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ANALYZING ASSET OF BUBBLES IN THE HOUSING MARKET WITH RIGHT-TAILED UNIT ROOT TESTS: THE CASE OF TURKEY

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ABSTRACT

Purpose- Housing markets are linked to macroeconomic and financial stability. The creation of different financial instruments on residence, the presentation of residence as an assurance, the impact of residence prices on saving and consumption through the wealth effect are some of the housing market and general economic interactions. Developments in the residential sector must be carefully monitored for financial stability. The residential sector has usually played an important role in the global economy and financial sector bubbles. It has been observed that the wealth effect created by the housing bubble surpasses the effect of the stock bubble and that the housing bubble explosion causes more economic devastation compared to the other assets bubbles. While housing markets are increasingly buried in financial markets, the connections between them have strengthened. Such a situation can cause financial crises as a way of extinguishment of a housing bubble. In the case of housing bubbles, bank balance sheets are generally more affected by real estate and it is more likely that the decline in real estate prices are transmitted to the other sectors of the economy with the credit channel. When the housing price bubble burst, the collapse in the financial system is also reflected in the real sector. In this study, with reference to the real housing price index and the real rent price index, it has been investigated whether there is the housing bubble in Turkey.

Methodology- Sup ADF and Generalized SADF (GSADF) tests were used to determine the asset of bubbles and to determine when the housing bubbles had occured. The data set obtained in the study extends from January 2010 to November 2017.

Findings- The results reveal empirical evidence on the absence of speculative bubbles in the Turkish housing market.

Conclusion- There is no data with reference to housing price to say that there is the housing bubble in Turkey during the period under study. Turkey blocked the creation of the housing bubble in the period under review with corrections through its internal dynamics.

Key Words: The housing bubble, Turkey, SADF, GSADF
JEL Classification: C20, R31

1. INTRODUCTION

Bubbles are typically associated with increases in asset prices and then with a collapse. If the price exceeds the basic value of the asset, the bubbles emerge. This situation may appear if investors hold assets as they believe they can sell for a higher price than other investors even though the price of the asset exceeds its basic value. (Malkiel, 2010: 13). Speculative bubbles are a period when investors are manipulated to an investment irrationally, because the rising prices, at least at some consciousness levels, urge to expect more price increases. A feedback develops; as assets become more and more attractive for people, more and more price increases are made. When people no longer expect the price to increase, the bubble ends up, and the demand falls and the market crashes. (Shiller, 2003: 97).

One of the earliest known examples of the asset price bubbles is the tulip bubble which started in the Netherlands in 1634 and exploded in February 1637. The most well known examples are real estate bubbles. There are the US land bubble in the 1920s, the Japanese land bubble and the Swedish real estate bubble in the 1990s, the China real estate bubble in the 2000s and the US 2007 housing bubble, which caused a global crisis. When the housing price bubble burst in 2007, the real sector was affected from the collapse in the financial system and caused many countries in the world to go through the recession process.

Real estate, especially the housing market, is an integral part of an economy and is closely related to financial markets. Economic peaks and collapses are closely linked to fluctuations in real estate prices. (Quigley, 2002: 14). Since the 1980s, the real estate sector has played an important role in the global economy and financial sector bubbles. Housing markets are linked to macroeconomic and financial stability, and there are several reasons for that. First of all, the size of the markets is important. The housing loan constitutes a large part of the household credits and usually constitutes a large part of the activities of the financial sector. Secondly, leverage is important. The leverage limits of households through housing loans are higher than the other asset classes. Moreover, real estate is secured not only for households and construction companies, but also for companies in other sectors. (Cerutti, Dagher, Ariccia, 2017: 7). Higher housing prices increase housing demand for households with limited borrowing and cause financial institutions to open credit. That makes the housing market prone to significant price fluctuations. With the effect of initial price increase, feedback investors can continue to buy and sell homes and cause the price increases to continue. (Brunnermeier, Julliard, 2008: 155) As a result, the prices may rise in the short term with the speculations encouraged because of higher earnings than expected. The cyclicality of housing prices may lead to the significant differences in the assurance position of the household on the market cycle. It was observed that the amount of secured loan was closely related to this loan position and that the spread of mortgage rates over risk-free prices varied according to the loan position of each household. (Xiao, Devaney, 2016: 4274).

Because the price of a home depends on its future core values, it is likely that investors undervalue or overestimate the base price in an environment with imperfect (deficient) information. In particular, investors who are overly optimistic about the expected growth can keep the price above the conversion cost. In effective financial markets, deviations from the base price are defrayed by sophisticated investors selling homes until the price returns to its base value. Optimistic investors remain on the market as long as prices are on the rise and financing is available. Long construction time lag prevents rapid provision reaction, so prices continue to rise for a long time and a price bubble develops. Finally, as prices move away from their core values, more and more investors start to sell and the price inflation slows down. When this process gains speed, prices drop suddenly. Such bubbles can logically arise because the nominal asset prices are misdirected from the bases and the short-term incentives of economic operators differ from the long-term benefits. (Zhao et al., 2017:154).

The impact of wealth on housing refers to the expenditures of the households trying to improve their consumption throughout the life cycle and more borrowing as long as the value of the housing assets increases. It is claimed that the valuation of housing prices can redistribute the wealth but not increase it in total and the effect of wealth on consumption and investment is uncertain. There will be a positive asset impact on owners who have a permanent increase in housing prices and tenants. (Aoki, Proudman, and Vlieghe, 2004: 419; Goodhart and Hofmann, 2008: 190). The effects of bubbles formed in different assets on economy are not the same. Investigations have shown that the wealth effect created by the housing bubble surpasses that of the stock bubble. According to some researches, it has also been seen that the burst of stock bubbles caused less damage in the economy compared to the burst of housing bubbles. (Kansu, 2011: 38) One of the reasons for this is that the individual consumption decisions are more sensitive to changes in housing prices than changes in stock prices. This is related to the fact that real estate constitutes the large share of household assets and this is related to establish connection between the banking system with the guarantee of real estate collateral for large share of bank loans. Another reason is the constraint of the effect of the collapse of bank balance sheets in the countries where the purchase of housing is financed with borrowing. Low interest rates make a significant contribution to the housing bubbles and the expansion of the mortgage market. (Machaj, 2016: 392)

The latest crisis in the US shows that the negative impact of the housing bubble burst could be much more destructive due to the fact that the loads related to the residential sector expand mortgage-based securitization into other institutions and investors in the financial system rather than just the usual connection between the bank and the borrowing household (Kansu, 2011: 40).

In the case of housing bubbles, bank balance sheet is generally more affected by real estate and it is more likely that the decline in real estate prices will be transmitted through credit to other sectors of the economy. In part of the literature, it is pointed out that the decline in real estate prices may reduce real investments, as real estate assets are often used as assurance by firms. Moreover, volatility in real estate prices directly affects the construction sector. Finally, the housing excess supply which is a frequent by-product of real estate bubbles is abuse of a resource much more laborious than the

oversupplying of companies which are a by-product of equity bubbles and can positively contribute to GDP growth. (Scherbina, Schlusche, 2012: 466).

International comparisons lead us to various findings and references. Firstly while housing markets are increasingly buried in financial markets, the connections between them have strengthened. Such a situation can cause financial crises as a way of extinguishment of a housing bubble. Secondly, policy mistakes and mismanagement by the government expedite the collapse of asset bubbles. Thirdly, and most importantly, overly optimistic market confidence is reflected in excessive increases in housing prices and in the prices of related financial products (such as loans, asset-based securities and related financial sector services). As the anticipations of market operators converge more closely on economic foundations, radically changing views lead to very pessimistic price expectations and cause price bubbles to burst and eventually lead to long-term economic recession. Psychological factors play an important role in the economy and unreasonable enthusiasm can cause serious price discordances in housing and financial markets. (Zhao et al., 2017: 156).

In an academic study on the data related to the housing prices, the loans and the mortgage debt in 40 countries from 2000 to 2009, it has been determined that 87 percent of the countries with a housing bubble burst experienced a financial crisis or a sharp decline in GDP growth. (Both the housing bubble burst and a credit market burst in 91%) (Crowe et al., 2013: 304).

In this study, the aim is to detect the asset of the bubbles in the housing market by using real housing price index and the real rent price index in Turkey. For this purpose, the monthly data between January 2010 and November 2017 were used and the data were obtained from the CBRT EDDS database. It is aimed to determine whether housing bubbles are present or not with reference to the real housing price index and the real rent price index. The most important feature that distinguishes our study from other studies is that it determines the asset of bubbles using all country data, its dynamic structure makes it possible to predict bubbles in advance unlike indirect methods of the tests SADF and GSADF which are used and to determine when they have occurred in the case of formation of the housing bubble and it achieves more accurate results than standard econometric tests. Besides, in a literature search some studies concerning the bubbles in the housing market in Turkey have been seen and it has been observed that real housing price index and rent price index are not considered together in these studies. Moreover, the housing bubble was intensionally argued in Turkey in 2017. The data set will provide an empirical contribution to this discussion using the dates January 2010 and November 2017. When evaluated in this framework, it is thought that the study will provide important benefits in terms of scope as well as methodology in the literature.

2. LITERATURE REVIEW

Many theoretical and empirical studies have been carried out on the housing bubbles in literature. Some of these studies are shown in Table 1.

Table 1: Studies on Housing Bubbles

Study	Country/Term	Method	Results
Ardila et al. (2013)	Switzerland	LPPL Bubble Model	It was concluded that in 11 critical regions, the housing bubbles were about to explode, and in 7 regions the housing bubble bursts.
Basco (2014)	USA/ 1983-2007	Fixed Effect OLS	It is pointed out that with the globalization, housing prices have increased and the tendency of appearance of housing bubbles has increased.
Zeren and Ergüzel(2015)	Turkey/2010:01-2014:06	SADF ve GSADF	There is no housing bubble in Turkey Housing Market and while the increases seen in the housing market are experienced in the short term, it is not permanent in the long term.
Caspi(2016)	Israel/2008q1-2013q4	ADF ve SADF	Israel also points to the asset of a housing bubble
Engsted et al. (2016)	The countries of OECD/1970-2013	Right-tailed Unit Root test and Co-Explosive VAR	In many housing markets, it has been found that there is a housing bubble.

Martori et al. (2016)	Spain/2001-2011	Exploratory Spatial Data Analysis (ESDA)	In the housing bubble of the period in question, the spatial autocorrelation is growing, and this growth is greater in urban areas such as Madrid, Barcelona and Zaragoza than in the past.
Solak and Kabadayı (2016)	Turkey	ARDL Approach/1964/2014	It has been emphasized that there is a positive relationship between housing demand and housing prices and these findings in the future can feed a housing bubble in Turkey.
Xiao and Devaney (2016)	England/1983-2012	Markov Regime Switching Model	The magnitude of the credit is a big influence on the housing prices in Great London, and also this effect has a positive feedback effect due to past price movements in regions close to Great London.
Çoşkun et al. (2017)	Turkey/2010:01–2014:M12 and 2007:06–2014:12	OLS/FMOLS/DOLS, Kalman filter and ARIMA models	It has been pointed out that prices were overvalued in the Turkish housing market, but there was no bubble in the housing market.
Çoşkun and Jadevicius (2017)	Turkey/2010:01-2014:12	Right-Tailed ADF Unit Root Analysis	It was concluded that there is no housing bubble in the housing market in Turkey.
Shi (2017)	USA/1978-2015	VAR	It was determined that there has been a housing bubble that began in the mid-2000s in the US housing market; on regional level there were two housing bubbles from the end of the 1980s and from the beginning of the 2000s to the middle of the 2000s.
Vogiazas and Alexiou(2017)	7 OECD Country/2002-2015	GMM	GDP, the credit growth, long-term bond return, and real effective exchange rate are determinants of housing prices and also credit-based economies are influential in the spread of housing bubble.

From these studies Ardila et al (2013) identified the asset of bubbles in the Swiss housing market and the risk of occurrence, between the year of 2005 and 2013, the development of data of the housing prices in all Swiss regions have been analyzed through the log periodic power law (LPPL) bubble model. In the study, it has been found that housing bubbles were about to explode in 11 critical areas and the housing bubbles burst in 7 areas.

Basco (2014) analyzed the relationship between globalization and the evolution of rational bubbles in the 138 US Metropolitan areas with the data including the period from 1983 to 2007. In the survey carried out with the help of the fixed effect OLS model assumption, it has been found that the bubble will not be formed in a financially developed and autarchic country whereas as globalization increases, the sighting prevalance of bubbles in financially developed countries increases. In the study, it is also pointed out that with globalization, housing prices have also increased and the tendency of appearance of housing bubbles has increased.

Engsted et al.(2016) analysed the housing bubbles with the help of Phillips et al.'s right-tailed unit root analysis and the model of co-explosive VAR of Engsted and Nielsen in the housing market of 18 OECD countries from 1970 to 2013. The results of the study point to the asset of a housing bubble in many housing markets.

Xiao and Devaney (2016) studied the differences in price- credit relationship with the three-month using the Markov Regime Switching Model data between the years of 1983 and 2012 for 12 regions in the UK. According to the results of the study, it has been emphasized that the magnitude of the credit is a big influence on the housing prices in London, and also this influence has a positive feedback effect due to past price movements in the regions close to Great London.

Martori et al. (2016) made the spatial structure analysis of overgrowth in construction sector with the method of Explanatory Spatial Data Analysis (ESDA) in 6 large metropolitan regions in Spain between in 2001 and 2011. As a result of the study it was concluded that the spatial autocorrelation growed in the housing bubble of the period in question, and this growth was greater in urban areas such as Madrid, Barcelona and Zaragoza than in the past.

Caspi (2016) investigated whether there was a housing bubble at the regional and national level by right-tailed ADF and Generalized SADF Unit root analysis in Israel housing market in the period between 2008 and 2013. Empirical results indicate the asset of a housing bubble in Israel.

Shi (2017) investigated the asset of housing bubbles in the US national housing market and in 21 regional housing markets between 1978 and 2015 through the model of VAR by considering macroeconomic conditions (interest rate, per capita income, employment, population increase etc.) Findings from the study revealed that there was a housing bubble that began in the mid-2000s in the USA. At the regional level, on the other hand, it was found by the end of the 1980s and from the beginning to the middle of the 2000s that two housing bubbles were formed.

Vogiazas and Alexiou (2017) investigated the relationship between housing prices and the business cycle in 7 OECD countries during the period of 2002-2015 through the model of GMM (Generalized Moments Method). The results obtained show that GDP, the credit growth, long-term bond return, and real effective exchange rate are determinants of housing prices and also credit-based economies are influential in the spread of housing bubble.

On the other hand, the findings of a study where Solak and Kabadayı examined demand for housing in Turkey for the period 1964-2014 with the ARDL Bound Testing Approach revealed a positive relationship between the housing prices and the housing demand. It is emphasised that in the future the relation found in the study might feed a housing bubble in Turkey.

Zeren and Ergüzel (2015) analysed whether housing bubbles existed in Istanbul, Izmir and Ankara, which are the important parts of the Turkish housing market, with SADF and Generalized ADF (GSADF) Unit root analysis between January 2010 and June 2014. According to the results obtained by the researchers, there is no housing bubble in Housing Market in Turkey and the increases observed in the housing market are experienced in the short term, but not permanent in the long term.

Similarly, in an analysis performed with Right-Tailed ADF Unit root analysis in the period between January 2010 and December 2014 in Istanbul, Izmir and Ankara, Çoşkun and Jadevicius (2017) concluded that there was no housing bubble in Turkey Housing Market.

Finally, in order to determine the determinants of housing market in Turkey and the risk of bubble in the housing market, Coşkun et al (2017) used the sub-terms of 2010:01– 2014:12 and 2007:06–2014:12 through OLS/FMOLS/DOLS, Kalman filter and ARIMA models and they indicated that prices in the Turkish housing market were overvalued but that there was no bubble in the housing market.

3. DATA SET AND METHOD

In this study, it was aimed to determine the asset of the bubbles in the housing market in Turkey by using real housing price index and the real rental price index. For this purpose, the monthly data between January 2010 and November 2017 were used and the data were obtained from CBRT EDDS database in this study.

In the study, it was examined whether there are bubbles in the housing market by using the method ADF (SADF) of Phillips et al. (2011) and the generalized Dickey Fuller (GSADF) test of Phillips (2015). Because of their good performance in determining the speculative bubbles and when they occur, these methods are recursive and right-tailed unit root tests which have been frequently used in recent times.

The supremum ADF (SADF) test which is one of the most commonly used right-tailed unit root tests performed by Phillips et al. (2011), a standard extended Dickey-Fuller (ADF) test, was developed to determine speculative bubbles and when they occurred and as Homm and Breitung (2012) stated, this test shows great performance as well as other tests using similar procedures. SADF is essentially based on repeated assumption of the standard ADF test. The SADF test is obtained as the lower value corresponding to the ADF statistical sequence and it is determined by estimating the equality given in number 1 equation with minimum squares. (Philips et al. ,2015).

$$x_t=\mu_x+\delta x_{t-1}+\sum_{j=1}^{j} \emptyset j_j \Delta x_{t-j}+\varepsilon_{x,t}\ ,\varepsilon_{x,t} \sim NID(0,\sigma_x{}^2) \quad (1)$$

For several given values of J in Eq. 1, ND shows independent and normal distribution, and H_0:$\delta=1$ zero hypothesis and H_{01}:$\delta>1$ alternative hypothesis are formed in SADF right-tailed unit root test. At each passing one observation is increased in recursive regressions in sample data and as a result it can be estimated recursively using sub-sets.

$$\text{Sup}_{\ r\ \in[r0,1]}\ \text{ADF}_r \rightarrow \text{sup}_{\ r\ \in[r0,1]} \frac{\int_0^r \widetilde{W} dW}{(\int_0^r \widetilde{W}^2)^{1/2}} \quad (2)$$

Equation number 2 shows the W standard Brownian motion and $\tilde{W}(r)=W(r)-1/r\int_0^{r1} W$ the minimized Brownian motion. (Philips et al., 2011: 206-207) On the other hand, in case more than one bubble occurs in the literature, Phillips et. al (2015), who considered the criticisms of statistical power reduction of the SADF test, developed the generalized GSADF unit root test to cover the shortcomings of the SADF test. Even though the GSADF test has similiar characteristics with SADF, it differs from SADF as it uses recursive flexible estimations of the regression obtained from the standard ADF test while the test is calculated and takes into account long-running, nonlinear structures and structural breaks. In this regard, GSADF performs more effectively compared to SADF and standard ADF unit root test since it provides more consistent and accurate results in the case of existence of more than one bubble (Phillips et al.,2015). Even though The GSADF test depends on the recursive functioning of the ADF test in sub-samples similar to SADF, it is conceived as the largest ADF test being much wider compared to the SADF test.

Firstly, recursive regression equation number 3 is estimated in order to calculate the GSADF test statistic. Here, the k delay length is included in the equalization to represent the start and end points of the sub-sample, so that r1 and r2 recurcive regression estimations can be respectively performed. (Çağlı and Mandacı,2017:66).

$$\Delta y_t=\tilde{\alpha}_{r1,r2}+\tilde{\beta}_{r1,r2}y_{t-1}+\Sigma_{i=1}\tilde{\Psi}^{i}_{r1,r2}\,\Delta y_{t-l}+\tilde{\varepsilon}_t \quad (3)$$

The GSADF test equation number 3 is repeatedly estimated using sub-sets as future-dated for multiple sub-samples and unlike the SADF test, the sub-samples whose start points change dynamically and differentiate from the zero point at r1 are formed instead of the ending points r2 of the sub-samples. (Çağlı and Mandacı,2017:66). Thus the GADF test is calculated by means of the formula given in equation number 4. (Philips, Shi and Yu, 2015: 1049).

$$GSADF(r_0)=\sup_{r2\in r1\in[0,r2-r1]}[r_{0,1}]\ \{ADF^{r2}_{r1}\} \quad (4)$$

4. FINDINGS

In the study, it was aimed to determine whether the housing bubbles exist or not based on real housing price index and real rent price index. For this purpose, in SADF and GSADF tests which are used to determine the asset of bubbles and to determine when the bubbles are formed, Monte Carlo simulation with 1000 replications for each observation was used. The estimation results obtained are given in Table 2 and Table 3. The graphs for the SADF and GSADF tests are shown in Figure 1 and Figure 2.

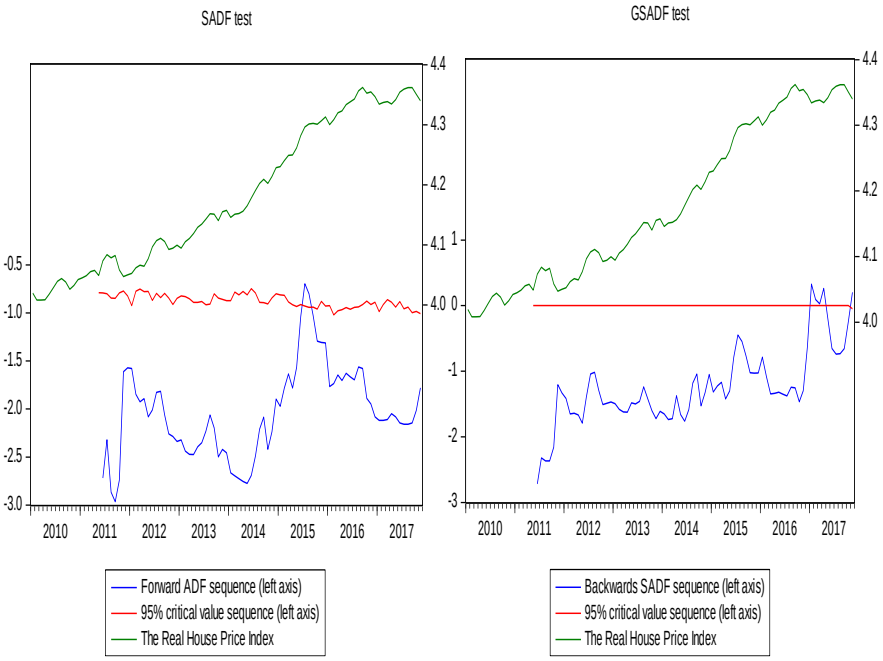
Table 2: SADF and GSADF Test Results for the Real House Price Index

	Test Statistic		
Parameter	**SADF**	**GSADF**	
Real Housing Price Index	-0.696 (0.49)	0.327 (0.35)	
Real Rent Price Index	-1.40 (0.85)	-0.218 (0.75)	
	Critical Value		
	% 1	% 5	% 10
SADF	0.879	0.473	0.186
GSADF	1.571	1.113	0.887

Note: ( ) refers to the probe values of the variables

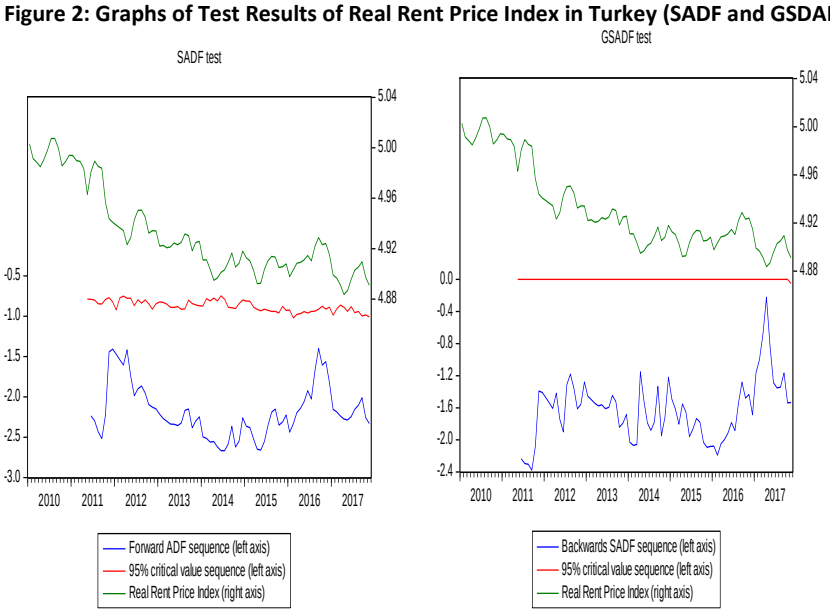
The SADF and GSADF test statistics given in Table 2 are statistically insignificant for the real house price index. In other words, this result shows empirical evidence that speculative bubbles do not occur in housing prices. In the light of the this result, Turkey blocked the creation of the housing bubble with adjustments through its internal dynamics and lack of macroeconomic spillover effect from Turkish mortgage markets. The SADF and GSADF graphs given in Figure 1 also indicate the housing price bubbles exist in the middle of 2015 and in the first months of 2017. This finding indicate that if the house prices continue to rise at same rate, there may be a risk of bubbles in housing market in Turkey.

