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Araştırma Makalesi / Research Article

Effects of Dollarization on Bank Performance: Analysis for Turkey *

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Abstract

Dollarization has significant effects on the real sector, monetary policy, and financial system. In this study, the effects of dollarization on banks' performance in Turkey for the period of 2012-2017 are investigated by using both static and dynamic panel data analyses. Our Generalized Method of Moments (GMM) results indicate the statistical significance of the negative impact of deposit dollarization on return on assets (ROA). Both the random effects regression and GMM results show a negative and significant effect of deposit dollarization on return on equity (ROE). On the credit dollarization side, while random effects regression results indicate a negative and significant impact of credit dollarization on ROA and one-step system GMM results indicate the negative effect of credit dollarization on ROE, the rest of our estimations do not show any significant effect of credit dollarization on bank performance.

Keywords: *Dollarization, Bank Performance, Banking Sector.*

Dolarizasyonun Banka Performansı Üzerine Etkileri: Türkiye Analizi

Öz

Dolarizasyonun reel sektör, para politikası ve finansal sistem üzerinde önemli etkileri bulunmaktadır. Bu çalışmada, 2012-2017 döneminde dolarizasyonun Türkiye'deki bankaların performansları üzerindeki etkisi hem statik hem de dinamik panel veri analizi yöntemleri ile araştırılmıştır. Genelleştirilmiş Momentler Metodu (GMM) sonuçlarımız, mevduat dolarizasyonunun aktif karlılığı üzerindeki olumsuz etkisinin istatistiksel olarak anlamlı olduğunu göstermektedir. Hem rastgele etkiler modeli, hem de GMM sonuçları mevduat dolarizasyonunun özkaynak karlılığı üzerinde negatif ve istatistiksel olarak anlamlı bir etkisi olduğunu göstermektedir. Kredi dolarizasyonu açısından ise, rastgele etkiler modeli sonuçları kredi dolarizasyonunun aktif karlılığı üzerinde negatif ve istatiksel olarak anlamlı bir etkisi olduğunu ve tek aşamalı sistem GMM sonuçları kredi dolarizasyonunun özkaynak karlılığı üzerinde negatif bir etkisi olduğunu göstermekte iken, diğer sonuçlarımız kredi dolarizasyonunun banka performansı üzerinde istatiksel olarak anlamlı bir etkisi bulunmadığını göstermektedir.

Anahtar Kelimeler: *Dolarizasyon, Banka Performansı, Bankacılık Sektörü.*

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INTRODUCTION

Dollarization is an important issue for emerging economies since the 1970s with its significant impacts on the real sector, government debt management, monetary policy, and the financial system. Various policies are being developed to prevent dollarization in developing economies since it is considered an important source of risk. Denomination of a large part of the financial assets and liabilities in foreign currencies creates a currency mismatch between assets and liabilities held in foreign currencies and those in domestic currency. Currency mismatch causes financial fragilities and subsequent serious macroeconomic risks. Independent of the exchange rate regime, in a highly dollarized economy a currency mismatch risk arises for banks, and it increases banks' currency risk. Banks, which burden these risks by accepting foreign currency deposits and lending foreign currency funds while functioning as an agent between depositors and creditors, could experience various impacts of dollarization on their performances. Moreover, other types of risks stemming from foreign currency operations of banks, namely; interest rate risk, credit risk, country or solvency risk, and time-zone risk accompany the currency risk in these economies.

As a result of the regulations about the liberalization of capital movements, exchange rate regime changes, political instability, and economic crises in developing economies in the late 1980s, the use of foreign currencies as the store of value, the unit of account, and the medium of exchange, has continued to deepen up to the present.

In Turkey, the roots of the dollarization phenomenon started to form in the late 1960s and the early 1970s together with the legislations about foreign currency deposits. The reforms on financial liberalization, the changes in foreign exchange regulations, and macroeconomic developments in the 1980s and 1990s played important roles in the development of dollarization in Turkey. Before these developments, Decree No. 1[1], published in February 27, 1930 dated and 1435 numbered Official Gazette with the name of "Protection of the Value of Turkish Currency", foreign exchange purchases and sales were prohibited except for stock exchange, banks, authorized bankers and those listed in the list of needs, issued or announced by the Ministry of Finance. According to the regulations made between Decree No. 1 and Decree No. 13[2], only banks could engage in the foreign exchange buying and selling operations and they could not sell foreign exchange to those, who did not have the permit issued by the Ministry of Finance. Starting from 1955, the restrictions regarding foreign exchange had been started to ease. With Decree No. 17[3], published in September 14, 1962 dated and 11206 numbered Official Gazette the residents in Turkey were allowed to open deposits with foreign currencies, which are not compulsorily brought to Turkey. This regulation could be accepted as the first step of the development of the dollarization phenomenon in Turkey. After this regulation, the convertible deposit accounts and foreign exchange deposits with credit letters were put into practice in 1967 and 1976, respectively.

At the beginning of the 1980s, an economic stabilization program was put into force, in which several reforms and foreign exchange legislation amendments were made regarding financial liberalization. The first of the important legislative amendments made in this context was Decree No. 26[4] regarding the protection of the value of Turkish currency, which was about the rules to be applied for the opening of foreign currency deposit accounts of those who make foreign exchange earning transactions. It was published in the Official Gazette dated January 12, 1983 and numbered 17926 and this Decree made enabled residents in Turkey to open foreign

currency demand deposits with the foreign exchange, which they must have brought to Turkey. However, the amount of these deposits could not exceed 5% of the amount, brought to Turkey.

Liberalizing the interest rate of deposits and credits, introducing Capital Market Law and Banking Law were the main important reforms and legislations made in this period. Along with these reforms and regulations, inflation and foreign exchange rate movements played role in the development of dollarization in Turkey between 1980 and 1989.

As stated by Civcir (2005), until the end of 1988, the high and volatile difference between domestic and foreign inflation and depreciation of domestic currency affected the inflation rate. As a result, as he mentioned, residents, who want to be protected against inflation, turned to foreign currency. As well as high inflation rates, fiscal deficits, financial crises, and political instabilities deepened dollarization phenomena in Turkey and increased dollarization rate.

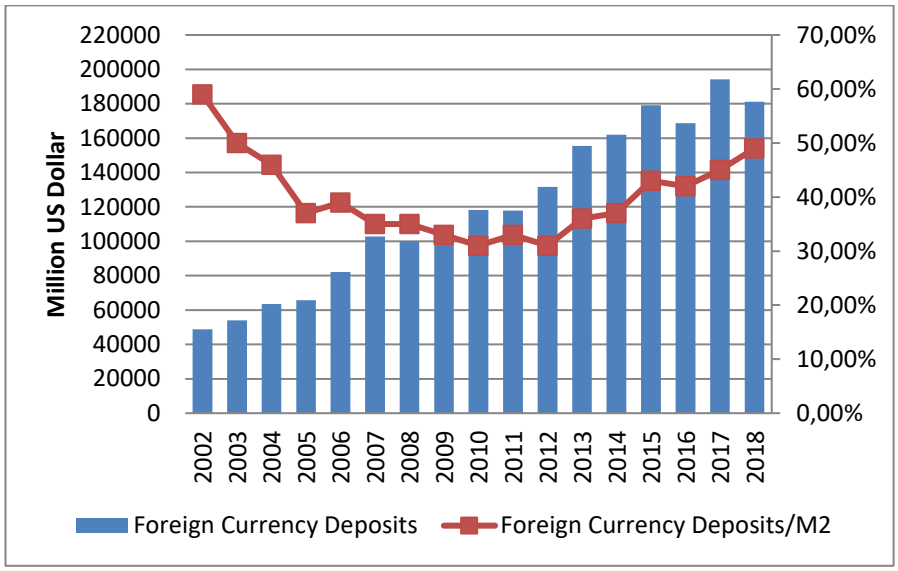
When it came to 1989, the most important financial liberalization reform was realized and Decree No. 32 on Protection of the Value of Turkish Currency[5] entered into force.

In their paper, Kepenek and Yentürk (2005) state that, with the liberalization of the capital account in 1989, the capital inflow to Turkey was more than expected, and Turkey evaded from foreign exchange bottleneck, while capital inflows led to overvaluation in the real exchange rate.

Serdaroğlu (2011) mentions that the difference between domestic and foreign interest rates shows the increasing risk perception about the domestic economy and gives acceleration to deposit dollarization.

