to the industry because it will increase inflation. The estimation results confirm this statement. The increase in energy prices has a weakening effect on sectoral competitiveness.

Globalization is a driving force in improving competitiveness (OECD, 1996). Globalization supports the increase of international commercial activities. Companies that interact with the world may lose their ability to compete if they cannot follow the developments and fail to incorporate innovations. These companies may have difficulty in maintaining their continuity and in the case of failing, they may have to withdraw from the market. Increasing the market share and product diversity that is effective in increasing the globalization competitiveness offers an opportunity for a cheaper production with a shorter time span. In addition, it provides benefits such as learning technologies and incorporating this technological information into their production processes. Economic globalization is expressed as the economic integration of the world by making goods, services, labor and capital roaming faster and easier between countries, by increasing the barriers such as customs walls, tariffs, quotas and capital restrictions that separate the economies of the country from each other (Adıgüzel, 2013). The estimation results obtained in this study show that the economic globalization index increases the competitiveness of the sub-sectors of manufacturing. Yurttaçıkırmaz et al. (2014) added the share of exports in GDP to their study to represent the trade openness of the economy. In the statistical results they obtained, the authors reveal that the deepness in the openness dimension supports the competitiveness. In our study, it is seen that the ratio of sector exports added to the model as an indicator of the trade openness of the sectors to GDP positively affects the competitiveness index. This result supports the result obtained from the studies of Yurttaçıkırmaz et al. (2014).

5. CONCLUSION

In this study, the effect of liability dollarization on the competitiveness of the manufacturing industry sub-sectors between 2008 and 2016 was analyzed using panel data and fixed and random effects estimators. The estimation results obtained show that the increase in liability dollarization rate and energy prices and the effect of the economic crisis weaken the competitiveness of manufacturing industry sub-sectors, but the economic globalization index and the ratio of exports to GDP that is used as an indicator of trade openness and exchange rate support the competitiveness.

In economies with low saving rates, it is inevitable for the economic units to borrow in foreign currency to ensure the continuity of production and investment activities and to increase their commercial activities. However, there are some disadvantages of such fund use besides its advantages such as supporting investment and production activities. These are exchange rate risk and interest cost. In particular, excessive volatility affects the economic progress and decisiveness of the sectors, as the economies whose foreign currency income cannot meet their foreign currency debt may be unprotected against foreign exchange risk. The economic globalization index, which also reflects the effect of globalization, and the fact that the openness variables have a positive effect on competitiveness are indicators that the increase in international commercial activities strengthens their competitiveness capabilities.

It is seen that the dollarization of the manufacturing sector in Turkey decreased between 2008 and 2010 whereas it increased in the 2010-2014 period. As of 2014, it has had an upward trend. The competitiveness index value of the sector decreased between 2009 and 2011, and since then, it has generally shown an increasing trend. In 2016, according to the results of the liability dollarization rate calculated as the share of the sum of cash loans used in foreign currency in total cash loans, the sector of other transportation vehicles, which are among the sub-sectors of the manufacturing industry, was 92% dollarized. Compared to other sectors, it is the sector with the highest fragility due to the highest exchange rate and interest risk and the high amount of foreign currency debts. The sector with the lowest dollarization rate is the "tobacco product manufacturing" sector with 29%. The sector with the highest competitive power index value is the "manufacturing of clothing" sector with an index value of 0.71. The sector with the lowest competitiveness index is the "manufacturing of computers, electronic and optical products" sector with an index value of -0.75.

Sectors with a tendency to borrow in foreign currencies should balance their foreign currency income and expenses. Matching currency in assets and liabilities of the firm may have effects such as an increase in debts, creating new investments and profit. Firms can affect their competitiveness with their current and future decisions, considering the overall economic situation. The fact that the sector has a strong financial structure is of great importance to survive during the crises that are likely to occur.

Considering the findings of this study, it is recommended to decrease the liability dollarization rate in the manufacturing industry sectors and increase the sector's competitiveness for a stronger economy. Accordingly, the domestic saving rate should be increased and sectoral funding needs should be directed from foreign currency sources to domestic currency. Thus, sectoral fragility caused by dollarization can be reduced. In addition, in the case of high liability dollarization, the risk of failing to repay their debts also increases. Failure to repay the debts on time distorts the foreign currency income and balance of the banks or other intermediary institutions that these sectors borrow. Foreign currency debts, a risk factor for both the financial and non-financial sectors, are recommended to be decreased by increasing the trust in domestic money, ensuring macroeconomic stability and creating an environment of confidence by eliminating economic uncertainties.

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DETERMINATION OF PRODUCT DIVERSITY IN CHINA'S EXPORT SECTORS IN 2001-2017 THROUGH CLUSTERING ANALYSIS¹

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ABSTRACT

Purpose- It is to evaluate the export-oriented general economic structure of China, which alone meets 20% of world exports today, and to reveal the changes and cluster differences in the export products group of China before and after its membership to the WTO.

Methodology- It is to reveal and interpret the change in China's exports before and after becoming a member of the WTO by sectoral cluster analysis method.

Findings- When China's total export from 1992 to 2017 and the export changes in 25 different sectors are examined, it is observed that there is a significant increase in all sectors.

Conclusion- Statistically significant differences were found for each sector before and after China's WTO membership. This shows that China's membership is meaningful. In addition, after becoming a member of the WTO, while the agricultural raw material sector was the least specialized and the lowest competitive sector in Chinese exports, the sector with the highest competitive power was its mechanical electronic devices and machinery. In other words, after the WTO membership, it is seen that China's total exports increased approximately 10 times during 2001.

Keywords: WTO, People's Republic of China, clustering analysis method, export, globalization.

JEL Codes: F10, F13.

1. INTRODUCTION

Even though economies have faced significant cyclical fluctuations recently, all countries around the world have reached unimaginable growth rates. This growth is witnessed in Asian economies most.

The People's Republic of China, which is among Asian economies, became the growth model leading the world economy in the 21st century and the most studied country due to the developments that speed its growth and the historical background of its growth trend. This rapid transformation process called 'the Chinese miracle' can be viewed in three parts: 1949-1977 Mao era, the 1978-2001 transition period from a closed structure to a modern socialist market economy, and post-2001 reformist policies and growth period. During Mao era, a closed economic system was embraced under the influence of Marxist ideology while a Soviet-type planned economy and development plans were put into effect. In 1978, with Deng Xiaoping coming to power, China opened its doors to the World and embarked on radical process of restructuring towards liberalization and integration into the capitalist system.

Many factors have an impact on China's success and trade gains, such as the direct flow of capital into the country, exchange rate policies, human capital investments, private economic zones, and export-based development strategies. Today, China has become

¹ This study is a part of the second author's MA thesis supervised by the first author.

the world's largest exporter and the second largest importer. It has become a major investment, cooperation and trading partner of other countries.

China's growth and trading volume had also positive effects on other countries regarding exports and imports. In line with these strategies and policies, China, which actively participated in membership and cooperation activities in international organizations, and the country wants to have a voice in the international arena. The most important one among these organisations is the membership of World Trade Organization (WTO); the sustainable growth in the Chinese economy has made significant contributions in increasing the volume of foreign trade and becoming a super power in the world.

Although the membership of China in WTO and its competitive advantage are perceived as a risk for the USA and the countries that have a say in the world economy, China's pro-harmony and peace policies have been eliminating this perception. In this battle for gaining competitive advantages, the process should be followed closely and the domino effect of the steps taken should be kept in mind. The main purpose of this study is to evaluate the export-oriented general economic structure of China, which alone meets 20% of world exports today, and it is to examine the country's sustainability of growth rates which have been over 8% for many years. In addition, the examination of the policies followed reveals the changes and the cluster differences in the group of export products before and after its membership to the WTO.

2. CHINESE ECONOMY IN THE HISTORICAL PROCESS

2.1. People's Republic of China (1949-1977)

With Mao, who came to power in 1949, a closed economic order based on strict central planning prevailed in the People's Republic of China until 1978. Once Mao came to power, the Chinese economy did not do well. Mao first implemented the first five-year development plan in 1953 with the Soviet-type planned economy and received technical support from the Union of Soviet Socialist Republics in this process. (Naughton 2007: 66).

In the first five-year development plan, high growth rates were targeted especially with the development of heavy industry and this goal was achieved (Özsoylu 2006: 9-10).

With the second five-year development plan, which was put into effect in 1958, the rapid transition from the pre-1949 agricultural feudalism to communism was aimed, and its "Special Agricultural Production" was completely banned (Yang 1996: 35).

It is seen that the goals of the third five-year development plan implemented in 1966 were the national defence investments in the country. The fourth and fifth development plans were put into practice in the period of 1971-1980. (Tan 2006: 10).

2.2. The Period of 1978-2001

With Deng Xiaoping taking power in 1978, a reformist process began, which was described as a turning point in Chinese history. Over time, the Chinese economy gave up its introverted centralist structure and attained an open modern socialist market economy (Öğütçü 1998: 68).

The basic development program of the new era was based on the concept of quadruple modernization. As well as foreseeing modernization in the fields of industry, agriculture, national defence, science and technology, this concept envisioned its achieving progress with open strategies and policies instead of closed ones. Since 1978, a series of legal regulations has been made in order to form/build a steady foundation for the improvement of foreign investment, money and capital markets all together with the free market system (Tan 2006: 6-9).

In addition, the applied external planning system in foreign trade was gradually abolished at first, and by the 2000s it was completely abandoned. While the government maintained its control in foreign trade, most of the trade became determined by the market. This resulted in an enormous increase in the number of companies dealing with foreign trade (Huang and Wang 2004:336-337).

While the foreign trade figures of China increased regularly during the reformist process, a radical change process was experienced in the goods subject to foreign trade. China, whose foreign trade was almost non-existent in the previous periods, showed a ten-fold growth in the period of 1949-1978. While this rate increased approximately fifty times in the period of 1978-2001. Besides, while the share of primary goods in total exports was 51% in the first years of the reform, the share of the capital-intensive processed goods increased greatly after 1986, reaching 74% in 1990 and 90% of total exports in 2002 (Pingyao 2004: 38-50).

2.3. 2001 and the Following Years

2001 was a turning point for the Chinese economy. Although the reforms carried out since 1978 provided a certain growth and economic development in China, on a global basis they do not reach the targeted point. The country, which hosts 1/8 of the world population, is in demand for exports with economic reforms, but it is limited in the production of original products due to the production of counterfeit or similar products. In addition, during this period, trade partners are primarily neighbouring countries. It cannot be said that China had a significant influence on central economies during this period (Becker 2007: 35).

After China's membership in the World Trade Organization in 2001, the growth in exports reached 30% on average. China, which was seen as a more reliable supplier with its admission to the WTO, became more effective in the markets. In 2005, with quotas being lifted in the textile sector, the economic breakthrough started moving forward (Lim 2006: 29).

The membership of WTO provided a wide range of imports. There was a significant increase in world oil imports, especially due to the increasing demand of China, which is dependent on capital goods and raw materials. Apart from that, with a population of 1.386 billion, China has a great market potential in terms of consumer goods. In addition, market expansions to be provided by China in line with the increasing demand in service sectors such as financial services and telecommunication provide significant gains to the developed countries (Porath 2004: 48).

3. CHINA'S MACROECONOMIC STRUCTURE

3.1. Growth

The revolutionary movement that started with Mao in 1949 lasted until 1978, and the People's Republic of China, which achieved some high growth rates thanks to the policies of market openness after 1978 and the reforms in the market economy. This brought the country from being an underdeveloped country to being the second fastest growing country in the World. Thus, China became the centre of attention for the countries of the world. (Angresano 2005: 472).

