Econder|

International Academic Journal

[Econder], 2021, 5 (2): 108/118

The Determinants of Dollarization in Turkey: An Econometric Analysis

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Türkiye'de Dolarizasyonun Belirleyicileri: Ekonometrik Bir Analiz

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Makale Bilgisi / Article Information

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Abstract

The aim of the study is to examine the determinants of dollarization in Turkey. For this purpose, the 2013M1-2021M2 period was analyzed with monthly data using regression and causality tests. As a result of the regression analysis, a positive relationship was found between international reserves and returns of financial investment instruments and dollarization. On the other hand, a negative relationship was found between domestic and foreign interest rates difference and exchange rate and dollarization. As a result of the Granger causality test, a one-sided causality was found from international reserves and returns of financial investment instruments to dollarization. In addition, a one-sided causality relationship has been found from dollarization to exchange rate. Policy implications have been made in the context of the results of the study and some suggestions have been made for future studies.

Keywords: Dollarization, Reserves, Returns, Turkey, Time Series Analysis

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Öz

Çalışmanın amacı, Türkiye'de dolarizasyonun belirleyicilerini incelemektir. Bu amaçla 2013M1-2021M2 dönemi regresyon ve nedensellik testleri kullanılarak aylık verilerle analiz edilmiştir. Yapılan regresyon analizi sonucunda uluslararası rezervler ile finansal yatırım araçlarının getirileri ile dolarizasyon arasında pozitif yönlü bir ilişki bulunmuştur. Öte yandan, yurt içi ve yurt dışı faiz farkı ile döviz kuru ve dolarizasyon arasında negatif bir ilişki bulunmuştur. Granger nedensellik testi sonucunda uluslararası rezervlerden ve finansal yatırım araçlarının getirilerinden dolarizasyona doğru tek yönlü bir nedensellik bulunmuştur. Ayrıca dolarizasyondan döviz kuruna doğru tek yönlü bir nedensellik ilişkisi bulunmuştur. Çalışmanın sonuçları bağlamında politika çıkarımları yapılmış ve gelecek çalışmalar için bazı önerilerde bulunulmuştur.

Anahtar Kelimeler: Dolarizasyon, Rezervler, Getiriler, Türkiye, Zaman Serileri Analizi

1. Introduction

Dollarization can be defined as the holding by residents of a significant portion of their assets in foreign currency. Official (de jure) dollarization can be expressed as governments' acceptance of foreign currency as the dominant payment instrument. Unofficial (de facto) dollarization is when individuals hold bank deposits or banknotes (paper money) in foreign currency to protect their purchasing power against high inflation. Liberalization of capital movements and changes in the exchange rate regime in developing economies in the late 1980s deepened the use of foreign currencies as a unit of account and exchange tool.

Dollarization has both advantages and disadvantages. The advantages of dollarization are integration with international markets, competition in international markets, and the availability of a better-equipped range of assets for domestic investors. Dollarization can help stop capital flight, especially in countries with high inflation rates (Baliño et al., 1999: 1). The decrease in seigniorage revenues and the increase in financial fragility constitute the cost of dollarization. Financial fragilities can limit policy makers' options and put an additional cost on the central bank.

The beginning of the dollarization process in Turkey dates back to the late 1970s with the foreign exchange deposit legislation (Işık, 2019: 1). The financial liberalization process and macroeconomic developments that started in the 1980s have an critical role in the development of dollarization in Turkey. Although dollarization rates have decreased in the historical process, it can be stated that it is still an important phenomenon for Turkey.

The aim of the study is to examine the determinants of dollarization in Turkey for the 2013-2021 period. For this purpose, regression and causality analysis were performed in the study with monthly data. In the first part of the study, the theoretical and empirical literature on the subject is included. The following section describes the data and method used. In the last part, the findings obtained from the analysis result are presented.

2. Literature Review

Dollarization has been an important topic in especially developing economies since the 1970s. The determinants of the dollarization may differ from country to country. Dollarization increases sharply in times of extreme macroeconomic instability. In this context, it is important to identify the determinants of dollarization.