Figure 1: Graphs of Test Results of Real Housing Price Index in Turkey (SADF and GSADF)



The SADF and GSADF test statistics given in Table 2 for the real rent prices index are also statistically insignificant. This conclusion implies that similar to real house prices index, it can not be concluded that there are bubbles in the speculative housing market. In other words, despite the rise in Turkey's housing rent prices due to the increase in demand for second hand house market and the temporary relocation activities during the demolition and reconstruction of buildings, it is not possible to mention the existence of bubbles in the period under review. The SADF and GSADF graphs given in Figure 2 also show that there is no bubble in the real rent prices index.

Figure 2: Graphs of Test Results of Real Rent Price Index in Turkey (SADF and GSDAF)



Considering together the results regarding the real housing price index and the real rent prices index in Turkey, even though the results obtained imply that there has been a forward risk of bubble in housing prices recently, it also indicates that housing bubbles were not empirically formed during the period under review.

5. CONCLUSION

Housing market is in serious interaction with the general economy. Creating different financial instruments on housing, presentating housing as assurance, impact of housing prices on saving and consumption through wealth effect are some of these possible interactions. The housing sector generally plays an important role in the global economy and financial sector bubbles. It has been observed that the wealth effect created by the housing bubble is greater than that of the stock bubble and the explosion of the housing bubble causes more damage to the economy than the other asset bubbles. For these reasons, developments in the housing sector should be followed carefully.

In this study, it has been determined whether housing bubbles exist or not based on real housing price index and real rent price index. For this purpose, in SADF and GSADF tests used to determine the asset of bubbles and to determine when the bubbles are formed, the Monte Carlo simulation with 1000 replications for each observation was used. The SADF and GSADF test statistics are statistically insignificant for the real house price index. In other words, this result provides empirical evidence that speculative bubbles do not occur in housing prices in line with Zeren and Ergüzel (2015), Çoşkun et al.(2017) and Çoşkun and Jadevicius (2017). Furthermore, SADF and GSADF graphs indicate that bubbles occur in housing price in the middle of 2015 and in the first months of 2017.

SADF and GSADF test statistics were found statistically insignificant for the real rent prices index. This conclusion implies that in the same way with the real house prices index, there is no bubble in real rent price index in the speculative housing market. Considering together the results regarding the real housing price index and the real rent prices index in Turkey, even though the results obtained imply that there has been a forward risk of bubble in housing prices recently, it also indicates that housing bubbles were not empirically formed during the period under review.

In recent years, the ongoing debate on the question of whether a housing bubble exists in Turkey was also mentioned in the last report of the International Monetary Fund (IMF). In the IMF's Global Monitoring Report in February 2017,it was stated that the value of housing swelled in Turkey but a macroeconomic expansion effect from the housing market was not expected. With population growth, income growth and increase in tendencies to be urbanized, the increase in housing demand all over the world in the last quarter of 1990s led to increase in residential sales prices. This increase turned into a downtick with the global crisis that began in 2008, but it did not last long. This tendency was experienced with a similar trend in Turkey. In addition, there are country-specific factors which increase significantly the demand for housing in Turkey. 50% of the population in Turkey is under the age of 30,and migration to cities and urban transformation continue. It is estimated that 85% of the population will be living in cities in 2023. In addition, infrastructure investments, especially investments in transportation, also support construction and sales of housing. Since new areas can not be created in city centers, prices are swelling with demand, but empirical findings show that we can not generalize it. In the recent period, with increase in exchange rates and interest rates, prices have risen more rapidly in some places and housing stocks of construction companies have increased. It is likely that this factor will also push prices down. This should not be confused with bubbles. As a result, there is no data with reference to housing price to say that there is the housing bubble in Turkey during the period under study. Turkey blocked the creation of the housing bubble in the period under review with corrections through its internal dynamics.

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WAS THE DOLLAR TREE – FAMILY DOLLAR MERGER SYNERGIC?: FINANCIAL STATEMENTS ANALYSIS

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ABSTRACT

Purpose- Family Dollar and Dollar Tree were the second and the third largest firms in the discount variety store industry in the United States of America. In July 2014, Dollar Tree made an offer to acquire Family Dollar, citing potential synergy. In this study, we examined whether the expected benefits from the Dollar Tree-Family Dollar merger materialized.
Methodology- We examined the pre-merger and post-merger performance of the two companies by analyzing the companies' annual financial statements. Improvements in performance of the merged company should be reflected in better financial ratios for the post-acquisition period compared to the pre-acquisition period.
Findings- We found an across-the-board improvement in the financial ratios and a possible decrease in systematic risk after the merger of the two companies.
Conclusion- Our analysis of financial statements indicates possible synergy in the merger of Dollar Tree and Family Dollar.

Keywords: Financial statements, financial ratios, performance, merger, pre and post-merger analysis
JEL Classification: G34, M41

1. INTRODUCTION

Financial statements and their accompanying notes contain a wealth of useful information regarding the financial position of a company, the success of its operations, the policies and strategies of management, and insight into its future performance. The objective of this research paper is to find and interpret this information to answer questions about Dollar Tree, Inc. Dollar Tree acquired Family Dollar in 2015, motivated by potential synergy between the two companies. Almost three years have passed since the acquisition. By examining the financial statements of Dollar Tree and Family Dollar over time, we try to find if there is any evidence of synergy since the acquisition. Although a company's performance is influenced significantly by its management, factors beyond its control such as industry-wide and economy-wide factors could also have an impact. To control for these effects and evaluate the performance relative to the industry, we compare the performance of Dollar Tree with Dollar General which was the largest company in the industry before the Dollar Tree-Family Dollar merger and the second largest company after.

Examination of financial statements addresses significant questions such as "would an investment generate attractive returns? What is the degree of risk inherent in the investment? Should existing investment holding be liquidated? Does the company provide a good opportunity for employment, future advancements, and employee benefits?" The financial statements and other data generated by the three companies for the past ten years can help us answer some of these questions as well as many others. For our analysis, we mainly use the annual reports published by the companies primarily for the shareholders and the public. The Securities and Exchange Commission requires large, publicly held companies to

annually file a 10-K report. This filing is generally a detailed document, which regulators, analysts, and researchers use. We will explain and interpret the financial statements and supplementary data contained in these financial statements.

2. LITERATURE REVIEW

The three companies discussed in this study are Dollar Tree, Family Dollar, and Dollar General. Of the three, Dollar General is the oldest. Dollar General began its operations in 1939 as a family owned business in Kentucky, with the name J.L. Turner and Son. In 1968, it went public with its new name, Dollar General. In July 2007, Dollar General was acquired by private equity investors. It went public again in August 2009 with Richard W. Dreiling as the CEO and Chairman of the Board.

Leon Levine opened Family Dollar in Charlotte, North Carolina, in 1959. He first considered buying a franchise of Dollar General but decided to start his own company. Eleven years later, in 1970, Family Dollar had its initial public offering. When Leon Levine retired in 2003, his son Howard R. Levine succeeded him as Chairman and CEO.

Dollar Tree, the youngest of the three companies, traces its origin to Ben Franklin store—a variety store—started by K. R. Perry in 1953 in Norfolk, Virginia. Subsequently, K. R. Perry, along with others, started chain stores called "Only $1.00." At inception, the company had only five stores—one in Georgia, one in Tennessee and three in Virginia. The name of the company was changed from "Only $1.00" to Dollar Tree in 1993 and went public on March 6, 1995. In 1999, Bob Sasser was hired as its Chief Operating Officer. He was promoted to CEO in 2004.

Although all three companies focused on selling household and variety products at a low price, Dollar General and Family Dollar had more in common with each other than with Dollar Tree. Dollar Tree followed a single-price format, meaning it sold the products at one price, mostly a dollar (or below), whereas Dollar General and Family Dollar sold products priced over a range, up to ten dollars.

The financial crisis of 2007 brought good times for the discount variety store business. However, as the market began to slow down, Family Dollar was affected considerably and became a potential target for acquisition. Dollar General seemed an ideal company to acquire Family Dollar because of their similarities in products and pricing strategies. Ironically, these similarities stood in the way of a merger of the two.

Family Dollar and Dollar General held talks regarding a possible merger of the two companies. However, in a surprise move, on July 28, 2014, Family Dollar announced that it agreed to be acquired by Dollar Tree for an 80/20 cash/stock deal, worth $8.5 billion—a 23% premium of Family Dollar stock price at the time. A few days after the announcement, on August 18, 2014, Dollar General made an all cash $9.7 billion bid to acquire Family Dollar. Leon Levin, the then CEO of Family Dollar, was not in favor of the Dollar General offer because of the regulatory issues the merger would bring. He argued that as Family Dollar and Dollar General sold similar products and were competitors in most of their locations, there could be problems getting approval from the Federal Trade Commission. In Levin's opinion, the Dollar General deal would raise more objections by the regulators than the Dollar Tree deal. Levin also mentioned that although Dollar General had plenty of time to make an offer earlier it chose not to do so, thus questioning the motive behind the offer. In January of 2015, after a favorable review by the FTC, Family Dollar shareholders overwhelmingly approved the Dollar Tree offer, effectively ending Dollar General's acquisition attempts.

When Dollar Tree made the offer to acquire Family Dollar in July 2014, the offer was justified by citing potential synergies from the combined operation of the two firms. It was believed that the merger would result in annual savings of about $300 million from an increase in buying power, consolidation of distribution networks, and a wider range of product offerings. It has been about three years since the acquisition took place. In this study, we examine whether the expected benefits for the Dollar Tree-Family Dollar merger materialized.

3. DATA AND METHODOLOGY

Analysis of Dollar General, Dollar Tree & Family Dollar's Financial Statements

Financial statements provide insight into a company's status and lead to the development of policies and strategies for the future. It should be pointed out, that company management is responsible for preparing the financial statements. Researchers pay careful attention to the financial statements' notes and supplement their analysis with other material in the annual reporting and sources such as pre and post-merger analysis.

Before beginning the analysis of the Dollar General, Dollar Tree and Family Dollar financial statements, it is necessary to specify the objectives of the analysis. The primary purpose of the paper is to examine whether the acquisition of Family Dollar by Dollar Tree resulted in improved performance. We analyzed performance by the commonly used financial ratios that measure a firm's activity: profitability, costs, etc. To compare the post-merger performance with pre-merger performance, we computed the financial ratios for the pre-acquisition and post-acquisition time-periods. During the pre-acquisition period Dollar Tree and Family Dollar were two independent firms. Therefore, to compare their pre-and post-

merger performances, we created a hypothetical company (a combination of the two) by pooling the accounting figures of Dollar Tree and Family Dollar. We refer to the pooled data of the two companies as "Dollar Tree+Family Dollar."

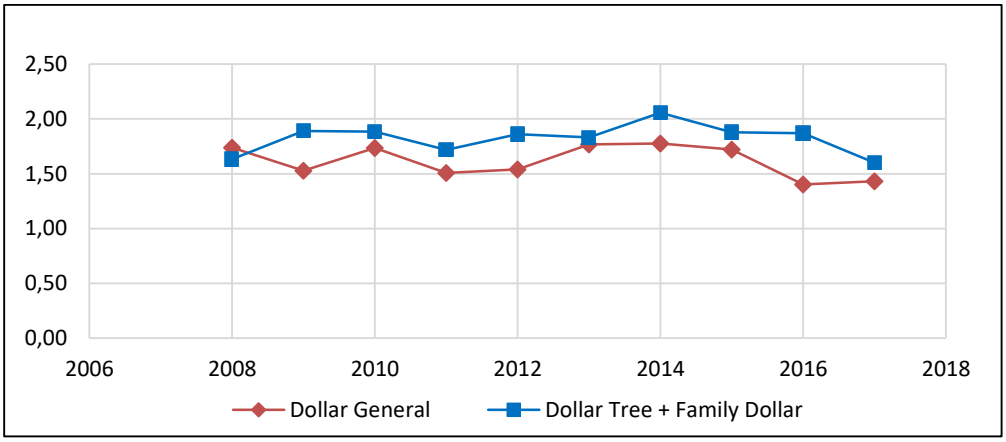
After the merger, the name of the combined company has been Dollar Tree. Therefore, reference to Dollar Tree for the post-merger years-- 2015, 2016, and 2017--indicates the merged companies. Improvements in performance of the merged company should be reflected in better financial ratios for the post-acquisition period compared to the pre-acquisition period. However, performance of a firm could also be affected by factors not under the firm's control, such as unexpected changes in the industry and the wider economy. To control for these external factors and check the performance relative to the industry, we computed the same financial ratios for Dollar General, a company that operates in the same industry and is comparable to Dollar Tree in several aspects.

4. FINDINGS AND DISCUSSIONS

4.1. Liquidity Ratios: Short-Term Solvency

Current Ratio is a commonly used measure of short-term solvency, the ability of a firm to meet its debt requirements as they come due. Current Liabilities are used as the denominator of the ratio because they are considered to represent the most urgent debt, requiring retirement within one year or one operating cycle. The available cash resources to satisfy these obligations must come primarily from cash or conversions to cash of other current assets. The trend of current ratio for Dollar Tree + Family Dollar ranged from 1.6 to 2.0 for the past 10 years. As shown in Figure 1, this ratio for the post-merger period declined slightly for Dollar Tree but compares well with its main competitor Dollar General.

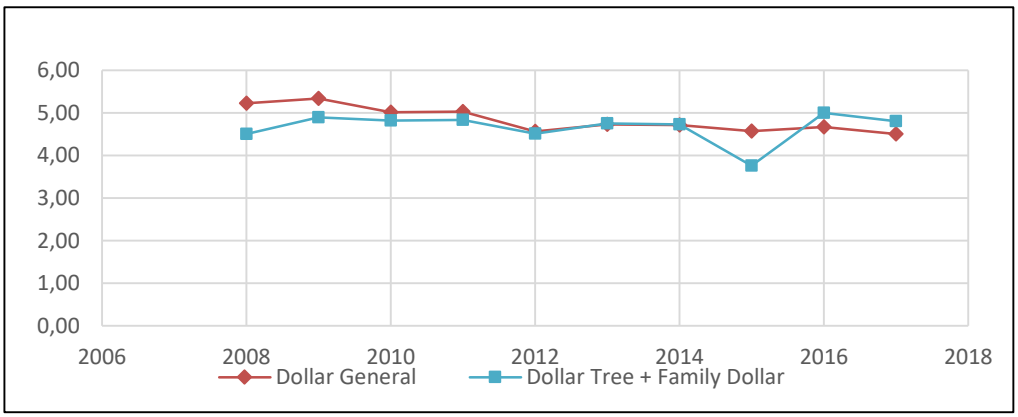
Figure 1: Current Ratios for the Pre-merger (2008-2014) and Post-merger (2015-2017) Periods



4.2 Activity Ratios: Asset Liquidity, Asset Management Efficiency

Inventory turnover measures the efficiency of the firm in managing and selling inventory. It is a gauge of the liquidity of a firm's inventory. The ratio is calculated with net sales in the numerator and average inventory as the denominator. As shown in Figure 2, the inventory turnover for Dollar Tree + Family Dollar ranged between 4.5 and 5 over the pre and post-merger periods. In 2015 the ratio dropped, but it recovered significantly after 2016 and showed a better turnover compared to Dollar General, although the difference is not much.

Figure 2: Inventory Turnover Ratios for the Pre-merger (2008-2014) and Post-merger (215-2017) Periods



This is a sign of efficient inventory management; a faster inventory turnover, after acquisition period, implies a higher profit for the merging companies.

4.3. Profitability Ratios: Overall Efficiency and Performance

Return on Assets indicate the profit earned relative to the level of investment in total assets. As shown in Figure 3, the pooled data of Dollar Tree and Family Dollar indicate that the ROA had been declining since 2012. The steepest decline for the merged firm was in 2015, the first year after the merger. The substantial decline in the performance of the merged company during that year could be attributed to the merger activities and related expenses. However, after the merger, there has been considerable improvement in the profitability, as reflected in the increase in ROA. If the trend continues, its ROA could come back to the pre-merger level and even reach higher values.

Figure 3: Return on Assets for the Pre-merger (2008-2014) and Post-merger (2015-2017) Periods

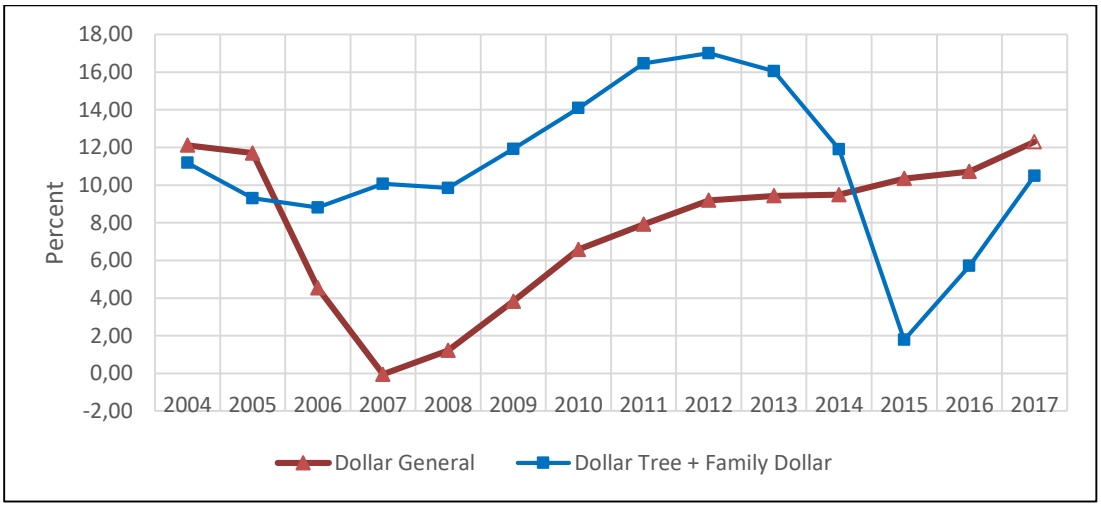


Figure 4 shows Net Income as a percentage of Net Sales for the Dollar Tree+Family Dollar pooled data for the pre-merger 2008-2014 period and the post-merger data. This ratio corroborates the ROA figures discussed above. The dramatic decline in net income in 2015 for Dollar Tree was due to the merger related expenses. It may be noted that in a very short time the ratio climbed back to the pre-merger level and surpassed not only its past record, but the its main competitor and our benchmark company, Dollar General. The trend in performance after merger shows a solid improvement from the acquisition.

Figure 4: Net Income as a Percent of Annual Net-Sales for the Pre-merger (2008-2014) and Post-merger (2015-2017) Periods

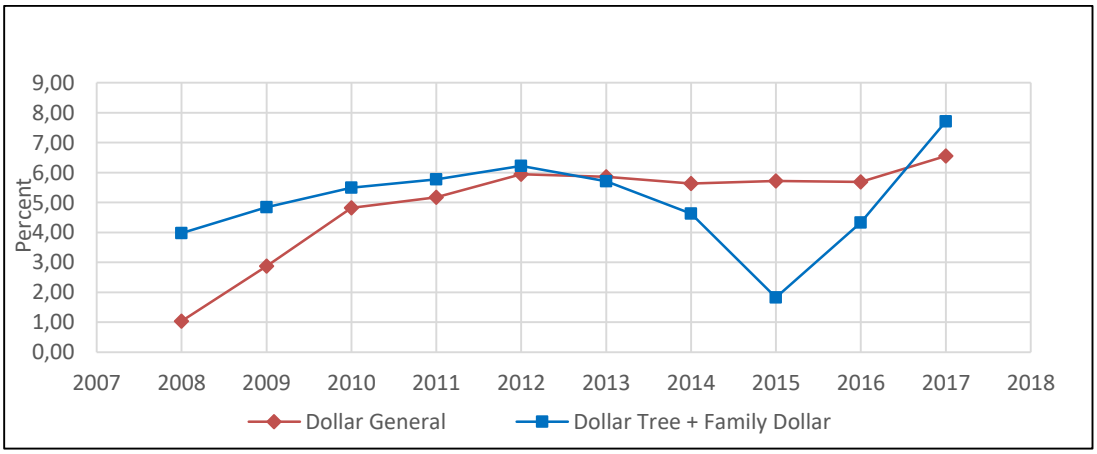


Figure 5 shows annual net sales of the three companies before the merger. We can note that Dollar Tree and Family Dollar were much smaller than Dollar General before the merger. The two companies were, individually, about half the size of Dollar General by sales.