The Chinese economy, which had a growth rate of 9% in the 1990s, managed to keep its growth in the 10-13% range through its openness to new export markets after its admission to the WTO in 2001. The growth figures, which started to shrink partially in 2012, remained at the level of 6% in the period of 2015-2016 and 2017.

On the other hand, its GDP, which was \$863.7 million in 1996, had doubled until 2001, and reached \$1.339 million. China, whose GDP continues to increase with each passing year after its membership of the WTO in 2001, increased its GDP approximately 3.43 times from \$1.339 million in 2001 to \$4.594 million in 2008. As a result of its membership to the WTO, the GDP figures increased 10.16 times in 17 years, and the amount reached \$13.610 million in 2018.

Table 1: The Sectoral Shares of Chinese GDP (%)

Years	Agriculture	Industry	Service
2008	10,1	46,9	42,8
2009	9,6	45,9	44,4
2010	9,3	46,4	44,1
2011	9,1	46,5	44,2
2012	9,1	45,4	45,4
2013	8,9	44,1	46,8
2014	8,6	43,2	48,1
2015	8,4	41,1	50,4
2016	8,1	40,1	51,8
2017	7,5	40,5	52,1
2018	7,0	39,7	53,3

Source: World Bank, OECD National Data, (E.T: 29.11.2020)

In Table-1, the sectoral shares of China's GDP between 2008-2017 are given. Between 2008 and 2017, the share of the agricultural sector in GDP declined on average, although it remained at constant rates. China, which has experienced significant developments in the name of industrialization for the last 30 years, has seen small declines in the share of the industrial sector in GDP from year to year, while the share of the service sector is increasing. While the share of the service sector in GDP was around 42.8% in 2008, this ratio increased to 48% in 2014 and 52.1% in 2017.

3.2. Investments

Foreign investments are of great importance as a determining factor in the economic growth process for all countries. The openness of countries to foreign investment is proportional to their growth potentials. After the 1978 reforms, China became a sought-after country for any investments through the autonomous free zones it created. The main reasons for this include its liberalization, economic structure, incentives, cultural environment, cheap labour and tax advantages. Moreover, the increasing trade potential following WTO membership has also been effective in attracting investments to the country (Knight, Song 2005: 9), (Tseng, Zebregs 2002: 8).

In addition, while the growing Chinese economy invests in its own country, it also makes investments around the world. The majority of China's foreign investments are distributed over seven countries or regions, including China's Hong Kong Special Administrative Region, ASEAN, EU, USA, Russia, Africa and Japan. This increase is attributed to the formation of a strong capital created by the growing economy, the transition from importing technology to exporting, and the competitive power of companies (Knight, Song 2005: 9).

3.3. Employment and Workforce Structure

China's globalized economy created a dual structure in its workforce, namely agricultural poor workforce and industrial rich workforce (Knight, Song 2005: 3).

In the sectoral distribution of employment, the share of agriculture in its total employment was 42.6% in 2017, 25.2% of industry and 32.2% of the tertiary sector (National Bureau of Statistics Of China ET: 27.10.2018). China with 42.6% share of agriculture within employment is at the same level as the low-middle income countries such as Sri Lanka, Indonesia and Thailand are. Among high income countries such as the USA, Japan, Canada, Australia and the EU, the share of agriculture in employment is 4.9% on average. While the shares of industry and service sectors of employment in China are 25.2% and 32.2% on average, the shares of industry and service sectors of employment in high-income countries are 24.5% and 71.8%, respectively. A significant portion of the Chinese population lives in rural areas and is employed in agriculture. The productivity of its agricultural workers is very low too. China's membership to the WTO directly affected the structure of employment in agriculture. The share of the work force, the working rate in the industry and service sector as well as those with the rising income level in employment increased. It is observed that the increase in foreign capital investments provided by open door policies affects unemployment rates directly. Following open door policy and foreign capital investments, [China's] unemployment rate dropped to 1.8% in 1985 (Zhu 2005: 21).

3.4. Inflation

When the prices were determined by the state in China before 1978, there was no inflation. After 1978, inflation started to pose a problem for the country and this continued until 1997 (Wong and Ding 2002: 11–13).

One of the most important reasons for post-1978 inflation is the reform of the state's economic policies and the country's rapid economic growth with the reforms. Its inflation rate reached double digits in the period of 1986-1990 when reforms accelerated and radical economic practices were implemented to attract foreign direct investment to the country (Pingyao 2006: 15-29).

A significant decline in prices started in China in 1996-2002, and the economy was in recession. The boom in the economy, which began with the effect of the WTO membership in 2002, caused increases in prices. With the effect of the 2008 global economic crisis, it is observed that the inflation approached double digits. The actions made by the state regarding investments had a great impact on inflationary fluctuations in China. Therefore, inflation in China did not follow a linear pattern (Pingyao 2006: 15-29).

3.5. Interest Rates

In addition to its great success in economic development, China started to develop in banking and finance sectors with compliance with the international banking and financial system, and the increase in foreign capital which the country attracted. In this successful process, aggregate demand management, sustainability of growth and interest rate policies were fundamental mechanisms in controlling inflation (Doğru 2016: 39).

3.6. Distribution of Income

The economic growth in China initially revealed a significant income inequality, increasing the inequality in income distribution between regions and groups (Zhuang, Li 2016: 2). The income inequality was considered as normal after the reforms and the rapid growth in the country. The growth is often related to early stages of progress in certain sectors and regions. Its income inequality occurs as leading sectors and regions develop more than others do. During the transition period from the socialist planned

economy, which is characterized by egalitarian wage and income distribution systems in China, to a free market economy, created inequality. The risk and uncertainty in markets, income difference, occurred between individuals depending on productivity, human capital, entrepreneurship and wealth (Shi vd. 2008: 42).

Another indicator of income distribution in China is the rate of poverty. The rate, which was quite high in the early 1980s, was in a downward trend due to the economic development in the country, and it decreased to 6% in 2015.

Its poverty is higher in rural areas and the western China than anywhere. Until 2004, its poverty was 9% in coastal areas and 22% in inland regions. In 2004, according to the poverty threshold of \$ 1.5 a day, the number of poor rural people in coastal areas (11%) was less than a third of its level in 1989. Over the same period, the urban poverty in coastal areas fell from 16% to 6%. The urban poverty in inland regions fell from 27% in 1989 to 18% in 2004 while the rural poverty fell more rapidly, by half, from 47% to 24%.

4. THE GENERAL STRUCTURE OF CHINESE FOREIGN TRADE

With the high growth experienced in China in the 1980s, an increase in trade volume was observed. These developments in China led to some changes in the international and local areas. China's close follow-up of scientific and technological developments and the implementation of some reforms accelerated its adaptation process to the world economy. This rapid economic growth that dominated China after its WTO membership and the desire to take advantage of the emerging opportunities paved the way for incentives to be given to the foreign investors. With the withdrawal of foreign investments from the country, it contributed to the elimination of the deficit in capital and technology, and thus new production techniques began to be used in domestic industries. In line with these developments, China's trade volume, which was \$29.2 billion in 1979, reached \$3.86 trillion in 2012, and for the first time in 2014, its foreign trade volume exceeded \$4 trillion, and China became the first country in the world with the largest foreign trade volume (China Country Bulletin, <http://www.etonet.org.tr/uploads/cin.pdf> ET: 05.01.2019), thus the most dynamic and fastest growing sector in the country was the foreign trade sector.

Table 2: China's Foreign Trade Indicators (Million Dollars)

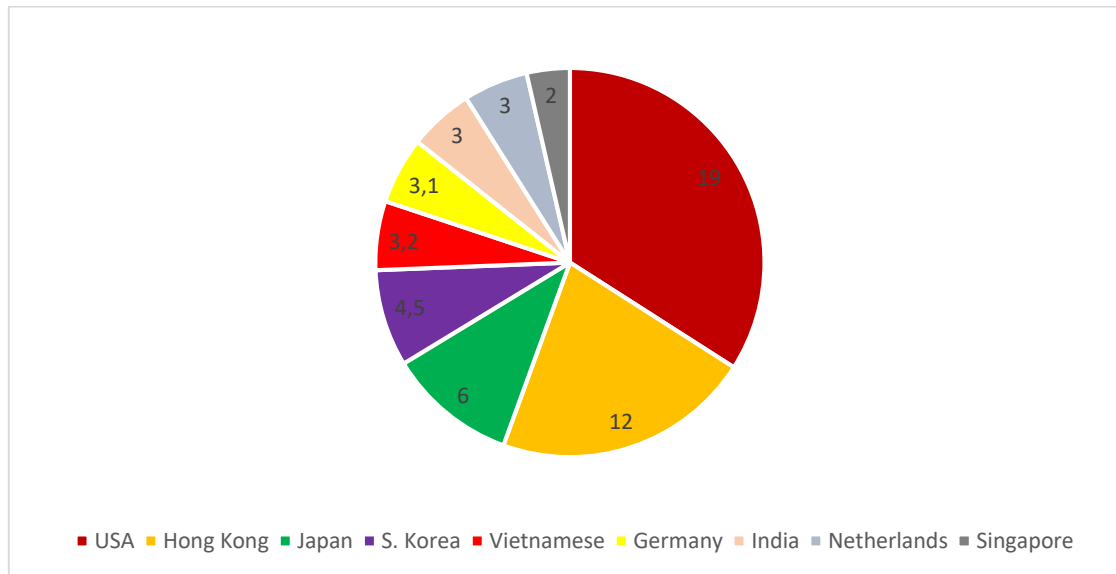
Foreign Trade Indicators	2012	2013	2014	2015	2016	2017	2018
Imports	1.818.405	1.949.990	1.959.233	1.681.951	1.587.431	1.840.957	2.134.983
Exports	2.048.714	2.209.005	2.342.293	2.274.949	2.098.161	2.271.796	2.494.230
Foreign Trade/GDP (%)	48,1	46,6	45,7	40,5	37,1	38,8	34,0
Exports / imports (%)	169	172	173	169	163	123	116
Foreign Trade Volume	3867.119	4.158.995	4.301.526	3.956.900	3.685.592	4.112.753	4.629.213

Source: WTO, 2019; The World Bank, 2019, <https://wits.worldbank.org/countrysnapshot/en/CHN> (ET:02.12.2020)

In the period from 2000 to 2013, China achieved a three-fold increase in its exports of goods, increasing its share in world exports from 3.8% to 12.1%. The World Bank estimates that this ratio will be around 20% by 2030 (The World Bank 2014).

In Table-2, China's 2012-2017 export, its import values, its foreign trade volume, the ratio of exports to imports and the percentage share of foreign trade in GDP are given. The import value, which was \$1.818.405 million in 2012, showed a dramatic increase in 2014 and reached \$1.959.233 million. Meanwhile, the change in exports was recorded as \$2.048.714 million in 2012, while this figure reached \$2.342.293 million in 2014 with a significant increase. With the increase in global competition and product diversity, there was a decrease in import and export figures in 2016 and an increase in the following year, in 2017.

The main reason for China's high export volume and its global leadership is due to the rapid diversification in the export market. Along with the diversification in the export market, the diversification of export products emerged as well (Jarreau, Poncet 2009: 2). In addition, its direct foreign investments, WTO membership, effective use of the global value chain, low exchange rate policy and special economic zones are among the determining factors for China's success in exports (Çelik 2016: 47).