The financial crises that occurred at the beginning of the 2000s contributed to the dollarization phenomenon in Turkey. In May 2001, a new economic program, namely "Strong Economy Transition", started to be implemented. Özatay (2005) mentions that the program had begun to show its effects, and inflation expectations, inflation rate, and the ratio of public debt to Gross National Product (GNP) declined by the end of 2001. At the beginning of 2002, the Central Bank of the Republic of Turkey (CBRT) announced that it would implement implicit inflation targeting. Besides high inflation, fiscal dominance, risk premium, and exchange rate volatility; the high level of dollarization was one of the factors that make the transition to inflation targeting difficult for the Turkish economy. In Figure 1, the ratios of foreign exchange deposits[6] to the M2 money supply, the widely used measure of deposit dollarization, in Turkey between 2002 and 2018 are illustrated.

Figure 1: Deposit Dollarization in Turkey (2002-2018)



Source: CBRT (2019), Banking Regulation and Supervision Agency (BRSA, 2019)

As is seen in Figure 1 after the 2001 crisis, the deposit dollarization ratio was recorded as 59% in 2002. In 2004 CBRT announced that it would start to implement explicit inflation targeting at the beginning of 2006. Metin-Özcan and Us (2007) mention that, in this period, Turkey was exposed to external factors like a flow of capital to developing economies, as a consequence of increasing oil and commodity prices, global inflation rises, a worldwide slowdown in economic growth, and increasing policy rates in developed economies. Furthermore, they state that Turkey experienced high economic growth and achieved its targets on inflation and primary surplus between 2002 and 2005, which increased the confidence in the economy. Figure 1 demonstrates that the ratio of foreign exchange deposits to the M2 money supply continuously increased starting with 2012 and it reached 49% in 2018.

Besides asset dollarization, the evolution of liability dollarization in Turkey should be analyzed. The first time that residents in Turkey were allowed to use credit from abroad was July 7, 1984, when Decree No. 30 on Protection of the Value of Turkish Currency[7] came into force. With the same regulation, residents in Turkey were allowed to give foreign currency credits, under certain conditions like financing of export, investment goods, and expenses regarding international competitive bindings.

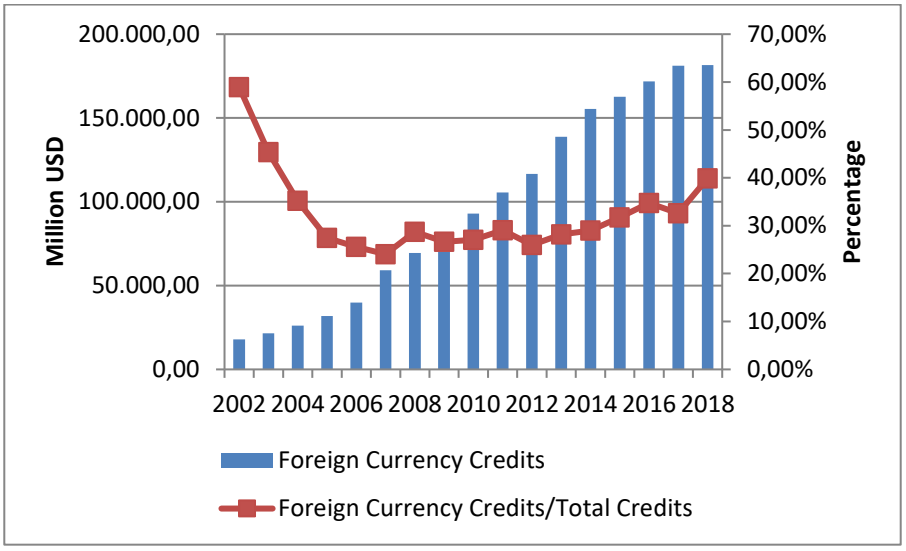
In years, the conditions for use of foreign currency credit were changed with several legislations. Until the amendment was made in 2009[8], the consumers and firms, who did not meet these conditions, were not able to use foreign currency loans from the domestic banking system; however, there was not any restriction on using foreign currency indexed loans from Turkey. In addition, all firms were able to obtain foreign currency loans from abroad to finance all kinds of commercial and professional activities. In this case, companies were directed to use foreign currency loans from foreign branches of banks established in Turkey. With the amendment in 2009, the use of foreign currency indexed loans of residents in Turkey was prohibited, except for the credits used for their professional and commercial purposes.

Moreover, banks were allowed to extend foreign currency credits, which were more than 5 million US dollars (USD) and had an average maturity longer than 1 year.

In 2018, another amendment[9] regarding foreign currency credits was put into force. According to the new legislation, residents in Turkey, who have foreign exchange liabilities of less than 15 million USD, could borrow in foreign exchange according to a limit that does not exceed the sum of their foreign currency income of the last three fiscal years, with some exceptions. With the same amendment, the use of foreign currency indexed credits by residents in Turkey was prohibited completely.

In Figure 2, the ratio of foreign currency credits extended by banks in Turkey to total credits extended by those banks is presented, between 2002 and 2018.[10]

Figure 2: Credit Dollarization in Turkey (2002-2018)



Source: BRSA (2019)

As it is shown in Figure 2, after the transition to a flexible exchange rate regime, the ratio of foreign currency loans to total loans decreased significantly. The companies with limited foreign currency income reduced their foreign currency credit use to avoid currency risk. The ratio of foreign currency loans to total loans was recorded as 59% in 2002 and it decreased gradually until 2007. It followed a fluctuating course between 2008 and 2012 and started to increase after 2012. A slight decrease was observed in 2017 and it reached 40% in 2018.

Figure 1 and Figure 2 show that both deposit and credit dollarization maintain their importance in the Turkish economy.

In this study, the effects of dollarization on banks' performances in Turkey for the period of 2012-2017 are investigated by using both static and dynamic panel data analyses. Fixed effects regression, random effects regression, and GMM approaches are employed for estimations. Financial data of 26 banks are used for the analyses.

Our GMM results indicate the statistical significance of the negative impact of deposit dollarization on ROA, at the 10% significance level. Both random effects regression and GMM results show a negative and significant effect of deposit dollarization on ROE. Our results are in line with the expectation of a negative impact of deposit dollarization on financial deepening and the transfer of exchange risk to credit risk in dollarized economies.

On the credit dollarization side, while random effects regression results indicate a negative and significant impact of credit dollarization on ROA at the 10% significance level and one-step system GMM estimation results indicate the negative effect of credit dollarization on ROE, the rest of our estimations do not show any significant effect of credit dollarization on bank performance.

1. LITERATURE REVIEW ON THE EFFECTS OF DOLLARIZATION ON BANK PERFORMANCE

Dollarization is studied under two main classes in literature, namely, full and partial dollarization. The terms asset dollarization, liability dollarization, and financial dollarization describe different characteristics of partial dollarization.

De Nicolo et al. (2005) investigate the relationship of deposit dollarization with the financial deepening of the onshore financial system and banking risk along with the causes of deposit dollarization. They measure deposit dollarization as the ratio of foreign currency onshore bank deposits to a total of onshore bank deposits and use the data of 100 countries for the period starting from 1990 to 2001. According to their empirical results, in inflationary environment dollarization enables the economy to maintain more monetary depth than it would otherwise be achieved. The results also show that the risk of financial intermediaries, measured by the mean ratio of non-performing loans, the deposit volatility, or a proxy aggregate measure for a bank's "distance-to-default", is higher in dollarized countries.

Quispe-Agnoli and Whisler (2006) examine the impacts of full dollarization and other macroeconomic and institutional factors on the bank performance indicators for the Ecuador and El Salvador banks between 1995 and 2004 and show that dollarization has a positive effect on loan quality, while it affects the bank liquidity ratio negatively. Ozsoz (2008) investigates the effects of financial dollarization on commercial bank performance in 11 developing countries between 1991 and 2004 with bank-level data and states that dollarization does not directly explain bank profitability, whereas the estimations on loan-loss provisions show the significant effect of foreign currency deposits on the changes in the banks' bad loans to its overall loan portfolio ratios. Kutan et al. (2012) analyze deposit dollarization and banks' profitability relationship for 36 countries between 1991 and 2006, and document that the dollarization ratio does not have any significant effect on banks' profitability, whereas the mentioned effect in the previous periods had a statistically significant impact on bank profitability. In other words, the results showed that deposit dollarization has a negative impact on the profitability of banks with a time lag. They explained the reason behind this with the adaptive expectations of the bank managers.