Figure 5: Annual Net Sales for the Pre-merger Period

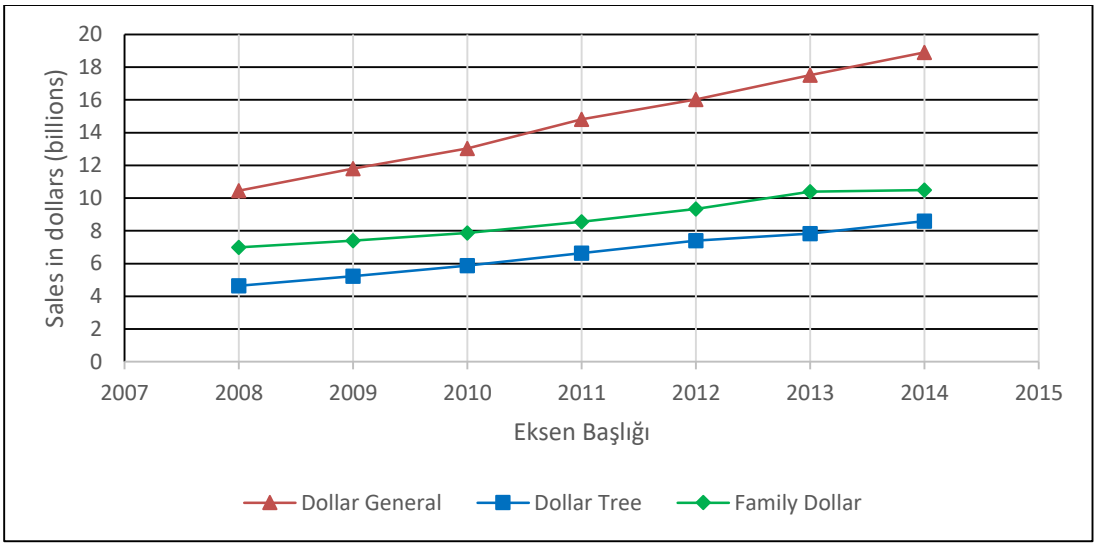


Figure 6: Annual Net Sales for the Pre (2008-2014) and Post-merger (2015-2017) Period

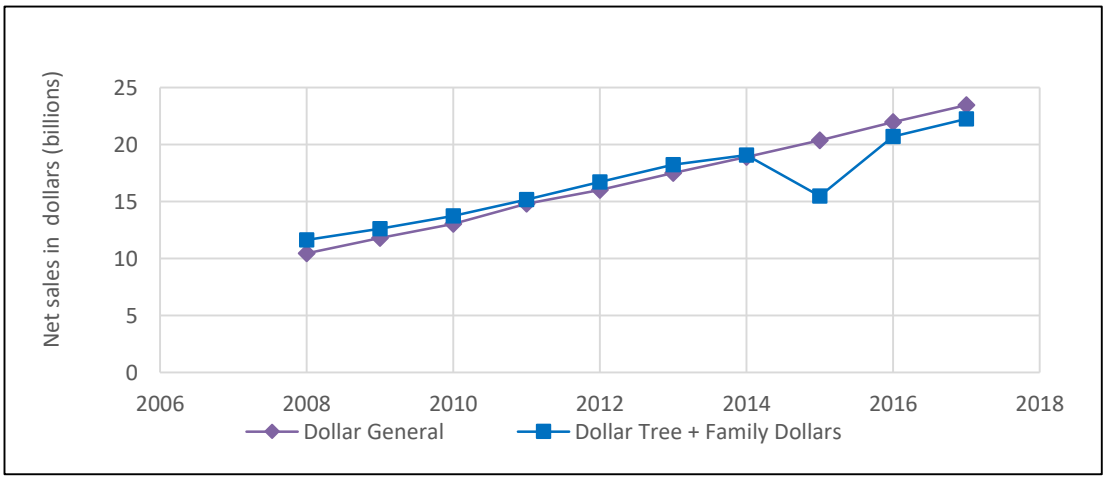


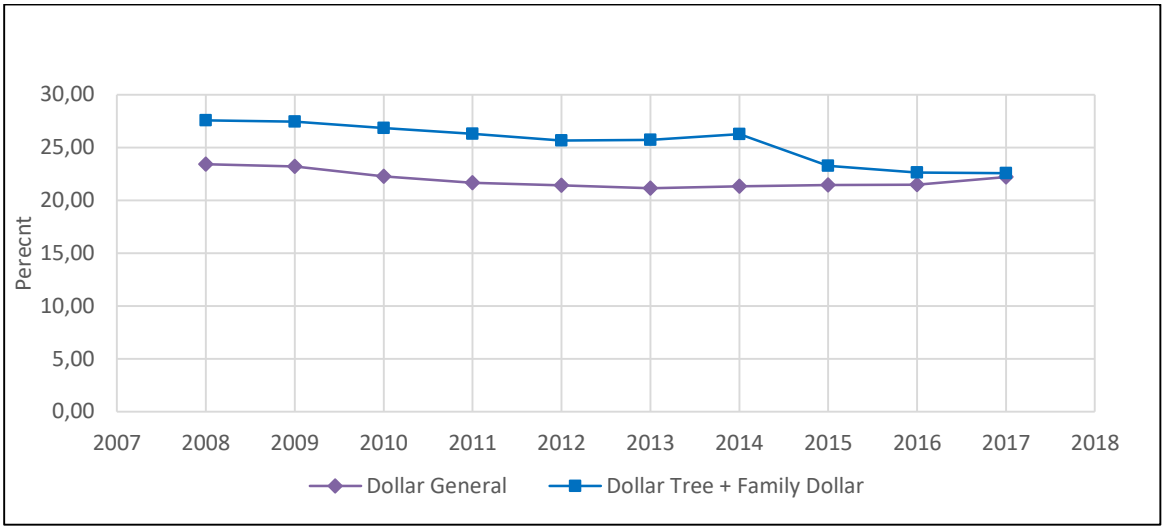
Figure 6 shows the annual net sales of the Dollar Tree+Family Dollar combination for the pre-merger as well as the post-merger periods. For the pre-merger period, we find the combined net sales of Dollar Tree and Family Dollar was just about the same as Dollar General. During the year immediately following the merger activities (2015), the net sales of the merged Dollar General decreased considerably. However, soon after that the net sales for the merged firm picked up significantly. By net sales, Dollar Tree still fell short of Dollar General, but only slightly.

Before the Dollar Tree + Family Dollar deal was approved, Dollar General was in fierce pursuit of Family Dollar. One of the reasons that the deal did not go through was that, without significant changes, the combination of Dollar General and Family Dollar would likely reduce the competition in that segment of the industry. The Dollar Tree-Family Dollar has probably resulted in greater competition in the industry because now there are two equally large companies in the industry.

The merger of Family Dollar with Dollar Tree also increased efficiency by reducing selling and administrative expense and that gives the merging company a competitive performance with Dollar General. Figure 7 shows Selling and Administrative expenses as a percent of net sales. The graph indicates that this ratio after the merger had improved considerably relative to its pre-merger values. The graph also indicates that Dollar General had consistently outperformed the Dollar Tree +

Family Dollar combination during the pre-merger period. In the post-merger period, although Dollar General maintained its performance, its competitive edge as reflected in this measure has declined relative to Dollar Tree. In the year 2017, both companies had the same selling and administrative expenditure as a proportion of net sales.

Figure 7: Selling and Administrative Expenses as a Percent of Annual Net Sales for the Pre-merger Period (2008-2014) and the Post-merger Period (2015-2017)



Systematic Risk

Textbooks show that a merger of two companies for the sole purpose of risk reduction could be value destructive. Such mergers, known as pure conglomerate mergers, that have no impact on the operations or profitability of the firms, incur only costs with no accompanying benefits. Investors can attain such risk reduction through portfolio allocation on their own at much lower costs. In this section we discuss whether the Dollar Tree – Family Dollar merger resulted in reduced risk, a risk reduction that investors might not have been able to achieve by themselves.

Systematic risk (beta) quantifies the non-diversifiable risk of an asset. It captures the relationship between a stock's returns and the market portfolio. The beta of a portfolio of two stocks is the weighted average of the betas of the individual stocks weighted by the proportion of investment on the individual stocks. To compare the betas of two companies before and after merger, we have to use the pre-merger market capitalization as weights and the betas of the two companies to compute the weighted average. The weighted beta can be compared with the post-merger beta to check if there has been any significant changes. Even in the absence of the knowledge of the market capitalization of the two companies, in certain cases, we could make some guesses. For example, assume the pre-merger beta of one company's stock is one and the beta of another company's stock is two. A pure conglomerate merger would result in a beta between one and two for the combined company's stock, as the resulting beta must lie between the individual companies' beta.

To document and examine any changes in the beta of Dollar Tree after acquisition, we estimated the beta for the periods before and after the merger. We used the monthly returns of stocks for the immediate past thirty-six months to estimate the beta for a given month. For example, to estimate the beta for January 2014 we used the returns for the preceding thirty-six months — from January 2011 to December 2013. Although generally betas are estimated using sixty monthly returns, we use thirty-six months because of data limitations. As it is not yet sixty months since the Dollar Tree-Family Dollar merger was voted on, we do not have the conventional sixty monthly returns to get this estimate. However, estimates with less than sixty monthly returns are not uncommon. For example, Yahoo. Finance, a popular financial web service, uses thirty-six monthly returns to estimate betas.

We estimated the beta for Dollar Tree as well as Family Dollar for every month from November 2012 – May 2014. We excluded the June 2014 – January 2015 period because the stock price of the companies we examined could have been affected more by the acquisition related news than the broad market forces that are relevant for estimating beta. Three major events pertaining to the merger took place in June, July, and August of 2014 that affected the stock price of Family Dollar significantly. In June 2014 Carl Icahn, an activist investor, announced that he had acquired 9.5% equity of Family Dollar. In July 2014 Family Dollar announced that it had agreed to be bought by Dollar Tree. In August 2014 Dollar General made a competing offer to buy Family Dollar. These announcements affected the price of Family Dollar significantly. We also excluded stock returns in the remaining months of 2014 and January 2015 from analysis because there was news

about acquisition related activities until January 2015. In January 2015 Family Dollar stockholders voted overwhelmingly approving the Dollar Tree offer and ended the acquisition battle between Dollar Tree and Dollar General.

Figure 8: Estimates of Beta before the Merger

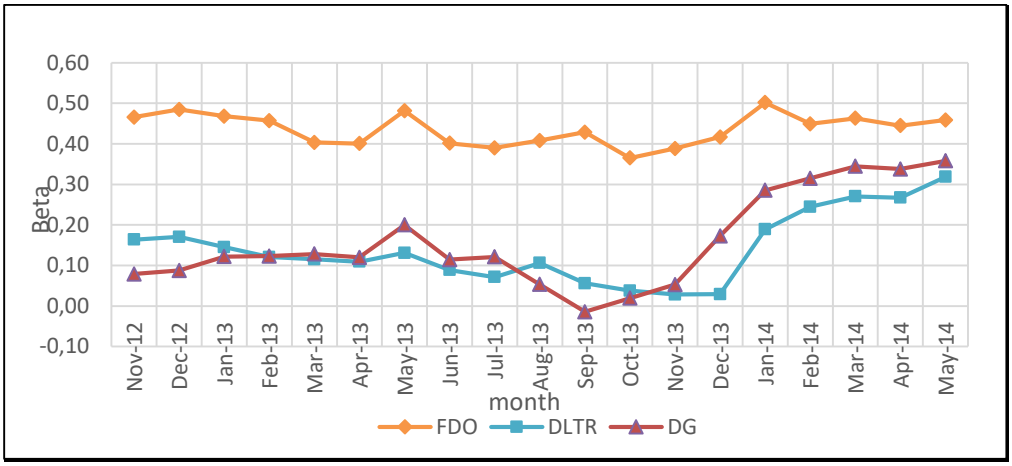
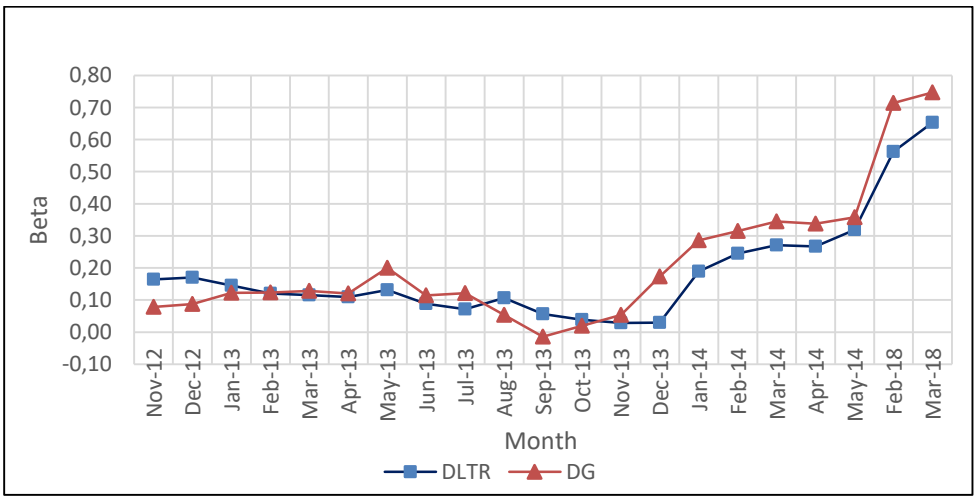


Figure 8 shows the estimates of beta for Dollar Tree, Family Dollar, and Dollar General before the merger. Although both Dollar General and Family Dollar had low betas (less than 1), Family Dollar's beta was relatively high—ranging between 0.40 to 0.50, about four times that of Dollar General. The estimates of betas of these two companies contradict the popular notion that these two companies were very much alike. In contrast, our analysis indicates that the betas of Dollar General were much closer to those of Dollar Tree during the pre-merger period. Both had almost the same betas, below 0.20 until the end of 2013 and started increasing in early 2014. Therefore, for the pre-merger period, for the Dollar Tree + Family Dollar combination the beta would have been higher than Dollar General's.

For the post-merger period, we could estimate beta for only two months—February 2018 and March 2018. As we needed thirty- six monthly returns to estimate beta, staring from the month after the voting on merger, the first month for which we could estimate beta was February 2018. We added the estimated beta for February 2018 and March 2018, the two months in the post-merger period to the pre-merger period estimates as displayed in Figure 9.

Figure 9 shows that, after the acquisition, the beta of Dollar Tree is less than the beta of Dollar General—just the opposite of pre-merger estimates—indicating that after the merger, the policies implemented by the merged firm could have reduced the systematic risk for the merged firm. This reduction in beta might not have been possible through portfolio reallocation by investors. It a benefit to the stockholders of Dollar Tree and Family Dollar that the companies could not have provided had they remained as independent firms.

Figure 9: Estimates of Beta for the Pre-merger Period (November 2012 – May 2014) and Post-merger Period (February and March 2018)



5. CONCLUSION

The analysis of the financial statements of Dollar Tree, Family Dollar, and Dollar General consist of a mixture of steps and pieces that interrelate and affect each other. No one part of the analysis should be interpreted in isolation. Short-term liquidity impacts profitability; profitability begins with sales, which relates to the liquidity of assets. The efficiency of asset management influences the cost and availability of credit, which shapes the capital structure. Every aspect of the three firms' financial condition, performance, and outlook affects the share prices.

Data indicates that the sales of (merged) Dollar Tree improved after an initial decline in 2015. During the same period, the sales of Dollar General had also increased. Therefore, the merger by itself does not seem to have resulted in significant increase in sales for Dollar Tree. It could have been an industry wide factor. However, during the post-merger period, Dollar Tree's operational efficiency increased, relative to the industry benchmark, as indicated by ratio analysis. Further, there seems to be some evidence of a reduction in systematic risk after the merger that the shareholders of Dollar Tree and Family Dollar could not have attained otherwise.

Our analysis shows that the merger of Family Dollar with Dollar Tree puts the merging company in a competitive edge with its rival Dollar General in all financial aspects and performance. The pre and post-merger data analysis indicates that, within a few years of the merger, there seems to be some evidence that Dollar Tree's prediction of potential synergies from merger is validated.

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MODERATOR EFFECT OF RDI ON FIRM FINANCE PERFORMANCE: TAIWAN TEXTILE INDUSTRY

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ABSTRACT

Purpose- Is the textile industry only pursuing high labor intensity, low value added products and moving factories to reduce production costs? Just only high tech industries alone emphasize research and development investment(R&D) and pursue high value added products?
Methodolog - This study examined the impact of R&D investment on the finance performance of the Taiwanese textile industry, for the period 2006-2016. A panel data model was used to empirically analyses the impact of R&D intensity (RDI), firm size on finance performance.
Finding - RDI of the textile industry has a positive impact on financial performance and lag periods. In regard to the resource based view, the resources owned by an enterprise are positively correlated with performance. However, this study also finds that RDI as moderator effect for firm's size on finance performance.
Conclusion- The effect of R&D on finance performance is not only limited to the high tech industry. This indicates that RDI affect firms' sustainable management.

Keywords: R&D intensity、finance performance, knowledge absorptive capacity, firm Size, textile industry
JEL Codes: O30, M00, D83

1. INTRODUCTION

The textile industry has a long history as a leading industry from the Industrial Revolution onwaeds, and now has become a typical low tech industry (Von Tunzelmann & Acha, 2005). However, with the use of synthetic fibers in the early 1920s, and the smart textiles recently launched (Lu, 2012). Traditional industry regarded innovative activities and the ability to adapt to changing needs and environment as the basis for their competitiveness. External R&D absorption varies between industries, so firms should concentrate on the innovation and absorption of R&D needs, even in low tech industries (Naanaa & Sellaouti, 2017). In policy, government encourages high tech companies to do more R&D and often subsidizes a certain amount (Xing M, 2018).

Specifically, the textile industry has attached great importance to labor-intensive textiles and clothing since the 1980s. Nonetheless, Taiwan is a small open economy and depends on the import of raw materials. Due to the shift of manufacturing industry and soaring labor costs, to remain competitive, the manufacturers of many companies in this industry outsourced their production to other countries/regions with lower labor and production costs. Taiwanese firms needs focused on high tech man-made fibers and other knowledge intensive textiles which required greater R&D abilities and more advanced technology (Chang & Robin, 2012). Chiao (2013) R&D activities on business financial performance

clearly suggested that R&D exerts a certain impact on the yield ratio of manufacturers' daily business income and on their operation. Therefore, firms must stress RDI in order to improve future business value.

In the current literature it is found that Companies with the traditional industries pay less attention to R&D than high tech industries. This study will probe into the above issues, and conduct an empirical study on Taiwan's textile industry within the traditional industries. In order to streamline the study, it will eliminate other external factors and only focus on whether the manufacturers' business performance will be affected by RDI and certain operational factors on the part of the manufacturers. This empirical study is designed to explore the following issues: (1) The related impact of the lagged effects of R&D on the manufacturers' operation and financial performance. Whether the characteristics of lag effect of R&D exist as textile industries. (2) Exploration and empirical research into the resource-based view and R&D; R&D and knowledge absorptive capacity were examined respectively. This study collected information, regarded the relevant impact of RDI in the R&D activities of companies in China's Taiwan as the subjects, and provided the empirical results to the managers or R&D entities for reference.

2. LITERATURE REVIEW

This chapter will explore and propose research hypotheses of the impact of knowledge absorptive capacity and RDI in firms' R&D activities on business performance, as well as firm size and performance in the resource-based view.

2.1 Resource-Based View (RBV and R&D)

R&D investment is innovation activies. Poldahl (2012) firms' R&D activities and total factor productivity growth is fixed. R&D seems to not only directly lead to productivity growth, but indirectly to innovations which beat competitors and other companies. In respect of firm size, Lee et al., (2010) took Korean firms as examples and found that firm size in different industries impacted innovation performance. They believe that firm size is positively correlated with innovation performance. They also point out that larger firms are more capable of increasing investment in innovative talents and capital due to sufficient funds. On the contrary, small firms fear unknown risks and therefore will not invest a great amount of resources in innovation. Large firms attach greater importance to in-house R&D innovation activities, external R&D innovation and other innovation activities than small firms. Kiran, R. (2017) Investing in R&D firms is likely to add value to existing products, but its impact may be limited to a few medium sized and large businesses, as most small businesses lack the immense resources needed for their products.

Urata & Kawai (2002) examined various aspects of total factor productivity across different firm sizes in Japan, and indicate that larger firms had higher total factor productivity levels and growth. Barney et al.,(2001) firm can develop short-term business performance and long-term sustainable competitive advantage by virtue of their unique resources and capabilities.

Legros & Galia (2012) firm size have a positive impact on the decisions and intensity of R&D. De & Nagaraj (2014) small firms have the advantage of more flexible management and lower response time to market changes, larger firms have the advantages of economies of scale and political clout. Chen & Chang (2010) R&D performance of the US pharmaceutical industry that larger firms can make use of more resources than small firms do. The advantages of firm size in the pharmaceutical industry are significant. When pharmaceutical firms have more resources to carry out R&D activities, it enables better R&D performance and generates better profitability. However, some scholars indicate that smaller companies have an advantage over large companies in producing more new products per unit of R&D investment, but that this advantage was overshadowed by a decline in the quality of their innovative products (Lejarraga & Martinez, 2014). As can be concluded from the above opinions, the larger the firm size have more resources (R&D、sales and advertising budget), the better the resources can promote finance performance. Therefore, this study offers the following hypotheses:

H1: firm's resource are proportional to finance performance.

2.2 Exploration of R&D Activities

2.2.1 R&D and Knowledge Absorptive Capacity

Firm's R&D has started a new round of knowledge transfer process, bringing new knowledge and skills unique to the firm to further improve product quality and grade, production process or reduce production costs, and finally reflects the financial statements. And the study of knowledge as a key determinant of economic growth(Sokolov-Mladenović, Cvetanović, & Mladenović, 2016). Legros & Galia (2012) knowledge accumulation is one of the most important characteristics of innovation. The accumulation of knowledge arises from complex and dynamic interactions between a firm's own internal capability and external expertise. R&D remains important in the innovation process, but it must be integrated with knowledge from other sources, such as training and knowledge capitalization.

Cohen & Levinthal (1989, 1990) proposed two aspects of R&D: 1. A firm's ability to enhance the assimilation of knowledge, explore and absorb knowledge of the external environment through its own R&D is referred to as "Absorptive Capacity". 2. New knowledge developed from a firm's investment in R&D. A firm's R&D not only generates innovation and new knowledge, but also develops the firm's ability to identify opportunities. Kim (2015) argues that absorptive capacity may be the byproduct of R&D investment and participation in export markets. However, the author of this argument properly questioned that when a manufacturer focuses on R&D, in case of unchanged time required and other conditions, an enterprise's absorptive capacity should be enhanced. This should be more appealing to manufacturers in making investments. Ferragina & Mazzotta (2014) firms in the high tech-intensive industries are more likely to benefit from FDI. Becker & Hall (2013) government funding is significant only for low tech R&D, while foreign R&D and skilled labor matter in high tech sectors. Naanaa & Sellaouti (2017) R&D enhances a firm's knowledge absorptive capacity. The understanding of mechanisms by which technology is involved in determining business performance differs depending on the industry studied (depending on whether it is high or low technology), the level of human capital, and also the importance of trade and the foreign direct investment. RDI has a certain impact on business performance. Vithessonthi & Racela (2016) RDI as a means by which firms engage in both exploitative and explorative forms of knowledge acquisition.

2.2.2 RDI and Finance Performance

Lu (2012) textile firms that rely on acquiring new machinery、technology and are involved in internal R&D activities, are more likely to have more highly effective R&D, which translates into a positive profit margin. RDI does not contribute significantly to R&D effectiveness. However, to offset increasing production cost and sustain its diminishing low-cost comparative advantage, the textile industry's next step was to focus on R&D to keep the industry competitive in the global marketplace.

Bogliacino (2013) explored the determinants of industries' RDI, innovative turnover and profit growth, and highlighted the complexity of relationships, reciprocal influences and feedback loops for 38 manufacturing and service sectors in 8 European countries for two periods from 1994 to 2006. Greater R&D expenditures resulted in successful innovations. The ability to realize innovations led to high entrepreneurial profits, and higher business income encouraged the manufacturers to make a greater commitment to invest in technological improvement. Industries, innovation and performance showed a dynamic and interactive relationship. Li (2011) foreign technology alone did not facilitate innovation in Chinese high tech enterprises, unless in house R&D was also conducted. In contrast, domestic technological R&D absorptive capacity was found to have a favorable direct impact on innovation. As a result, it can be observed from his study that internal R&D expenditures are far more important that the introduction of foreign technology (Haberl, 2015). The global textile industry was confronted with rising raw material, labor and transportation costs, yet it still concentrated on a relatively low product value chain. Typically, the enterprise value chain needs to increase expertise and R&D to improve corporate profits. Generally, improving a value chain by R&D activities is one of the industry indicators.

They also propose an overall long-run effect of R&D investments on the knowledge production required by firms, such as the innovation process of pharmaceutical firms. R&D innovation activities affect a company's performance, and R&D during the time difference (lag effect) would be directly proportional to firm performance (Falk, 2012; Maliranta, 2005). Lin (2006) indicates that lagged effects would be produced for 4 years, resulting from R&D investment. Wang & Hagedoorn (2014) lag 1 year being significant in all distributed lag specifications. However, R&D has a lagged effect, but there is no consensus about lag periods.

Based on the above viewpoints,(1) R&D activities and intensity of R&D investment help to improve an enterprises' absorptive capacity, which in turn enhances the firm’s innovation and business performance.(2) Due to differences in industrial structure and in the requisite technical skills, the effectiveness varies. The high tech industry focuses more on R&D activities and investment than the traditional industries do. The textile industry manufacturers in Taiwan also began to develop higher value added textile products, which exerts a positive impact on the manufacturers' finance performance. Therefore, this study offers the following hypothesis:

H2: R&D intensity has a lagged effect and positive effect on finance performance

H3: R&D intensity as moderator effect for firm's size on finance performance

3. DATA AND METHODOLOGY

3.1.1 Data Sources

We drew data from the Taiwan Economic Journal (TEJ) and the Taiwan Stock Exchange Corporation’s Market Observation Post System. It sorted and analyzed published financials of companies from 2006 to 2016. To improve accuracy of assessment, we excluded firms that were acquired, delisted, presented no data, or had missing values during the period. We disregarded firms that had not existed or had not been publicly traded at least 6 years, 52 firms remained for study.

3.1.2 Methodology

This paper conducted an empirical study on panel data. All variable data were first subject to a panel unit root test to confirm whether the data were stationary. This study then examined whether the empirical data presented in this paper were stationary by means of the LLC test (Levin, Lin & James Chu, 2002) and the PP test (Maddala & Wu, 1999).

In this study, panel data was used for analysis. panel data, also known as "vertical and horizontal data", this analysis combined with cross-sectional data and time series data analysis method, for each study of the company for a period of continuous observation, the observed data is vertical and horizontal information. Hausman test can be performed first. If the test statistic rejects null hypothesis, Establish a fixed effect model; if you cannot reject the null hypothesis, the use of random effects model. According to the test results, we use the fixed effects model in panel data to analyze the effects of unobserved variables on the model by adding dummy variables to measure the differences among different companies. In the meantime, Dummy variables, in order to control the impact of different years.ε_t is the residual of time period t, it is used to test for the existence of autocorrelations in the residuals, and use Durbin-Watson statistics to test for the presence or absence of autocorrelation in errors.