There are four basic theories to explain dollarization; currency substitution theory, portfolio theory, market failure theory, and the institutional theory. According to the currency substitution theory, the drop in prices and the depreciation of the exchange rate lowers the real value of financial assets (Tarawalie and Jalloh, 2020: 163). The driving force of the theory is that economic agents maintain their purchasing power due to weakening macroeconomic fundamentals. In this framework, dollarization will increase and capital flight will occur in countries with macroeconomic instability.

Portfolio theory explains dollarization as the most suitable portfolio option in terms of real returns in currencies (Ize & Levy Yeyati, 2003). According to the theory, the fact that the return of foreign currency deposits is higher than the return of domestic currency deposits leads to

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[Issn: 2602-3806]

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dollarization. Therefore, if the increase in domestic inflation exceeds the real currency, the dollarization process occurs.

The market failure theory explains dollarization by externalities and inadequate regulatory framework. According to the theory, restriction of the use of foreign currency due to the limited current account deficit and weak financial sector causes market failure (Tarawalie and Jalloh, 2020: 163). However, the theory suggests that financial dollarization increases when economic agents can easily access foreign currency credit facilities.

The institutional theory highlights the relationship between policy makers' commitment to a stable exchange rate and dollarization. Policy makers may be inclined to build their credibility at a stable exchange rate, ignoring the creation of a strong institutional framework to increase confidence in the domestic currency. Hence, the weak institutional framework increases dollarization and the additional costs associated with depreciation of the exchange rate (De Nicolo, et al., 2005).

There are many empirical studies in the literature focusing on the determinants of dollarization. Mundell (1963) claimed that the demand for money depends on the exchange rate, interest rate and income. Under macroeconomic instability conditions, economic units turn to foreign currencies to counter potential risks. Arango and Nadiri (1989) revealed that expectations in foreign interest rate and exchange rate are important determinants of dollarization. On the other hand, Bordo and Choudhri (1982) found in their study covering Canada that the most important determinant of foreign exchange demand is the exchange rate. Kaplan et al. (2008) found in their study on Turkey that there is a long-term cointegration relationship among nominal effective exchange rate, M_1 money supply, real income and nominal interest rate. Akinlo (2003) found that there is no causality from the depreciation of the domestic currency to the foreign exchange demand. Arteta (2002) focused on transition and developing economies and found that flexible exchange rate system stimulates deposit dollarization more than credit dollarization.

Another important determinant of dollarization is the difference between domestic and foreign interest rates. Sahay and Vegh (1996) emphasized that the difference between domestic and foreign interest rates positively affects foreign exchange demand in their study on transition economies. Savastano (1996), in his study dealing with the period of 1970-1993 and Latin American countries, concluded that the difference between macroeconomic stability, institutional quality and domestic and foreign interest rates affects foreign exchange demand. Basso et al. (2011) in his study on transition economies concluded that the difference between interest rates affects dollarization negatively.

The impact of the financial sector on dollarization has become more prominent in recent years. Metin-Ozcan (2006) argued that dollarization may occur due to political and macroeconomic uncertainties even in periods when real returns on assets denominated in Turkish lira are higher than real returns in foreign currency. Kaya and Açdoyuran (2017) found a causality relationship from BIST-100 index return to dollarization in their study on Turkey. Raheem and Asongu (2018) analyzed the determinants of dollarization in sub-Saharan African countries for the period 2001-2012. As a result of the study, they found a positive relationship between dollarization and the difference between domestic and foreign interest rates and international reserves.

3. Data and Methodology

The monthly data used in the study covers the period 2013M1-2021M2. Stata statistics / econometrics program was used for analysis. FED is a proxy for dollarization (foreign currency deposit as a ratio of broad money supply). RES represents the amount of international reserves. INT variable is the difference in interest rate between domestic and foreign currencies. RETURN represents returns of financial investment instruments. On the other hand, EXCHANGE refers to the real effective exchange rate. While FED, RES, INT and EXCHANGE variables were obtained from the World Bank data set, the RETURN variable was obtained from TURKSTAT.