Stix (2013) argues the effects of dollarization on the cash demand of households in transition countries by using micro-level data from a household survey. The results of his study revealed that the sensitivity of people about the safety of deposits is higher in dollarized economies. In addition, he points out that in dollarized economies foreign currency cash is held

as a safe asset and network effects of dollarization are getting stronger as the level of dollarization of the economy increases.

Caglayan and Talevera (2016) study the effects of credit dollarization on the Turkish commercial banks' liquidity and profitability by using quarterly data for 46 banks between 2003 and 2014. Their results show that banks decrease their liquid assets while lending more in foreign currency and liability dollarization fosters banks for using their resources more effectively. It is also shown that the supply of funds in foreign currency, deposit dollarization, and total foreign liabilities do not have any significant effect on liquidity management, while the coefficient of exchange rate volatility is significant and positive. The paper suggests that the positive impact of foreign currency loans on bank performance decreases as exchange rate volatility or the interest rate spread between the liabilities and assets are increasing.

To determine the correct variables of empirical analysis, reviewing some empirical works about the determinants of bank performance would be purposeful. A huge number of empirical analyses were conducted for examining the determinants of bank performance. From the very first studies, the variables, impacts of which on the bank performance are investigated, are classified under different groups, particularly, bank-specific variables, financial sector structure related variables, and macroeconomic variables. The bank-specific variables, which are under the control of banks, are described as internal variables, whereas the financial sector structure-related and macroeconomic variables are grouped under the name of external variables. One of the earlier examples of works related to determinants of bank performance was conducted by Short (1979). He analyzes the determinants of banks' performance and especially the effect of banking sector concentration on banks' profit rate, i.e., the annual average ratio of after-tax profits to total shareholders' funds. He used data from 60 banks from 12[11] countries. Also, he added the central bank discount rate and long-term government bond rate to his model as proxies of economy-wide profitability. The results showed that concentration measures, central bank discount rate, and long-term government bond rate have positive impacts on banks' profitability, whereas the effect of government ownership is negative. Additionally, it is found out that in the models including central bank discount rate, the coefficient of the rate of growth of assets is statistically significant and negative. A similar study was done by Bourke (1989) and his results support the positive relationship between concentration and bank performance. Molyneux and Thornton (1992) examine the determinants of bank performances for 18[12] European countries for the period of 1986-1989. They show that ROE has statistically significant positive relationships with concentration, nominal interest rates, and government ownership. Their results regarding government ownership are conflicting with the results of previous studies. From the ROA side, the estimation results indicate positive relationships with capital, nominal interest rates, staff expenses, concentration, and government ownership. On the other hand, the results imply the existence of a weak negative relationship between profitability and liquidity. The cost of holding liquidity, especially those held compulsorily, could help to elucidate the negative relationship between profitability and liquidity. A recent study regarding determinants of bank performance is conducted by Kohlscheen et al. (2018) on 534 banks from 19[13] emerging market economies. The findings of the estimation results reveal that long-term interest rates and credit growth have an increasing effect on bank profitability. However, short-term interest rates and sovereign risk premium decline the bank profits. Naceur (2003) examines the effects of several internal and external variables on net interest margin (NIM) and the profitability of banks in Tunisia, between the years 1980 and 2000. According to the results of

the study, capital and overheads have significant and positive effects on both NIM and profitability of banks in Tunisia. The size variable has a statistically significant negative relationship with NIM, whereas the variable of bank loans has a positive one. On the other hand, the effect of the stock market development is statistically significant and positive for bank profitability. The macroeconomic variables inflation and growth rates do not have any statistically significant effect on NIM and profitability. In addition, the results show that concentration affects NIM negatively. Another example of single country analysis is the study of Guru et al. (2002), regarding the determinants of commercial bank profitability in Malaysia for the period of 1985-1998. According to estimations of asset-based profitability, loans and current account deposits are the most profitable contributors to banks' profits. Liquidity and bad expenses management; on the other hand, contribute to the poor profitability performance of banks. The findings regarding capital-based measures of profitability show that loans, deposits, inflation, market interest rate, and investment in subsidiaries have positive impacts on performance. However, the coefficients of total expenditure, capital, and reserves variables are found to be negative. Athanasoglou et al. (2008) examine the impact of various bank-specific, industry-specific, and macroeconomic variables on Greek banks' performance between 1985 and 2001. In their study; capital, productivity growth, and inflation have statistically significant and positive effects on bank profitability, while, the effects of credit risk and operating expenses are found to be negative. In addition, the results showed that the size and the ownership structure of banks, whether government-owned or privately owned, are insignificant in affecting banks' profitability.

In the literature, there are also some works conducted for explaining the determinants of banks' performance in Turkey. Tunay and Silpar (2006) analyze the profitability of banks in Turkey by using various statistical and econometrical methods. In this study, not only scales of banks but also ownership structures are handled separately for the regression analysis. Their results show that ratio of credits to total assets, log of total assets, ratio of non-interest income to total assets, inflation, real national income, the ratio of deposits to stock market capitalization value, the ratio of stock market capitalization value to national income and ratio of total assets to national income affect the profitability of banks in terms of all three dependent variables; ROA, ROE, and NIM. Atasoy (2007) investigates the determinants of the Turkish banking sector profitability by using a panel dataset regarding commercial banks in Turkey from 1990 through 2005. NIM and ROA are used as indicators of bank profitability, whereas many bank-specific variables, financial sector structure-related variables, and macroeconomic variables are added to estimation as independent variables. The estimation results reveal that equity, loan loss provisions, non-interest earnings assets, size of bank, inflation, and bank concentration ratio have significant effects on both ROA and NIM. However; the findings show that overhead and importance of bank finance relative to GNP are only associated with ROA. According to estimation results, deposits, growth of GNP, and importance of stock market finance relative to GNP have significant impacts on only NIM. By using financial data of 25 Turkish commercial banks between 2002 and 2007, Ata (2009) works on the determinants of bank profitability after the 2001 economic crisis. He employs cost ratio, capital adequacy, liquidity, asset profitability, and size indicators as internal variables, whereas Gross Domestic Product (GDP) growth rate, consumer price index (CPI), the growth rate of M2Y money supply, the ratio of total assets of the deposit banks to GDP and concentration ratio of banking sector variables constitute the external variables. The Ordinary Least Squares (OLS) and fixed effects regression results reveal that the impacts of internal factors on the profitability of banks are more than those of external

variables. The effects of cost management, capital adequacy, asset profitability, and concentration ratio of the banking sector are found to be statistically significant and negative. On the other hand, liquidity, size, and the ratio of total assets of the deposit banks to GDP have statistically significant and positive effects on bank profitability. Alper and Anbar (2011) investigate the effects of asset size, capital adequacy, asset quality, liquidity, deposits, income-expenditure structure, annual real GDP growth rate, annual inflation, and real interest rate on the profitability of 10 commercial banks in Turkey for the 2002-2010 period. The fixed effects panel regression results demonstrate that only bank size and non-interest income significantly affect profitability, indicated by ROA. On the other hand, asset quality has negative impacts on ROA. When ROE is employed as the measure of bank profitability, only the positive effects of bank size and real interest rate were found to be statistically significant. Similarly, Topak and Talu (2017) studied the determinants of Turkish banks' profitability from 2005 through 2015 by employing panel data analysis. They use ROA and ROE ratios for the assessment of profitability. According to empirical findings, the ratios of loan interest to deposits interest, net fees and commissions' revenues to total operating expenses and bank size have statistically significant and positive effects on banks' profitability measures, ROA and ROE. However, the ratio of nonperforming loans to total loans, capital adequacy, and the ratio of other operating expenses to total operating revenue have negative impacts on profitability. Among the macroeconomic variables, real GDP and interest rate have positive impacts on banks' profitability, while the effect of the exchange rate was found to be negative.

In brief, there has not been a consensus on the issue of dollarization and bank performance relationship yet. While some empirical studies show that dollarization does not have a significant impact on bank profitability, others reveal that the effect of dollarization on bank profitability is statistically significant. Besides, the sign of the relationship is found to be positive in some studies and negative in others. Our study aims to shed light on this issue in the Turkish banking sector and contribute to the existing literature.