3.1.3 Model Variables

Business performance is affected by fluctuations in the macro economy and by microfactors such as firm size, debt, competitors, market share, domestic tax rates, international trade tariffs, exchange rates, natural disasters, and many other factors. Therefore, it is impossible to consider all the factors. This article focuses on the internal impact of the company, and lists the following variables.

Dependent Variables

Finance performance: ROA (return on assets,ROA) = (earnings before interest, taxes, depreciation and amortization/average total assets) is often used to measure business performance, innovation performance and business profitability indicators. Vithessonthi & Racela (2016) ROA to measure firm performance.

Independent Variables

(1) RDI (R&D intensity ,RDI) is the result of dividing a company's R&D expenses by net revenues over a certain period. RDI)= R&D expenses/net operating income. Gentry & Shen (2013)RDI as the proportion of corporate R&D expenses to sales in each fiscal year, and used this variable to measure the intensity of a company's R&D expenses.

(2) SIZE (Total Asset, SIZE) measures company resources. (Ciftci & Cready, 2011)On the basis of regarding returns to scale as a concept, the profits to firms resulting from R&D investment and the changes in profits are affected by firm size. With regard to the resource-based view, the larger the firm (total assets) size, the more available resources.

Control Variables

(1) LEV (Debt Ratio, LEV) is an important indicator of a company's capital structure. LEV = (total debts/total debts). When the debt ratio is high, it indicates that the company needs to repay larger debts, which may reduce the company's earning power and performance (Vithessonthi & Racela, 2016).

(2) GPM (Gross Profit Margin, GPM) is one of the analysis indicators of operational capacity commonly used in financial analysis. GPM = (Gross Profit / Net Operating Revenue) *100%.

(3) TAGR (Total asset growth rate, TAGR) reflects the growing trend of a company and can be estimated as follows. TAGR = (Total assets of current time range − Total assets of previous time range)/total assets of previous time range.

Panel Data Model

We assume that the factors influencing innovation performance (ROA) are RDI, SIZE, LEV, GPM and TAGR. In model , subscripts *i* and *t* denote the company and the current year ,subscripts *i* and *t−k* represent the company and the lag year. $RDI_{i,t-k}$ is the RDI of the $(t–k)^{th}$ year. In model (3), subscripts SIZE*RD,if this interaction variable holds, it represents moderation's effect factor exists.

To test whether the firm's size and performance have a positive correlation, a research model is developed, equation(1)

$$\mathrm{ROA}_{i,t} = \beta_{1,t} SIZE_{i,t} + \beta_{2,t} LEV_{i,t} + \beta_{3,t}\mathrm{GPM}_{i,t} + \beta_{4,t}\mathrm{TAGR}_{i,t} + \alpha_i + \gamma_t D_t + \varepsilon_{i,t} \quad (1)$$

To test whether there is a positive correlation between the firm's R& D on business performance and with lag periods of R&D, equation (2)

$$\mathrm{ROA}_{i,t} = \beta_{1,t}\mathrm{RDI}_{i,t-k} + \beta_{2,t}LEV_{i,t} + \beta_{3,t}\mathrm{GPM}_{i,t} + \beta_{4,t}\mathrm{TAGR}_{i,t} + \alpha_i + \gamma_t D_t + \varepsilon_{i,t} \quad (2)$$

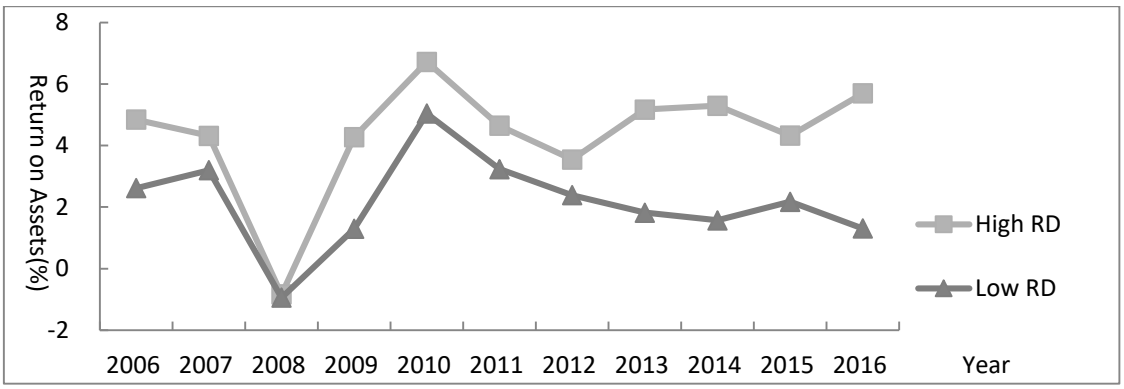
Finally, for testing RDI has a moderating effect on firm size and performance, as equation (3)

$$\mathrm{ROA}_{i,t} = \beta_{1,t}SIZE_{i,t} + \beta_{2,t}LEV_{i,t} + \beta_{3,t}\mathrm{GPM}_{i,t} + \beta_{4,t}\mathrm{TAGR}_{i,t} + \beta_{5,t}\mathrm{RDI}_{i,t-k} + \beta_{6,t}SIZE_{i,t} * \mathrm{RDI}_{i,t-k} + \alpha_i + \gamma_t D_t + \varepsilon_{i,t} \quad (3)$$

3.2 Empirical Analysis

Figure 1 We divide the average R&D expenditures of individual textile firms into two groups with high and low R&D expenses that measure innovation performance. For example, in the financial tsunami in 2008, firms with a high R&D expenditure group had higher innovation performance ROA than those with low R&D expenditure, and finance performance rebounded well after Economic recovery.

Figure 1: ROA of R&D Investment of Textile Companies in Taiwan, 2006–2016



Source: Taiwan's new economic (TEJ) database

Table1, Results for the LLC and ADF-Fisher tests of unit roots for each variable are presented herein. The p-values of all variables are below 0.1. just only In the ADF-Fisher Chi-square of the SIZE variable is 0.1846 ,p>0.1.indicating statistical stationarity.

Table 1: Unit-root Test

Method	ROA	SIZE	LEV	GPM	TAGR	RDI
LLC	-11.996***	-1.996**	-7.281***	-14.12***	-19.79***	-7.696***
PP	235.106***	116.779	139.195**	250.865***	338.429***	117.402***

*Note: * p < 0.1, ** p < 0.05, *** p < 0.01*

Table2,As regards the deferred effect, $\mathrm{RDI}_{i,t-k}$, where k is the lag periods (in years), the value of k was estimated using the individual root-Fisher ADF test. k=3, ADF - Fisher Chi-square and Choi Z-stat Both are significant, k = 3 best choice ($\mathrm{RDI}_{i,t-3}$)

Table 2: Individual Root-Fisher ADF Test

	Lag period	RDI_{-1}(k=1)	RDI_{-2}(k=2)	RDI_{-3}(k=3)
AIC	ADF - Fisher Chi-square	117.40***	103.418**	145.148***
	ADF - Choi Z-stat	-1.13164	-0.6088	-1.79915**

*Note: * p < 0.1, ** p < 0.05, *** p < 0.01*

The Hausman test is performed prior to Panel Data model analysis as a basis for selecting random or fixed effects models. Test statistic was 45.017、37.039、40.335,p< 0.05，The above test statistic all fell into the reject domain, which denied the random effect model of null hypothesis. This indicates that this study is suitable for adopting the individual fixed effect model.

Table 3: Impact of RDI and Firm's Size on ROA

	ROA		
Variable	Model 1	Model 2	Model 3
SIZE	0.548*** (4.824)		0.5674*** (3.211)
LEV	-0.1527*** (-2.8284)	-0.1232* (-1.6757)	-0.1229 (-1.4482)
GPM	0.3316*** (10.649)	0.3211*** (7.8107)	0.3989*** (8.0594)
TAGR	0.1602*** (6.1124)	0.1793*** (5.3283)	0.0964*** (2.7464)
$RDI_{(-3)}$		0.1214** (2.0493)	0.1259** (2.0013)
SIZE*RDI			0.1547*** (3.0321)
Adj-R^2	0.7178	0.7184	0.7501
Sum squa redresid	145.6145	107.4199	81.8516
D-W	1.7259	1.7295	1.8101
F	27.4072***	20.2536***	30.2012***
Fixed Effect Model			

*Note：***p<0.001;**p<0.05,*p<0.1, The coefficient estimates are standardized and the brackets are the t statistics for the coefficient estimates.*

As can be seen from Table 3, Model 1 mainly considers the impact of a firm's resources on its finance performance.The result shows that Adj-R^2 is 0.7178;D-W is 1.7259 were between 1.5-2.5. Therefore, there was no autocorrelation in errors between the residuals of the model. Firm's resources (Size) is positively correlated with ROA (β=0.548, t =4.824 and p< 0.05); LEV is negatively correlated with ROA (β= -0.1527, t =-2.8284 and p< 0.1); GPM and ROA are positively correlated (β=0.3316, t =10.649, and p < 0.01), TAGR and ROA (β=0.1602, t = 6.1124 and p < 0.01). Hypothesis 1 gets support.

Model 2 mainly considers the impact of a company's RDI on its finance performance. The result shows that Adj-R^2 is 0.7184; D-W is 1.7295. The lagged RDI is positively correlated with ROA (β=0.1214, t =2.0493 and p< 0.05); LEV is negatively correlated with ROA (β= -0.1232, t =-1.6757 and p< 0.1); GPM and ROA are positively correlated (β=0.3211, t =7.8107, and p < 0.01), and TAGR and ROA (β= 0.1793, t = 5.3283 and p < 0.01). It can be observed from the above results that, the R&D expense investment (RDI) of Taiwan's textile companies exhibits a lagged effect and produces a positive impact on finance performance. Hypothesis 2 gets support.

Model 3, This model takes both RDI and firm's resources (Size) into consideration and observes their changes: The result shows that Adj-R^2 is 0.7501; D-W is 1.8101. The Size*RDI is positively correlated with ROA (β=0.1547, t =3.0321 and p< 0.01). Hypothesis 3 gets support.

4. FINDINGS AND DISCUSSIONS

In recent years, textile companies in the international market have been reduced by emerging countries with low labor costs and low need for technological capacity. Do Taiwan's textile companies only have to constantly relocate in pursuit of cutting production costs? Perhaps the textile firms are need considering whether investment in R&D expenses, manpower and time can help their finance performance. This study only probes into the firm's RDI according to the resource based view and to literature and theories related to finance performance. carried out empirical research into the impact of RDI and resource-based view on performance and arrived at the following theory empirical and conclusions:

(1) RDI has a lagged effect because R&D expenditures input enterprises led R&D activities generated new knowledge, skills and products are takes time to form and accumulate. RDI has positive impact on finance performance. This also shows that the impact of RDI on finance performance in addition to existing in high tech industries also exist in the traditional industries.

(2) The larger an firm's assets, the more it implies that there are more corporate resources available to invest in more resources than the smaller vendors such as marketing, labor and advertising budgets. It can be observed from the above results that, the firm's resources of Taiwan's textile companies exhibits and produces a positive impact on finance performance.

RDI plays moderating effect between the firm's size and finance performance. RDI in the firm's operating process have this interference effect. This also means that firms with larger or smaller assets should pay attention to their own RDI.

5. CONCLUSION

However, R&D activities are a viable choice regarding a firm's operation. Companies can pursue commodities of higher added value, improve product quality and production efficiency, and optimize their process. A feasible way is to invest in R&D, or they can still mass produce to lower the unit price of production costs, or relocate the production bases to areas with lower labor and production costs. Nonetheless, once the labor costs and production costs increase, will the companies repeat the above practice? This problem requires us to think carefully. In addition, the impact of R&D investment on innovation performance will have a positive impact on the size or the industry to which they belong, just have different degree. Jacobs et al. (2002) even small economies needed to invest in R&D. Truett (2014) in case of small textile industrial scale or no benefits brought by economies of scale in country/regional economies, maintaining a high-quality reputation might be a very useful strategy. These results indicate the great importance of R&D. To conclude, this study hopes that its findings will be useful to practitioners, researchers and policymakers, and will be of some help to relevant future research as a reference.

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DETERMINING LEVELS OF CUSTOMER LOYALTY TOWARDS COMMERCIAL BANKS AND PARTICIPATORY BANKS

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ABSTRACT

Purpose- The purpose of this paper is to determine the difference between customers of commercial banks and participatory banks with regard to levels of awareness, familiarity, image, satisfaction and loyalty. Furthermore, in research is aimed to determine the strength, direction and significance of the relationship among the study variables.

Methodology- The model developed for the purpose of the research has five dimensioons. One of the dimensions is awareness. The awareness dimension affects the image and familiarity dimensions. The second dimension of the research is familiarity. Familiarity is affected by the awareness dimension and affects the image dimension. The third dimension of the research, image, is affected by the awareness and familiarity dimensions and affects the satisfaction dimension. The fourth dimension of the research, satisfaction, is affected by the image dimension and affects the loyalty dimension. The fifth and last dimension, that of loyalty, is affected by the satisfaction dimension.

Findings- The statistical analysis revealed that when the effect level of the relationship among the variables in the research model was examined, there was found to be a significant and positive effect of awareness on familiarity, awareness on image, familiarity on image, image on satisfaction and satisfaction on loyalty. Besides, according to result of difference in means, no significant difference could be determined between customers of commercial banks and of participatory banks for the awareness, satisfaction or loyalty variables ($p>0.05$); however, a significant difference was found for the familiarity and image variables ($p<0.05$).

Conclusion- As a result of the research, it was revealed that while no statistically significant difference was found between participatory and commercial banks in terms of awareness, image, satisfaction or loyalty, a statistically significant difference was determined between the two bank types in terms of familiarity.

Keywords: Commercial banking, participatory banking, loyalty, satisfaction, image, awareness, familiarity.
JEL Codes: G20, G21, G29

1. INTRODUCTION

Banks are financial organisations which perform and organise all types of transactions to do with capital, money and credit, and which work to meet all kinds of needs in this sector of private and corporate individuals, of the state, and of business organisations. Banks carry out important intermediation in the economy by providing financial support to the markets with the deposits that they accumulate (Babuscu and Hazar, 2016). Banks perform economic functions such as directing the economy and supporting the development of nations. Assuming an important role in the management of countries' monetary policies, banks also determine the welfare of peoples by providing support for the development of the countries they live in (Aladag, 2010).

Playing an important role within the financial system, banks carry out many functions like financial intermediation, ensuring liquidity of funds, ensuring efficient use of resources, setting maturity date and quantity of funds, creating deposits and developing international trade(Aydin et al., 2012).According to the functions they perform, banks in the banking system are examined in three groups, namely commercial banks (deposit banks), participatory banks (interest-free banking), and development and investment banks.

Commercial banks (deposit banks) are financial institutions which accept deposits with the aim of making profits, which raise funds from financial markets and offer these funds to commercial enterprises in the form of credit, which transfer funds to investments by brokerage on the issue of valuable assets like stocks and shares, and which perform portfolio management and investment consultancy (Aydin et al., 2012). All commercial banks have two basic functions: borrowing and lending.

Since the frequent use of interest, one of the working principles of the commercial banks, contravenes the principles laid down by Islam, there is a need for an interest-free banking system. The basis of interest-free banking relies on the idea that money is not a commodity, and that the person making the investment and the person providing the finance that he/she needs should both abide by the profit or loss incurred as a result of the investment (Gencturk and Cobankaya, 2015). Bank customers who do not wish to deal with commercial banks may find the support they need for their savings and investments in participatory banks. From this aspect, with the inclusion of participatory banks in the banking system, funds that had remained idle have begun to be used in the financial system. In this sense, the most important contribution provided by the participatory banks to the financial system is that of creating resources in the economy by adding the assets of people who avoid interest to the economic system (Ozsoy et al., 2013).

Quests for new products and systems for the financial sector began during the 2008 Global Financial Crisis, which affected all countries of the world. At the time of the crisis, the Islamic banking model used in countries in the Middle East and Asia was considered to be a good alternative. When examining the history of Islamic banking in the world, it is seen that the first practices were carried out in 1963 in Egyptin the form of profit- and loss-sharing. In a real sense, Islamic banking activities began in 1975 with the establishment of the Dubai Islamic Bank (Kaytanci et al., 2013).

In Turkey, interest-free banking began its activities in 1983, under the name of “Özel Finans Kurumu” (Private Financial Institution) (Uyan, 2005). Due to the confusion caused by the names of the Private Financial Institutions, interest-free institutions set up to make use of the savings of Muslim people, these were renamed as “Participatory Banks” (Aras and Ozturk, 2011) by the name change made in the Banking Law no. 5411 of 2006.

As of 2016, a total of 52 banks, of which 34 are commercial banks, 5 are participatory banks, and 13 are development and investment banks continue their business. When the number of bank branches is examined, it is seen that the number of public bank branches is 3,799, that of domestic private banks is 4,143, and that of foreign banks is 3,805.If we look at the number of bank personnel, we can see that 62,705 people work in public banks, 74,850 work in domestic private banks and 73,355 work in foreign banks. The size of assets of the Turkish banking sector is approximately 2,731 billion TL (BRSA).

In Turkey, the developments that have occurred in participatory banking have presented different services to bank customers. Together with the increase in the level of awareness of bank customers towards participatory banking services, participatory banks have become more competitive with commercial banks. Since two public banks have also begun participatory banking activities in recent years, it is envisaged that the competition between commercial and participatory banks will continue to increase.

The increase in range of products and services and in the number of banks that resulted from the financial deregulation that occurred in the Turkish economy and banking sector in the 1980s caused a significant increase in competition (Demirhan, 2009). With the effect of this increase in competition, the banks provided more choices to their customers by increasing the range of services that they offered.

In this study, with the aim of determining the levels of awareness, familiarity, image, satisfaction and loyalty of bank customers, a face-to-face questionnaire interview was conducted with 317 people who were commercial and participatory bank customers throughout Balikesir Province. Then, from the questionnaire forms obtained, 301 were accepted as complete and correct and the questionnaire data of these were analysed. In the questionnaire, questions were directed towards commercial and participatory bank customers with a view to measuring their levels of awareness, familiarity, image, satisfaction and loyalty. With the answers obtained from these questions, the strength, direction and significance of the relationship among the research variables were determined. Besides, an examination was made as to whether or not there was a significant difference between commercial and participatory bank customers with regard to their levels of awareness, familiarity, image, satisfaction and loyalty.

2. LITERATURE REVIEW

In the literature section of the study, explanations are given related with the research variables, namely awareness, familiarity, image, satisfaction and loyalty, and some of the national and international studies in the literature related with the variables are included.

Awareness is the ability of the consumer to identify a product, service or brand under different conditions (Tara et al., 2014). The awareness created by firms in the markets affects their market performance. Before customers buy a product or service, their familiarity with and awareness of that product or service affect their buying decisions (Ghassan and Khairi, 2013). Nowadays, since the banks carry out their activities in the banking sector with intense competition, the awareness that they create among their customers will be of benefit to them. A high level of awareness will lead to a high level of satisfaction (Bashir, 2013). Kaytanci et al., in their study (2013), stated that participatory bank customers had a high level of awareness with regard to participatory banks. In the research carried out by Genctürk and Cobankaya (2015), it was concluded that participatory bank customers had high levels of awareness. They stated that while the majority of interviewers who were participatory bank customers regarded participatory banks as different from other banks, the majority of interviewers who were not participatory bank customers did not see any difference between their banks and participatory banks.

In their study conducted in Jordan, Naser et al. (1999) researched the reasons for bank customers' awareness of, satisfaction towards, and preference for Islamic banking. With reference to this, in their questionnaire study answered by 206 people, bank customers were asked for information regarding a number of products used in Islamic banking. As a result, the bank customers stated that they were aware of the great majority of the products used in Islamic banking but that they did not use them. Moreover, it was determined that they had a low level of satisfaction towards the products of Islamic banking.

In the research carried out by Khattak and Rehman (2010), the levels of awareness and satisfaction of customers in the Islamic banking sector were analysed by means of a survey conducted on 156 participants in different cities in Pakistan. As a result, it was determined that the participants were aware of some services provided by Islamic banking but that they had no awareness of other services such as *murabaha* (Islamic credit) and *ijara* (Islamic leasing). Generally, it was observed that the participants were satisfied with the services provided by Islamic banks.

In the research carried out by Akhtar et al. (2010), a study was made to determine the awareness levels of bank customers and the relationship between quality of service and customer satisfaction for Islamic banks. Following the questionnaire study conducted on 167 people, it was determined that there was a strong positive relationship between customer satisfaction and quality of service.

In the study made by Saini et al. (2011) in South Africa, research was made into customers' awareness levels and use of products of Islamic banks. Another subject researched in the study was to determine the factors affecting customers' choices between Islamic banks and commercial banks. The research results revealed that Muslims had awareness of Islamic banking. However, it was concluded that the usage rates for Islamic banking services and products were low. When the reasons why Muslim customers preferred Islamic banking were examined, factors such as effect of religious views, low service charges, access to cash dispensers, and widespread of bank branches were found to be important.

Familiarity may be defined as the number of experiences occurring for the consumer in terms of brand, product and service (Park, 2009). The level of familiarity with commercial and participatory banks may be defined as the knowledge gained from past experiences with both types of bank by bank customers wishing to avail themselves of the services provided by these banks. Indeed, one of the research questions asked by Naser et al. in their study (2013) was aimed at determining the familiarity level of bank customers towards participatory bank products and services.

Yildirim and Cakar (2016), following their questionnaire study conducted on 708 academic personnel throughout Turkey, researched the factors affecting feelings towards participatory banking. The results of the study revealed that familiarity, trustworthiness and transparency were factors affecting the intention to use participatory banking.

Brand knowledge possessed by consumers will create that brand's image (Keller, 1993). The image of a product, service or brand, with the effect of logical or emotional perceptions made by the customer, is a general impression related to the components in question (Dobni & Zinkhan, 1990; Aaker, 1996a). It is argued that just as brand image may be formed in relation to the use of that brand, an image of a brand may also be created with impressions formed by those possessing no experience of that brand (Bird et al., 1970).

In the questionnaire study conducted in Balikesir Province by Dogan and Varinli (2010) on 537 bank customers, the corporate image of banks was examined. Results revealed that customers' perceptions of the corporate image of banks they deal with was related with the demographic features of participants.

In the research carried out by Ozsoy et al. (2013) with regard to reasons for bank customers' preference for participatory banking in Turkey, data was gathered through the questionnaire technique with a bulk sample obtained from 217 people. As a result, it was concluded that among the reasons for preference for participatory banks were image and factors of confidence.

In the questionnaire study conducted by Akdogan and Sener (2015) in Nevsehir on 416 commercial bank customers, the effect of corporate image on customer loyalty was researched. Results showed that corporate image affected customer loyalty.

In the questionnaire study carried out by Kalyancioglu and Faiz (2016) in Duzce on 467 people comprised of public and private bank customers, research was made into whether service quality perceptions of bank customers affected banks' corporate image. Research results revealed that for public commercial banks, physical assets, trustworthiness, confidence and customer identification were the service quality dimensions that had significant effects on banks' corporate image, whereas for private deposit banks, the dimensions that significantly affected banks' corporate image were physical assets, trustworthiness, responsiveness, confidence and customer identification.

In the ultra-competitive banking sector, another important consideration is customer satisfaction. Customer satisfaction is important both for enabling the bank to gain new customers, and for existing customers to continue their relations with the bank (Kaytanci et al., 2013). Customer satisfaction can be explained as "an emotional concept which manifests itself post-purchase and which, in a non-cognitive way, directly guides customers in determining their future attitudes and trends" (Ozbek and Kulahli, 2016a).

In their study, Naser et al.(2013) researched awareness and satisfaction levels of Kuwait Finance House (KFH) bank customers with regard to Islamic products and services. The study results revealed that the bank customers were unaware of the majority of products and services offered to them. Most of the participants dealt with Islamic banks not because of their profitability but because they regarded them as secure. In the majority of answers given by participants to satisfaction questions, it was determined that customers' satisfaction levels were high.

