İktisat Politikası Araştırmaları Dergisi
Journal of Economic Policy Researches
Cilt/Volume:6, Sayı/Issue:1,
Yıl/Year: 2019, 31-42

DETERMINANTS OF NOMINAL EXCHANGE RATE

Gülden Şengün[1]
Akmyrat Amanov[2]

Abstract

Purpose –Understanding the movements in the exchange rate will make it easier for households to make decisions by eliminating uncertainties. With the elimination of uncertainties, resources can be used in the most efficient way. As the level of awareness increases, a healthier communication will be established between the household and the policy authorities. In this study, the determinants of the nominal exchange rate in Turkey`s economy for a sample period of 2005M1-2018M10 were examined.

Methodology – In order to establish the relationship between the variables correctly, a unit root test was implemented. According to the test results, it was decided that the appropriate methodology was Johansen Cointegration Analysis. Thus, the long-term causality relationship between variables was indicated.

Findings – The first finding is that the most important determinant of USDTRY is the CPI difference between Turkey and USA. The Central Bank may use the policy interest rate as a policy tool to halt the continuous rise in the USDTRY. In addition, as the increase in industrial production is dependent on imported inputs, it leads to a depreciation in TRY. On the other hand, changes in oil prices have little impact on the USDTRY. Moreover, there is a mutual causality between inflation gap and USDTRY.

Conclusion – In order to prevent the depreciation of the domestic currency, the Central Bank should first reduce inflation. The 10 unit inflation gap (CPI_{tur}-CPI_{usa}), causes a %40 rise in USDTRY. The Central Bank can use the interest rate as a policy tool to control this unexpected rise. Moreover, the inflation gap falls only if there is an increase in industrial production.

Keywords: Nominal exchange rate, inflation, monetary policy, Johansen Cointegration Analysis
JEL Codes: F39, E31,E50, C32

Nominal Döviz Kurunun Belirleyicileri

Öz

Amaç – Döviz kurundaki hareketleri anlamak, belirsizlikleri ortadan kaldırarak hanehalkının karar almasını kolaylaştırmaktadır. Belirsizliklerin ortadan kalkmasıyla kaynaklar maksimum verimle kullanılabilmektedir. Hanehalkının farkındalık seviyesi yükseldikçe, politika otoriteleri ile hanehalkı arasındaki iletişim daha sağlıklı olacaktır. Bu çalışmada Türkiye ekonomisinin 2005A1-2018A10 dönemleri için, nominal döviz kurunun belirleyicileri incelenmiştir.

Yöntem – Değişkenler arasında doğru bir ilişki kurabilmek için öncelikle birim kök sınaması gerçekleştirilmiştir. Sınama sonuçlarına göre uygun yöntemin Johansen Eşbütünleşme Analizi olduğuna karar verilmiştir. Böylece değişkenler arasındaki uzun vadeli ilişki saptanmıştır.

Bulgular – İlk bulgu, Türkiye ile ABD TÜFE farkının nominal döviz kurunun en önemli belirleyicilerinden birisi olmasıdır. Merkez Bankası nominal döviz kurundaki sürekli yükselişi durdurmak için politika faizini kullanabilmektedir. Ayrıca, sanayi üretiminin ithalat girdilere bağımlı olmasından dolayı, sanayi üretimindeki artış döviz kurunun yükselmesine neden olmaktadır. Öte yandan, petrol fiyatlarındaki artış nominal döviz kuru üzerinde küçük bir etkiye sahiptir. Son olarak, enflasyon açığı ile nominal döviz kuru arasında çift taraflı bir nedensellik ilişkisi mevcuttur.

Sonuç – Yerli paranın değer kaybını durdurmak için Merkez Bankası öncelikle enflasyondaki yükselişi durdurmalıdır. 10 birimlik enflasyon açığı ($TÜFE_{Türkiye}$-$TÜFE_{ABD}$), USDTRY'nin %40 yükselmesine neden olmaktadır. Merkez Bankası politika faizini bu beklenmeyen hareketleri kontrol etmek amaçlı kullanabilmektedir. Ayrıca, enflasyon açığı ancak sanayi üretiminde artış gerçekleştiğinde kapanmaktadır.