Figure 1: Major Countries in China's Export (%)

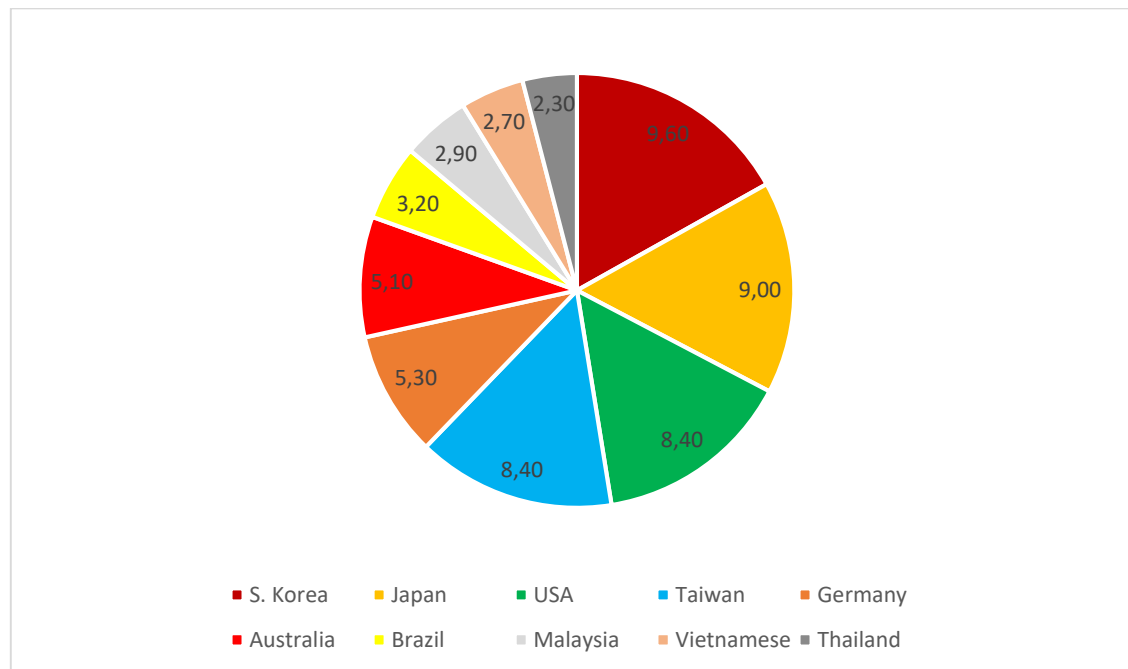
Source: The Global Trade Atlas (2018).

Looking at the major countries to which China exported in 2017, as seen in Figure-1, the USA ranks as the first with the largest export of \$431 billion and a 19% share. Hong Kong followed the USA with \$280 billion and 12% share, and Japan with \$137 billion and 6% share. The other top ten countries to which China exported the most are: South Korea, Vietnam, Germany, India, the Netherlands and Singapore in order. In 2019, Turkey ranked 28th with \$18 billion and 0.8% respectively.

In 2017, the broadcast equipment ranked first with 9.6%, and its computer exports ranked second with 6.1%. At the same time, China was the world's second largest importer after the USA, with \$ 1.84 trillion in 2017. The import figures of \$1.42 trillion in 2012 reached \$1.4 trillion in 2019 and a 1.2% increase was achieved. https://oec.world/en/profile/country/chn/#Trade_Balance (ET: 25.07.2019).

Besides, most of China's imports are raw materials and intermediate goods. Since these imported goods are converted into final products and re-exported within the country, the increase in exports also affects the import (Sandıklı 2005: 305). Among the most imported products, the integrated circuits (telephone, office machine parts, semiconductor devices, broadcast accessories) ranked first with 13.5%, while crude oil was the second largest import product with 9.4% (https://oec.world/en/profile/country/chn/#Trade_Balance (ET: 25.07.2019)).

Figure-2, on the other hand, shows the main countries from which China imported in 2017. Accordingly, the most imports were from South Korea with \$177 billion and 9.6% share. This country was followed by Japan with \$165 billion and 9% share and the USA with 154 billion dollars share 8.4%. Turkey ranked 54 with 0.2% share and nearly \$ 4 billion.

Figure 2: Major Countries in China's Import

Source: The Global Trade Atlas (2019).

5. DETERMINING PRODUCT DIVERSITY IN CHINA'S EXPORT SECTOR BY CLUSTERING ANALYSIS (2001-2017)

5.1 Literature Review

Amighini (2005) investigated China's place in the world market in information-communication technologies industries. Balassa's Announced Comparative Advantage Index and net trade index were used to analyse 1991 and 2001, and the SITC five-digit trade classification was used. It was observed that China had disadvantages in technology-intensive sectors where it specialized in unskilled labour-intensive sectors between 1991 and 2001. In addition, it was determined that competitive power increased in some selected sub-sectors. Since the 1990s, the competitive power in technology-intensive sectors has been increasing. Specifically, it increased in the electronics, machinery, informatics, telecom and office equipment and electrical goods in the last decade. It is revealed that the foreign capital investments entering the country and the country's global production networks play an active role in the developments in information and communication technologies. In this cluster analysis, the emphasis on electronic products and machinery sector in China for the period of 1992-2001 is in line with the increase of China's competitiveness in these sectors after its WTO membership, with the aim of focusing on high technology products after 2001.

Veeramani (2006) has made a comparative analysis of the changing patterns of exports and specialization in India and China since 1980. The 1980-2003 period was taken into account in the analysis, the factor intensity of China and India were calculated by using SITC Rev.3. It was observed that China and India had comparative advantages in labour intensive goods in line with their factor endowment. The comparative advantage of both countries in technology-intensive goods was low. The comparative advantage in human capital and technology-intensive goods was gradually increasing in both countries. Compared to India, China had more comparative advantages in terms of technology-intensive products and unskilled labour. In addition, in the study, it is stated that India specialized in agricultural raw materials, mineral resources and low quality labour-intensive goods; China, on the other hand, was observed to specialize in unskilled labour-intensive and agricultural raw material-intensive goods, although it has decreased in recent years. As a result of our study, China's high competitive power in labour-intensive products is in line with Veeramani's work in terms of its orientation towards technology-based exports while it is not similar in the agricultural raw materials sector which indicates that specialization in exports and competitiveness are minimal.

Özer and Çiftçi (2009) analysed the relationship between R&D expenditures and general exports, information communication technologies exports and advanced technology exports in 19 OECD countries in the period of 1993-2005 by using panel data analysis in their studies. Since high-tech products are products that create added value in the country's exports, it was determined

that the shifting of R&D expenditures from low-tech products to high-tech products had a positive effect on high-tech product exports.

Kosekahyaoglu and Ozdamar (2011) studied the competitiveness of the 1990-2009 period based on labour-intensive, raw-material intensive, capital intensive, research-based goods that can be imitated easily and the goods which are hard to imitate in five categories through the results in Turkey, China and India. The Revealed Comparative Advantage Index, Export Specialization Index and Comparative Export Performance Index were used to measure the competitiveness of these countries. As a result, it was observed that competitiveness in these countries was high in labour-intensive goods, but the importance of capital-intensive goods has gradually increased in India recently. In addition, labour-intensive goods that can be replicated across China's Turkey is not very advantageous and easy, while across India, it was found to have a better export expertise in capital-intensive goods than raw materials and easily imitated goods.

Han and Lee (2012) examine how much of the foreign trade between China and Korea took place in the form of vertical intra-industry trade. In this study, the relevant data were taken from the United Nations Comtrade database using the International Standard Trade Classification Rev.5 product grouping. In the analysis made, it was seen that approximately 50% of the trade between China and Korea from 1990 up to date was in the form of intra-industry trade. The analysis showed that most intra-industry trade takes place in the form of vertical intra-industry trade. However, it was determined that this condition varies in some sectors. It was determined that since the 2000s, while horizontal intra-industry trade has increased in the chemical industry, vertical intra-industry trade has been decreasing. On the other hand, it is observed that the vertical intra-industry trade increased in textile, fabricated metal and machinery industry and electronics industry, but horizontal intra-industry trade decreased.

Bulum et al. (2013), in their cluster analysis study conducted by WTO member countries on international trade volumes, the countries were divided into groups through Ward's method which is applied in hierarchical cluster analysis, and the Squared Euclidean distance was preferred for the measurement of distance. Considering the import and export figures, it is seen that following the USA, which was the leading country in international trade volume, came China and Germany. Taking the export figures alone into consideration, it is determined that China surpassed the USA and Germany. It is that China has an important position in international trade volume, but when the population criterion is taken into account, the foreign trade returns are disproportionately distributed among the country's population. The evaluations made in China are in line with the results reached in our study.

In his study, Şahin (2015) analysed the export structures of Turkey and BRIC (Brazil, Russia, India, China) according to density factor, and compared the comparative advantages of Turkey's labour-intensive goods exports for the period of 1992-2013 with BRIC countries. In the study, the Revealed Comparative Advantage Index (RCA) was used in the analysis of competitiveness in labour-intensive goods. The 1992- 2013 data analysed and results were made within the scope of the SITC Rev.3 double-digit product group. Turkey, China and India's labour intensity factor was found that it consists of intensive goods. While Brazil's factor density consists of capital-intensive and raw material-intensive goods; Russia's factor density consists of raw material-intensive goods. In addition, Turkey, China and India had high competitiveness in labour-intensive goods; Russia's labour-intensive goods found to have low competitiveness. For Brazil, it is observed that the competitiveness of labour-intensive goods was higher than Russia but lower than the other countries.

Şahin (2017) analyses the effect of labour-intensive goods on foreign trade volume in ASEAN-5 countries covering the years of 2000-2014. The level of intra-industry trade of labour-intensive goods and the competitiveness of labour-intensive goods were analysed. While the Revealed Comparative Advantage Index (RCA) is used in the measurement of competitiveness, the Grubel-Lloyd Index (GL) is used in the measurement of intra-industry trade. As a result of the study, it is determined that the level of intra-industry trade in labour-intensive goods was high. In the competitiveness analysis, Indonesia and Thailand were highly competitive in labour-intensive goods; It is determined that Malaysia, Singapore and the Philippines were less competitive.

Ervani et al. (2018), in their study based on the years of 1995-2015 on Indonesia's east Asian export models, reach that there was a competition with Japan, China, Hong Kong, Korea and Singapore. The data used in this study is obtained from the UN database, and the three-digit SITC Rev-2 classification is used as a variable. In this study, the country based on the six East Asian countries whose exports are analysed was Indonesia. The general observation of East Asian countries (Indonesia, China, Japan, Hong Kong, South Korea and Singapore) are that they specialized more on product groups with low comparative advantages. According to the research, it is determined that in core products, China had a comparative advantage in labour-intensive products and Japan in technology-intensive products. Although the comparative advantage varied for Korea, Singapore and Hong Kong, it is determined that they had a comparative advantage in technology-intensive products. It is observed that the exports of China, Japan, Korea and Singapore increased in the period of 1995 and 2015, but Indonesia's exports decreased. It is determined that China and Japan

were a regional threat regarding export prospects, which were major rivals for Indonesia. The specialization model of Hong Kong, South Korea and Singapore offered opportunities for Indonesia's development and export prospects.

5.2 Method and Findings

The statistical analysis of the study has been made in SPSS 19.0 software program. In order to show the effect of WTO membership on China's exports, the export data of China in different sectors were evaluated. The aforementioned data were obtained from the World Bank website. A total of 25 different sector definitions obtained from the World Bank between 1992 and 2017 are given in Table 3.