In Ghassan and Khairi's (2013) study, customer satisfaction and awareness regarding Islamic retail products were investigated for Kuwait. It was determined that customers were aware of some Islamic retail products but not of other products. It was concluded that the great majority of retail bank customers in Kuwait were satisfied with the services provided by the banks.

In the study made by Arslan and Bulut (2014), the Servqual Service Quality questionnaire was applied to customers of 4 participatory banks and 4 commercial banks with the aim of determining their satisfaction levels and preferences according to product and service quality. Results showed that commercial bank customers had more positive opinions of banks than participatory bank customers did. Moreover, it was concluded that commercial bank customers had a higher number of excellent perceptions of banks than participatory bank customers did.

Okumus, in her study (2015), researched customer satisfaction towards and awareness of Islamic bank products when considering customers' criteria for choice of bank and the dynamics of the banking sector. By using two data sets collected in 2004 and 2009, she examined the development of the Islamic banking sector in Turkey. Results revealed that while one section of Islamic bank customers chose Islamic banks because they suited their religious beliefs, another section chose them on the advice of relatives and friends. Moreover, it was concluded that Islamic banks increased customer satisfaction.

Oliver (1999) defined brand loyalty as purchasing a brand or service again or being a customer again even though external factors and marketing efforts have the potential to lead to brand-changing behaviour (Oliver, 1999). According to another definition, however, brand loyalty is the tendency for the consumer to continually search for and purchase a single brand even if competitors offer lower prices and make special offers (Ozbek and Kulahli, 2016b).

Caruana (2002) analysed the effect of service quality and customer satisfaction on loyalty of bank customers in Malta by means of a questionnaire survey conducted on 205 people. Results showed that customer satisfaction and service quality played an intermediary role in establishing loyalty.

Demirel (2007), conducting a questionnaire on 395 personnel working in 55 different bank branches operating in Turkey, investigated whether or not customer loyalty displayed any differences according to management styles by examining the relationship between customer loyalty and banks' management style and demographic features of staff. Results showed that as communication with the customer, interaction, value given to the customer, customer data banking and management style improved, so customer loyalty increased. On the other hand, however, as educational level, age, seniority, length of service in the sector and length of service in the same workplace of staff and management increased, so their attitudes towards customer loyalty weakened.

In the questionnaire study carried out Islam and Ali (2011) in Bangladesh on 222 people who were private and public bank customers, the relationship between loyalty and service quality and satisfaction was discussed. As a result, it was determined that customer satisfaction and the bank's respectability played a role in customer loyalty.

In the study carried out by Bulbul et al. (2012) in the Turkish banking sector, it was revealed that offering a quality service did not directly affect the customer's intention to purchase the service again (customer loyalty), but that increase of customer satisfaction had an indirect and powerful effect on the intention to repurchase.

Lau et al. (2013) conducted a questionnaire study with 119 bank customers in the Hong Kong retail banking service in order to determine the relationship between customer loyalty and service quality and customer satisfaction. As a result, it was determined that loyalty was directly related with customer satisfaction which was to a great extent affected by the value of services offered to customers.

In the study carried out by Ari and Yilmaz (2015) on students of Dumlupinar University, Structural Equation Modelling (SEM) was used in the analysis section in order to identify the relationship between their satisfaction with and loyalty towards banks. The research analysis revealed that the factors that increased satisfaction with and loyalty towards banks were the trustworthiness and cashpoint service dimensions. Furthermore, it was determined that as the students' satisfaction with and loyalty towards banks increased, they would continue to prefer the products and services of the banks they dealt with.

Explanations of the research variables, namely awareness, familiarity, image, satisfaction and loyalty have been made above and some of the national and international studies in the literature related with the variables have been included. In addition to these studies, comparisons related with participatory and commercial banks have also been made in studies by Aktas and Avci (2013), Pehlivan (2016), Ozulucan and Deran (2009), Parlakkaya and Curuk (2011) and Sakarya and Kaya (2013).

3. RESEARCH METHODOLOGY

3.1. Aim of the Research

Nowadays, in order for banks to cope with the intense competition they experience, it is important for them to keep customer satisfaction and loyalty at high levels. Features such as awareness, familiarity and image, which are so important for customers when choosing which bank to deal with, have become characteristic for banks. From this point of view, the aim of this research is to determine the level of the relationship among the research variables, namely awareness, familiarity, image, satisfaction and loyalty. A further aim is to reveal the differences between levels of awareness, familiarity, image, satisfaction and loyalty of commercial and participatory bank customers.

3.2. Research Method

The research population was composed of commercial and participatory customers of banks operating in Balikesir. The questionnaire form used to collect the data needed for the research was made up of questions aimed at determining bank customers' demographic features and the levels of awareness, familiarity, image, satisfaction and loyalty of commercial and participatory bank customers. When preparing the scales that would be utilised for measuring bank customers' levels of awareness, familiarity, image, satisfaction and loyalty, the scales of Aaker (1996b) and Keller (2001) for measuring levels of awareness, those of Kent and Allen (1994) and Dursun et al. (2011) for measuring levels of familiarity, that of Aydin and Ozer (2005) for measuring image levels, that of Lam et al. (2004) for measuring levels of satisfaction, and those of Zeithaml et al. (1996) and Lam et al. (2004) for measuring levels of loyalty were taken and adapted to suit bank types.

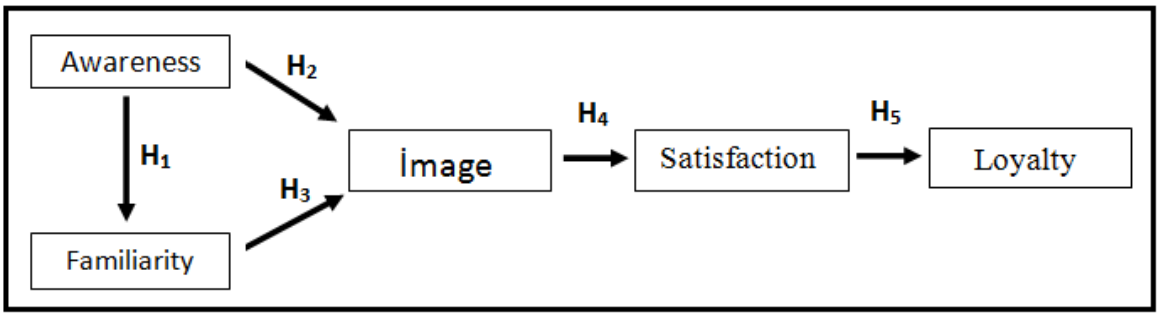
Within the scope of the research, the questionnaire forms were completed through face-to-face interviews with 317 bank customers chosen with the convenience sampling method who had visited commercial and participatory banks. 16 defective or incomplete questionnaire forms were excluded, and a total of 301 questionnaire forms were accepted as correct and complete.

The model developed for the purpose of the research is shown in Figure 1. One of the dimensions is awareness. The awareness dimension affects the image and familiarity dimensions. The second dimension of the research is familiarity. Familiarity is affected by the awareness dimension and affects the image dimension. The third dimension of the research, image, is affected by the awareness and familiarity dimensions and affects the satisfaction dimension. The fourth dimension of the research, satisfaction, is affected by the image dimension and affects the loyalty dimension. The fifth and last dimension, that of loyalty, is affected by the satisfaction dimension.

It was aimed to reveal the relationship among the variables forming the research model through regression analysis of the 301 samples taken up for evaluation. In the implementation section, correlation analysis was carried out to determine the strength and direction of the relationship among the research variables, while regression analysis was performed to determine whether or not there was a relationship. Furthermore, it was revealed whether or not there was a difference

between the customers of commercial and participatory bank customers in terms of their levels of awareness, familiarity, image, satisfaction and loyalty by application of independent sample t-test. Prior to these analyses, the validity and reliability of the scale were tested through explanatory and confirmatory factor analyses.

Figure 1: Research Model



3.3. Formation of Research Hypotheses

The first five hypotheses related to the research were formed with the aim of determining whether the effect of the dimensions taken as independent variables through regression analysis on the dependent variables was significant or not. The remaining five hypotheses of the research were formed in order to find out whether or not there was a significant difference between commercial and participatory bank customers in terms of their levels of awareness, familiarity, image, satisfaction and loyalty.

In the formation of the hypotheses, similar studies in the national and international literature were referenced. For the relationship between awareness and familiarity, the study made by Park (2009) was referenced. For the relationship between awareness and image, the studies carried out by Alamro and Rowley (2011) and Saleem et al. (2015) were referenced. For the relationship between familiarity and image, the study made by Park (2009) was referenced. For the relationship between image and satisfaction, the researches made by Bloemer and Ruyter (1998), Sondoh et al. (2007), Martenson (2007), Lai et al. (2009), Chen (2009), Park (2009) and Tu et al. (2012) were referenced. For the relationship between satisfaction and loyalty, the researches conducted by Selnes (1993), Bloemer and Ruyter (1998), Sivadas and Prewitt (2000), Caruana (2000), Back and Parks (2003), Hellier et al. (2003), Martenson (2007), Sondoh et al. (2007), Lai et al. (2009), Park (2009), Tolba (2011), Erciş et al. (2012), Tu et al. (2012) and Walter et al. (2013) were consulted.

The hypotheses developed for the purpose of the research are as follows.
H_1: There is a positive and significant effect of awareness on familiarity.
H_2: There is a positive and significant effect of awareness on image.
H_3: There is a positive and significant effect of familiarity on image.
H_4: There is a positive and significant effect of image on satisfaction.
H_5: There is a positive and significant effect of satisfaction on loyalty.
H_6: There is a significant difference between commercial bank customers and participatory bank customers in terms of awareness.
H_7: There is a significant difference between commercial bank customers and participatory bank customers in terms of familiarity.
H_8: There is a significant difference between commercial bank customers and participatory bank customers in terms of image.
H_9: There is a significant difference between commercial bank customers and participatory bank customers in terms of satisfaction.
H_{10}: There is a significant difference between commercial bank customers and participatory bank customers in terms of loyalty.

4. RESULTS

4.1. Demographic Findings

Data regarding the demographic features of respondents of the research are given in Table 1 distribution of participants' demographic structures.

In Table 1, distribution of participants' demographic structures according to occupation, educational level, gender and marital status is shown. Considering occupation distribution, of the total of 301 participants, 18.6% were civil servants,

35.5% worked in the private sector, 16.6% were self-employed, 14.6% were retired, 6.7% were students and 8% belonged to other groups (housewives, unemployed). When examining distribution of educational level, 19.6% of the participants were primary school graduates, 28.9% were high school graduates, 12.6% were undergraduates, 34.2% were graduates and 4.7% were postgraduates. According to gender distribution, 67.8% of the participants were male and 32.2% were female. When considering the marital status of the participants, 33.2% were single and 66.8% were married.

Table 1: Distribution of Participants' Demographic Structures

Demographic Features	Category	Frequency	Percentage
Occupation	Civil Servants	56	18.6
	Private Sector	107	35.5
	Self-Employed	50	16.6
	Retired	44	14.6
	Students	20	6.7
	Others	24	8.0
		301	**100**
Educational Level	Primary School Graduates	59	19.6
	High School	87	28.9
	Undergraduates	38	12.6
	Graduates	103	34.2
	Postgraduates	14	4.7
		301	**100**
Gender	Male	204	67.8
	Female	97	32.2
		301	**100**
Marital Status	Single	100	33.2
	Married	201	66.8
	Total	**301**	**100**

4.2. Explanatory Factor Analysis of the Research Variables

In this section, explanatory factor analysis was applied in order to test the validity of the scale, while Cronbach's alpha coefficients were examined in order to test its reliability. Values relating to the awareness, familiarity, images, satisfaction and loyalty variables of the study are given in Table 2.

When Table 4 is examined, it can be seen that the KMO (Kaiser-Meyer-Olkin) sampling adequacy coefficient necessary for factor analysis to be performed on the awareness variablewas 0.901. The p-value of Bartlett's sphericity test was determined as 0.001 ($p<0.05$). The KMO value of the familiarity variable was determined as 0.722 and its p-value as 0.001 ($p<0.05$), the KMO value of the image variable was found to be 0.861 and its p-value 0.001 ($p<0.05$), the KMO value of the satisfaction variable was determined as 0.905 and its p-value as 0.001 ($p<0.05$), and the KMO value of the loyalty variable was found as 0.909 and its p-value as 0.001 ($p<0.05$). When the explained variances are examined, it can be seen that these were 72.022% for awareness, 82.162% for familiarity, 70.696% for image, 86.082% for satisfaction and 86.030% for loyalty respectively, and that these values may be said to be of good standards.

Table 2: Validity and Reliability Values of Research Variables

Variables	Factor Loads	Eigen-Values	Explained Variances (%)	Cronbach Alfa (α)	KMO	p
AWARENESS						
AW1	0.833	4.554	72.022	0.913	0.901	0.001
AW2	0.867					
AW3	0.787					
AW4	0.890					
AW5	0.858					
FAMILIARITY						
FM1	0.864	3.224	82.162	0.888	0.722	0.001
FM2	0.937					
FM3	0.910					

IMAGE						
İMA1	0.851	4.109	70.696	0.889	0.861	0.001
İMA2	0.669					
İMA3	0.870					
İMA4	0.872					
İMA5	0.883					
SATISFACTION						
SAT1	0.936	4.032	86.082	0.960	0.905	0.001
SAT2	0.948					
SAT3	0.931					
SAT4	0.925					
SAT5	0.901					
LOYALTY						
LOY1	0.924	5.445	86.030	0.967	0.909	0.001
LOY2	0.926					
LOY3	0.937					
LOY4	0.935					
LOY5	0.918					
LOY6	0.925					

*(**AW1:** I know what the type of bank I use supports, **AW2:** I have an opinion of the type of bank I use,**AW3:**I am aware of the type of bank I use, **AW4:**I am conscious of the type of bank I use,**AW5:** I frequently think about the type of bank I use, **FM1:**I have used the services of this bank, **FM2:**I have knowledge of the services of this bank, **FM3:**The services of this bank are well known, **İMA1:** I consider that it is safe to benefit from the activities of this bank,**İMA2:**I consider that the staff of this bank are cordial and sympathetic, **İMA3:**I consider that the infrastructure of this bank with regard to the activities it provides is adequate, **İMA4:**I consider that the deposit and credit rates applied by this bank are suitable, **İMA5:**I consider that it is right for this bank to undertake investment, **SAT1:**All in all, I am very satisfied with my dealings with this bank, **SAT2:**All in all, this bank meets my expectations, **SAT3:**All in all, the services provided by this bank are adequately utilisable, **SAT4:**All in all, I am very satisfied with the services offered by this bank, **SAT5:**All in all, the behaviour of this bank towards its customers is very honest, **LOY1:**I will continue to be a customer of this bank, **LOY2:**My first preference will always be for this bank, **LOY3:**I will also continue to use this bank's services in future years, **LOY4:**I would recommend this bank to friends who seek my advice, **LOY5:**I would encourage people around me to be customers of this bank, **LOY6:**I would say positive things about this bank to people around me).*

In Table 3, the correlation analysis results for the research variables are shown. When examining the correlation results for the variables of the first five hypotheses created for the model, it is seen that the correlation values were calculated to be: 0.723 between awareness and familiarity, 0.532 between awareness and image, 0.499 between familiarity and image, 0.734 between image and satisfaction, and 0.800 between satisfaction and loyalty. This shows high and significant correlation values for the variables of the first five hypotheses created for the model.

Table 3: Correlation Analysis Results of The Research Variables

Variables	1	2	3	4	5
1) Familiarity	1				
2) Awareness	0.723 0.001	1			
3) Image	0.499 0.001	0.532 0.001	1		
4) Satisfaction	0.509 0.001	0.478 0.001	0.734 0.001	1	
5) Loyalty	0.579 0.001	0.523 0.001	0.687 0.001	0.800 0.001	1

The fit statistics, fit measures, good consistency and acceptable fit criteria of the confirmatory factor analysis performed within the scope of the research can be seen in Table 4. Analysis shows that the SRMR value (0.049) has good consistency. It can also be seen that NFI (0.920), RMSEA (0.076) and x^2/Df (2.756) possess satisfactory fit values. Moreover, GFI (0.853), AGFI (0.813) and CFI (0.940) are seen to have close to satisfactory fit values. These results show that the factor structure has generally acceptable fit values.

Table 4: Confirmatory Factor Analysis Fit Measures Data

Fit Measures	Good Consistency*	Acceptable Fit Criteria**	Revealed Value in Research
SRMR	0≤ SRMR≤0.05	0.05≤ SRMR≤0.10	0.049*
GFI	0.95≤ GFI ≤ 1.00	0.90≤ GFI < 0.95	0.853
AGFI	0.90≤ AGFI ≤ 1.00	0.85≤ AGFI < 0.90	0.813
NFI	0.95≤ NFI ≤ 1.00	0.90≤ NFI< 0.95	0.920**
CFI	0.97≤ CFI ≤ 1.00	0.95≤ CFI < 0.97	0.940
RMSEA	0≤ RMSEA≤0.05	0.05≤ RMSEA≤0.08	0.076**
x^2/Df	0 < x^2/Df < 2	0 < x^2/Df < 3	2.756**

(*) Good Consistency, (**) Acceptable Fit Criteria

In Table 5, regression analysis results relevant to the model are shown. It was determined that for participatory banking, awareness had a statistically significant and positive effect on familiarity (R^2=0.654; β=0.787; p<0.05). It was also determined that for commercial banking, too, awareness had a statistically significant and positive effect on familiarity (R^2=0.407; β=0.741; p<0.05). The H_1 hypotheses were, therefore, accepted for both bank types.

It was determined that for participatory banking, awareness had a statistically significant and positive effect on image (R^2=0.378; β=0.251; p<0.05). It was also determined that for commercial banking, too, awareness had a statistically significant and positive effect on image (R^2=0.292; β=0.420; p<0.05). The H_2 hypotheses were, therefore, accepted for both bank types.

Table 5: Regression Analysis Results of The Model

Dimensions	Bank Types		Non-Standard Coefficient	Standart Error	t	Probability Values	R^2	Hypothesis Results
Awareness→Familiarity	Participatory Banks	Constant	0.871	0.218	3.991	0.001	0.654	***H_1:Accepted***
		Awareness	0.787	0.054	14.540	***0.001***		
	Commercial Banks	Constant	1.250	0.264	4.732	0.001	0.407	***H_1: Accepted***
		Awareness	0.741	0.066	11.265	***0.001***		
Awareness ↘ Image ↗ Familiarity	Participatory Banks	Constant	1.963	0.278	7.057	0.001	0.378	***H_2: Accepted*** ***H_3: Accepted***
		Awareness	0.251	0.110	2.290	***0.024***		
		Familiarity	0.314	0.113	2.787	***0.006***		
	Commercial Banks	Constant	1.677	0.265	6.333	0.001	0.292	***H_2: Accepted*** ***H_3: Accepted***
		Awareness	0.420	0.081	5.194	***0.001***		
		Familiarity	0.144	0.070	2.077	***0.039***		
Image → Satisfaction	Participatory Banks	Constant	0.781	0.285	2.735	0.007	0.567	***H_4: Accepted***
		Image	0.808	0.067	12.117	***0.001***		
	Commercial Banks	Constant	1.573	0.197	8.004	0.001	0.473	***H_4: Accepted***
		Image	0.631	0.049	12.875	***0.001***		
Satisfaction →Loyalty	Participatory Banks	Constant	0.552	0.224	2.461	0.015	0.695	***H_5: Accepted***
		Satisfaction	0.838	0.052	15.986	***0.001***		
	Commercial Banks	Constant	0.627	0.234	2.680	0.008	0.536	***H_5: Accepted***
		Satisfaction	0.830	0.057	14.610	***0.001***		

It was determined that for participatory banking, familiarity had a statistically significant and positive effect on image (R^2 =0.378; β=0.314; p<0.05). It was also determined that for commercial banking, too, familiarity had a statistically significant and positive effect on image (R^2=0.292; β=0.144; p<0.05). The H_3 hypotheses were, therefore, accepted for both bank types.

It was determined that for participatory banking, image had a statistically significant and positive effect on satisfaction (R^2=0.567; β=0.808; p<0.05). It was also determined that for commercial banking, too, image had a statistically significant and positive effect on satisfaction (R^2=0.473; β=0.631; p<0.05). The H_4 hypotheses were, therefore, accepted for both bank types.

It was determined that for participatory banking, satisfaction had a statistically significant and positive effect on loyalty (R^2=0.695; β=0.838; p<0.05). It was also determined that for commercial banking, too, satisfaction had a statistically significant and positive effect on loyalty (R^2=0.536; β=0.830; p<0.05). The H_5 hypotheses were, therefore, accepted for both bank types.

Table 6 shows the results of independent sample t-test conducted to ascertain whether or not there was a significant difference between the levels of awareness, familiarity, image, satisfaction and loyalty according to bank types. When examining t-test results for awareness, it can be seen that while the mean for awareness level of commercial bank customers was 3.94, the mean for awareness level of participatory bank customers was 3.85. The independent sample t-test results show that awareness levels of commercial bank customers were close to those of participatory bank customers, indicating that no significant difference between commercial and participatory bank customers was found in terms of awareness levels (p>0.05). Based on this result, hypothesis H_6 was rejected.

Table 6: Differences of Awareness, Familiarity, Image, Satisfaction and Loyalty Levels of Bank Customers According to Bank Types

Variables	Bank Types	Statistics Results			T-Test Results				Hypothesis Results
		N	$\overline{X}$	σ	F	t	df	p	
Awareness	**Commercial Banks**	187	3.94	0.76	35.136	0.815	299	0.416	***H_6: Rejected***
	Participatory Banks	114	3.85	1.20					
Familiarity	**Commercial Banks**	187	4.17	0.89	11.026	2.254	299	0.025	***H_7:Accepted***
	Participatory Banks	114	3.90	1.11					
Image	**Commercial Banks**	187	3.93	0.77	35.136	-2.113	299	0.035	***H_8:Rejected***
	Participatory Banks	114	4.15	1.03					
Satisfaction	**Commercial Banks**	187	4.05	0.70	23.029	-0.763	299	0.446	***H_9:Rejected***
	Participatory Banks	114	4.13	1.11					
Loyalty	**Commercial Banks**	187	3.99	0.80	20.867	-0.204	299	0.839	***H_{10}:Rejected***
	Participatory Banks	114	4.01	1.11					

When examining t-test results for familiarity in Table 6, it can be seen that while the mean for familiarity level of commercial bank customers was 4.17, the mean for familiarity level of participatory bank customers was 3.90. The independent sample t-test results show that familiarity levels of commercial bank customers were higher than those of participatory bank customers, indicating that a significant difference between commercial and participatory bank customers was found in terms of familiarity levels (p<0.05). Based on this result, hypothesis $H_7$was not rejected, but accepted.

When examining t-test results for image, it can be seen that while the mean for image level of commercial bank customers was 3.93, the mean for image level of participatory bank customers was 4.15. The independent sample t-test results show that image levels of commercial bank customers were close to those of participatory bank customers, indicating that no significant difference between commercial and participatory bank customers was found in terms of image levels (p>0.05). Based on this result, hypothesis H_8 was rejected.

When examining t-test results for satisfaction, it can be seen that while the mean for satisfaction level of commercial bank customers was 4.05, the mean for satisfaction level of participatory bank customers was 4.13. The independent sample t-test results show that satisfaction levels of commercial bank customers were close to those of participatory bank

customers, indicating that no significant difference between commercial and participatory bank customers was found in terms of satisfaction levels (p>0.05). Based on this result, hypothesis H_9 was rejected.

When examining t-test results for loyalty, it can be seen that while the mean for loyalty level of commercial bank customers was 3.99, the mean for loyalty level of participatory bank customers was 4.01. The independent sample t-test results show that loyalty levels of commercial bank customers were close to those of participatory bank customers, indicating that no significant difference between commercial and participatory bank customers was found in terms of loyalty levels (p>0.05). Based on this result, hypothesis H_{10} was rejected.