Regression analysis is a method used to examine the numerical relationship between dependent and independent variables. The regression equation for the determinants of foreign exchange demand is as follows;

$$FED = \beta_0 + \beta_1 RES + \beta_2 INT + \beta_3 RETURN + \beta_4 EXCHANGE + \varepsilon_i$$

Random error ε shows a normal distribution, its mean value is zero and has a constant spread. Random error is included in the model because in economics the functional linear relationship between two variables is often probabilistic, since data sets are based on the observation of a certain number of samples and are affected by measurement errors (Anghelance and Anghel, 2014: 55). In order to apply the multiple linear regression method, the assumptions that are basically accepted are as follows (Turanlı and Güriş, 2015: 462);

- It is known that the sample used is either random sample or highly representative of the main population.

- It is assumed that the dependent variable has random error and the mean error is zero. Regression analysis does not cover systematic error.

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- According to the fixed variance and homoscedasticity assumption, the errors are not interdependent over time and among themselves.

- According to the autocorrelation assumption, the error variance is constant and it is assumed that it does not change at all between the data.

- Errors are normally distributed.

- According to the multicollinearity assumption, there should be no relationship between independent variables.

In order to test the causality relationship between variables the Granger causality test is usually applied (Granger, 1969). A time series (X_t) is said to Granger-cause another time series (Y_t) if the prediction error from regressing Y on X declines by using past values of X in addition to past values of Y. If the Y_t variable can be better predicted when the past values of the X_t variable are used, it is said that X_t is the Granger cause of Y_t. Assuming that X_t and Y_t variables are stationary, the Granger causality test requires the estimation of the specified Vector Autoregressive (VAR) models 1 and 2 (Asteriou and Hall, 2011: 322).

$$Y_t = \alpha_1 + \sum_{i=1}^{n} \beta_i X_{t-i} + \sum_{j=1}^{m} \delta_j Y_{t-j} + e_{yt} \tag{1}$$

$$X_t = \alpha_2 + \sum_{i=1}^{n} \theta_i X_{t-i} + \sum_{j=1}^{m} \gamma_j Y_{t-j} + e_{xt} \tag{2}$$

In the causality analysis, the significance of the H_0 and H_A hypotheses stated below is tested. Accordingly, if the H_0 hypothesis is rejected, it can be claimed that there is a causality relationship between the variables.

4. Findings

The VIF (Variance Inflation Factors) test was applied to measure that the independent variables are not interrelated.

Table 1. VIF Test Results

Variable	VIF	1/VIF
EXCHANGE	3.01	0.332154
INT	2.19	0.457558
RES	1.93	0.518657
RETURN	1.77	0.563913
Mean VIF	2.22	

According to the test results, the VIF values of the variables are less than 10 and the average VIF value is less than 5. There is no multicollinearity problem in the model.

Breusch-Pegan / Cook-Weisberg test was applied to find out whether the model meets the condition of the homoscedasticity assumption. The H_0 hypothesis of the test states that the error terms have constant variance.

Table 2. Breusch-Pegan / Cook-Weisberg Test Results

$chi^2(1)$ = 0.27	
Prob > chi^2 = 0.6015	

When we look at the probability value of the model, it is seen that it is greater than 0.05. H_0 Hypothesis is accepted. There is no changing variance problem in the model.

Durbin-Watson test was applied to examine whether there is autocorrelation between error terms. If the Durbin-Watson statistics is above 2, it indicates that there is no autocorrelation between the error terms.

Table 3. Durbin-Watson Test Results

Durbin-Watson statistic = 2.023180

When the results of the test are examined, it is seen that the Durbin-Watson value is greater than 2. Hence, shows that there is no autocorrelation in the model.

Shapiro-Wilk W test was used to investigate the assumption that the error terms are normally distributed. The H_0 hypothesis of the test states that the error terms are normally distributed.

Table 4. Normality Test Results

Variable	Obs.	W	V	Z	p
r	98	0.96994	2.441	1.977	0.02401

According to the test result, the H_0 hypothesis is rejected because the probability value is less than 0.05. Error terms in the model do not show normal distribution. However, according to the central limit theorem, the normality assumption can be neglected for large samples.