Table 3: Sectors Included in the Analysis

6	Animal	Sector-14(z15)	Mechanics and Electronics
Sector-2(z3)	Vegetables	Sector-15(z16)	Shipping
Sector-3(z4)	Food products	Sector-16(z17)	Mixed Commercial Goods
Sector-4(z5)	Minerals	Sector-17(z18)	Mines
Sector-5(z6)	Petroleum products	Sector-18(z19)	Textiles (fabric)
Sector-6(z7)	Chemicals	Sector-19(z20)	Machine
Sector-7(z8)	Plastics	Sector-20(z21)	Raw materials
Sector-8(z9)	Hide and leather	Sector-21(z22)	Commercial intermediate goods
Sector-9(z10)	Wooden	Sector-22(z23)	Consumer goods
Sector-10(z11)	Textiles (clothing)	Sector-23(z24)	Production goods
Sector-11(z12)	Shoes	Sector-24(z25)	Agricultural raw material
Sector-12(z13)	Stone, glass	Sector-25(z26)	Agricultural products
Sector-13(z14)	Metals		

Non-hierarchical cluster analysis method was used in the study. The cluster numbers were found by looking at the dendrogram graph obtained in each analysis. Accordingly, it was determined that there were two clusters before and after the WTO. The difference between sectors was tested with the Mann–Whitney U test and the significance level was taken as 0.05. In order to show the effect of WTO membership on China's exports, the export data of China in different sectors were evaluated. The aforementioned data were obtained from the World Bank website and a total of 25 different sector definitions obtained from the World Bank between 1992 and 2017. The findings obtained as a result of the analysis made in the study can be summarized as follows, when China's total exports from 1992 to 2017 and the changes in exports in 25 different sectors were examined, it was observed that there was a significant increase in all sectors. These results are given in Table.4 below.

Table 4: Sectoral Analysis Before and After WTO Membership

	WTO Membership		P value
	Before	After	
Total Exports	151.0 (84.9-249.2)	1430.7(266.1-2342.6)	<0.001
Animal	3.8(2.6-4.5)	9.6(4.6-18.7)	<0.001
Vegetables	4.7(4.4-6.0)	12.7(5.0-25.9)	<0.001
Food Products	4.3(3.3-5.2)	18.2(5.8-30.9)	<0.001
Minerals	1.3(0.8-1.6)	3.6(1.4-35.4)	<0.001
Petroleum Products	5.2(4.1-7.9)	26.7(8.4-35.4)	<0.001
Chemicals	8.4(4.1-11.6)	68.8(12.8-114.3)	<0.001
Plastics	4.4(1.8-7.9)	41.5(8.3-91.1)	<0.001
Hide and Leather	5.6(2.9-7.5)	18.3(8.4-35.1)	<0.001
Wooden	3.2(1.7-4.5)	21.9(4.9-40.2)	<0.001

Textiles (clothing)	35.9(24.6-49.4)	179.7(49.8-287.6)	<0.001
Shoes	8.5(5.1-12.0)	36.0(12.3-70.5)	<0.001
Stone, Glass	4.4(2.2-6.6)	31.1(6.6-112.3)	<0.001
Metals	12.1(4.6-16.6)	115.7(16.1-184.3)	<0.001
Mechanics and Electronics	31.1(11.5-72.9)	610.6(84.9-981.0)	<0.001
Shipping	4.2(1.8-9.3)	70.7(9.4-109.1)	<0.001
Mixed Commercial Goods	15.6(8-26.9)	132.7(27.4-240.1)	<0.001
Mines	3.1(1.4-4.6)	21.9(4.6-29.3)	<0.001
Textiles (fabric)	39.0(26.4-53.5)	188.3(54.5-302.3)	<0.001
Machine	35.3(13.2-82.5)	677.7(94.9-1115.1)	<0.001
Raw Materials	11.8(10.1-13.4)	30.7(13.9-41.3)	<0.001
Commercial Intermediate Goods	33.8(16.8-42.8)	246.7(44.0-385.4)	<0.001
Consumer Goods	80.2(47.5-123.6)	497.6(127.4-901.3)	<0.001
Production Goods	27.1(8.6-68.5)	632.8(80.3-1022.9)	<0.001
Agricultural Raw Material	2.5(1.9-2.8)	5.9(2.4-10.0)	<0.001
Agricultural Products	127.3(66.8-129.9)	1331.8(235.9-2202.7)	<0.001

Note: Values refer to Median value (minimum-maximum), p values refer to Mann Whitney U test results.

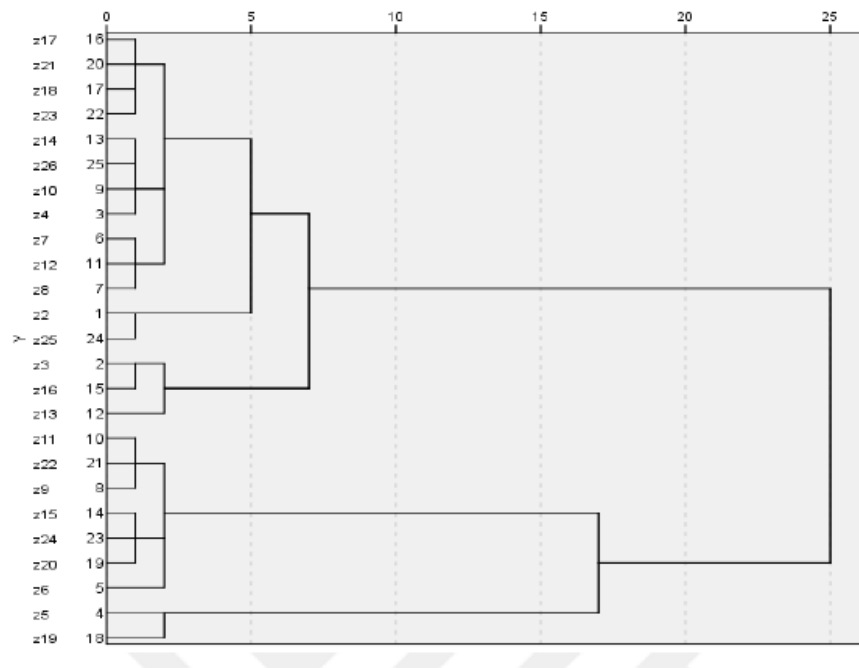
*Export values are given as "Million Dollars".

The Mann-Whitney U test was used to investigate whether there was any difference between sectoral analysis variables before and after WTO membership. It can be said that there was a difference between all variables before and after WTO membership ($p < 0.05$).

Between 1992 and 2017, export items were evaluated through individual clustering analysis before and after the WTO membership in order to determine the sectors that were close to each other. Accordingly, the results were obtained separately for before and after the WTO membership.

Pre-membership clustering results were interpreted with a dendrogram chart in Figure 3.

Figure 3: A Dendrogram Chart before WTO Membership



Sector groups are clustered in Table-5 according to pre-membership clustering results.

Table 5: Sector Groups Before WTO Membership

Z2	Animal	Z15	Mechanics and Electronics
Z3	Vegetables	Z16	Shipping
Z4	Food products	Z17	Mixed Commercial Goods
Z5	Minerals	Z18	Mines
Z6	Petroleum products	Z19	Textiles (fabric)
Z7	Chemicals	Z20	Machine
Z8	Plastics	Z21	Raw materials
Z9	Hide and leather	Z22	Commercial Intermediate Goods
Z10	Wooden	Z23	Consumer goods
Z11	Textiles (clothing)	Z24	Production Goods
Z12	Shoes	Z25	Agricultural Raw Material
Z13	Stone, Glass	Z26	Agricultural Products
Z14	Metals		

Accordingly, the cluster results are as follows:

CLUSTER-1: Z2. Z3 Z4 Z7 Z8 Z10. Z12. Z13. Z14. Z16. Z17. Z18 Z21. Z23. Z25. Z26

CLUSTER-2: Z5. Z6 Z9. Z11. Z15. Z19. Z20. Z22. Z24

Similarly, the dendrogram and clustering results for the sector groups after WTO membership are given in Figure 4 and Table 6.

Figure 4: Dendrogram Chart after WTO Membership

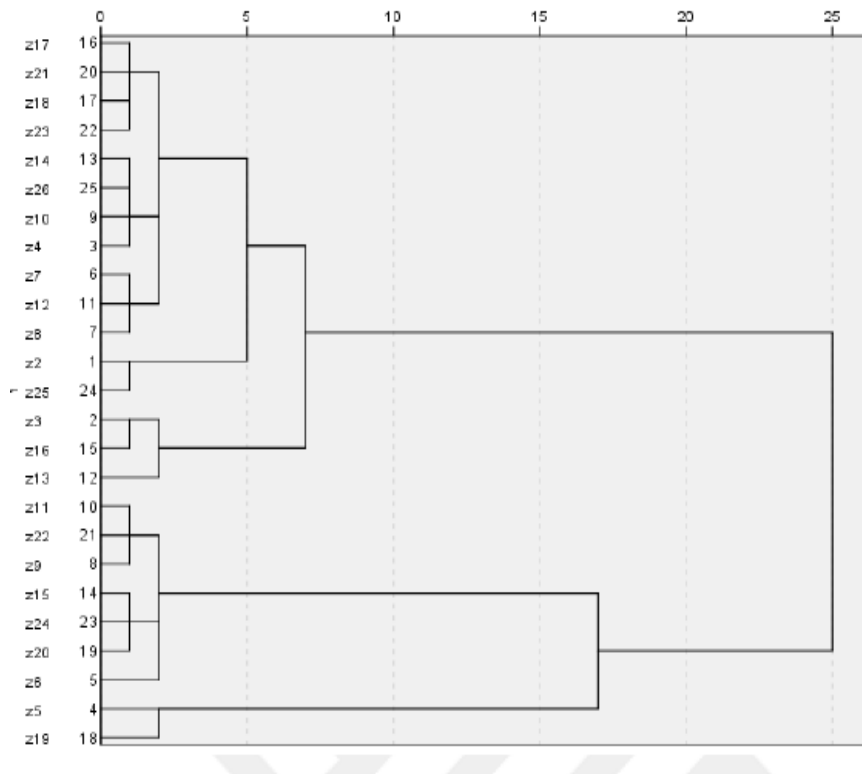


Table 6: Sector Groups after WTO Membership

Z2	Animal	Z15	Mechanics and Electronics
Z3	Vegetables	Z16	Shipping
Z4	Food products	Z17	Mixed Commercial Goods
Z5	Minerals	Z18	Mines
Z6	Petroleum products	Z19	Textiles (fabric)
Z7	Chemicals	Z20	Machine
Z8	Plastics	Z21	Raw materials
Z9	Hide and leather	Z22	Commercial intermediate goods
Z10	Wooden	Z23	Consumer goods
Z11	Textiles (clothing)	Z24	Production goods
Z12	Shoes	Z25	Agricultural raw material
Z13	Stone, glass	Z26	Agricultural products
Z14	Metals		

According to the clustering results, it was seen that clothing textile, fabric textile, machinery, petroleum products, commercial intermediate goods, leather-skin and production goods were together in industrial and production sectors.

The cluster results obtained before and after the WTO are given with export data in Table 7 and Table 8.

Table 7: Cluster Groups and Export Data Before WTO Membership**Group 1**

	Sectors	Export (Million \$)
1	Minerals	1.3
2	Petroleum Product	5.2
3	Hide and leather	5.6
4	Textiles (Fabric)	39
5	Textiles (Clothing)	35.9
6	Mechanics and Electronics	31.1
7	Machine	35.3
8	Commercial intermediate goods	33.8
9	Production goods	27.1

Group 2

	Sectors	Export (Million \$)
1	Animal	3.8
2	Vegetables	4.7
3	Food Products	4.3
4	Chemicals	8.4
5	Plastics	4.4
6	Wooden	3.2
7	Shoes	8.5
8	Stone, Glass	4.4
9	Consumer Goods	80.2
10	Shipping	4.2
11	Agricultural Products	127.3
12	Mines	3.1
13	Raw Materials	11.8
14	Metals	12.1
15	Agricultural Raw Material	2.5
16	Mixed Commercial Goods	15.6

Considering the Table 7, some sectors in the two groups that existed prior to the WTO membership changed places after China joined the WTO (Table-8.). It is notable that sectors that were in the first group before the WTO such as textile (clothing), mechanical electronics, machinery, commercial intermediate goods and production goods, have demonstrated a substantial rise in export figures after the WTO, approaching the predominant final goods shown in the second group sectors.