5. CONCLUSION

The research was conducted on customers of commercial and participatory banks operating in Balikesir. Analyses were performed on the data obtained from 301 complete and correct questionnaires taken from a questionnaire study carried out on a total of 317 people.

When examining the occupational situation from among the demographic features of the participants, it can be seen that 35.5% of the participants worked in the private sector. When the participants' educational level is examined, it can be seen that the highest percentage of participants were graduates (34.2%) while the lowest percentage were postgraduates (4.7%). It was revealed that 77.8% of the participants were male, while 66.8% were married.

It may be said that the observed validity and reliability values of the variables used in the study, namely awareness, familiarity, image, satisfaction and loyalty, meet adequate criteria. Correlation values of the variables were calculated. It was concluded that the correlation values of the variables created for the model were high.

When the analysis results for the research hypotheses are examined, it is seen that hypotheses H_1, H_2, H_3, H_4 and H_5 were accepted. Of the hypotheses testing the differences between participatory and commercial banks, hypothesis H_7 was accepted, while hypotheses H_6, H_8, H_9 and H_{10} were rejected.

As a result of the regression analyses of the dimensions in the research model, it was determined that there was a statistically significant relationship between the awareness and familiarity, awareness and image, familiarity and image, image and satisfaction, and satisfaction and loyalty variables for both commercial and participatory banks.

As a result of the research, it was revealed that while no statistically significant difference was found between participatory and commercial banks in terms of awareness, image, satisfaction or loyalty, a statistically significant difference was determined between the two bank types in terms of familiarity.

It is suggested that research should be conducted on a larger number of bank customers and especially in different regions and provinces, as broadening the scope of the study will produce more objective and generic results.

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ESTIMATION OF ECONOMIC GROWTH USING GREY COBB-DOUGLAS PRODUCTION FUNCTION: AN APPLICATION FOR US ECONOMY

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ABSTRACT

Purpose- In this paper, we apply the Grey Cobb-Douglas production model to predict the GDP, examine the effects of the variation rate of capital, and labor inputs to economic growth. Many factors contribute to economic growth, such that technological progress, labor force, capital accumulation, the optimal using of sources, energy, institutional innovation ext. In reality, a variate of economic factors often intertwine with each other.

Methodology- The capital and labor are main elements of economic growth. Improving the capital and labor performance plays important role in increase the wealth of a country. Traditionally, Cobb-Douglas (C-D) production model use only capital stock and labor to describe the economic growth. In this study, firstly C-D production function is established and confirmed that the capital and labor has a positive impact on economic growth (GDP). Then GM(1,1) prediction model is used to predict the future values of capital stock and labor force inputs.

Findings- The future GDP values are predicted by the estimated capital and labor values putting into the Cobb-Douglas model. We also obtained the production elasticities of capital and labor inputs. Findings suggest that the contribution rate of capital is 0.403 and labor is 1.094 to economic growth. The sum of the contributions of factors is 1.497 and greater than one.

Conclusion- Findings of this empirical studies shows that percentage of the increase in GDP is greater than that of the increase in capital stock and labor.

Keywords: Cobb-Douglas production function, economic growth, Grey-prediction model.
JEL Codes: E23, E37, C53

1. INTRODUCTION

The production level in general economy or firm environment is described by production function. One of the main problems for the economic authorities is to choice the functional relationship between the economic inputs and production value. In the literature generally four different production functions is used. In literature, very often used production functions are linear production function, Cobb-Douglas production function(C-D), Constant Elasticity of Substitution production function (CES), Variable Elasticity Substitution production function (VES), Leontief Production function and Translog production function (Cheng, M. and Han, Y., 2017). In this study, we used Cobb-Douglas production function to establish model impact of capital investments and labor on economic growth.

Christensen, Jorgenson and Lau (1973) consider an extension of Cobb-Douglas function that is called *translog production* function. Important contributes made by Romer (1986), Lucas (1988), Mankiw, Romer and Weil (1992) and Benhabib and Spiegel (1994).

The error term in Cobb-Douglas production function is modelled by either additive or multiplicative. In this study, we will use additive form. Bahatti (1993), Hossain et al. (2010), Prajneshu (2008), Golfeld and Quandt (1970) are used classic regression model estimate the Cobb-Douglas function.

There are a lot of factor have contributed to production level such that capital, technology optimal allocation of sources, innovations etc. In this study, the future economic production level is forecasted based on GM (1, 1) Grey Cobb-Douglas production model. In addition, we make an empirical analysis on the elasticity of substitution, direction of technical change and the contribution rate of US economic growth factors to total factor productivity.

2. PRODUCTION FUNCTIONS

Cobb-Douglas function has a constant cost share of capital and strong co-movement in labor productivity and capital productivity. Cobb-Douglas function is every time Hicks neutral. Another words, the marginal productivities of capital and labor do not effect from allocation of factors. The growth of economics generally has measured by Gross Domestic Production (GDP) rate in current price. In this study, we assume that economic growth is only based on asset and employment. In substance, economics production is effected from various environmental factors such as capital, labor, agricultural activities, technology, industry, energy, raw materials etc.

In economic theory, the production function is described as the empirical relationship between given the quantity of economic inputs and specified outputs. One of the basic problems for economics governance in production process is determining the functional relationship between the production output and input factors. The general form of production function is described by $f: D \rightarrow R_+$, $D \in R_+^n$ and

$$Q = f(X_1, X_2, \dots, X_n) \tag{1}$$

where $X_1, X_2, \dots, X_n$ are inputs and Q is production level. A production function with n input factors is called $h-$ homogeneous, $h > 0$, if

$$f(kX_1, kX_2, \dots, kX_n) = k^h f(X_1, X_2, \dots, X_n) \tag{2}$$

where $k \epsilon R$ and,

- If $h > 1$, per percent increase in input levels would result greater than per percent increase in the output level,
- If $h < 1$, per percent increase in input levels would result less than per percent increase in output,
- $h = 1$ represent the constant return to scale.

Traditionally assumed that the most important factors that affect the production are capital and labor inputs (Cobb, C. W. and Douglas, P. H.,1928). We can write the production function with two input factor as follows,

$$Q = f(L, K) \tag{3}$$

where Q is the quantity of total output (production), L is the quantity of labor and K is the capital used.

The output Q is usually measured by physical units produced or by their values, Labor is typically measured in man - hours or number of employees. Capital represents aggregations of different components. Determination of its value is difficult.

There are different functional forms for$f$, Table 1 shows some of widely accepted functions (Godin, A. and Kinsela, S., 2013).

Table 1: Different Functional Forms of Production Function

Cobb-Douglas production function	$Q = AK^{\alpha}L^{\beta}$, $\alpha + \beta = 1$
Constant Elasticity of Substitution (CES) production function	$Q = \gamma[\delta K^{-\rho} + (1-\delta)L^{-\rho}]^{-\vartheta/\rho}$
Translog production function	$\ln Q = \alpha_1 \ln K + \alpha_2 \ln L + \beta_{11}(\ln K)^2 + \beta_{12} \ln K . \ln L + \beta_{22}(\ln L)^2$
Polynomial (cubic) production function	$Q = \alpha_1 K + \alpha_2 K^2 + \alpha_3 K^3 + \beta_1 L + \beta_2 L^2 + \beta_3 L^3$
Leontief production function	$Q = min[\alpha K, \beta L]$

The historical evolution of production function see also refer to Misra, S. K.(2010). We can state the marginal productivity of factors as follows,

$$MP_L = \left.\frac{\Delta Q}{\Delta L}\right|_{K\ is\ constant} = \beta\ AK^{\alpha}L^{\beta-1} = \beta\left(\frac{Q}{L}\right) \quad , \text{ (marginal productivity of labor)}$$

$$MP_K = \left.\frac{\Delta Q}{\Delta K}\right|_{L\ is\ constant} = \alpha A\ K^{\alpha-1}L^{\beta} = \alpha\left(\frac{Q}{K}\right) \quad , \text{ (marginal productivity of capital)}$$

In Cobb-Douglas production function, capital receives the constant share α total product. For a Cobb-Douglass production function with two inputs, *elasticity of substitution*;

$$\sigma = \frac{d\ln(K/L)}{d\ln(MP_L/MP_K)} = 1\,. \tag{4}$$

This specification creates isoquants that are convex. The distribution of national income between capital and labor determine the elasticities of substitution. If $\sigma = 1$, any change in K/L is matched by a proportional change in w/r and te relative income shares of capital and labor stay constant, where w is wage rate and r is rental rate of capital. As a result, constant shares of output are allocated to capital and labor even though the capital – labor ratio may change over time. An elasticity of substitution equal to unit implies that these factor shares will remain constant for any capital – labor ratio because any changes in factor proportional will be exactly offset by changes in the marginal productivities of the factor input (Miller, E., 2008).

For a production function that has more than two inputs, *Hicks elasticity of substitution measure* is described as (Stern, D. I., 2011),

$$\sigma_{ij} = -\frac{\partial\ln\left(X_i/X_j\right)}{\partial\ln\left((\partial Q/\partial X_i)/\left(\partial Q/\partial X_j\right)\right)}\,. \tag{5}$$

Cobb-Douglas function is based on the assumption that the elasticity of substitution between factors is one.

2.1 Cobb-Douglas Production Function

The studies on production function were made firstly by Knut Wicksell (economist) in 1906. Then, Cobb-Douglas production function was developed by Charles W. Cobb (mathematician) and Paul H. Douglas (economist) in 1928. The Cobb-Douglas production function is widely used in economic studies. This function is describes the economic output as a function of two factors, capital and labor. Cobb-Douglas production function is used the modeling the substitution between capital input, labor services and technical change. This model implies the elasticity of substitution equals one. This function is describes the economic output as a function of two factors, capital and labor. The Cobb-Douglas production function is given by

$$Q = f(K, L) = AK^{\alpha}L^{\beta} \tag{6}$$

where Q is total production (the monetary value of all goods produced in a year), (usually use GDP), A is productivity of existing technology (total factor productivity) (technical process, economic system etc.), K is investment capital input which is represent by the total investment in fixed assets (the monetary worth of all machinery, equipment and buildings) and L is the quantity of the labor input (the total number of person - hours worked in a year) (Cobb, C. W. and Douglas, P. H., 1928). Parameter α and β are the output elasticities to capital and labor, respectively.

Output elasticity measures the responsiveness of output to a change in levels of either labor or capital used in production and given by,

$$\alpha = \frac{\partial Q/Q}{\partial K/K} \quad , \text{ (Output elasticity coefficient of capital)}$$

$$\beta = \frac{\partial Q/Q}{\partial L/L} \quad , \text{ (Output elasticity coefficient of labor)} \tag{7}$$

Cobb-Douglas production function allow us to change the magnitude of inputs response to factor price changes. One of the limitation of model is that use two factor input to explain the production (Liao, Q., Wu, Z. and Xu, J., 2010).

2.2. Properties of Cobb-Douglas Production Function

a) Cobb-Douglas production function is a homogeneous function. The degree of homogeneity of function is described with $\alpha + \beta$. Let $(c > 1) \in R$ and $Q_1 = AK_1^{\alpha}L_1^{\beta}$ then,

$$Q_2 = A(cK_1)^{\alpha}(cL_1)^{\beta} = c^{\alpha+\beta}AK_1^{\alpha}L_1^{\beta} = c^{\alpha+\beta}Q_1\,.$$

If each factor is increased by a factor c, total output Q will increase by $c^{\alpha+\beta}$. The production function shows *constant returns to scale* if changing in input factors by positive proportion has changing output by the same proportion.

$i)$ $\alpha+\beta=1$, function denotes the constant return the scale,

$ii)$ $\alpha+\beta>1$, it shows increasing returns to scale,

$iii)$ $\alpha+\beta<1$, diminishing returns to scale (Besanko, D. A. and Braeutigam, R. R., 2010).

Here, return to scale is determined by,

$$\text{Return to scale} = \frac{\%\Delta\ (\text{quantity of output})}{\%\Delta\ (\text{quantity of all inputs})}.$$

b) Cobb-Douglas production function is linear.

c) The marginal productivity of capital, $MP_K = \frac{\partial Q}{\partial K}$ and the marginal product of labor, $MP_L = \frac{\partial Q}{\partial L}$

d) The marginal rate of the technical substitution of labor (L) for capital (K) is given by

$$MRTS = \frac{MP_L}{MP_K} = \frac{\partial Q}{\partial L}\Big/\frac{\partial Q}{\partial K} = \left(\frac{\beta}{\alpha}\right)\left(\frac{K}{L}\right). \tag{8}$$

The generalized form of Cobb-Douglas function is given as,

$$Q(\boldsymbol{X}) = AX_1^{\beta_1}\, X_2^{\beta_2} \dots\, X_n^{\beta_n}. \tag{9}$$

If the logarithms of both sides are taken, we obtained that

$$\ln Q = \beta_0 + \beta_1 \ln X_1 + \cdots + \beta_n \ln X_n \tag{10}$$

where $\beta_0 = lnA$, $\boldsymbol{X} = (X_1, X_2, \dots, X_n) \in R_+^n$, $A > 0$ is a constant, Q is total production level, X_i are input factors, $i = 1, 2, \dots, n$ and $\beta_1, \beta_2, \dots, \beta_n$ are parameters, n is the number of factors which are used in the production function (Vîlcu, G. E. ,2018; Wang, X., 2016).

Hicks J.R and Allen, R.G (1934) proposed a generalization of Hicks elasticity coefficient as,

$$H_{i,j}(\boldsymbol{X}) = \frac{\dfrac{1}{X_i\left(\dfrac{\partial f}{\partial X_i}\right)} + \dfrac{1}{x_j\left(\dfrac{\partial f}{\partial X_j}\right)}}{-\dfrac{\dfrac{\partial^2 f}{\partial X_i \partial X_i}}{\left(\dfrac{\partial f}{\partial X_i}\right)^2} + \dfrac{2\left(\dfrac{\partial^2 f}{\partial X_i \partial X_j}\right)}{\left(\dfrac{\partial f}{\partial X_i}\right)\left(\dfrac{\partial f}{\partial X_j}\right)} - \dfrac{\dfrac{\partial^2 f}{\partial x_j \partial X_j}}{\left(\dfrac{\partial f}{\partial X_j}\right)^2}} \tag{11}$$

where $= (X_1, X_2, \dots, X_n) \epsilon R_+^n$, $1 \le i \ne j \le n$ and the $H_{i,j}$ denotes the Hicks elasticity of substitution of i th production factor respect to the j th production factor (Bang-Yen Chen, 2012).

2.3.Parameter Estimations of Generalized Cobb-Douglas Production Function

Cobb-Douglas Production function defined as in Eq. (9) is used to estimate the following regression equation,

$$Q_i = AX_{1i}^{\beta_1} X_{2i}^{\beta_2} \dots X_{ni}^{\beta_n} + \varepsilon_i$$

Shifting the ε_i left side of equation then taking the logarithm on both side of equation,

$$log\ (Q_i - \varepsilon_i) = logA + \beta_1 logX_{1i} + \beta_2 logX_{2i} + \cdots + \beta_n logX_{ni} \tag{12}$$

Let $m_i = \varepsilon_i / Q_i$ (the relative error of the observations of Q_i) (Mahaboob, B. et al., 2017). We consider m_i is small, i.e. ε_i are small. In this case, we can write,

$$log(Q_i - \varepsilon_i) = logQ_i + log(1 - m_i) \cong logQ_i - m_i\,. \tag{13}$$

Hence,

$$logQ_i = logA + \beta_1 logX_{1i} + \beta_2 logX_{2i} + \cdots + \beta_n logX_{ni} + m_i \tag{14}$$

where, $m_i \sim N\left(0\,, \sigma^2/Q_i^2\right)$ so it is not satisfy the assumption of linear regression. Now we multiply by Q_i on both of side equation $logQ_i$ then, we obtain new equation as,

$$Q_i\, logQ_i = Q_i logA + Q_i\beta_1 logX_{1i} + Q_i\beta_2 logX_{2i} + \cdots + Q_i\beta_n logX_{ni} + Q_i m_i$$

$$Q_i logQ_i = Q_i logA + Q_i\beta_1 logX_{1i} + Q_i\beta_2 logX_{2i} + \cdots + Q_i\beta_n logX_{ni} + \varepsilon_i \tag{15}$$

where $\varepsilon_i \sim N(0\,, \sigma^2)$.

In the matrix notation,

$$\boldsymbol{Q} = \begin{pmatrix} Q_1 logQ_1 \\ Q_2 logQ_2 \\ \vdots \\ Q_n logQ_n \end{pmatrix} \quad , \quad \widehat{\boldsymbol{\beta}} = \begin{pmatrix} log\hat{A} \\ \widehat{\beta_1} \\ \vdots \\ \widehat{\beta_n} \end{pmatrix} \quad , \quad A = \begin{pmatrix} Q_1 & Q_1 logX_{11} & \cdots & Q_1 logX_{n1} \\ Q_2 & Q_2 logX_{12} & \cdots & Q_1 logX_{n1} \\ \vdots & \vdots & \vdots & \vdots \\ Q_n & Q_n logX_{1n} & \cdots & Q_1 logX_{nn} \end{pmatrix} \tag{16}$$

The least squares estimation of the parameters obtains as follows (Qi, W., Yingsheng, S. and Pengfei, J., 2010),

$$\widehat{\boldsymbol{\beta}} = (\boldsymbol{A^T A})^{-1} \boldsymbol{A^T Q}. \tag{17}$$

3. GREY PREDICTION MODEL GM(1,1)

In the analysis of empirical data is widely used the multiple regression models, prediction of the future value of response variable based on multiple regression models need to know the future value of the independent random variables. Grey system theory initiated in J. L. Deng (1982) can provide a more flexible approximation to fitting a model to observed data. Grey model was building on the differential equation. Solution of differential equation has an exponential function.

In the grey system theory, the basic model is GM(1,1). It is predict a single variable. This model eliminates the randomness of data by accumulating the original time series (Honghong Liu, 2010). We can summarize the model calculation as following,

Step 1: Original data:

$$X^{(0)} = \left(x^{(0)}(1), x^{(0)}(2), \dots, x^{(0)}(n)\right) \tag{18}$$

We assume that the original data non-negative and generally assumed that, $n \geq 4$.

Step 2: Accumulate generating data (1-AGO):

$$X^{(1)} = \left(x^{(1)}(1), x^{(1)}(2), \dots, x^{(1)}(n)\right) \tag{19}$$

where

$$x^{(1)}(k) = \sum_{i=1}^{k} x^{(0)}(i)\,, \qquad k = 1,2, \dots, n \tag{20}$$

this sequence is monotone increasing.

Step 3: The generated mean sequence $Z^{(1)}$ is described as,

$$Z^{(1)} = \left(z^{(1)}(2), z^{(1)}(3), \dots, z^{(1)}(n)\right) \tag{21}$$

where

$$z^{(1)}(k) = 0.5\left(x^{(1)}(k) + x^{(1)}(k-1)\right), \quad k = 2,3, \dots, n \tag{22}$$

$X^{(1)}$ represent the monotonic increasing sequence, so it is similar to the solution of first order linear differential equation. This differential equation is called whitening equation for $X^{(1)}$ and is given by

$$\frac{dX^{(1)}}{dt} + aX^{(1)} = b \tag{23}$$

where a is called developing parameter and parameter b is called grey input coefficient.

Step 4: a and b parameters are determined by discrete form of above differential equation. The difference equation is written as,

$$X^{(0)}(k) + aZ^{(1)}(k) = b, \qquad \mathrm{k} = 1, 2, 3, \dots \tag{24}$$

The model parameters a and b are estimated as follows,

$$\begin{pmatrix}\hat{a}\\ \hat{b}\end{pmatrix} = (B^T B)^{-1} B^T Y \tag{25}$$

where

$$B = \begin{pmatrix} -\frac{1}{2}\left(x^{(1)}(1) + x^{(1)}(2)\right) & 1 \\ -\frac{1}{2}\left(x^{(1)}(2) + x^{(1)}(3)\right) & 1 \\ \vdots & \vdots \\ -\frac{1}{2}\left(x^{(1)}(n-1) + x^{(1)}(n)\right) & 1 \end{pmatrix}, \qquad Y = \begin{pmatrix} x^{(0)}(2) \\ x^{(0)}(3) \\ \vdots \\ x^{(0)}(n) \end{pmatrix} \tag{26}$$

Pa rameter α and b also estimated as follows by using the time series form by the least square method:

$$\hat{a} = \frac{\sum_{k=2}^{n} z^{(1)}(k) \ \sum_{k=2}^{n} x^{(0)}(k) - (n-1)\sum_{k=2}^{n} x^{(0)}(k) \ \ z^{(1)}(k)}{(n-1)\sum_{k=2}^{n}[z^{(1)}(k)]^2 - (\sum_{k=2}^{n} z^{(1)}(k))^2}, \tag{27}$$

$$\hat{b} = \frac{\sum_{k=2}^{n} x^{(0)}(k) \ \sum_{k=2}^{n}\left[z^{(1)}(k)\right]^2 - \sum_{k=2}^{n} x^{(0)}(k) z^{(1)}(k) \sum_{k=2}^{n} z^{(1)}(k)}{(n-1)\sum_{k=2}^{n}[z^{(1)}(k)]^2 - (\sum_{k=2}^{n} z^{(1)}(k))^2}. \tag{28}$$

Step 5: Solving the differential equation with an initial condition $x^{(1)}(1) = x^{(0)}(1)$, we obtain a prediction model as follows,

$$\hat{x}^{(1)}(k+1) = \left[x^{(0)}(1) - \frac{\hat{b}}{\hat{a}}\right] e^{-\hat{a}k} + \frac{\hat{b}}{\hat{a}} \quad , \quad k = 1,2,3,\ldots \tag{29}$$

We estimates the original data by inverse accumulated generating operation (IAGO) which is defined as

$$\hat{x}^{(0)}(k+1) = \left(1 - e^{-\hat{a}}\right)\left(x^{(0)}(1) - \frac{b}{a}\right) e^{-\hat{a}k} \ , \qquad k = 1,2,3,\ldots \tag{30}$$

4. EMPIRICAL ANALYSIS

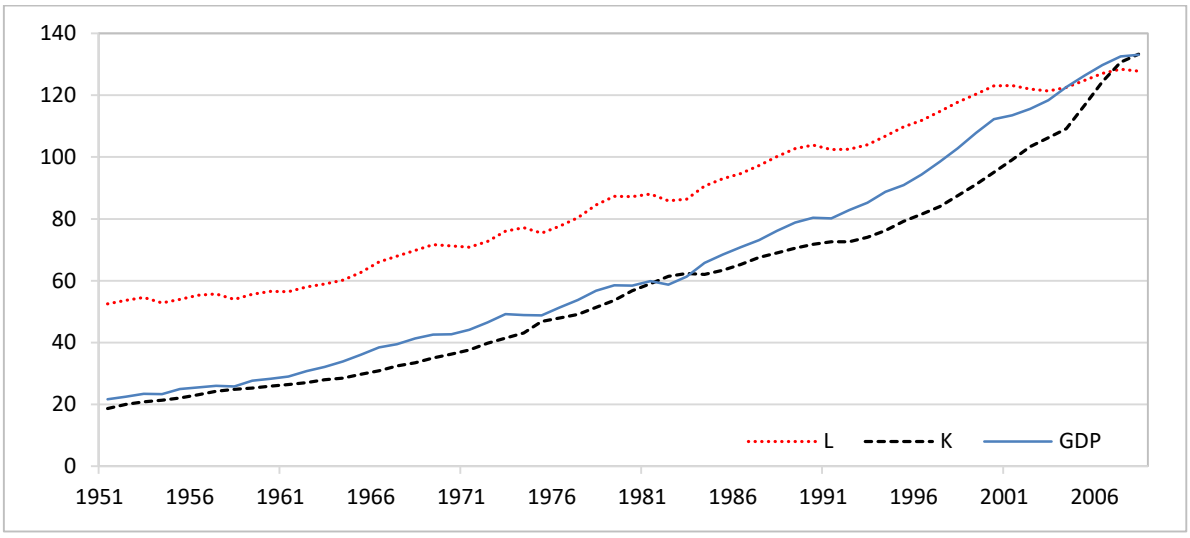
In this study, we analysis the economic growth of US, first we describe the behavior pattern of economic factors and then we measure the input factor's contribution rate to economic growth.