2. DATA

The raw data are obtained from the database of The Banks Association of Turkey (BAT, 2019). After the exclusion of investment and development banks, 26 banks' data operating in Turkey are used in this study. For maintaining the adequate and efficient number of observations for GMM procedure, quarterly data starting from the first quarter of 2012 to the fourth quarter of 2017 are used, which also maintains the necessity of the number of cross-sections that should be equal to or greater than the number of periods. Data period starts through the end of the European sovereign debt crisis and ends before the period of currency shocks in Turkish economy in 2018, representing a relatively stable period in terms of crises.

In the empirical analyses, bank performance takes place as the dependent variable, whereas deposit and credit dollarization are independent variables. Besides the dollarization variables, some macroeconomic and bank-specific variables are also used in the analyses, for isolating the impacts of dollarization. Bank size, bank capital, economic growth, and inflation are the other independent variables employed in the analyses. GDP data is taken from the Turkish Statistical Institute (TURKSTAT) database (TURKSAT, 2019). The CPI data is obtained from the CBRT database (CBRT, 2019).

In the literature, bank performance has been addressed in many aspects and several indicators are used to measure it. However, the appropriate measure of bank performance

depends on the aim of the study. In our study, bank profitability is used as the indicator of bank performance. Two different measures of bank profitability, ROA and ROE are employed as dependent variables. Moreover; for considering the persistence in the profitability of banks, the lagged value of bank performance is included in the models as independent variables. The variables are described precisely in Table 1.

Table 1: Description of Variables

Variable Name	Description	Formula	Data Source
Return on Asset (ROA)	The measure of the profitability of the bank relative to its total assets	Net Income/ Total Assets	BAT (2019)
Return on Equity (ROE)	The measure of the profitability of the bank relative to its total equity	Net Income/ Total Equity	BAT (2019)
Deposit Dollarization	The ratio of foreign currency deposits to total deposits received by the bank	Foreign Currency Deposits/ Total Deposits	BAT (2019)
Credit Dollarization	The ratio of foreign currency credits to total credits extended by the bank	Foreign Currency Credits /Total Credits	BAT (2019)
Size	The logarithm of the total assets of the bank	Log (Total Assets)	BAT (2019)
Capital	The ratio of a bank's equity to its total assets	Equity/ Total Assets	BAT (2019)
Growth	The logarithm of the gross domestic product value of Turkey	Log (GDP)	TURKSTAT (2019)
Inflation	The logarithm of the consumer price index value of Turkey	Log (CPI)	CBRT (2019)

For considering the persistence in the profitability of banks by following Athanasoglou et al. (2006) and Kutan et al. (2012), the lagged value of bank performance is added to the model as an independent variable. Both static and dynamic panel data analyses are conducted for empirical research.

As demonstrated by Court et al. (2012), even if the inflation process of a country is moderate, deposit dollarization affects financial depth negatively. This fact could be a result of the banks' credit restrictions to the private sector during the high dollarization periods, which decreases their profitability. Also as mentioned by De Nicolo et al. (2003) and Chang and Velasco (2001), in dollarized banking systems, exchange rate risk is transferred into default risk and it could decrease the profitability of these banks. In the existence of those studies, the expected coefficient of the deposit dollarization variable is negative.

As mentioned by Caglayan and Talevera (2016), it could be expected that the foreign currency liabilities harm the performance of banks, because of the risks stemming from operating per available international money market funds. However, since the banks are

generally fully hedged against exchange rate risks, the impact of liability dollarization could be positive as found in their study.

Although our main concern is about the signs and significance of dollarization variables, it is possible to make some predictions about the other dependent variables. The effect of the bank size on the bank performance is based not only on the characteristics of an individual bank but also on those of the banking sector. Increasing bank size could raise the profitability of banks since it allows banks to benefit from economies of scale. On the other hand, small banks could be able to build more powerful relationships with domestic clients than big banks and these advantages could offset any loss of scale economies (see Regehr & Sengupta, 2016). Therefore, the sign of the size coefficient could be positive or negative, depending on which effect is dominant. The supporters of the negative relationship between capital and bank performance mention that a higher capital ratio could decrease the equity risk and it reduces the expected return on equity (Berger, 1995). The findings of Guru et al. (2002) and Ata (2009) are in line with this argument. However, some empirical studies like Molyneux and Thornton (1992) and Athanasoglou et al. (2006) reveal that the relationship between capital and bank performance is positive, which supports the idea regarding the safety role of capital in the financing process. The effect of economic growth on bank performance is expected to be positive since the economic growth indicates an increase in credit demand and a decrease in default risk at the same time. On the other hand, as stated by Revell (1979) the sign of the coefficient, showing the effect of inflation on bank performance, depends on whether salaries of bank employees and other expenditures increase faster than inflation. Thus, the relationship between the inflation rate and bank profitability is ambiguous.

The descriptive statistics are presented in Table 2.

Table 2: Descriptive Statistics

Variable	Mean	Maximum	Minimum	Standard Deviation	Observations
ROA	0.009	0.386	-0.128	0.020	624
ROE	0.058	0.210	-0.581	0.057	624
Deposit Dollarization	0.472	0.999	0.042	0.189	624
Credit Dollarization	0.292	1.000	0.000	0.161	624
Size	7.211	8.637	3.836	0.957	624
Capital	0.189	6.458	0.056	0.521	624
Growth	8.735	8.949	8.522	0.108	624
Inflation	2.400	2.511	2.307	0.060	624

As it is seen in Table 2, the value of the deposit dollarization ratio is always above 4% and it reaches 99.9% as maximum. On the other hand, the credit dollarization ratio takes a value within a wide range of 0 to 100%. The means of deposit dollarization and credit dollarization are 47% and 29%, respectively. The indicators of bank performance, ROA, and ROE have an average of 0.9% and 5.8%, respectively. The value of ROA has a maximum of 38.6% and a minimum of -12.8%, whereas the maximum value of ROE is 21% and the minimum value of it is -58.1%.

Correlation coefficients are presented in Table 3.

Table 3: Correlation Coefficients

	ROA	ROE	Deposit Dollarization	Credit Dollarization	Size	Capital	Growth	Inflation
ROA	1							
ROE	0.393***	1						
Deposit Dollarization	0.072*	-0.270***	1					
Credit Dollarization	-0.140***	-0.144***	0.487***	1				
Size	-0.203***	0.368***	-0.497***	-0,111***	1			
Capital	0.746***	-0,067*	0.219***	-0.092**	-0.411***	1		
Growth	0.007	0.104***	0.145***	0.179***	0.104***	-0.056	1	
Inflation	-0.038	-0.001	0.149***	0.185***	0.107***	-0.053	0.953***	1

*, ** and *** show the significance at the 10%, 5% and 1% levels, respectively.

According to Table 3, ROA has a positive correlation with bank capital and a negative correlation with credit dollarization and bank size at the 1% statistical significance level. The positive correlation between ROA and deposit dollarization is significant at the 10% significance level. The dependent variable, ROA, has the highest correlation coefficient with bank capital.

On the other hand, ROE has positive and significant correlation coefficients with bank size and growth, at the 1% statistical significance level. ROE is negatively correlated with deposit dollarization and credit dollarization at the 1% significance level. The negative correlation between ROE and bank capital is found significant at the 10% significance level. ROE has the highest correlation coefficient with bank size.

3. METHODOLOGY

In this study, the impact of financial dollarization on the banks' performance in Turkey is analyzed by using a panel data structure. Gujarati and Porter (2009) and Baltagi (2013) mention the benefits of using a panel data structure. Panel data make it possible to control individual heterogeneity. More precisely, the panel data estimation techniques could consider individual heterogeneity by enabling the use of subject-specific variables. Panel data put time series of cross-section observations together, provide more informative data, more variability, less collinearity among the variables, more degrees of freedom, and more efficiency. Panel data are

more convenient to identify and measure the effects, which simply could not be observed in pure cross-section or time-series data. Additionally, dynamics of adjustments could be observed better by panel data analysis, since it studies the repeated cross-section of observations. Panel data allow studying more complicated behavioral models than do pure cross-section or time-series data. Furthermore, panel data could minimize the bias stemmed from aggregating individuals or firms into broad aggregates, by making data for several thousand units available.