Similarly, according to the differences between clusters before and after the WTO, in Tables 7 and 8, it is seen that food products and the sectors depending on industrialization and industrial development formed two separate clusters. It is viewed that a few sectors shifted towards the groups that they converged in terms of content and export figures before and after the WTO membership. In general, it is determined that two main clusters exist after WTO membership.

Table 8: Cluster Groups and Export Data after WTO Membership**Group 1**

	Sectors	Export (Million \$)	Amount of Increase
1	Minerals	3.6	2.7
2	Petroleum Products	26.7	5.1
3	Hide and Leather	18.3	3.2
4	Textiles (Fabric)	188.5	4.8
5	Mines	21.9	7
6	Raw Materials	30.8	2.6
7	Metals	115.7	9
8	Agricultural Raw Materials	5.9	2.3
9	Mixed Commercial Goods	132.7	8.5

Group 2

	Sectors	Export (Million \$)	Amount of Increase
1	Animal	9.6	2.5
2	Vegetables	12.7	2.7
3	Food Products	18.2	4.2
4	Chemicals	68.8	8.1
5	Plastics	41.5	9.4
6	Wooden	21.9	6.8
7	Shoes	36	4.2
8	Stone, Glass	31.1	7
9	Consumer Goods	497.9	6.2
10	Shipping	7.7	16
11	Agricultural Products	1331.9	10
12	Textiles (Clothing)	179.7	5
13	Mechanics and Electronics	610.6	19.63
14	Machine	677.7	19.19
15	Commercial Intermediate Goods	246.7	7.2
16	Production Goods	632.8	23.3

As seen in Table-7, five sectors including textile (clothing), mechanical electronics, machinery, commercial intermediate goods and production goods were in the first group before the WTO; After the WTO membership (Table-8), export figures approached the sectors in the second group where final goods were predominant. In five sectors including mines, raw materials, metals, agricultural raw materials and mixed commercial goods in the second group before the WTO (Table-7); After the membership of WTO (Table-8), export figures approached the sectors in the first group where the raw material sector was predominant.

Regardless of the proximity in export figures and the content of the sectors, it is seen that they are in the same group in different sectors. When the changes in export items before and after WTO membership are analysed, it is seen that the least increase in exports is in the agricultural raw materials sector (2 times). Although the WTO membership brings a more liberal order to the Chinese economy, China kept its strategies in line with the interests of the country above the responsibilities brought by the WTO membership. The taxes, prohibitions and quotas on exports were mostly used in restricting agricultural raw material exports in China. For this reason, the sector with the least increase in exports was the agricultural raw materials sector (2 times). From this point of view, after the WTO membership, China developed its industry and service sector the most, and the share of agriculture in GDP decreased. Although this change seems to be against the agricultural sector, it actually indicates to economic development (Şimşek 2005: 83). However, we see that the highest increase in exports is in the goods production sector (23 times). When it is examined the change in exports before and after WTO membership, the sectors with the highest increase in exports after the production sector were electrical devices (approximately 20 times) and the machinery sector (19 times). As seen in exports, China, which has a great competitive power in the mechanical-electronic devices and machinery sector, has an important share in the

world economy in this field. With this development, China has become the number one country in the foreign trade with the USA in the electrical devices and machinery sector.

While most of China's exports consist of medium-level technology and labour-intensive goods with high international competitiveness in foreign trade, capital-intensive goods are among both exported and imported goods. China's exports, 81% of which are manufactured products, are 19% basic goods. After its WTO membership, the export sector shows remarkable growth and diversity, compared to other countries. Directing the cheap labour force, which is the biggest advantage in the growth of Chinese foreign trade for goods that require advanced technology, and this made China a sought-after market for developing economies. After China's accession to the WTO (2001-2017), exports of high-tech goods increased by 25% in the overall export volume, but its share in low-tech goods exports dropped to 50%. In the same period, total exports increased approximately 10 times.

Since 1990, significant changes have occurred in China's export partners as a result of the conclusion of international agreements. With China's WTO membership, the elimination of many trade quotas and restrictions led to the highest level of trade relations with the USA, which has always maintained its place as the leading country in China's exports. While China was the 14th largest USA trading partner in the 1980s, the USA was China's third largest trading partner. The annual foreign trade increase of the two giant economies, which became the biggest trade partners after 2000, reached 20%. The size of the two economies, complementarity factor and mutual interests were effective in the development of US-China trade relations to such extent.

Table 9: Major Countries in China's Export in 2017

Country	Total Exports (Million Dollars)	Total Export Rate (%)
1. United States of America	430.328	%19
2. Hong Kong	279.211	%12
3. Japan	137.256	%6
4. Korea	102.704	%4.5
5. Vietnamese	71.617	%3.2

Source: China Exports by Country <https://tr.tradingeconomics.com> (ET:28.08.2019)

Due to the 2008 crisis with Hong Kong, China's second export partner, exports decreased by 11.4% in 2009. Apart from this, China-Hong Kong foreign trade generally showed an upward trend, with a growth of 9.9% between 2003-2012. Similarly, the rapid development of South Korea over the years in China-Korea foreign trade and the increase in the importance given to mutual trade led to the development of trade relations (Dogru 2016: 88-90).

6. CONCLUSION

China, which has managed to become the world's manufacturing centre in foreign trade with its soft power strategy, globalization-oriented balance policy over the last 30 years, has become an economic actor closely followed by the whole world today. As the miracle of Asia, the world's largest manufacturing centre and largest exporter, its journey from the past until the present, by turning its advantages into opportunities in the best way is important in terms of creating an exemplary growth model in the world arena.

China took its position to the highest levels with its WTO membership. WTO membership has brought many benefits in terms of globalization. As it inspired investor countries confidence in attracting foreign investments, there has been an appropriate globalization trend. Its WTO membership also brought to light some issues that could hinder the Chinese economy. China has achieved a steady growth rate of 10% by transferring labour from sectors with relatively low productivity to those with higher productivity.

In this study, the groupings before and after membership are determined by conducting a cluster analysis on the basis of 25 sectors determined before and after China's WTO membership. The economic relations between the determined groups are investigated. In addition, statistically significant differences are found for each sector before and after WTO membership. This shows that China's membership is meaningful. In the study, after the WTO membership, the agricultural raw materials sector in Chinese exports appeared as the sector with the lowest competitiveness, but the highest competitive power is the production goods, mechanical electronic devices and machinery sector. In other words, after the WTO membership, it is determined that China's total exports increased approximately 10 times during the 2001- 2017 period.

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EFFECTS OF MARKET VARIABLES ON NET INCORPORATION: EVIDENCE FROM TURKISH 2018 DEBT AND EXCHANGE RATE CRISIS

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ABSTRACT

Purpose- The aim of this study is to determine the periodic effects of market variables on net incorporation during the Turkish 2018 Currency and Debt Crisis in Turkey. Because one of the main problems of the companies in Turkey are higher foreign exchange position. Increased exchange rate, interest rate and inflation shocks increases the fragility of the economy of Turkey. High foreign exchange openings together with the increasing fragility increase the risk of closing on companies. On the other hand, increasing interest shocks increase financing costs and increase the risk of closure, and make it difficult for new companies to open up. Therefore, to create a perspective for the study was selected the 2018 Turkey exchange rate and debt crisis as a case.

Methodology- In this essay concept of firm had been used as company or corporate mean. And also concept of firming or net incorporation had been used difference between number of new opening companies and number of closing companies. Exchange rate, interest rate and inflation were selected as market variables. Closing firms and opening firms were selected as firm variables. The model was formed based on the Vector Auto Regressive Model. The values of the variables were observed in the monthly frequency and in the range of 2010 1st month and 2019 12th month.

Findings- According to results, inflation and interest had a negative impact on the number of opening firms. And also, the increasing effect of exchange rates on the number of closing firms was generally greater than interest rate and inflation.

Conclusion- Consequently, it has been argued that net firm number growth has been increasing in Turkey during periods when exchange rates are stable in a certain band range and inflation and interest rates start to decrease at the same time.

Keywords: Firm Closure, incorporation, Financial Fragility, Exchange and Debt Crises

JEL Codes: G00, G17, G32

1. INTRODUCTION

The increase in the number of companies closed and changes in the number of newly opened companies are particularly important in times of crisis. Because every firm that closes in these periods is more panic and higher risk premium pricing for the country in crisis.

For this reason, the effects of market variables on firms' closing and new opening are analyzed in terms of crisis periods. Economic crises cause many companies to close and a decrease in the number of new companies. In this context, the 2018 crisis should be examined first.

After the 2001 banking crisis, a policy framework of low exchange rate and high interest rates has begun to implement in the Turkish economy. In the following years, the abundance of global liquidity has helped that the Turkish economy achieve sustainable high growth rates. The financial crisis that emerged in the sub-threshold credit market in 2007 turned into a global crisis with the bankruptcy of Lehman Brothers in September 2008.

While Turkey recovered rapidly during the 2008 global crisis, it reached an effective average growth rate of about 7%. The relative decline in the public debt ratio the 2010's has reduced the strong its' growth rates reached in the 2000's (Eliot, 2018). The recession and commercial-financial losses caused by the global crisis negatively affected to markets. Interest rate and exchange rate shocks caused financial fragility in emerging markets after FED Chairman Bernanke had announced a gradual reduction of the bond-buying program on May 22, 2013.

As a result of these fragility, the economic policy framework of the Turkish economy has evolved into the policy framework of high exchange rates-high interest rates- high inflation. Rising political risk and the starting of Fed's interest rate in 2016 have increased exchange rate shocks in the Turkish economy. With the structuring of exchange rate shocks and increasing external financing deficits, the macro-financial equilibration mechanism has deteriorated.

Turkish lira has been begun depreciating with the increasing rate since February 2018. As political uncertainties make financial markets more volatile, aside from the global factors, June 24, 2018 elections can be stated as the main reason for this significant fluctuation in the price of the Turkish lira. One month before elections, May 2018, percentage increase so the amount of depreciation in lira per dollar rate is the 7.3 percent, that is the highest level relative to percentage changes in other countries' exchange rates (Kerra Geldi, 2018:4)

The diplomatic crisis between the US and Turkey gave a push to the economic downturn in Turkey that was already coming. Indeed, the Turkish Lira already depreciated by more than 20% against USD in 2018 before the diplomatic tension peaked. The depreciation in the Turkish Lira against USD for 2018 was roughly 41% (Oyvut, 2018)

After the shock wave in the exchange rate, the Turkish government tried to stabilize the exchange rates with the regulations it made in terms of the management of financial crises. On the other hand, it has taken a number of measures for companies facing the risk of closure and bankruptcy. In addition, The government has tried to transform the direction of the political economy of the country from the low exchange rate-high interest policy framework to an exporter economy.

Commercial and financial losses arising during financial crisis periods increase the risk on the equity of companies. After this risk, businesses whose asset-resource match is broken or that lose their equity are faced with the risk of bankruptcy and closure.

Increasing exchange rates in times of crisis can negatively affect companies in two fundamental ways. The first is foreign currency openings. Another is that enterprises that produce with imported inputs lose their domestic goods competitive power. On the other hand, exchange rate shocks will make it difficult for companies to access financing in terms of external resources during the investment period for new companies.

Increasing interest rates during crisis periods adversely affect the borrowing dynamics of firms. Disrupted debt dynamics can also cause failure to operate the firm. Increasing financing costs with increasing interest rates increase the sales price of the enterprises and cause a loss of competitiveness. On the other hand, high interest rates will make it difficult for new companies to access financing during the investment period.