We are used the annual data Gross Domestic Product (GDP-Billion US dollar) (Q_t) as a output and Labor (the number of employees (10.000 people)) (L_t) and Capital (fixed asset investment)(Billion US dollar) (K_t) as a input factors series for United State of American economy for 1951 to 2008. Data obtained from the United States Department of Commerce and the NIPA National Income Product Accounts (Thompson, H., 2016). The present series in Fig. 1 include labor and capital inputs and GDP. The capital stock time series used in models are not directly observable, then we obtain them by using capital formation index and GDP. Generally, the deflate values of inputs and outputs are used as a proxy of physical quantities (De Loecker, 2011).

Capital : Capital was taken as the total of the stock of machines, equipment and structures used in production. The time series of capital is usually not found in economics databases. We can built it using two index as Gross capital formation (GKF) and GDP as follows (Godin, A. and Kinsella, S., 2013),

$$K_t = \frac{GKF_t}{\overline{GDP} + 0.05}. \tag{31}$$

Figure 1: Trends in Labor, Capital and GDP



Labor: Labor is computed as total man-hours worked during the time period as

$$L_t = pop_t . part_t (1 - nairi_t) hours_t \tag{32}$$

where pop_t: total population, $part_t$: participation rate, $nairi_t$: non-accelerating inflation rate of unemployment, $hours_t$: average hours worked per capita. Or, if we don't have data, we use the number of people working (labor force) or the total population of working age (15-64).

4.1. Statistical Analysis of Parameter Estimation

Cobb-Douglas production function in Eq. (6) can be converted to linear form as follows,

$$\ln Q = \ln A + \alpha \ln K + \beta \ln L.$$

The regression results obtained as Table 2.

Table 2: The Regression Results

Adjusted R Square	0.9955
F statistics	6306.6823

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	-5.7761	1.1151	-5.1799	3.252E-06
ln K	0.4030	0.0677	5.9545	1.905E-07
Ln L	1.0936	0.1281	8.5377	1.170E-11

Obtained Cobb-Douglas model parameters are given in Table 3.

Table 3: Cobb-Douglas Model Parameters

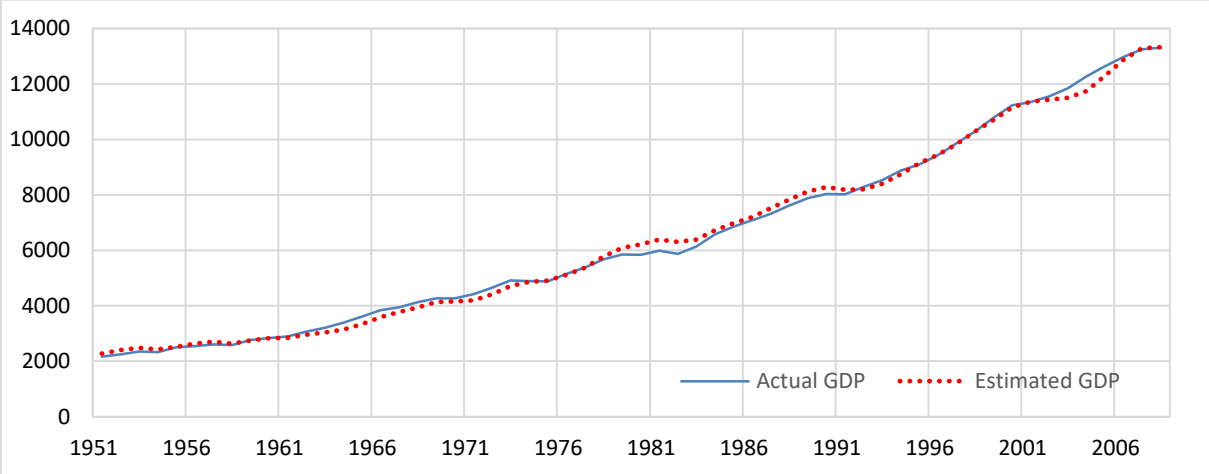
$\hat{A}$	$\hat{\alpha}$	$\hat{\beta}$	$\hat{\alpha} + \hat{\beta}$
0.0031	0.403	1.094	1.497

The model coefficient of determination is $R^2 = 1 - \frac{\sum_{t=1}^{58}(Q_t - \hat{Q}_t)^2}{\sum_{t=1}^{58}(Q_t - \bar{Q}_t)^2} = 0.9957$. It shows that the model has a very high fitting precision. Finally, Cobb-Douglas production function regression equation can be obtained as follows,

$$\hat{Q}_{regression} = 0.0031\, K^{0.403}\, L^{1.094}\,. \tag{33}$$

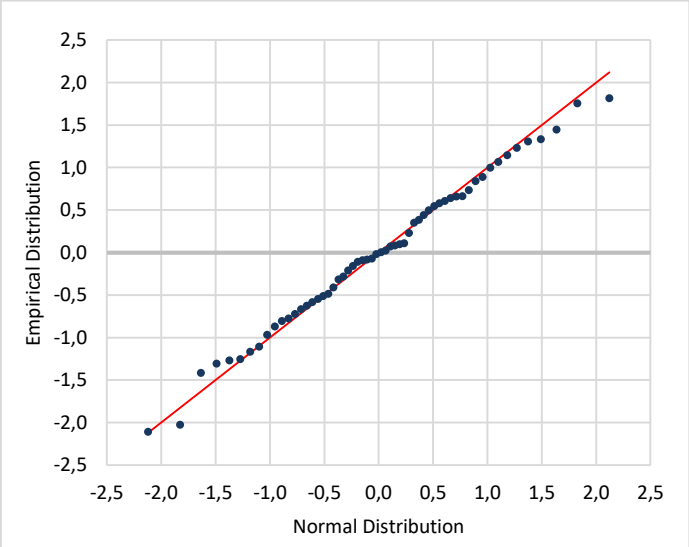
Result of the regression show that regression equation is significant. Then, the explained ratio of GDP by changes in capital and labor is 99.55%.

Figure 2: Actual GDP and Estimated GDP According to Cobb - Douglas Production Function for $\widehat{A} = 0.0031$, $\widehat{\alpha} = 0.403$ and $\widehat{\beta} = 1.097$.



Errors between the observed real GDP values and the values which estimated by Cobb-Douglas production function are distributed as a normal. This situation is shown by using the Q-Q plot in Fig. 3.

Figure 3: Q-Q Plot of Residuals between Real GDP and Estimated GDP



The points in the Q-Q plot lie on straightforward line. This shows that the residuals are based on normal distribution.

Production function in Eq. (33) show that level of production technology is 0.0031. The elasticity of capital α is 0.403. This value shows that 1% increase in capital lead to 0.403% increase in GDP. The elasticity of labor β is also 1.094. This value shows that a 1% increase in labor lead to a 1.094% increase in GDP. The sum of elasticities of input factors is

$$\alpha + \beta = 0.403 + 1.094 = 1.497 > 1.$$

This shows that per percent of increase in GDP is greater than that of the increase in capital and number of employees, i.e. it shows increasing return to scale.

We obtain the picture shown in Fig. 4 of Cobb-Douglas production function in Eq. (33) having increasing return to scale.

Figure 4: Cobb-Douglas Production Function for $\widehat{A} = 0.0031$, $\widehat{\alpha} = 0.403$ and $\widehat{\beta} = 1.094$.

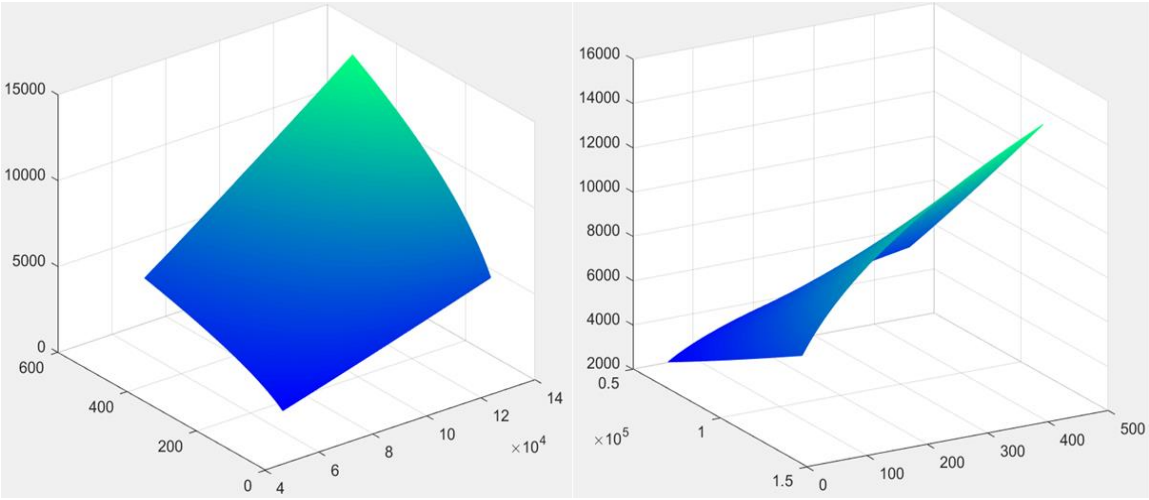


Figure 5: Labor Productivity and Capital Productivity

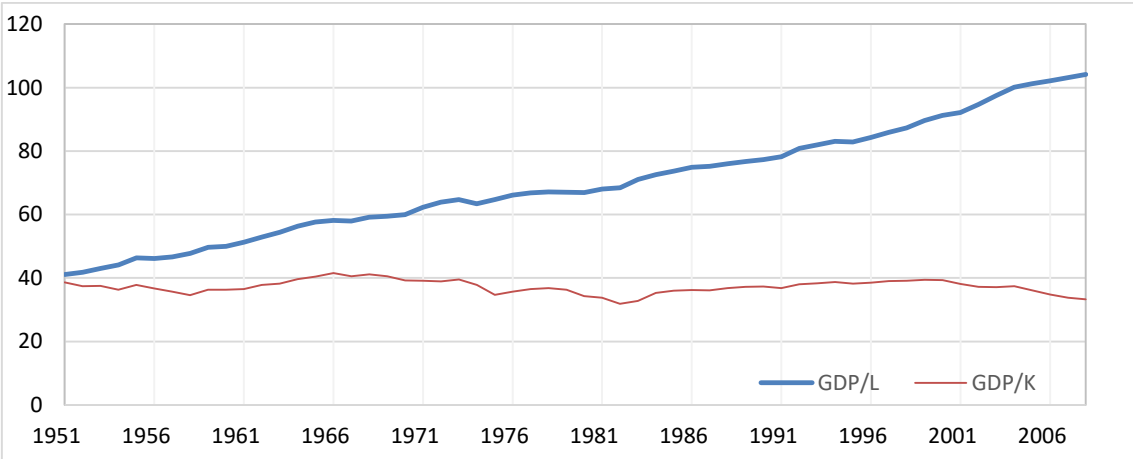
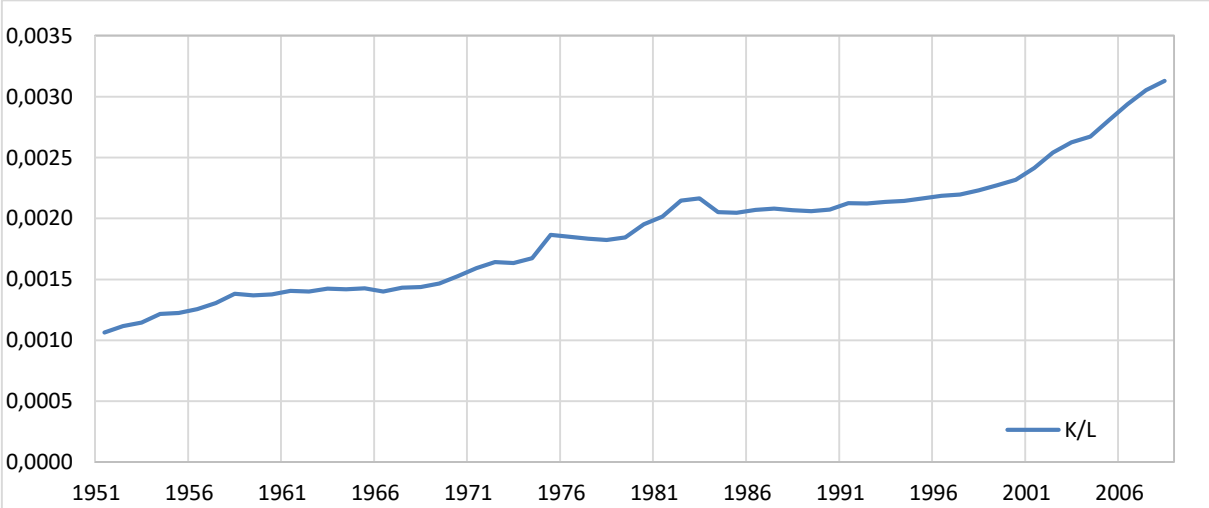


Figure 6: Capital – Labor Ratio



4.2. Grey Cobb-Douglas Production Function

Predictions for the values of K and L input factors obtained by using GM(1,1) model shown in Table 4.

Table 4: Prediction of Production Factors by Using GM(1,1) Model

Year	GM(1,1) prediction for L	GM(1,1) prediction for K	Year	GM(1,1) prediction for L	GM(1,1) prediction for K
2009	141277.17	467.76	2014	147525.08	452.55
2010	137815.06	397.71	2015	150057.65	467.40
2011	140180.94	410.77	2016	152633.70	482.74
2012	142587.44	424.25	2017	155253.97	498.58
2013	145035.25	438.17	2018	157919.23	514.94

Figure 7: Actual Capital and Estimated Capital Obtained by Using GM(1,1) Prediction for K

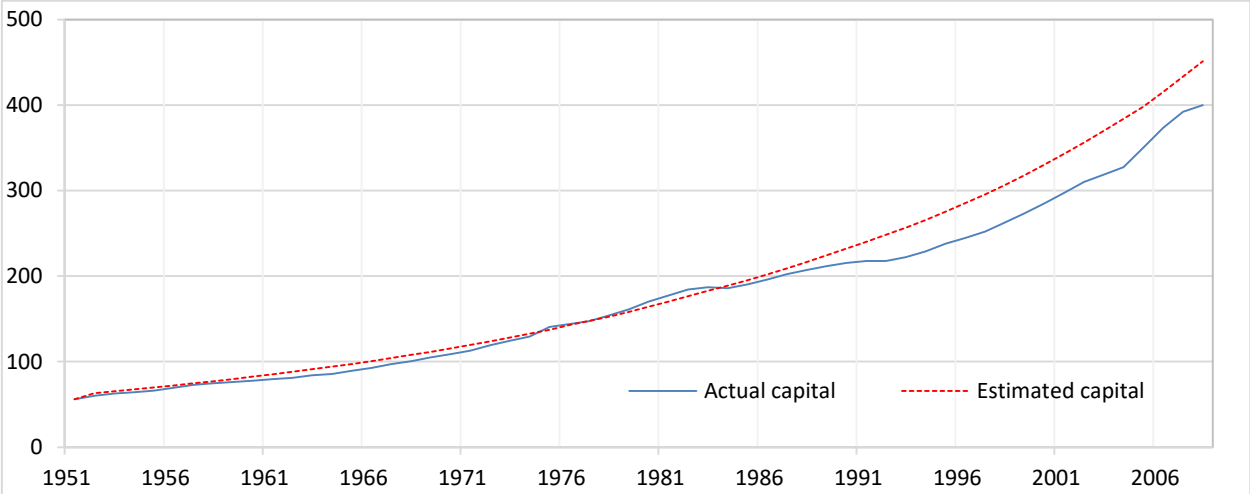


Figure 8: Actual Labor and Estimated Labor Obtained by Using GM(1,1) Prediction for L

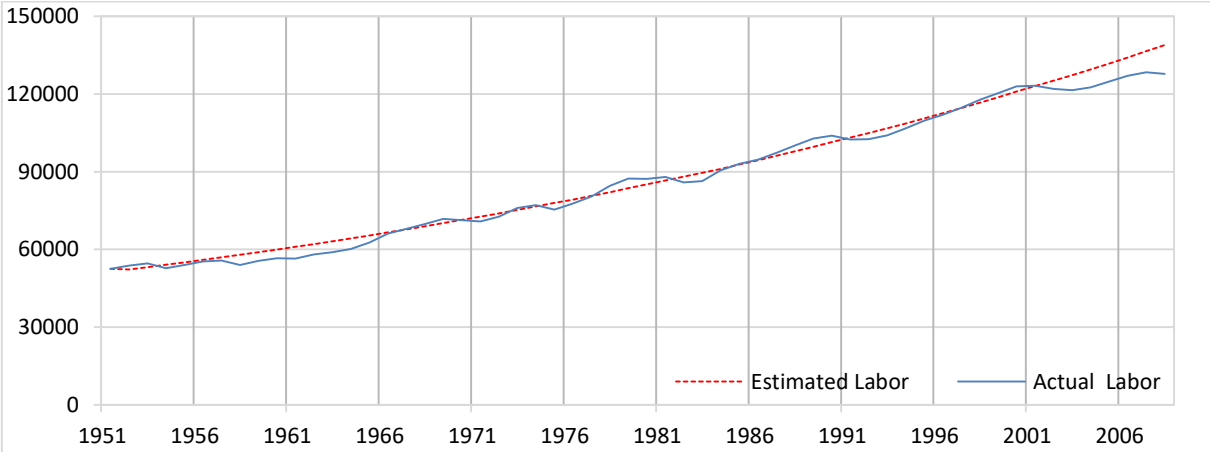
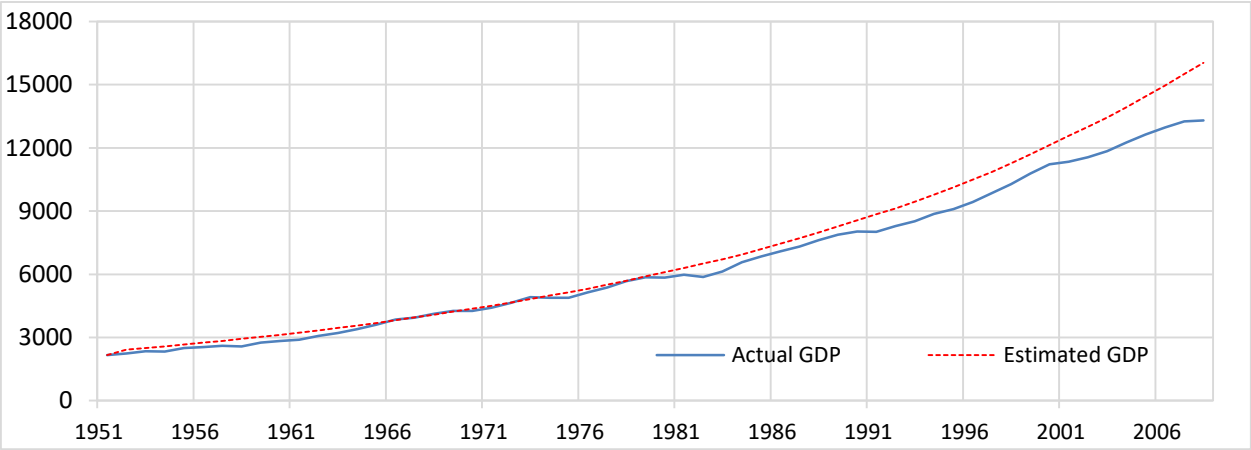


Figure 9: Actual GDP and Estimated GDP Obtained GM(1,1) Prediction for GDP



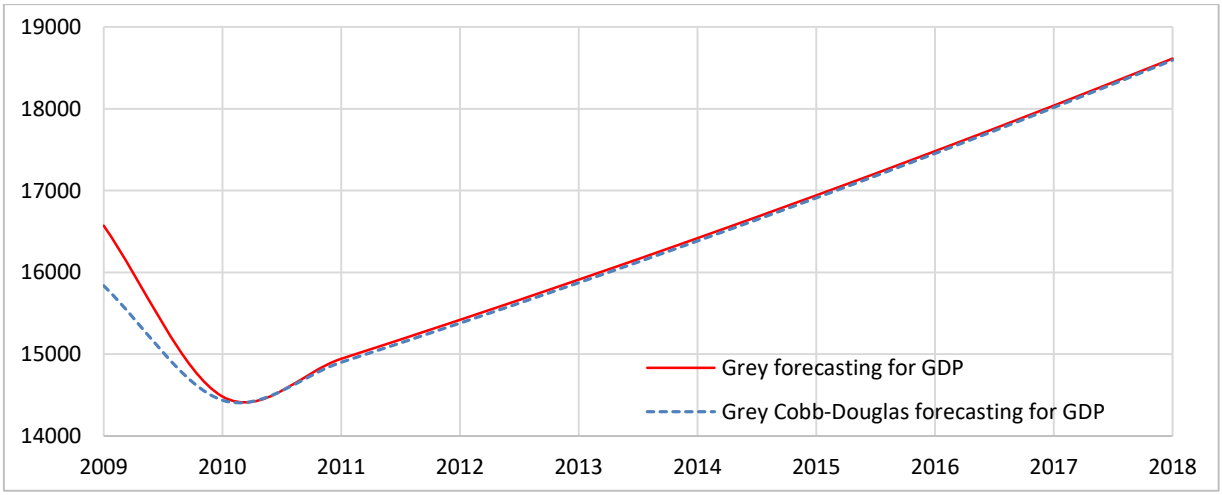
We determine the Grey Cobb-Douglas production function as (Zhu. S., Wu. Q. J. and Wang. Y., 2011).

$$\hat{Q}_t = \hat{A}\left(\hat{K}_t^{Grey}\right)^{\hat{\alpha}}\left(\hat{L}_t^{Grey}\right)^{\hat{\beta}}. \tag{42}$$

Table 5: The GM(1,1) Forecasting and Grey Cobb-Douglas Forecasting for GDP

Year	GM(1,1) forecasting for GDP	Grey Cobb-Douglas forecasting for GDP
2009	16570.35	15836.51
2010	14481.48	14437.28
2011	14942.97	14901.18
2012	15419.17	15379.99
2013	15910.55	15874.18
2014	16417.59	16384.25
2015	16940.78	16910.72
2016	17480.64	17454.09
2017	18037.72	18014.93
2018	18612.54	18593.79

Figure 10: Plot of the GM(1,1) Forecasting and Grey Cobb-Douglas Forecasting for GDP



4.3. Error Analysis

Error Analysis is needed for examining the precision of forecasted results. The Mean Absolute Percentage Error (MAPE) is one of the most widely used methods that is evaluation of forecasting error. The MAPE is calculated as,

$$MAPE = \frac{1}{n}\sum_{t=1}^{n}\left|\frac{Q_t - \hat{Q}_t}{Q_t}\right| . \tag{43}$$

Where Q_t is actual value. $\hat{Q}_t$ is also forecasting value at time t. n is the number of periods forecasted (Makridakis. S.. Wheelwright. S. C. and Hyndman. R. J., 2008).

Table 6: MAPE reference values for forecasting accuracy

MAPE	Forecasting Accuracy
Less than 10%	Highly accurate
11% to 20%	Good forecast
21% to 50%	Reasonable forecast
51% or more	Inaccurate forecast

MAPE value for Cobb-Douglas production function estimation is calculated as

$$MAPE = 0.0282.$$

This value is less than 10%, so we can say that Cobb-Douglas production function is suitable model for forecasting of GDP values.

5. CONCLUSION

The percent change growth of production is proportional to percentage change growth in the quantities of input factors without changing factor usage shares. That is the constant return to scale form of the production function. Cobb-Douglas production function model is applied to capital, labor, Gross Domestic Product (GDP) time series for United States of American economy for 1951 to 2008 and is obtained that marginal contribution to GDP of capital input is 0.403 and marginal contribution to GDP on labor input is 1.094. Findings show that United States economic (GDP) is labor intensive. In addition, it is confirmed that the labor force and capital has a positive effect on economic growth. Besides, GM(1,1) model is used to prediction of future labor and capital values. Predicted values for K and L putting into grey Cobb-Douglas production model is forecasted GDP values. Finally, improvement of the labor quality can help to increase of the GDP values.