In panel data estimations, fixed effects regression and random effects regression models are applied very often. According to Gujarati and Porter (2009), deciding on one of these methods depends on the assumptions regarding the possible correlation between the individual or cross-specific error component and the regressors. In the fixed effects regression model, even though the intercept term might change across cross-sections, each cross section's intercept term does not vary over time. On the other hand, in the random effects regression model, intercept terms and coefficients might change across cross-sections and over time. For testing which assumption is appropriate, Hausman (1978) suggests a test, built on the difference between random effects and fixed effects. A statistically significant difference is considered as evidence to reject the random effects regression model assumptions (see Wooldridge, 2002). Baltagi (2013) states that a dynamic relationship is characterized by the presence of the lagged dependent variables among independent variables. Following Athanasoglou et al. (2006) and Kutan et al. (2012), the lagged dependent variables are added to the models as independent variables for considering the persistence in the profitability of banks. Although OLS is one of the common methods, in a dynamic model the lagged value of the dependent variable is correlated with the error term, and under this condition, the OLS estimators are biased and inconsistent; i.e. there is a dynamic panel bias. To avoid it, the GMM procedure is implemented. GMM makes it possible to formulate models and it provides a method of formulating models and implicit estimators with no need for strong assumptions about distributions. By using GMM, it is possible to control fixed effects both related to time and cross-section, and to overcome the endogeneity problem, the appropriate lagged values of independent variables could be used as instrumental variables (see Nickell, 1981; Greene, 2003; Baltagi, 2013). Arellano and Bond (1991) estimator is one of the main estimation models used in GMM. The lagged values of independent variables are taken as instrumental variables and their first difference are used for minimizing the specific impacts of components. If the orthogonality conditions between the dependent variable's lagged values and error terms are utilized, additional instruments could be attained in a dynamic panel data model. In the case of the heteroscedastic error term, Arellano and Bond (1991) propose two-stage GMM estimators. In the first stage, error terms are assumed as independent and homoscedastic to time and cross-section. However, as they stated, this assumption could be relaxed when the consistent estimator of the variance-covariance matrix is obtained owing to the residual terms obtained from the first stage. With the assumption that the first differences of instrumental variables are not correlated with the fixed effects, Arellano and Bover (1995) and Blundell and Bond (1998) improved Arellano-Bond estimator and it enables the introduction of more instruments on account of the improvement of efficiency. The system, which they built, is known as "System GMM" and it is the system of the original and the transformed equations (Roodman, 2009). The system GMM estimators are designed for the case that some regressors are independent of current error terms but could be influenced by past error terms, such as lagged dependent variables. In the light of all this methodological information, at the static panel data analysis part of this study, both fixed effects regression and random effects regression

models are used and the final method is determined accordingly to Hausman test results. In addition, the System GMM approach is applied at the dynamic panel data analysis part.

3.1. Stationarity Analysis

A stochastic process is stationary if its mean and variance are constant over time and the value of covariance between the two time periods depends only on the distance or lag between the two time periods (Gujarati & Porter, 2009). As mentioned by Maddala and Wu (1999), the commonly used unit root tests, such as Dickey-Fuller, Augmented Dickey-Fuller and Phillips-Perron could be inadequate for panel data analyses. Therefore, the literature suggests using panel data unit root tests for increasing the power of single time series unit root tests. Thus, the stationarity of the variables is tested through panel unit root tests. Levin et al. (2002) and Im et al. (2003) tests are applied for testing the stationarity of the variables. The results of the tests are presented in Table 4.

Table 4: Results of Unit Root Tests for Levels

	Levin, Lin & Chu Test		Im, Pesaran & Shin Test	
	Without Trend	**With Trend**	**Without Trend**	**With Trend**
ROA	0.000	0.000	0.000	0.000
ROE	0.000	0.000	0.000	0.000
Deposit Dollarization	0.000	0.000	0.001	0.000
Credit Dollarization	0.070**	0.006	0.090**	0.040*
Size	0.006	0.000	0.921***	0.007
Capital	0.000	0.000	0.000	0.005
Growth	0.065**	0.000	0.999***	0.000
Inflation	1.000***	0.000	1.000***	0.003

Lags for Levin, Lin & Chu, and Im, Pesaran & Shin tests are determined through Akaike Information Criteria. *, ** and *** indicate rejecting of the null hypothesis of stationarity at the 10%, 5%, and 1% level of statistical significance, respectively.

The test results show that at the 1% statistical significance level ROA, ROE, deposit dollarization, and capital variables are stationary at level. However, the results for credit dollarization, size, growth, and inflation variables are mixed. Our results show that growth and inflation follow an increasing trend [14]. Thus, the test results with the trend are taken into consideration for these variables. Test results with trend indicate the stationarity of growth and inflation variables at the level for the 1% statistical significance. On the other hand; credit dollarization and size variables, do not show any trend. Thus, the first differences of these variables are tested for stationarity. The results are presented in Table 5.

Table 5: Results of Unit Root Tests for First Differences

	Levin, Lin & Chu Test		Im, Pesaran & Shin Test	
	Without Trend	**With Trend**	**Without Trend**	**With Trend**
ΔCredit Dollarization	0.000	0.000	0.000	0.000
ΔSize	0.000	0.000	0.000	0.000

Lags for Levin, Lin & Chu, and Im, Pesaran & Shin tests are determined through Akaike Information Criteria. Δ denotes the first difference.

According to test results in Table 5, credit dollarization and size variables are stationary at first difference. Thus, in the following parts, the first difference of the variables credit dollarization and size are used for the analysis.

3.2. Estimation Results

3.2.1. Estimation results of static panel data models

In the first stage of empirical analysis, static panel data estimations are conducted. The following static models are constructed according to the results of the unit root tests.

Model 1.1:

$$ROA_{i,t} = \beta_0 + \beta_1\ DepositDollarization_{i,t} + \beta_2\ \Delta CreditDollarization_{i,t} + \beta_3\ Capital_{i,t} + \beta_4\ \Delta Size_{i,t} + \beta_5\ Growth_t + \beta_6\ Inflation_t + u_{i,t} \quad (1)$$

Model 1.2:

$$ROE_{i,t} = \beta_0 + \beta_1\ DepositDollarization_{i,t} + \beta_2 \Delta CreditDollarization_{i,t} + \beta_3\ Capital_{i,t} + \beta_4\ \Delta Size_{i,t} + \beta_5 Growth_t + \beta_6 Inflation_t + u_{i,t} \quad (2)$$

where *i* denotes cross section as bank and *t* denotes time.

Initially, Model 1.1 and Model 1.2 are estimated by applying both fixed effects and random effects methods. The results are presented in Table 6.

Table 6: Fixed Effects and Random Effects Estimation Results

	Dependent Variables			
	ROA		**ROE**	
Independent Variables	***Fixed Effects (1.1)***	***Random Effects (1.1)***	***Fixed Effects (1.2)***	***Random Effects (1.2)***
Deposit Dollarization	0.000 (0.006)	-0.007** (0.003)	-0.024 (0.020)	-0.041 (0.017)**
ΔCredit Dollarization	-0.021*** (0.006)	-0.023*** (0.006)	-0.041* (0.022)	-0.041 * (0.022)
Capital	0.027*** (0.001)	0.029*** (0.001)	-0.010** (0.005)	-0.009* (0.005)
ΔSize	-0.006 (0.004)	-0.003 (0.004)	-0.037** (0.016)	-0.035** (0.016)
Growth	0.113*** (0 .016)	0.113*** (0.016)	0.664*** (0.055)	0.664*** (0.055)
Inflation	-0.188*** (0 .028)	-0.184*** (0.029)	-1.102*** (0.094)	-1.094*** (0.095)
Constant	-0.532*** (0.083)	-0.543*** (0.084)	-3.083*** (0.275)	-3.096*** (0.277)
Number of observations	598	598	598	598
Number of groups	26	26	26	26
Hausman Test	[0.627]		[0.765]	

The values in parentheses are the coefficient standard errors. *, ** and *** show the significance at the 10%, 5%, and 1% levels, respectively. The values in brackets are p-values.

To decide on the selection of fixed effects or random effects methods, the Hausman test is applied. The null hypothesis of the Hausman test states that the difference in coefficients is not systematic. That is to say, the null hypothesis indicates the consistency of random effects, whereas the alternative hypothesis indicates fixed effects' consistency. The null hypotheses of the Hausman test cannot be rejected for both models. Therefore, the results indicate the consistency of random effects estimations. Nevertheless, some diagnostic tests should be done for testing the efficiency of the estimation results.