Anahtar Kelimeler: Nominal döviz kuru, enflasyon, Johansen Eşbütünleşme Analizi
JEL Sınıflandırması: F39, E31, E50, C32

[1] Istanbul University, sengungulden@gmail.com
[2] Istanbul University, akmyratamanov@gmail.com

1. INTRODUCTION

The course of key macroeconomic indicators is important for the policies that policy authorities will implement. With the transition to the flexible exchange rate regime, the exchange rate became an important indicator for stable macroeconomic performance. One of the reasons for closely monitoring the nominal exchange rate is that the exchange rate is one of the main determinants of inflation. If the degree of openness of an economy is high, the depreciation of the domestic currency will lead to an increase in the cost of all imported goods, leading to a rise in inflation. Second, the exchange rate has an important role in foreign trade. The depreciation of the domestic currency causes domestic products to be cheaper and more advantageous than the products abroad, leading to an increase in exports. Third, the exchange rate stability is consistent with financial stability. An unexpected depreciation of the domestic currency may put companies with high foreign exchange liabilities in a difficult position. And for other reasons, it is necessary to know the determinants of the exchange rate in order to control the movements in the exchange rate. Understanding the movements in the exchange rate will make it easier for households to make decisions by eliminating uncertainties. With the elimination of uncertainties, resources can be used in the most efficient way.

Referring to studies conducted in Turkey, it was observed that the studies were generally done on the real exchange rate. The importance of real exchange rates is undeniable, but the uncertainty in the market may not disappear as a high proportion of households are not familiar with real values. When we consider that a high audience takes into account the nominal values, examining the movements in the nominal exchange rate is important for raising awareness of households. As the level of awareness increases, a healthier communication will be established between the household and the policy authorities.

In this study, the determinants of the nominal exchange rate in Turkey`s economy for a sample period of 2005M1-2018M10 were examined. As a dependent variable, USDTRY is used as the nominal exchange rate variable. As an independent variable (as determinants of USDTRY), the difference between Turkey Consumer Price Index and USA Consumer Price Index, policy interest rate, Industrial Production Index, net export/net imports and Europe Brent Spot Price FOB were used. In order to establish the relationship between the variables correctly, a unit root test was implemented. According to the test results, it was decided that the appropriate methodology was Johansen Cointegration Analysis. Thus, the long-term causality relationship between variables was indicated.

2. LITERATURE REVIEW

The purchasing power parity is one of the views trying to explain the movements in the nominal exchange rate. According to this view, the inflation gap between the two countries should be equal to the rise in the nominal exchange rate between these two countries. Therefore, the inflation gap

is one of the determinants of the nominal exchange rate. According to this view, the increase in the inflation rate in Turkey leads to a depreciation of the Turkish Lira.

The other determinant of the nominal exchange rate is the foreign trade. For example, the high dependence on import goods means that there is a constant demand for foreign currency. The higher demand for foreign currency will increase its price, and cause the depreciation of the domestic currency. Likewise, the currency of the exporting country will appreciate. The demand for the goods of this country will increase, and therefore the demand for the currency will be high.

The other determinant of the nominal exchange rate is the capital movements. Although a certain portion of foreign exchange transactions is made to foreign trade, another important part is made for the financial investment. According to Portfolio Approach, interest rates of countries play an important role in transactions made for financial investments. Investors will choose an asset (currency) which has higher returns (interest rate). According to this view, the increase in the interest rates in Turkey will raise the demand for Turkish Lira. Thus, the Turkish Lira will appreciate as the demand for the Turkish Lira rises.