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VALUE OF FINANCIAL RATIOS IN PREDICTING STOCK RETUNS: A STUDY ON BORSA ISTANBUL (BIST)

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ABSTRACT

Purpose- This paper investigates whether financial ratios can predict stock returns for the period between from 2004: II and 2014: IV in the Borsa Istanbul (BIST). For this purpose, four financial raitos have been used that include price to book ratio (P/B), price to earning ratio (P/E), dividend per share (DPS) and firm sizes are selected.
Methodology- This study applies panel data analysis which is an important predictive regression tools for predicting stock returns.
Findings- The results disclose that the financial ratios can predict stock return.
Conclusion- From financial ratios, firm size has a higher predictive power than dividend per share and price to book ratio respectively. However, there is no significant relationship between price to earning ratio and for stock returns.

Keywords: Financial ratios, stock returns, panel data models, BIST.
JEL Codes: G12, G17, C33

1. INTRODUCTION

One of the main purposes of stock markets was the allocation of resources, and matching those who have capital to those who need it. Today the financial markets perform essentially the same fundamental role as centuries ago. What is significantly different, however, is the speed of the processes, the international nature of investment businesses, the complexity of deals to meet the sophistication of the users' requirements and the sheer size of the 'market' (Loader, 2002; 2). There is another thing which has changed over time: trying to predict stock returns to get the highest expected return of an acceptable risk level. Thus, forecasting the stock returns has always been a pragmatic emergence in the financial studies of asset pricing.

A vast number of assets changes hands every day in financial markets around the world. Whether these assets are in the form of stocks, bonds, currencies or derivatives; there are common features driving the market price of these assets. For example, asset prices fluctuate more wildly than the prices of ordinary consumption goods in our daily lives. Another distinguishing feature of assets is that these assets entail uncertain payments, most of which occur far in the future. The price of assets is driven by expectations about these future payoffs. New information causes market participants to re-evaluate their expectations. For example, "news" about a company's future earning prospects changes the investors' expected value of stocks or bonds; while news of a country's economic prospects affect currency exchange rates. Depending on the information, market participants buy or sell the assets accordingly. In short, the information affects their trading activity and, thus, the asset price (Brunnermeier, 2001; 2).

Since information has a fundamental importance to forecasting future returns; financial practitioners and economists have sought to identify the most useful variables that predict stock returns. Among many others, information and variables the market price of a share is a key factor that impacts investment decision of investors. The share price is one of the most important indicators available to the investors for their determination to invest in or not a particular stock (Gill et al, 2012). The share price in the market is not static but dynamic nature. The most obvious factors that influence the share price are

demand and supply. The price of any commodity is affected in both from micro-economic and macro-economic factors in economics (Uddin et al, 2013). A number of macro-economic aspects including politics, general economic conditions i.e. how the economy is performing, government regulations, etc, as well as company-related aspects for instance ownership structure, management quality, labor force quality, dividend per share, book value (asset value) of the firm, earnings per share, price earnings ratio and dividend cover etc, all of these factors have an impact on the investor's pricing decision (Razuk, 2001; 5).

When Kendall (1953) observed that stock prices, he seemed to wander that stock prices behaviour were random over time almost sixty years ago; he and most of the other scholars contributed in literature on market efficiency and tested whether a typical price changes could be predicted using past returns (Lewellen, 2004; 210). Since then different valuation techniques have been produced in order to estimate the future prices of a stock. The type of analysis emphasized in this study takes into consideration business financial statements, health of financial statements, management, competitive advantages, competitors rivalry and markets. This type of an analysis technique is known as "fundamental analysis" in the business world. The main objective of fundamental analysis is to determine the -intrinsic value of a security by the careful examination of key value drivers such as earnings risk, growth, and competitive position. Ratio analysis is one of the main tools that fundamental analysts use in achieving this objective. Financial ratios are defined as mathematical relationships between relevant figures which are obtained from financial statements. The assessment of the relationship between financial ratio and stock prices may indicate whether there are patterns in the markets' response to that information, therefore indicating the usefulness of ratio analysis as a quantitative tool for security valuation (Razuk, 2001; 5).

It is important to note that a number of financial ratios and other variables as stated previously may impact on the dependent variable that are not included in the model proposed. The purpose of this study is not to create a model that explains the stocks' behavior, but rather to demonstrate whether if and how the selected financial ratios impact share prices in Istanbul Stock Exhange, Turkey.

In this research, effectiveness of financial ratios as predictors of stocks' performance are assessed in Istanbul Stock Exhange. The financial ratios are used in this study: price to book ratio (P/B), price to earning ratio (P/E), dividend per share (DPS) and firm sizes. A regression analysis is tested to find the correlation among the percentage changes in the financial ratios and the percentage change in the stock returns for the companies listed as BIST 100 in BIST.

The paper structure is organized in the following form. Section 2 provides a review of the existing literature on stock return predictability with financial ratios. Section 3 discusses data and methodology for constructing stock return predictors. Section 4 provides empirical findings. Section 5 puts up a conclusion.

2. LITERATURE REVIEW

Here is some empirical evidences that explain the association between dividend, book to market ratio, firm size and other income statement variables connected with stock returns. Collins (1957) found that dividend per share and book value per share influence share prices in the banking industry in the USA. Size of the firm, book to market ratio and earnings to price ratio reflects capital market integration (Eun Lee, 2010). Lam (2002), Chui and Wei (1998) captured the cross sectional variations of the stock returns and idiosyncratic return volatility with higher transaction costs, with lower investors sophistications that is linked with book to market ratio (Ali, Hwang, and Trombley, 2003). Midani (1991) investigated a sample of 19 companies in Kuwait and found earnings per share as a determinant of share prices. Nirmala et al (2011) collected data from Indian stock markets for the period of 2000-2009 and identified price-earnings and dividend per share ratio as the major determinants of share prices. Earnings-to-price ratio is determined to contribute significantly in explaining the long-term stock price variation (Campell and Shiller, 1988).

The intuition behind for dividend is explained by Skinner (2008); that dividend succintly predicts the stock returns because of policy payouts that emerged with pay dividends, regular repurchases and occasional repurchases. Dividend yield is a good predictor of the stock return (Al-Hares, Abu Ghazaleh, and Haddad, 2012); on the same way book to market and earnings-price ratio are the good predictors of stock returns for the short sample (see Lewellen (2004)), since there is strong and positive relationship between corporate dividends and stock return (see, Chen and Wu, (1999), Huang et al (2009)).

Similar studies by Ang and Liu (2007) demonstrated that expected stock return and return volatility are completely explained by the price ratio and dividend ratio. There is a common dynamic stochastic trend among earnings to price ratio and dividend ratio with expected stock return (see also Lee, 1996).

Book to market ratio is strongly associated with risk and stock returns (Hung, Chiao, Liao, and Huang (2012)). After controlling for risk factors- book to market ratio does not provide any significant information for expected stock return (Lewellen, 1999); meanwhile book to market ratio is strongly influenced by the past activities of trading institutions that predicts the stock return and firm size (Jiang H, 2010).

Morelli (2007) studied beta, size, book to market equity and stock returns for the UK securities data and found that market is segmented between ups and downs with a significant relationship between beta and stock returns, while book to market ratio is found to be a significant determinant of stock return. Aharoni et al. (2013) considered dividend discount model with comparative static valuation model and determined book to market ratio as a predictor of stock returns. Apergis and Payne (2014) studied the G-7 stock markets using the panel nonlinear co-integration model, and found that there is asymmetric effect between stock returns and size. Although some authors, such as Lo and MacKinnlay (1990), point out that the models for predicting the stock returns might be just data snooping, it is still widely believed that some financial and economic factors can explain much of the variation of the stock returns so as to have a great forecast power for stock return for example: the articles by Keim and Stambaugy (1986), Fama and French (1988), Campbell and Shiller (1988), Ferson and Harvey (1991, 1993), Whitelaw (1994), Pesaran and Timmermann (1995), Pointiff and Schall (1998) Bossaerts and Hillion (1999) and Martijn Cremers (2002). In these papers, the stock returns are suggested to be predictable by a linear model with some financial predictors such as earnings yield and some economic cycle components as well, including interest rate, inflation rate, industrial production growth effect on stock returns.

3. DATA AND METHODOLOGY

In order to examine the relationship between financial ratios and stock returns panel data methodology is used to estimate the relations among the related variables BIST100 companies that are taken into account for the period of 2004: II-2014: IV. However, due to some missing observations, we used 47 companies' quarterly data for our analysis in order to maintain the robustness and validity of our model. We obtained the data series for i variables from the İstanbul Stock Exchange's official website. Since, we are interested in applying panel data models, we will give a general introduction about the model, then we will present information about the panel data method. The companies that are taken into consideration for estimation in the analysis are shown in the Appendix 1.

$$STOCKRETURNS_{it} = \alpha_{it} + \beta_1 P/E_{it} + DPS_{it} + FIRMSIZE_{it} + P/B_{it} + \varepsilon_{it} \quad (1)$$

Here; $STOCKRETURNS_{it}$ = stock returns of firm *i* at time *t*

α_{it} = a constant impact which reflects the timing differences between firms

P/E_{it} = price to Earning Ratio of firm *i* at time *t*

DPS_{it}= dividend per share of firm *i* at time *t*

$FIRMSIZE_{it}$ = size of firm *i* at time *t*

P/B_{it} = price to book ratio of firm *i* at time *t*

β= Beta coefficient

ε_{it} = represents the residual of model.

Panel data analysis is significantly used from 1980s due to its validity. It reflects the desire properties for controlling unobservable individual private effects and may be associated with other variables in the scope of the model which is used to determine an economic relationship. (Hausman and Taylor, 1981: 1377). Hence, the panel estimation is the combined effect of multiple cross section objects' observations that are driven from the period of analysis in the panel data analysis, consequently the merger of time series and cross section observations are used for the estimation process. In a typical panel data analysis, an analysis is carried out by using "N" number of individual's T-term time series data for the dependent variable. General equation for panel data are expressed by equation number (2): (Kaya and Yılmaz, 2006: 69)

$$Y_{it} = \beta_{1it} + \beta_{2it} X_{2it} + \beta_{3it} X_{3it} + \varepsilon_{it} \qquad t = 1...T \text{ ve } i = 1...N \quad (2)$$

The simplest form of panel data analysis is used to keep the coefficients in the model constant for all cross sectional individuals. This assumption is represented by the equation as follows:

$$Y_{it} = \beta_1 + \beta_2 X_{2it} + \beta_3 X_{3it} + \varepsilon_{it} \quad (3)$$

Equation (3) suggests that all independent variables affect all the cross sectional individual observations equally. However, this equation is insufficient if it is assumed that independent variables affect different individuals in different ways. At this point, the basic issue arises on how to define the starting point (β_1) in an estimation model. The starting point can be held constant for all the individuals or different starting points are allowed for different cross sectional individuals not using

a starting point. In this regard, there are two alternative methods to define the starting point; "fixed effects model," and "random effects model". In the panel data analysis, models are called "fixed effects model" on the assumption that coefficients change accordingly with the unit and a time effect. The general formulation of the model is based on the differences between the units that can be captured with the differences occuring in the constant term. Thus, in this models only the constant term varies and constant term can show us differences at the cross sectional based as opposed to the time effect. Even though the time dimesion is retained by constant variables, behaviors between individuals show differences (Pazarlıoğlu and Gürler, 2007: 37-38). The fixed effects model is expressed in equation (4) used by: (Judge, 1985: 519)

$$y_{it} = \bar{\beta} + \alpha_i + \beta_1 X_{1it} + \ldots + \beta_k X_{kit} + \varepsilon_{it} \qquad i = 1, 2, \ldots, G \text{ ve } t = 1, 2, \ldots, N \tag{4}$$

Equation (4), y_{it} represents the dependent variable; $\bar{\beta}$ average constant term; α_i difference from the average constant term for the *i* section; , X_{it} independent variables; *i* cross sectional unit; *t*, time and ε_{it} error term. If there is a relationship between error term and explanatory variables in this equation, using the fixed effect model gives more accurate results. As, in equation 4, estimators of fixed effects model are acquiring drift. There is a thumb rule for the application of fixed and random effect model. One might conclude the appropirate selection of the model to choose a Hausman test, however, it is also certainly true in the econometrics that when the number of cross sections are too small and the number of observations are too large, we can apply a fixed effect model.

Fixed effects model formulate is an alternative approach to random effects model which is also expressed as "Error Components Approach". It is demonstrated that there are different trend values for each section unit in the random effects model and those trend values are remaining constant over a period of time. There is a temporary cross sectional relationship between the explained variables and explanatory variables. In this regard, the main difference of the random effects model are the trend values valid for the cross section unit which stems from a common trend value like α and ε_i that creates random variation, changes along the cross sections and remain constant for certain period. Therefore, starting from the common trend ε_i , it measures the random deviaiton of each unit of cross section (Brooks, 2008: 498)[1] . Random effects model can be expressed in equation 5, which was used by (Wooldridge, 2009: 489)

$$y_{it} = \beta_0 + \beta_1 X_{1ij} + \ldots + \beta_k X_{kij} + \alpha_i + \varepsilon_{it} \tag{5}$$

α_i , since it is considered to be related with one or more than one X_{ij} in the fixed effects model. In the random effects model number (5), it is assumed that α_i is unrelated to each explanatory variable for all time periods.

Cause and effect relationship between the variables was imparted for the first time in the literature by Granger (1964, 1969) and then was analyzed by using causality analysis developed by Hamilton (1994). In the Granger causality, the direction of relationship between dependent and independent variables is investigated. Sometimes the current value of dependent variable “Y” is better estimated with the previous period values than the current value of the independent variable “X” as Granger causality from X variable to Y variable was referenced in (Charemz and Deadman, 1993: 190) to demonstrate the causal relationship. We specifically reached at the following “causal relationship” with two variables that forms in (6) and (7) equation and this relationship was mentioned in (Kutlar, 2007: 267);

$$Y_{it} = \sum_{i=1}^{n} \alpha_{it} Y_{i,t-k} + \sum_{i=1}^{n} \beta_{it} X_{i,t-k} + EC_{it-1} + u_{1it} \tag{6}$$

$$X_{it} = \sum_{i=1}^{n} \alpha_{it} X_{i,t-k} + \sum_{i=1}^{n} \beta_{it} Y_{i,t-k} + EC_{it-1} + u_{2it} \tag{7}$$

Econometric assumption states that error terms of $u_{1i,t}$ and $u_{2i,t}$ should be assumed to be unrelated. Thus, equations number (6) and (7) determine the dependent variable values based on the past obserations along with its own past values.

[1] We would strongly urge you to look the paper (Brooks, 2008:498) on how to calculate the common trend.

However, by doing so, we may attain single and bi-directional causal relationship between Y_{it} and X_{it}, and we may also accomplish no casual relationship among variables from Granger causality analysis.

4. FINDINGS AND DISCUSSIONS

"The econometric estimation embarks on the unit root tests which inquire whether variables we obtain maintain the stationary property or not? Whenever panel data set is used to test the presence of unit root; testing the cross sectional dependence is crucial. If cross-sectional dependence is rejected, then using the first generation unit root tests is more suitable. On contrary, if it is determined that cross-sectional dependence is valid, then using the second generation unit root tests provides more consistent results in panel in data set (Çınar, 2010: 594). In this study, LM Pearson cross sectional dependence test is applied and it is observed that variables are not cross sectional dependent. Therefore, it would be suitable to use the first generation for panel data unit root tests.

Table 1: The Results of the Panel Unit Root Tests

Methodology	Variables	Statistic	Probability	Number of Cross	Number of Observation
Levin, Lin and Chu t Statistic	P/E	-49.5079*	0.0000	47	1397
	DPS	-58.6118*	0.0000	47	1815
	STOCKRETURNS	-32.2954*	0.0000	47	1885
	FIRMSIZE	-82.0030*	0.0000	47	1834
	P/B	-36.4890*	0.0000	47	1785
Im, Pesaran and Shin W Statistic	P/E	-35.2243*	0.0000	47	1394
	DPS	-41.4148*	0.0000	47	1815
	STOCKRETURNS	-31.2249*	0.0000	47	1815
	FIRMSIZE	-39.2561*	0.0000	47	1834
	P/B	-35.8025*	0.0000	47	1785
ADF-Fisher χ^2 Statistic	P/E	882.913*	0.0000	47	1397
	DPS	1090.34*	0.0000	47	1815
	STOCKRETURNS	961.794*	0.0000	47	1885
	FIRMSIZE	857.409*	0.0000	47	1834
	P/B	1039.44*	0.0000	47	1785
PP-Fisher χ^2 Statistic	P/E	1034.13*	0.0000	47	1441
	DPS	1176.77*	0.0000	47	1838
	STOCKRETURNS	1040.15*	0.0000	47	1907
	FIRMSIZE	932.387*	0.0000	47	1848
	P/B	1126.68*	0.0000	47	1903

Not: *The statistics for Fisher tests are computed using an asymptotic χ^2 distribution and all other tests assume asymptotic normality. *, ** and *** indicate the stationary of the variables at the significance level of 1 percent, 5 per cent and 10 per cent, respectively.*

Table 1 shows the results of the unit root test of the variables that are taken into account in the model and various types of the unit root tests. According to results of the various types of the unit root tests, the variables used in the model are stationary at the different significance levels. Since variables are found to be stationary at the different significance levels, there is no need to investigate a co-integration relationship which requires to investigate the long term relationships among the financial variables. Therefore, there is no need to investigate a long run casual relationship for this model. However, some studies from the literature found that, even though, there is no long term realtionship between variables, there might be possibility that a causal link in the short term exists. Boulila and Trabelsi (2004) found a long-term relationship between the variables (co-integration) for three countries in their study, which covers sixteen Middle East and North Africa countries and applied the error correction mechanism for these countries. However, they also found that a long-term relationship does not exist between pairs of variables in thirteen countries including Turkey and they also apply a short-term causality tests on the assumption of existence of short term relationship in these countries. Likewise, Ünalmış (2002) could not find long term relationship for two of the five variables in his study, which investigates the relationship between financial development and economic growth in Turkey and he also found that the short-term Granger causality test for these variables do not have a long run relationship. In this study, we conducted Granger Causality test with assumption of existence of short term relationships between variables.

Table 2: The Results of Granger Causality Analysis

Variable Pairs	The Direction of Causality	F Statistic	Probability
STOCKRETURNS (2) - P/E (5)	—	0.6083	0.6936
P/E(5) - STOCKRETURNS(2)	→	3.1252	0.0083
STOCKRETURNS (2) – DPS (7)	—	0.0303	0.9702
DPS(7) – STOCKRETURNS(2)	→	2.6287	0.0725
STOCKRETURNS (2) – FIRMSIZE (3)	→	3.2649	0.0206
FIRMSIZE(3) – STOCKRETURNS(2)	→	2.8461	0.0364
STOCKRETURNS (2) - P/B (2)	→	29.8585	0.0000
P/B(2) - STOCKRETURNS(2)	—	1.9042	0.1493

Note: *Values in parenthesis show the optimum lag lengths determined by taking AIC and SIC into consideration. *, ** and *** indicate the significance at 1 per cent, 5 per cent and 10 per cent significance level, respectively.*

Table 2 shows the results of Granger Causality analysis. Causal relationship between stock price and price/earnings ratio from price/earnings ratio to stock price has been found. Likewise, a causal relationship between stock price and dividend per share from dividend per share to stock price has also been found. A bi-directional casual relationship has been found between stock price and firm size. In other words, when stock price affects the firm size of the company, firm size of the company affects stock price. In the last investigation of causal relations, a one-way causal relationship has been found from stock price to market value/book value ratio.

Table 3: F and LM Test Results Demonstrating the Effects Unit and Time

Relationship	F Test		LM Test		Hausman Test
	Test	Statistics	Test	Statistics	
Model 1	F_{Unit}	0.9496	F_{Unit}	-2.5225	16.9558 *
	F_{Time}	33.4060*	F_{Time}	82.6105*	
	$F_{Unit-Time}$	16.7493*	$F_{Unit-Time}$	57.1013*	

Note: **, ** and *** indicate the significance at 1 per cent, 5 per cent and 10 per cent significance level, respectively. Test statistic developed by King-Wu were used in the calculation of LM test statistics for random effects models.*

Following the determination of causal relationships between variables, results of fixed and random effects models used to forecast the financial variables and their behaviour. For this purpose, *F* and *LM* tests are conducted to decide the appropriate panel data model.

Table 3 demostrates that the F and LM test results show the effects of unit and time. According to the table Hausman test statistics is rejected at 1% significance level and explain that fixed effects model is more appropriate than the random effects model with F-test results. Because of time effect and unit-time effect are rejected at 1% significance level according to the F test results, Therefore, it will be appropriate to use fixed effect model based on units of time.

Table 4: The Results of the Estimates of fixed and random effects models

Fixed Effect Model			**Random Effect Model**		
Variable	**Coefficient**	**t statistic**	**Variable**	**Coefficient**	**t statistic**
C	0.0722*	17.1957	C	0.0725*	4.9467
P/E	-0.0012	-1.3407	**P/E**	-0.0008	-0.8474
DPS	0.0013***	1.7834	**DPS**	0.0013**	1.9448
FIRMSIZE	0.0106*	2.4507	**FIRMSIZE**	0.0137**	2.3415
P/B	0.2708*	18.3534	**P/B**	0.2766*	16.2572
Unit Effect	There is not		Unit Effect	There is not	
Time Effect	There is		Time Effect	There is	
Unit - Time Effect	There is		Unit - Time Effect	There is	
R^2=0.6432	F=28.0844*		R^2=0.1978	F=93.7587*	
$F_{(probability)}$=0.0000	DW=1.8796		$F_{(probability)}$=0.0000	DW=1.8112	

Note: **, ** and *** indicate the significance at 1 per cent, 5 per cent and 10 per cent significance level, respectively.*

Table 4 shows the results of estimates of fixed and random effects models. As stated above, it was shown that fixed effect model gives more consistent results in the Hausman test. According to this DPS variable, FIRMSIZE and P/B variables are found positive and significant at the 10%, 1% and 1% significance level respectively. P/E variable found insignificant. R^2 value which shows the explanatory power of the model is approximately 64%. F value which shows overall significance of

the model is significant at the 1% significance level. Durbin-Watson value shows that model does not include autocorrelation.

5. CONCLUSION

Financial system plays a vital role in allocating capital source in a given economy. In a well organized financial system, funds flows from those who have surplus funds to those who have a shortage of funds, market-based financing as an indirect way, and bank-based finance (Duisenberg, 2001). The proper allocation of resources makes the decision makers to forecast the stock prices in appropriate way which is paradigm shift in financial and academic studies since 1980. Since investors cannot predict the stock prices accurately, forecasting the future returns have been a challenging issue in asset pricing. It is, not surprising that financial agents and policy makers in finance use many kind of variables in an attempt to forecast stock returns.

In this study, financial ratios are engaged to forecast the stock return for Borsa Istanbul 100. Borsa Istanbul is one of the influential, robust, technologically advanced, stable and with the highest potential stock market in the Middle East that play a vital role in the economic and regional foundation for Turkey. We used a Panel estimation for the period of 2004 to 2014 quarterly data to forecast the stock returns. We incorporated the financial ratios such as price to book ratio (P/B), price to earning ratio (P/E), dividend per share (DPS) and firm sizes that predict stock return effectively. The result of the panel estimation indicates that firm size has the higher power to predict the stock return among the other variables. Dividend per share and price to book ratio have less forecasting power. However, there is no significant relationship between price to earning ratio and stock returns. According to the Granger Causality Test, there is a causal relationship between stock price and price/earnings ratio. This study also explores the causal relationship between stock price and dividend per share. A bi-directional casual relationship has been found between stock price and firm size too. There is one-way causal relationship from stock price to market value/book value ratio.

The results from this study have important implications for policy makers, financial brokers and financial analysts who used to forecast the models for the future considerations and this estimation will give the glimpse to increase the capital funds and other investment projects in Turkey. In addition, adopting the firm size variable which has good power to predict the stock return will give a benchmark for investors to make investment, and earn better return in Turkish stock market.

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