Increasing inflation rates during crisis periods adversely affect the competitiveness of firms. On the other hand, low competitive power will cause low profitability, so weak profit expectations may not be attractive for new companies to enter the sector.

The most common crisis dynamics in emerging market economies is increasing financial vulnerabilities. Exchange rate, interest rate and inflation shocks are the basis of these vulnerabilities. For this reason, the effects of the crisis on the number of firms that are closed and the number of new firms to be opened have been tried to be analyzed over the variables of exchange rate, interest rate and inflation during the crisis period.

Theoretically, this process is likely to have negative effects on the number of opening and closing companies in Turkey for each of them. Because one of the main problems of many companies in Turkey is the increased risk of bankruptcy due to high foreign exchange position deficits in real sector. On the other hand, the commercial losses caused by the low competitiveness of the outward-facing firms also increased these risks. The increasing number of firms that are closing and the decreasing number of firms that are opening as a result of these risks caused the transformation of economic crises into financial crises.

2. LITERATURE REVIEW

The relevant literature can be examined within the framework of two basic problematics of the research. The first of these is the factors affecting incorporation, and another is the 2018 Turkish exchange rate crisis. Ertaş and Çetin, (2009) studied the relationship between incorporation and macroeconomic variables in Turkey between 1995-2008 with granger causality analysis method. In the measurement of incorporation, the number of companies opening and closing and their size were used. According

to the findings, it was determined that the incorporation interacts with GDP, real wages, real exchange rate, ISE Index, CPI, export and import variables.

Bakiş and Kökkızıl, (2017) The general course of companies established and closing in Turkey in the period 2010-2016 and their relationship with macroeconomic indicators were examined. Regression analysis was performed taking into account the annual changes in all macroeconomic indicators and the number of companies established and closing. In econometric analyses, which were conducted by checking the effects of the year, the effect of the increase in the number of firms established on employment and gross domestic product was statistically meaningless; however, the effect of the increase in the number of firms closing on employment and national income was found to be negative and statistically significant.

According to Metzger (2008), financial losses incurred by banks due to firm closure are effective on entrepreneurs starting a new firm, while losses incurred by shareholders and entrepreneurs are not effective.

Egbunike and Okerekeoti (2018) examines that the effects of interest rate, inflation rate, exchange rate and the gross domestic product (GDP) growth rate, with the firm characteristics as framework within size, leverage and liquidity with consumer goods sector on the Nigerian Stock Exchange, by means of multiple linear regression as the method of validating the hypotheses. The study shows that no significant effect for interest rate and exchange rate, but a significant effect for inflation rate and GDP growth rate on ROA. However, the firm characteristics were significant.

Headd, B. (2003) states that New firms were believed to have high closure rates and these closures are believed to be failures, in spite of fact that U.S. Census Bureau data sources illustrate that these assumptions could not be justified. He concludes that a planned exit strategy makes it possible closing a business without excess debt, sold a viable business, or retired from the work.

Aguilar and Posada (2019), examined the factors that determine the closure or jeopardize the continuity of micro and small enterprises (MSEs). They investigated the determinants of failure from the entrepreneur's perspective using a qualitative approach, and five variables emerged. Their findings shows that there are internal and external variables that impact on an enterprise's continuity, which are themselves correlated.

Coleman etc.(2013), They distinguished between voluntary firm closure in the form of merger or acquisition and compulsory firm closure in the form of failure/permanently closed operations. They underestimated survival rates. In addition, they reach the conclusion of factors that characterize closed businesses were different from those that characterize businesses that had been sold or merged with other businesses.

2.1. Drivers Leading to Firm Closure

The closing of existing companies and opening of new companies can be examined within the framework of five concepts. These are the concepts of mission, vision, internal environment, external environment and company purpose. The goal of firms is to maximize the present value of shareholders' wealth. Failure to fulfill this condition causes companies to fail to reach their vision and fulfill their mission. In this process, the rate of closing down and opening new companies decreases.

The closure of companies is generally divided into two. These; It is the company closing at its own will and closing it out against its own will. Closing voluntarily takes place in the form of merging with another company, ending its legal existence or transforming into a non-profit organization.

Closure involuntarily occurs as a result of the company's financial failure or inability to fulfill legal requirements. the factors that stand out for companies to shut down; macroeconomic conditions, low profit expectations, problem of access to resources and lack of competitiveness. Basically, all other factors are related to macroeconomic conditions. The most prominent of these factors are macroeconomic conditions.

The macroeconomic external environment plays an important role in the financial success of businesses. The two most prominent factors in terms of macroeconomic conditions are financial stability and sustainable high growth performance. Financial instability can most often push firms toward financial failure, bankruptcy and closure when companies have basic structural financial problems. Among these structural problems, the most related to financial stability are high foreign exchange position deficits. In such a structure, rising exchange rates will have an effect on the firm's asset-resource balance. On the other hand, low exchange rates will decrease profitability for exporting companies.

For firms that import inputs, rising exchange rates will have an inflationary effect on sales goods. High interest rates will increase the amount of financing expenses and weaken the firm's ability to compete in price. On the other hand, high interest rates will narrow the credit possibilities. On the other hand, the high sustainable growth performance in the country of operation will

positively affect the credit outlook of the country and expand the opportunities of companies to find foreign resources from abroad. Increasing these opportunities will enable companies to have a sustainable borrowing dynamic.

2.2. Drivers Leading to New Firm Opening

The possibilities of opening new companies are also related to the concept of company purpose. In this context; The existence of sectors that promise high profitability, new business lines, the growth targets of existing SMEs by transforming them into companies, the desire to provide financing with equity by incorporating the opportunity to go public, the rising profit expectations in the country, the increase in borrowing opportunities with low interest from abroad, high financial stability can trigger the opening of new companies.

3. DATA AND METHODOLOGY

In this study, the interaction between firms and Market Variables (exchange rate, interest rate and inflation) will be examined by on VAR model.

Sims (1980), developed the VAR model by opposing the internal-external variable separation, arguing that each variable in an econometric model can affect another variable and that these variables can also be affected by other variables (Sims, 1980: 1-49). The VAR model not only expresses the one-way relationship between variables, but also explores the forward and backward connections between variables (Kearney and Monadjemi, 1990: 197-217).

In simultaneous equation systems, it is sometimes necessary to make some constraints on the structural model in order to overcome the problem of determination (Darnell, 1990: 114-116). These restrictions pose a number of difficulties for research., On the other hand, VAR models can give dynamic relations without any constraints on the structural model and are therefore often used for time series (Keating, 1990: 453-454).

The multiple time series in question is assumed to be generated by the var(p) model, which has a stable structure. Where p is the delay value. In short, a VAR(p) model with P variables is written as follows (Lütkepohl, 2005).

$$y = v + A y_{t-1} + \dots + A_p y_{t-p} + u$$

While variance decomposition determines which variable is the most effective on a time series, the Effect-Response functions examine whether this effective variable can be used as a policy tool. Impulse-response functions; is a method that a standard error that will occur in one of the random error terms reflects the impact of the shock on the present and future values of the internal variables. (Özgen ve Güloğlu, 2004:97, Barışık ve Kesikoğlu, 2006:71).

For the purpose of the study; exchange rate, interest rate and inflation were selected as market variables. The exchange rate is the dollar/TL rate; the interest rate is the 2-year benchmark bond interest rate. And CPI variable is selected as inflation. The time series of number of closing firms and the number of opening firms have been created as about incorporation variables. As the scope of the study was based on the 2018 Turkish exchange rate crisis, the forecast range was set at monthly frequency for the period 2010-2019.

Data on firms from the Union of Chambers and Commodity Exchanges of Turkey Statistics, data on Market Variables investing.com obtained from their databases. In this respect, three different VAR model has been created. All variables were used as logarithmic form.

Firstly, the Augmented Dickey Fuller Unit Root Test (Dickey and Fuller, 1979), appropriate lag length, and tests on the theoretical assumptions of the VAR model were conducted. As a result of the tests, it was concluded that the established models met the relevant assumptions in relate to VAR model. These assumptions; AR root and AR polynomial inverse roots, autocorrelation, normality test expressing the normal distribution of residuals of time series and variance Heteroskedasticity test were performed. The model is stationary, there is no autocorrelation problem. In addition, the problem of normal distribution and variance was not observed. In order to determine the interaction between variables after long-and short-term equilibrium analysis, the VAR model was established within the framework of the unit root test results for the first difference values of the time series (Brooks, 2014).

Figure 1: Invers Roots of AR Characteristic Polynomial

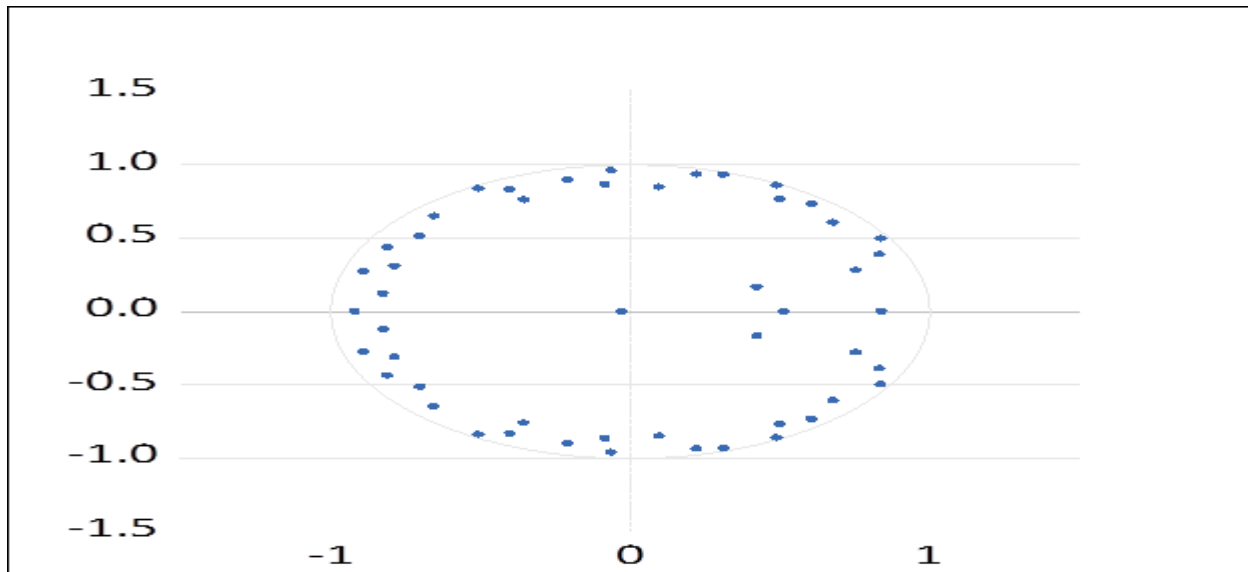


Table 1: Autocorrelation Test

VAR Residual Portmanteau Tests for Autocorrelations					
Null Hypothesis: No residual autocorrelations up to lag h					
Date: 09/20/20 Time: 19:44					
Sample: 2010M01 2019M12					
Included observations: 97					
Lags	Q-Stat	Prob.*	Adj Q-Stat	Prob.*	df
1	20.00810	---	20.21652	---	---
2	38.68864	---	39.29034	---	---
3	55.89475	---	57.04558	---	---
4	70.67277	---	72.45921	---	---
5	83.09612	---	85.55774	---	---
6	94.59774	---	97.81771	---	---
7	104.6226	---	108.6223	---	---
8	115.2428	---	120.1971	---	---
9	129.2152	---	135.5985	---	---
10	144.4006	---	152.5293	---	---
11	152.2732	0.0000	161.4089	0.0000	25
*Test is valid only for lags larger than the VAR lag order.					
df is degrees of freedom for (approximate) chi-square distribution					

Table 2: VAR Residual Normality Tests

VAR Residual Normality Tests				
Orthogonalization: Residual Correlation (Doornik-Hansen)				
Null Hypothesis: Residuals are multivariate normal				
Date: 09/20/20 Time: 19:44				
Sample: 2010M01 2019M12				
Included observations: 97				
Component	Kurtosis	Chi-sq	df	Prob.
1	4.372834	0.395852	1	0.5292
2	3.064305	0.008939	1	0.9247
3	22.01000	1.314767	1	0.2515
4	2.729873	0.082731	1	0.7736
5	4.084571	1.886035	1	0.1696
Joint		3.688323	5	0.5951
*Approximate p-values do not account for coefficient estimation				

Table 3: Heteroskedasticity Test

F-statistic	1.672788	Prob. F(10,86)	0.1003
Obs*R-squared	15.79517	Prob. Chi-Square(10)	0.1056

4. FINDINGS AND DISCUSSIONS

According to the variance decomposition results of the variable number of firms opened; Apart from the variable's own effect, the most effective variable in the early periods is the exchange rate. However, after the 5th period, the effect of the inflation variable has increased. After the 10th period, the inflation variable became the most important variable. This result can be discussed in terms of profit expectations. Since the increase in inflation expectations will increase profitability expectations, it can be claimed that the number of companies opened has increased.