3.2.1.1. Diagnostic tests

The homoskedasticity of Model 1.1 and Model 1.2 are tested by the likelihood ratio test. The null hypothesis of this test assumes that the disturbance term has a constant variance, in other words, the disturbance term is homoscedastic. The null hypotheses are rejected for both

models in the LR test, which implies heteroscedasticity problems[15]. For investigating whether there is an autocorrelation problem or not, in the models, the autocorrelation test, developed by Wooldridge (2002) is used. The null hypothesis of the test assumes no first-order autocorrelation, while the alternative hypothesis indicates the existence of the first-order autocorrelation. According to the results of the Wooldridge autocorrelation test, the null hypotheses are rejected at the 5% statistical significance level[16]. Thus, there is the first-order autocorrelation in Model 1.1 and Model 1.2.

3.2.1.2. Robust estimations

To overcome the autocorrelation and heteroscedasticity problems, the models are estimated with clustered robust standard deviations and the results are demonstrated in Table 7.

Table 7: Random Effects Estimation Results

	Dependent Variables	
	ROA	**ROE**
	Random Effects (1.1)	***Random Effects (1.2)***
Deposit Dollarization	-0.007	-0.041*
	(0.005)	(0.022)
ΔCredit Dollarization	-0.023*	-0.041
	(0.013)	(0.028)
Capital	0.029***	-0.009*
	(0.001)	(0.005)
ΔSize	-0.003	-0.035***
	(0.005)	(0.014)
Growth	0.113***	0.664***
	(0.032)	(0.094)
Inflation	-0.184***	-1.094***
	(0.045)	(0.132)
Constant	-0.543***	-3.096***
	(0.175)	(0.532)
Number of observations	598	598
Number of groups	26	26
R^2- within	0.556	0.216
-between	0.775	0.194
-overall	0.603	0.192
Wald Statistics	8733.69	78.05
	[0.000]	[0.000]

The values in parentheses are the coefficient standard errors. *, ** and *** denote the significance at the 10%, 5% and 1%, respectively. The values in brackets are p-values.

According to estimation results, capital and growth have positive impacts on ROA at the 1% statistical significance level, whereas the effect of inflation is negative. The credit dollarization has a negative effect on ROA at the 10% significance level. The effects of deposit dollarization and size on ROA are statistically insignificant.

Deposit dollarization and capital have negative effects on ROE at the 10% statistical significance level. While the effects of inflation and size on ROE are negative and significant at the 1% significance level, the effect of growth on ROE is positive and significant at the 1% significance level. The effect of credit dollarization on ROE is statistically insignificant.

Furthermore, the p-values of Wald statistics of both estimations show that all the coefficients in the model are different from zero.

De Nicolo et al. (2005) and Stix (2013) give implications that an increase in the demand for the foreign currency may be due to concerns about the economy, macroeconomic policy, and quality of institutions. Hence, those drivers may affect the level of dollarization and thus bank profitability. Therefore, we made a robustness check by controlling for credit risk (non-performing loan ratios, NPL, source: BAT, 2019), interest rate spread (average interest rate difference between lending and borrowing, source: CBRT, 2019), and a dummy for foreign exchange rate volatility (DVol, source: CBRT, 2019). Our results are robust under the aforementioned additional control variables, and they are presented in the Appendix; Table A1. Random effects results show that NPL and DVol have negative and significant effects on bank performance.

Using contemporaneous ROA/ROE and dollarization values in the estimations could be interpreted as correlation instead of causality. As mentioned in the literature review part, Kutan et al. (2012) analyze deposit dollarization and banks' profitability and they use the lagged value of foreign currency deposit rates as opposed to contemporaneous rates in their analysis. They explain the rationale behind this by making the next period's financial plans in bank management according to the data of previous periods' and expectations about the future and the lagged effects of extending foreign currency loans for hedging against currency mismatch risk on banks' income statement. For analyzing this issue further, the estimation results with lagged values of dollarization variables rather than the contemporaneous ones, are also given in the following part.

3.2.2. Estimation results of dynamic panel data models

To take possible persistency in banks' profitability into consideration, Model 1.1 and Model 1.2 are modified to Model 2.1 and Model 2.2, respectively, by adding the lag of endogenous variables to models.

Model 2.1:

$$ROA_{i,t} = \beta_0 + \beta_1 ROA_{i,t-1} + \beta_2 DepositDollarization_{i,t} + \beta_3 \Delta CreditDollarization_{i,t} + \beta_4 Capital_{i,t} + \beta_5 \Delta Size_{i,t} + \beta_6 Growth_t + \beta_7 Inflation_t + u_{i,t} \quad (3)$$

Model 2.2:

$$ROE_{i,t} = \beta_0 + \beta_1 ROE_{i,t-1} + \beta_2 DepositDollarization_{i,t} + \beta_3 \Delta CreditDollarization_{i,t} + \beta_4 Capital_{i,t} + \beta_5 \Delta Size_{i,t} + \beta_6 Growth_t + \beta_7 Inflation_t + u_{i,t} \quad (4)$$

where *i* denotes cross-section as bank and *t* denotes time.

In system GMM estimation, all bank-specific variables, deposit dollarization, credit dollarization, capital, and bank size are described as endogenous variables. Lag of dependent variable is taken as predetermined by following the suggestion of Roodman (2009) and macroeconomic variables, growth, and inflation, are assumed as exogenous. The estimation results are reported in Table 8[17].

Table 8: GMM Estimation Results

	Dependent Variables				
	ROA (2.1)			**ROE (2.2)**	
Independent Variables	***One-Step System GMM (2.1.1)***	***Two-Step System GMM (2.1.2)***	**Independent Variables**	***One-Step System GMM (2.2.1)***	***Two-Step System GMM (2.2.2)***
$ROA_{i,t-1}$	0.162 (0.120)	0.165 (0.119)	**$ROE_{i,t-1}$**	0.467*** (0.059)	0.462*** (0.076)
Deposit Dollarization$_{i,t}$	-0.015** (0.008)	-0.014* (0.008)	**Deposit Dollarization$_{i,t}$**	-0.067** (0.031)	-0.069** (0.035)
ΔCredit Dollarization$_{i,t}$	-0.022 (0.015)	-0.023 (0.015)	**ΔCredit Dollarization$_{i,t}$**	-0.038* (0.022)	-0.036 (0.026)
Capital	0.027*** (0.003)	0.026*** (0.003)	**Capital**	0.000 (0.003)	0.000 (0.004)
ΔSize	-0.019 (0.015)	-0.020 (0.014)	**ΔSize**	-0.012 (0.009)	-0.012 (0.011)
Growth	0.120*** (0.031)	0.117*** (0.030)	**Growth**	0.721*** (0.120)	0.723*** (0.126)
Inflation	-0.189*** (0.047)	-0.185*** (0.046)	**Inflation**	-1.143*** (0.191)	-1.142*** (0.201)
Constant	-0.588*** (0.164)	-0.575*** (0.157)	**Constant**	-3.492*** (0.603)	-3.513*** (0.649)
Number of observations	598	598	**Number of observations**	598	598
Number of groups	26	26	**Number of groups**	26	26
Wald Test [p-value]	$\chi^2(7)$= 39279.67 [0.000]	$\chi^2(7)$= 7751.60 [0.000]	**Wald Test [p-value]**	$\chi^2(7)$= 1009.31 [0.000]	$\chi^2(7)$= 249.72 [0.000]
Arellano-Bond Test	AR(1): z=-1.72 [0.085] AR(2): z=1.07 [0.285]	AR(1): z=-1.32 [0.188] AR(2): z=0.94 [0.348]	**Arellano-Bond Test**	AR(1): z=-1.89 [0.059] AR(2): z=1.71 [0.087]	AR(1): z=-1.65 [0.098] AR(2): z=1.53 [0.125]
Hansen Test	[1.000]	[1.000]	**Hansen Test**	[1.000]	[1.000]

The values in parentheses are the coefficient robust standard errors for one-step GMM estimations and Windmeijer-corrected robust standard errors for two-step system GMM estimations. *, ** and *** show the significance at the 10%, 5%, and 1% levels, respectively. GMM style instruments are ROA_{t-1} (ROE_{t-1}), deposit dollarization, credit dollarization, capital and size, and (t-2) lag structure is defined for these instruments. The standard instruments are growth and inflation. The values in brackets are p-values. Arellano-Bond tests AR(1) and AR(2) are for first-order and second-order serial correlation, respectively. Hansen J test is for instrument validity and over-identification restrictions.

In Table 8, the results of estimations derived by applying both one-step and two-step system GMM approaches are presented. Between the one-step and two-step estimations results, there are only slight changes. However, as Windmeijer (2005) demonstrated, in estimating coefficients, two-step GMM performs pretty better than one-step GMM with smaller biases and standard errors. Therefore, as mentioned by Roodman (2009), the Windjmeier-corrected standard errors for two-step estimations are slightly superior to the one-step estimation.