There are some other determinants of the nominal exchange rate as trade barriers, preferences, import dependency in production and relative efficiency. Assuming that a trade quota is applied to a country, the demand for that country`s goods will decrease, and the domestic currency will depreciate. Likewise, if the preferences for Turkish goods are high, Turkish Lira will appreciate because of the high demand for Turkish Lira. And, in the case of productivity growth in Turkey`s economy, prices will fall by a decline in production costs. With the fall in prices, demand for Turkish goods will rise and domestic currency will appreciate. The import dependency in industrial production will lead to depreciation in the domestic currency because of increased production costs.

Many empirical studies have been carried out on the determinants of the exchange rate. Empirical local studies are given in Table 1.

Table 1: Local Studies

Author	Country Period	Method	Findings and Conclusion
Zengin (2001)	Turkey, 1994-2000	Cointegration analysis	A direct causal relation exists from both export and import price indexes to real exchange rates. Exchange rates have an impact onthe import price index directly, but not on the export price index, however, its indirect effect is shown to operate through its causal relationship with the import price index.
Işık, Acar ve Işık (2004)	Turkey, 1982-2003	Johansen Cointegration analysis	Inflation and exchange rates are cointegrated and inflation will rise by 0.9% in response to a 1% increase in the exchange rate.
Gül ve Ekinci (2006)	Turkey, 1990-2006	Granger-causality test	There isunidirectional causality from export and import to the real exchange rates.
Gül ve Ekinci (2006)	Turkey, 1984-2003	Cointegration analysis	A long-run relationship between nominal exchange rates and inflation exist. However, a causal relationship occurs only onedirection from nominal exchange rates to inflation.
Aktaş (2012)	Turkey, 1989-2008	VAR model	Any change in the real exchange rate has no statistically significantimpact on the foreign trade balance and hence it cannot effectively be used to balancethe foreign trade.
Kara veÖğünç (2012)	Turkey, 2002-2011	VAR model	Import price pass-through is as important as the exchange rate pass-through on consumer price dynamics in Turkey. Moreover, the results of both the VAR and time-varying parameter models indicate that the exchange rate pass-through has been weakening through time.
TapşınveKara bulut (2013)	Turkey, 1980-2011	Toda and Yamamoto causality test	There are significant relationships from import to export and from real exchange rate index to imports
Öncelveİnal (2016)	Turkey, 2000-2015	ARDL model Bounds Testing	A unilateral causality was defined from real exchange rate towards foreign trade balance.
Yılmazve Altay (2016)	Turkey, 1985-2015	ARDL Bounds Testing	The effect of crude oil price change on exchange rate volatility in the long-run analysis is found negative statistically significant
Yurdakul (2016)	Turkey	Cointegration Analysis	The variables affecting exchange rate include money supply, general pricelevels, capital movements, export, and previous exchange rate.

3. DATA AND METHODOLOGY

In this study, the determinants of nominal exchange rate were investigated. Thus, the causation among variables and parameter estimation was examined by setting up the appropriate model. (LNUSD), (INF), (POL), (SUE), (KO) and (LNPET) variables were used to establish the model. (LNUSD) represents the logarithm of the USDTRY exchange rate, (INF) represents the difference between Turkey Consumer Price Index and USA Consumer Price Index, (POL) represents the overnight borrowing rate for the period 2005M1-2010M5 and represents the one week repo interest rate for the period 2010M5-2018M10, (SUE) represents the Industrial Production Index, (KO) represents the net export/net imports and (LNPET) represents the logarithm of the Europe Brent Spot Price FOB. The reason for our study on the nominal exchange rate is the fact that the findings can be easily interpreted by everyone and the previous studies are focused on the real exchange rate. In choosing the inflation variable, it was considered that choosing the inflation difference of the two countries subject to the exchange rate would be much healthier. Since the CBRT changed the policy interest rate in May 2010, overnight borrowing rate and one-week repo rate were used as the policy interest rate. The Industrial Production Index, net exports/net imports and Europe Brent Spot Price FOB were added to the model, as they were used in previous studies and were thought to have a significant effect on the nominal exchange rate. The time series are monthly, and the study covers the period 2005M1-2018M10. Time series were taken from CBRT EVDS system and Federal Reserve Bank of St. Louis FRED system.