According to the results of impulse-response functions; In the first periods, exchange rate, interest rate and inflation shocks negatively affected the number of companies opened. In line with the results of the variance decomposition, inflation shocks increased in the following periods.

According to the variance decomposition results of the variable number of firms closed; After the 5th period, the exchange rate variable increased the number of firms that closed. In the following periods, the effects of the interest and inflation variables converged to the level of the effects of the exchange rate. High foreign exchange position of the companies in this case can be argued to Turkey caused the deficit.

According to the results of impulse-response functions, after the 5th period; Exchange, interest and inflation shocks increased the number of firms that closed. In parallel with the results of the variance decomposition, the variable of the number of firms closing showed the greatest response to exchange rate shocks.

Figure 2: Variance Decomposition of Opening Firms

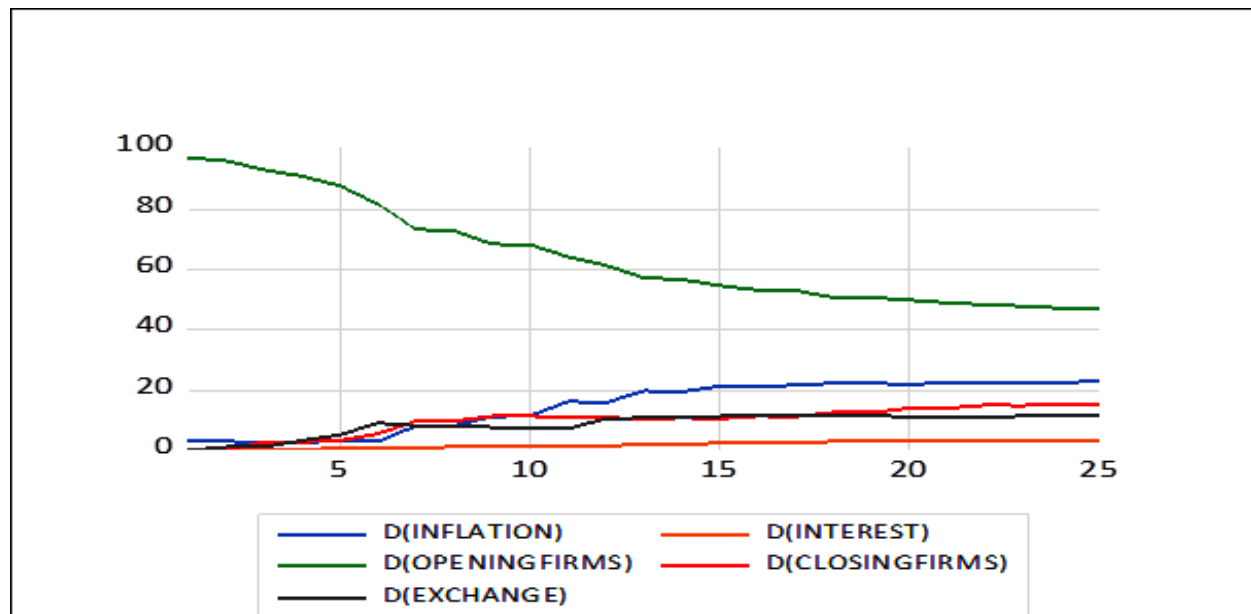


Table 4: Variance Decomposition of Opening Firms

Period	S.E.	D (CLOSING FIRMS)	D (EXCHANGE)	D (INTEREST)	D (INFLATION)	D (OPENING FIRMS)
1	0.878293	2.373140	1.677448	1.120974	2.861869	91.96657
2	0.890874	2.345543	3.052293	1.135526	2.864371	90.60227
3	1.129382	1.697525	4.148334	0.844660	3.194744	90.11474
4	1.151116	1.687111	6.452850	0.957391	3.131887	87.77076
5	1.172186	2.075571	8.293122	0.940800	3.944979	84.74553
6	1.215530	4.145431	11.94126	0.874924	3.989909	79.04848
7	1.283139	6.885779	10.74798	2.187193	8.670079	71.50897
8	1.293423	6.929575	10.67253	2.853209	8.532867	71.01182
9	1.334501	7.963821	10.19900	4.210741	10.75604	66.87040
10	1.344466	8.108023	10.05483	4.474203	10.79417	66.56877
11	1.387455	7.685260	9.441981	5.957588	14.19759	62.71759
12	1.419200	7.779396	12.22331	5.817410	13.96547	60.21441
13	1.469766	7.253334	12.41676	5.653287	18.42869	56.24793
14	1.479983	7.623636	12.55016	5.643442	18.17958	56.00319
15	1.509262	7.353341	12.75638	5.452604	20.55332	53.88436
16	1.537145	8.242200	13.50976	5.281180	20.39860	52.56826
17	1.549045	8.137060	13.42312	5.355267	20.75247	52.33209
18	1.584187	10.03671	13.21286	5.130564	21.57083	50.04904
19	1.594126	10.28585	13.21508	5.067543	21.57449	49.85705
20	1.618037	12.24754	12.84640	5.087856	21.09430	48.72391
21	1.633434	12.40755	12.89562	4.997757	21.88939	47.80968
22	1.648515	13.58675	12.82092	4.963359	21.56703	47.06194
23	1.657301	13.44878	12.92620	4.933356	22.02208	46.66958
24	1.668965	13.97963	12.87463	4.961772	22.16375	46.02021
25	1.674645	13.99999	12.78966	5.164179	22.32587	45.72029

Figure 3: Variance Decomposition of Closing Firms

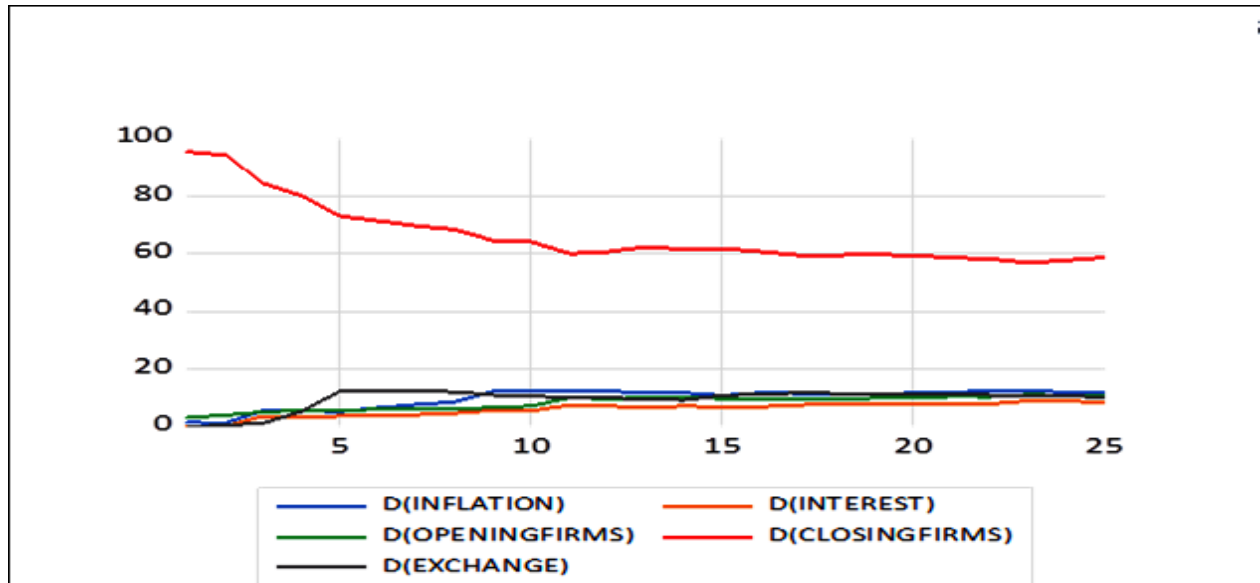


Table 5: Variance Decomposition of Closing Firms

Period	S.E.	D (CLOSING FIRMS)	D (EXCHANGE)	D (INTEREST)	D (INFLATION)	D (OPENING FIRMS)
1	0.248918	100.0000	0.000000	0.000000	0.000000	0.000000
2	0.263177	97.04670	0.663566	0.071047	0.067652	2.151036
3	0.304342	90.28233	1.288803	1.015930	5.427578	1.985359
4	0.314160	85.76496	5.487655	1.190616	5.468757	2.088013
5	0.330179	77.90094	11.06634	2.595641	4.955547	3.481535
6	0.335803	75.70243	10.90866	3.223078	5.958305	4.207517
7	0.340370	73.69857	11.10951	4.395344	6.286053	4.510527
8	0.346059	71.96571	10.91744	5.744385	6.629189	4.743275
9	0.363043	68.06818	9.919904	5.241517	11.06853	5.701878
10	0.369510	68.21772	9.621845	5.087175	11.03874	6.034526
11	0.384822	64.06552	9.138384	5.446070	13.09796	8.252067
12	0.394306	64.87288	9.370008	5.187947	12.67341	7.895762
13	0.414686	66.59351	8.876103	4.894870	12.18811	7.447405
14	0.421935	66.11674	8.660861	5.004701	12.65851	7.559183
15	0.439355	66.18296	10.05681	5.032260	11.68801	7.039953
16	0.443769	64.99177	10.43870	4.937016	12.72253	6.909985
17	0.448859	63.82526	10.55766	5.840340	12.45845	7.318289
18	0.453401	63.73158	10.55219	6.101902	12.30330	7.311026
19	0.458294	64.17226	10.33754	6.064812	12.04347	7.381916
20	0.460314	63.69194	10.24844	6.156969	12.46898	7.433678
21	0.463780	62.82873	10.23288	6.105084	12.75265	8.080653
22	0.466847	62.13926	10.10982	6.059537	13.65361	8.037777
23	0.472309	60.84982	9.881767	6.948149	13.54425	8.776013
24	0.477926	61.48688	9.658214	6.826163	13.43925	8.589501
25	0.488000	62.76652	9.263584	6.739638	12.89357	8.336683

Figure 4: Response of Opening Firms (One S.D)