According to dynamic panel data estimation results, bank capital, growth, and inflation have significant effects on ROA, at the 1% statistical significance level. The effects are positive for capital and growth, while the effect of inflation is negative. Deposit dollarization has a negative impact on ROA. However, the previous period's ROA value does not have any statistically significant effect on the current period's ROA. Effects of bank size and credit dollarization on ROA are statistically insignificant.

In the estimation results for Model 2.2, the impact of previous period ROE on current period ROE is positive at the 1% statistical significance level. At the same significance level, growth has a positive impact on ROE, whereas the effect of inflation on ROE is negative. Deposit dollarization has a negative and significant effect on ROE at the 5% statistical significance level. The results show that the bank capital and size do not have any significant impact on ROE. According to two-step GMM results, the effect of credit dollarization is insignificant, while one-step estimation shows a negative effect of credit dollarization on ROE at the 10% significance level.

The consistency of GMM estimators depends on the absence of first-order and second-order serial correlation in error terms. To check whether there is a serial correlation in the models the Arellano-Bond (1991) tests are used. For verifying the absence of autocorrelation the null hypothesis of AR(1) should be rejected and the null hypothesis of AR(2) should be failed to reject. In addition, because of the lagged dependent variables, the presence of first-order serial correlation is expected in GMM models and it does not indicate a problem. In the light of this information, Arellano-Bond tests results of two-step estimations, reported in Table 8, imply a lack of serial correlation for the two-step GMM estimations. The validity of instruments is tested through the Hansen test. The p–values of the Hansen test, presented in Table 8, demonstrate the validity of instrumental variables. Moreover, Wald statistics of the estimations indicate the joint significance of explanatory variables.

As argued in the previous part, estimation results of models with contemporaneous ROA/ROE and dollarization values could imply a correlation between those variables, not a causality. In their study, in which the lagged value of foreign currency deposit rates as opposed to contemporaneous rates, Kutan et al. (2012) document that dollarization (lagged one period) has a negative and significant effect on banks' profitability, which confirms their initial thinking regarding currency mismatch risk and its effect on bank profitability. They conclude that banks' current profitability depends on dollarization ratios experienced during the previous period since losses and earnings from loans and deposits are usually carried onto their financial sheets with a one-year lag. Therefore, for further analysis of the effects of deposit and credit dollarization on bank performance, we estimate Model 2.1 and 2.2 with different lags. Since the data is quarterly, estimations with 1 to 5 lags of deposit and credit dollarization are performed. The estimation results in Table 9 show that 1, 3, and 4 lags of deposit dollarization have significant and negative effects on ROA, at the 5% statistical significance level. Furthermore, the

negative effects of 2 and 5 lags of deposit dollarization on ROA are statistically significant at the 10% level. However, only 2 lags of credit dollarization have a significant impact on ROA and the sign of the coefficient is positive. The results for model 2.2 indicate that 3 and 4 lags of deposit dollarization have a significant and negative effect on ROE at the 5% statistical significance. On the other hand, the negative effect of 2 lags of deposit dollarization on ROE is statistically significant at the 10% level. In addition, the negative effect of 1 lag of credit dollarization is statistically significant at the 5% level. At a 10% statistical significance level, 2 lags of credit dollarization has a positive impact on ROE.

Table 9: Estimation Results with Different Lag Variables

Dependent Variables											
	ROA						ROE				
Independent Variables	***Two-Step GMM (2.1-1)***	***Two-Step GMM (2.1-2)***	***Two-Step GMM (2.1-3)***	***Two-Step GMM (2.1-4)***	***Two-Step GMM (2.1-5)***	**Independent Variables**	***Two-Step GMM (2.2-1)***	***Two-Step GMM (2.2-2)***	***Two-Step GMM (2.2-3)***	***Two-Step GMM (2.2-4)***	***Two-Step GMM (2.2-5)***
$ROA_{i,t-1}$	0.163	0.181	0.128	0.135	0.131	**$ROE_{i,t-1}$**	0.468***	0.519***	0.465***	0.477***	0.483***
	(0.130)	(0.137)	(0.117)	(0.154)	(0.163)		(0.069)	(0.037)	(0.053)	(0.060)	(0.061)
Deposit Dollarization$_{i,t-1}$	-0.013**					**Deposit Dollarization$_{i,t-1}$**	-0.048				
	(0.006)						(0.034)				
Deposit Dollarization$_{i,t-2}$		-0.013*				**Deposit Dollarization$_{i,t-2}$**		-0.062*			
		(0.008)						(0.036)			
Deposit Dollarization$_{i,t-3}$			-0.013**			**Deposit Dollarization$_{i,t-3}$**			-0.052**		
			(0.005)						(0.024)		
Deposit Dollarization$_{i,t-4}$				-0.016**		**Deposit Dollarization$_{i,t-4}$**				-0.059**	
				(0.007)						(0.027)	
Deposit Dollarization$_{i,t-5}$					-0.020*	**Deposit Dollarization$_{i,t-5}$**					-0.058
					(0.010)						(0.041)
ΔCredit Dollarization$_{i,t-1}$	-0.024					**ΔCredit Dollarization$_{i,t-1}$**	-0.120**				
	(0.016)						(0.055)				
ΔCredit Dollarization$_{i,t-2}$		0.018**				**ΔCredit Dollarization$_{i,t-2}$**		0.122*			
		(0.008)						(0.065)			
ΔCredit Dollarization$_{i,t-3}$			-0.005			**ΔCredit Dollarization$_{i,t-3}$**			-0.028		
			(0.008)						(0.032)		
ΔCredit Dollarization$_{i,t-4}$				-0.005		**ΔCredit Dollarization$_{i,t-4}$**				-0.012	
				(0.010)						(0.019)	
ΔCredit Dollarization$_{i,t-5}$					0.001	**ΔCredit Dollarization$_{i,t-5}$**					0.002
					(0.007)						(0.018)
Capital	0.027***	0.028***	0.030***	0.037***	0.037***	**Capital**	-0.001	0.001	0.003	0.005	0.004
	(0.005)	(0.004)	(0.004)	(0.009)	(0.010)		(0.005)	(0.006)	(0.008)	(0.005)	(0.007)
ΔSize	-0.021	-0.019	-0.009	-0.013	-0.011	**ΔSize**	-0.017	-0.004	-0.000	0.001	0.001
	(0.017)	(0.015)	(0.012)	(0.018)	(0.024)		(0.015)	(0.015)	(0.014)	(0.011)	(0.014)
Growth	0.116***	0.119***	0.109***	0.102***	0.102***	**Growth**	0.706***	0.755***	0.690***	0.632***	0.652***
	(0.029)	(0.030)	(0.033)	(0.027)	(0.023)		(0.124)	(0.117)	(0.138)	(0.140)	(0.137)
Inflation	-0.179***	-0.181***	-0.153***	-0.142***	-0.139***	**Inflation**	-1.089***	-1.143***	-0.991***	-0.916***	-0.922***
	(0.045)	(0.050)	(0.048)	(0.040)	(0.036)		(0.190)	(0.196)	(0.227)	(0.225)	(0.222)
Constant	-0.577***	-0.598***	-0.575***	-0.541***	-0.548***	**Constant**	-3.500***	-3.798***	-3.604***	-3.275***	-3.436***
	(0.149)	(0.151)	(0.177)	(0.148)	(0.125)		(0.643)	(0.584)	(0.677)	(0.707)	(0.692)
Number of observations	572	546	520	494	468	**Number of observations**	572	546	520	494	468
Number of groups	26	26	26	26	26	**Number of groups**	26	26	26	26	26
Wald Test [p-value]	$\chi^2(7)$= 5785.97 [0.000]	$\chi^2(7)$= 6244.49 [0.000]	$\chi^2(7)$= 3870.51 [0.000]	$\chi^2(7)$= 2944.69 [0.000]	$\chi^2(7)$= 2451.44 [0.000]	**Wald Test [p-value]**	$\chi^2(7)$= 158.71 [0.000]	$\chi^2(7)$= 518.91 [0.000]	$\chi^2(7)$= 349.27 [0.000]	$\chi^2(7)$= 357.35 [0.000]	$\chi^2(7)$= 165.81 [0.000]
Arellano-Bond Test	AR(1): z=-1.25 [0.213] AR(2): z= 0.96 [0.336]	AR(1): z=-1.17 [0.243] AR(2): z= 0.99 [0.321]	AR(1): z=-1.21 [0.225] AR(2): z=0.78 [0.438]	AR(1): z= -1.33 [0.183] AR(2): z=1.01 [0.314]	AR(1): z= -1.29 [0.197] AR(2): z=0.86 [0.389]	**Arellano-Bond Test**	AR(1): z=-1.97 [0.049] AR(2): z=1.99 [0.046]	AR(1): z= -2.01 [0.045] AR(2): z=1.68 [0.092]	AR(1): z= -1.64 [0.101] AR(2): z=1.60 [0.109]	AR(1): z=-1.60 [0.109] AR(2): z=1.36 [0.175]	AR(1): z=-1.61 [0.107] AR(2): z=1.42 [0.156]
Hansen Test	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]	**Hansen Test**	[1.000]	[1.000]	[1.000]	[1.000]	[1.000]