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As can be seen, the basic regression assumptions were tested in order to apply the model and it was concluded that the model was applicable. Regression analysis results are as follows;

Table 5. Regression Analysis Results

Source	SS	dF	MS		Obs = 97
Model	0.042820383	4	0.010705096		$F_{(4, 92)}$ =99.10
Residual	0.009938554	92	0.000108028		Prob > F =0.0000
Total	0.052758938	96	0.000549572		R^2 =0.8116
					Adj R^2 =0.8034
					Root MSE =0.01039
FED	Coef.	S.E	t	p	95% Con. Int.
RES	0.0007624	0.0003007	2.54	0.013	0.0001651 0.0013596
INT	-0.0012939	0.000354	-3.66	0.000	-0.0019969 - 0.0005908
RETURN	0.0310632	0.012625	2.46	0.016	0.0059888 0.0561377
EXCHANGE	-0.0035694	0.0003052	-11.70	0.000	-0.0041755 - 0.0029633
Cons.	0.6664813	0.0436961	15.25	0.000	0.5796971 0.7532654

According to the analysis results; the determination coefficient is R^2 = 0.8116. In other words, the model has the power to explain the variability in foreign exchange demand by 0.8116. Since the p-value in the model is less than 0.05, it can be said that the model is significant at 95% confidence level. Looking at the variables, it is seen that there is a significant relationship between all explanatory variables and foreign exchange demand. It is observed that the international total reserves and returns of financial investment instruments positively affect foreign exchange demand. On the other hand, it is understood that the increases in the interest rate difference (in favor of TL) and exchange rate decrease the foreign exchange demand.

To better understand the determinants of foreign exchange demand, Granger causality analysis was also applied. Granger causality test results are given in the table below.

Table 6. Granger Test Results

H₀ Hypothesis	chi2	df	Prob > chi2
FED ⇒ RES	1.3764	2	0.502
RES ⇒ FED	7.1811	2	0.028
FED ⇒ INT	4.636	2	0.098
INT ⇒ FED	1.093	2	0.579
FED ⇒ RETURN	4.8456	2	0.089
RETURN ⇒ FED	11.624	2	0.003
FED ⇒ EXCHANGE	22.931	2	0.000
EXCHANGE ⇒ FED	3.1037	2	0.212

Looking at the test results, a one-sided causality at a 95% significance level has been identified from international total reserves and returns of financial investment instruments to foreign exchange demand. It is seen that there is a one-sided causality from the foreign exchange demand to the exchange rate.

5. Conclusion

The study investigates the determinants of dollarization in Turkey. Although there are many determinants of dollarization in the literature, the determinants in this study differ from the studies in the literature. These determinants are international reserves, the difference between domestic and foreign interest rates, the returns of financial investment instruments and the exchange rate. The focus of this study was limited to Turkey for the period 2013–2021. The preference of this scope was due to limited number of studies on dollarization in Turkey. The contribution of this study to the literature is the expansion of the determinants explaining dollarization in Turkey, and the period analyzed.

Empirical findings show that international reserves and the returns of financial investment instruments are positively associated with dollarization. On the other hand, a negative relationship was found between domestic and foreign interest rates difference and exchange rate and dollarization. As a result of the Granger causality test, a one-sided causality was found from international reserves and returns of financial investment instruments to dollarization. In addition, a one-sided causality relationship has been found from dollarization to exchange rate.

Since the increase in international reserves will increase the cost of intervening in the exchange rate, the foreign exchange demand is increasing due to expectations. Moreover, it justified the notion that increasing the gap between domestic and foreign interest rates would reduce dollarization. On the other hand, as the returns in financial investment instruments increase, it

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is understood that households channel these returns to foreign currency with the motive to preserve their purchasing power.

The emphasis of the study is on the reduction of dollarization. It can be stated that dollarization is generally caused by macroeconomic unsteadiness and policy unreliability. The most effective instrument to prevent dollarization is to increase confidence in the domestic currency by providing macroeconomic stability.

The exchange rate regime and inflation targeting could not be examined in this study on dollarization. In addition, apart from macroeconomic variables, there may also be variables that determine dollarization. In this context, it is important to include different variables that determine dollarization in the model for future studies.

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International Academic Journal
[Issn: 2602-3806]

Cilt / Vol : 5,
Sayı/Issue: 2,
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