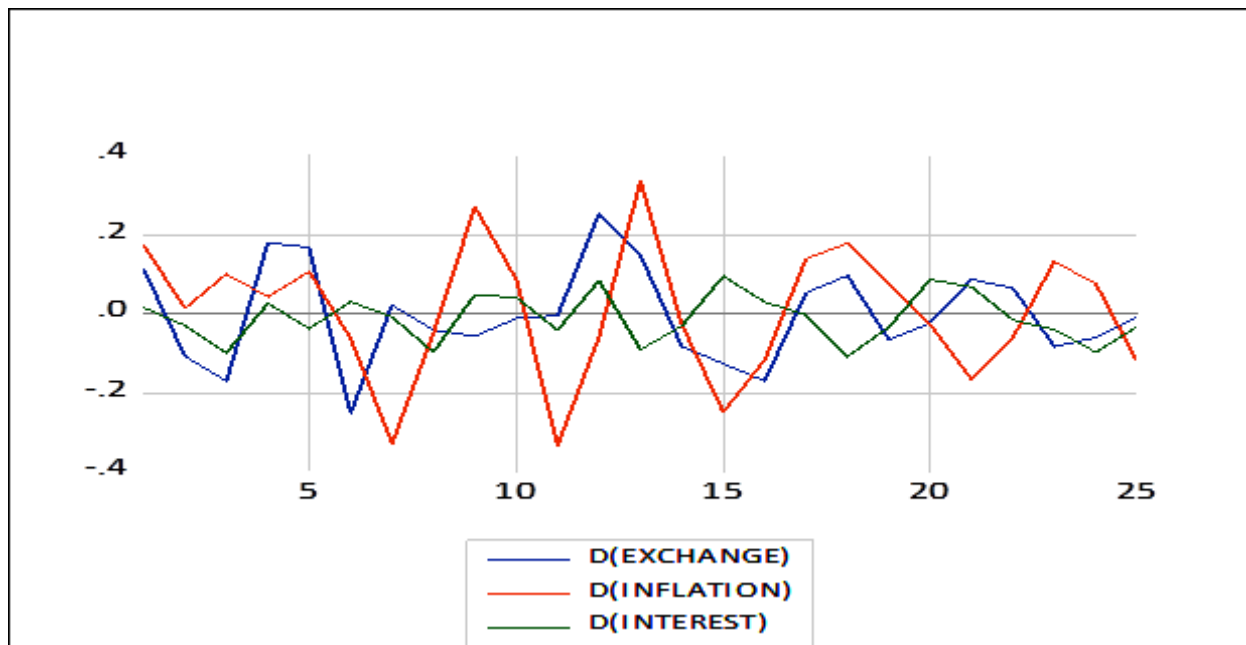
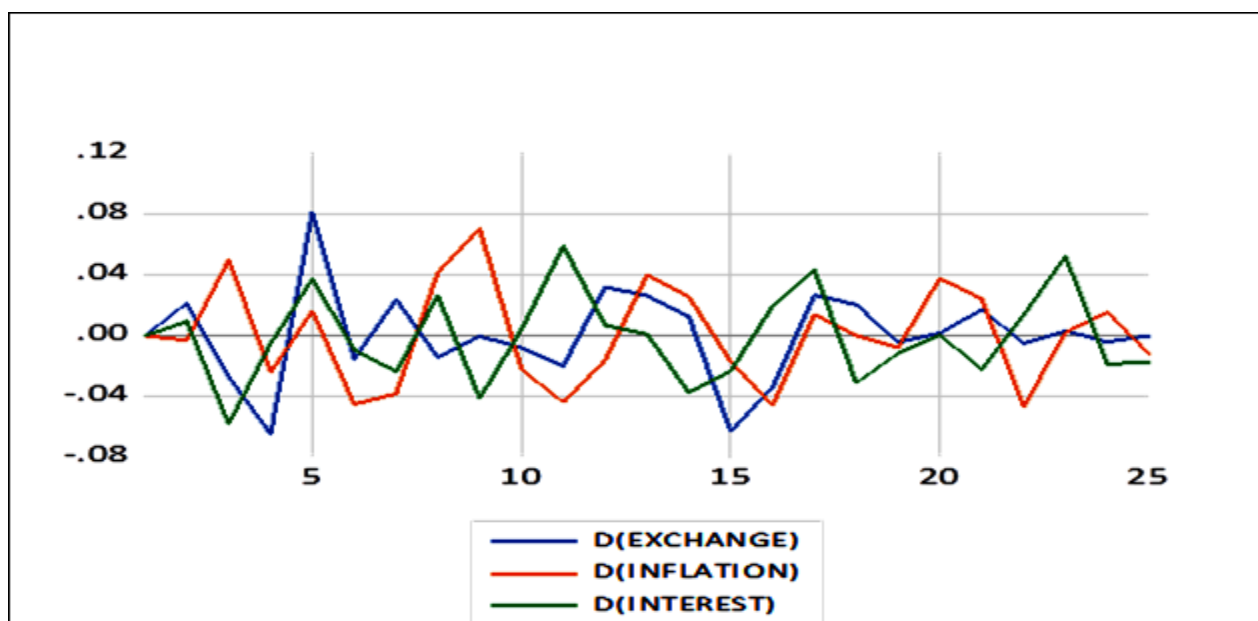


Figure 5: Response of Closing Firms (One S.D)



5. CONCLUSION

As a result of the low exchange rate-high interest rate policy in the Turkish economy, foreign exchange rates and inflation increases are generally realized through interest rate shocks through interest rate hike expectations (Kuzu, 2019). To summarize the results together with the theoretical framework, the number of firms that closing in Turkey is increasing because the shock waves in the exchange rates due to the high foreign exchange position deficits damage the equity structure of the firms. In addition, it can be argued that there is a negative correlation between the change in interest rates and the number of firms that opening, as the

financing costs of firms are an important account item during the investment period. In order for the inflation variable to have a positive effect on number of opening firm through profit expectations, inflation needs to be in a downward trend. In short, while exchange rates are stable in a certain band range and inflation and interest rates fall together, net firm growth in Turkey increases.

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APPENDICES

Appendix 1: Unit Root Test

Null Hypothesis: Unit root (individual unit root process) Series: CLOSINGFIRMS, EXCHANGE, INFLATION, INTEREST, OPENINGFIRMS Date: 09/20/20 Time: 19:15 Sample: 2010M01 2019M12 Exogenous variables: None Automatic selection of maximum lags Automatic lag length selection based on AIC: 1 to 12 Total number of observations: 562 Cross-sections included: 5				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			4.94635	0.8947
ADF - Choi Z-stat			0.66797	0.7479
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. Intermediate ADF test results UNTITLED				
Series	Prob.	Lag	Max Lag	Obs
CLOSINGFIRMS	0.6765	12	12	107
EXCHANGE	0.5454	5	11	107
INFLATION	0.4952	2	12	117
INTEREST	0.6631	1	12	118
OPENINGFIRMS	0.6959	6	12	113
Null Hypothesis: Unit root (individual unit root process) Series: CLOSINGFIRMS, EXCHANGE, INFLATION, INTEREST, OPENINGFIRMS Date: 09/20/20 Time: 19:16 Sample: 2010M01 2019M12 Exogenous variables: None Automatic selection of maximum lags Automatic lag length selection based on AIC: 0 to 12 Total number of observations: 561 Cross-sections included: 5				
Method			Statistic	Prob.**
ADF - Fisher Chi-square			429.006	0.0000
ADF - Choi Z-stat			-18.8773	0.0000
** Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality. Intermediate ADF test results D(UNTITLED)				
Series	Prob.	Lag	Max Lag	Obs
D(CLOSINGFIRMS)	0.0007	12	12	106
D(EXCHANGE)	0.0000	4	11	107
D(INFLATION)	0.0000	1	12	117
D(INTEREST)	0.0000	0	12	118
D(OPENINGFIRMS)	0.0000	5	12	113

Appendix 2: VAR Lag Order Selection

VAR Lag Order Selection Criteria						
Endogenous variables: D(INFLATION) D(INTEREST) D(OPENINGFIRMS) D(CLOSINGFIRMS) D(EXCHANGE)						
Exogenous variables: C						
Date: 09/20/20 Time: 19:43						
Sample: 2010M01 2019M12						
Included observations: 97						
Lag	LogL	LR	FPE	AIC	SC	HQ
0	-262.5183	NA	0.000171	5.515840	5.648557*	5.569505*
1	-234.1438	53.23863	0.000160	5.446264	6.242567	5.768250
2	-187.8093	82.16018	0.000103	5.006377	6.466265	5.596684
3	-164.0164	39.73655	0.000107	5.031267	7.154740	5.889895
4	-127.5367	57.16415*	8.61e-05*	4.794571	7.581629	5.921520
5	-111.4788	23.50741	0.000107	4.978944	8.429588	6.374215
6	-90.66710	28.32106	0.000122	5.065301	9.179530	6.728894
7	-72.10643	23.34435	0.000150	5.198071	9.975885	7.129985
8	-46.09815	30.03018	0.000162	5.177281	10.61868	7.377517
9	-12.38867	35.44708	0.000154	4.997705	11.10269	7.466262
10	26.23060	36.62859	0.000138	4.716895*	11.48546	7.453773
* indicates lag order selected by the criterion						
LR: sequential modified LR test statistic (each test at 5% level)						
FPE: Final prediction error						
AIC: Akaike information criterion						
SC: Schwarz information criterion						
HQ: Hannan-Quinn information criterion						

Appendix 3: AR Roots of Characteristic Polynomial

Roots of Characteristic Polynomial	
Endogenous variables: D(INFLATION), D(INTEREST) D(OPENINGFIRMS), D(CLOSINGFIRMS) D(EXCHANGE)	
Exogenous variables: C	
Lag specification: 1 10	
Date: 09/20/20 Time: 19:43	
Root	Modulus
0.490564 + 0.858196i	0.988511
0.490564 - 0.858196i	0.988511
0.312886 + 0.932265i	0.983370
0.312886 - 0.932265i	0.983370
-0.504515 - 0.836431i	0.976807
-0.504515 + 0.836431i	0.976807
0.838935 - 0.496883i	0.975040
0.838935 + 0.496883i	0.975040
-0.060968 + 0.959414i	0.961349
-0.060968 - 0.959414i	0.961349
0.222061 + 0.933776i	0.959817
0.222061 - 0.933776i	0.959817
0.606518 - 0.732014i	0.950636
0.606518 + 0.732014i	0.950636
-0.888432 + 0.272223i	0.929202
-0.888432 - 0.272223i	0.929202
-0.398571 + 0.830846i	0.921501

-0.398571 - 0.830846i	0.921501
0.834542 + 0.388858i	0.920690
0.834542 - 0.388858i	0.920690
-0.653151 - 0.648668i	0.920530
-0.653151 + 0.648668i	0.920530
-0.205217 + 0.896543i	0.919730
-0.205217 - 0.896543i	0.919730
-0.809707 - 0.435267i	0.919283
-0.809707 + 0.435267i	0.919283
-0.917793	0.917793
0.501310 + 0.765295i	0.914870
0.501310 - 0.765295i	0.914870
0.679437 + 0.605606i	0.910161
0.679437 - 0.605606i	0.910161
-0.082369 - 0.865207i	0.869119
-0.082369 + 0.865207i	0.869119
-0.700673 - 0.511818i	0.867698
-0.700673 + 0.511818i	0.867698
0.099577 + 0.847329i	0.853160
0.099577 - 0.847329i	0.853160
-0.785160 - 0.308177i	0.843474
-0.785160 + 0.308177i	0.843474
0.839300	0.839300
-0.353491 - 0.760402i	0.838551
-0.353491 + 0.760402i	0.838551
-0.823170 - 0.121062i	0.832024
-0.823170 + 0.121062i	0.832024
0.755779 - 0.279684i	0.805869
0.755779 + 0.279684i	0.805869
0.516549	0.516549
0.425359 + 0.165611i	0.456462
0.425359 - 0.165611i	0.456462
-0.024918	0.024918
No root lies outside the unit circle. VAR satisfies the stability condition.	