The values in parentheses are the Windmeijer-corrected robust standard errors. *, ** and *** denote the significance at the 10%, 5% and 1%, respectively. GMM style instruments are ROA_{t-1} (ROE_{t-1}), deposit dollarization, credit dollarization, capital and size, and (t-2) lag structure is defined for these instruments. The standard instruments are growth and inflation. The values in brackets are p-values. Arellano-Bond tests AR(1) and AR(2) are for first-order and second-order serial correlation, respectively. Hansen J test is for instrument validity and over-identification restrictions.

4. CONCLUSION

The foreign currency operations of banks prepare a substructure for many risks regarding not only financial systems but also banks' financial soundness. As mentioned by Kutan et al. (2012), in dollarized economies, banks, which collect foreign currency deposits, usually extend foreign currency credits for avoiding currency risk. However, this application provides a kind of substitution of currency risk with credit risk, rather than hedging against currency risk and the performance of banks still could be affected by foreign currency fluctuations.

In this context, the main objective of this study is to analyze the impact of financial dollarization on the performance of banks in Turkey. To test empirically whether deposit and/or credit dollarization has statistically significant effects on bank performance, both static and dynamic panel data analyses are conducted by using the data of 26 banks' in Turkey for the period starting from the first quarter of 2012 to the fourth quarter of 2017. Following the related literature, two measures of bank profitability, namely; ROA and ROE, are used as the indicators of bank performance. For the static data analysis, both fixed effects regression and random effects regression models are used and the final method to be interpreted is determined as random effects in accordance with Hausman test results. To consider the persistence in the profitability of banks, the lagged value of bank performance variables are added to the analyses. Both one-step and two-step system GMM approaches are performed for the dynamic panel data analyses.

Our GMM results indicate the statistical significance of the negative impact of deposit dollarization on ROA, at the 10% significance level. Both random effects regression and GMM results show a negative and significant effect of deposit dollarization on ROE. Our results are in line with the expectation of a negative impact of deposit dollarization on financial deepening and the transfer of exchange risk to credit risk in dollarized economies.

On the credit dollarization side, while random effects regression results indicate a negative and significant impact of credit dollarization on ROA at 10% significance level and one-step system GMM estimation results indicate the negative effect of credit dollarization on ROE, the rest of our estimations do not show any significant effect of credit dollarization on bank performance.

Considering the persistence in the profitability of banks, following Athanasoglou et al. (2006) and Kutan et al. (2012), the lagged bank performance measure is added to GMM estimations. While the impact of the lagged ROA is found to be insignificant, the lagged ROE has a positive impact at the 1% significance level on bank profitability.

Both random effects and GMM estimations show that the effect of bank capital on ROA is positively significant. The results are consistent with the findings of empirical studies of Molyneux and Thornton (1992), Naceur (2003), and Athanasoglou et al. (2008), and support the idea of the safety role of capital in the financing process. On the other hand, when the dependent variable is ROE, the bank capital is negatively significant at a 10% significance level in random effects regression while the GMM results show insignificancy.

The sign of the relationship between bank size and bank profitability is found to be negative in random effects estimation results where the dependent variable is ROE. This finding supports the view that small banks could utilize considerably from growth, but the advantages of growth are gradually diminishing in the growth process (Regehr & Sengupta, 2016).

All of the estimation results show a significant and positive relationship between economic growth and bank profitability. These results are consistent with the expectation of an increase in credit demand and a decline in default risk with the economic growth. In addition, the negative and significant coefficient of inflation for all estimation results are compatible with the expectation stemming from the idea that inflation gives rise to default risk, which may reduce the banks' profitability.

To conclude, besides its substantial effects on the real sector, government debt management, monetary policy, and financial system, the study has shown that deposit dollarization also has a negative impact on the profitability of the banks in Turkey for the period of 2012-2017. Thus, the policies aimed at decreasing the inflation ratio and promoting the use of domestic currency for reducing dollarization in Turkey could also be beneficial for banks in terms of their profitability.

FOOTNOTES

[1] The Decree is available at http://www.resmigazete.gov.tr/arsiv/1435.pdf.

[2] The Decree is available at http://www.resmigazete.gov.tr/arsiv/6615.pdf.

[3] The Decree is available at http://www.resmigazete.gov.tr/arsiv/11206.pdf.

[4] The Decree is available at http://www.resmigazete.gov.tr/arsiv/17926.pdf.

[5]The initial version of the Decree is available at http://www.resmigazete.gov.tr/arsiv/20249.pdf. The current version of the Decree could be accessed from https://hmb.gov.tr/finansal-piyasalar-ve-kambiyo-mevzuat.

[6] Foreign exchange deposits of both residents and non-residents, in the banks domiciled in Turkey.

[7] The Decree is available at http://www.resmigazete.gov.tr/arsiv/18451.pdf.

[8]The original text of the amendment is available at http://www.resmigazete.gov.tr/eskiler/2009/06/20090616-1.htm.

[9] The original text of the amendment is available at http://www.resmigazete.gov.tr/eskiler/2018/01/20180125-1.pdf.

[10] The data covers all the credits extended by banks domiciled in Turkey, except for the credits extended to each other by banks.

[11] The dataset includes Austria, Belgium, Canada, Denmark, England and Wales, France, West Germany, Italy, Japan, The Netherlands, Sweden, Switzerland.

[12] The dataset includes Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Liechtenstein, Luxembourg, The Netherlands, Norway, Portugal, Spain, Sweden, Turkey and The United Kingdom.

[13] The dataset includes Brazil, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Israel, South Korea, Mexico, Malaysia, Peru, Philippines, Poland, Russia, South Africa, Thailand and Turkey.

[14] Graphs are available upon request.

[15] LR $\chi^2(25)$ is 1035.34 (p-val: 0.000), and 406.73 (p-val:0.000) for models 1 and 2 respectively.

[16] Wooldridge Autocorrelation Test p-val: 0.024 and 0.002 for Models 1 and 2 respectively.

[17] GMM estimations were conducted by using Roodman (2009)'s xtabond2 command for Stata 15.

AUTHOR STATEMENT

Statement of Research and Publication Ethics

This study has been prepared in accordance with scientific research and publication ethics.

Author Contributions

The authors contributed equally to the study.

Conflict of Interest

There is no conflict of interest for the authors or third parties arising from the study.

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APPENDIX

Table A1: Random Effects Estimation Results with Additional Control Variables

	Dependent Variables	
	ROA	**ROE**
	Random Effects (1.1)	***Random Effects (1.2)***
Deposit Dollarization	-0.009	-0.042*
	(0.006)	(0.022)
ΔCredit Dollarization	-0.023*	-0.036
	(0.014)	(0.026)
Capital	0.029***	-0.010**
	(0.002)	(0.005)
ΔSize	-0.003	-0.035***
	(0.005)	(0.013)
Growth	0.115***	0.681***
	(0.029)	(0.092)
Inflation	-0.183***	-1.096***
	(0.043)	(0.135)
NPL	-0.000***	-0.002***
	(0.000)	(0.000)
Spread	-0.064	-0.115
	(0.072)	(0.275)
DVol	-0.001	-0.011***
	(0.001)	(0.004)
Constant	-0.552***	-3.218***
	(0.156)	(0.509)
Number of observations	598	598
Number of groups	26	26
Adjusted R-squared	0.578	0.219

The values in parentheses are the coefficient standard errors. *, ** and *** denote the significance at the 10%, 5% and 1%, respectively.