In order to find the appropriate model, it was first tested whether the variables contain a unit root. Since the economic model generally has higher autoregressive processes, the ADF unit root test is applied. When this test is applied, the appropriate number of lags included in the model is determined with the help of the Akaike and Schwarz information criteria. The results are shown in Table 2.

Table 2: Unit Root Test Results for Series

	ADF			
	Level	**Level Prob.**	**1st Difference**	**1st Dif. Prob.**
LNUSD	-0.996923	0.9406	**-10.03465***	0.0000
İNF	-0.976499	0.9433	**-8.671962***	0.0000
POL	-0.899132	0.9527	**-5.158817***	0.0002
SUE	-2.319721	0.4204	**-3.039766***	0.0335
KO	-1.964697	0.3022	**-17.43889***	0.0000
LNPET	-2.638439	0.2640	**-9.045511***	0.0000

MacKinnon (1996) one sided p-values.

* Significant at the 5 % level

According to the results of the unit root test, it is observed that when the first difference of the series is taken, they become stationary. Time series are integrated I (1) in the first degree. Although all series are not stationary at normal levels, there may be a long-run relationship between the variables due to being integrated at the first difference level. Thus, the Johansen approach (1988, 1995) was applied as a method of cointegration analysis.

4. FINDINGS AND CONCLUSION

The Johansen cointegration test accepts all variables in the model as endogenous. For this reason, estimates should be made with the help of vector and matrix. The VAR model was estimated, and the values of the lag length criteria were found. Two of these criteria (AIC and FPE) showed that 3 lags of variables should be taken. According to these two criteria, the appropriate model is VAR (3) and the appropriate error correction model is VECM (2). The results of the information criteria are shown in Table 3.

Table 3: Appropriate Lag Selection for VAR Model

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-1882.923	NA	1136.204	24.06271	24.17951	24.11015
1	-938.4195	1804.783	0.010700	12.48942	13.30701*	12.82147*
2	-894.0756	81.34414	0.009640	12.38313	13.90152	12.99980
3	-847.5714	81.75259	**0.008474***	**12.24932***	14.46850	13.15061
4	-814.4123	55.75798	0.008868	12.28551	15.20549	13.47141
5	-794.6933	31.65095	0.011078	12.49291	16.11368	13.96343
6	-760.7560	51.87865*	0.011633	12.51918	16.84076	14.27433
7	-735.8871	36.11533	0.013840	12.66098	17.68335	14.70074
8	-701.3284	47.54567	0.014718	12.67934	18.40250	15.00372

At the later stage, the appropriate rank for the model needs to be determined. The appropriate model for deterministic components has been chosen according to the Pantula principle (1989). The Pantula principle deals with the prediction of three models and gives results starting from the most constrained hypothesis. Trace statistics and critical values are compared. Since the equation must be used in terms of the differences of the internal variables, it is transformed into the VECM (2) model.

Table 4: Pantula principle test results

r	Model 2		Model 3		Model 4	
0 (none)	131.56*	→	117.50*	→	149.43*	→
1 (at most 1) →	**73.21!**		60.20		84.71	

Significance of trace statistic is determined according to Osterwald-Lenum (1992). `!` Shows the point at which the null hypothesis cannot be rejected first. * Significant at 5% level.

While the trace statistics calculated for the three models, it was decided according to their significance level. The value in the second row of Model 2 is 73.21, where the null hypothesis cannot be rejected first. It is determined that the appropriate model is Model 2 and the rank of the Π matrix is equal to one. In model 2, there is no trend in the long-run cointegration model; there is no intercept and trend in the short-run VECM model. Moreover, the λmax and λtrace statistics in the Model 2 frame and the results are given in Table 5.

Table 5: Johansen Cointegration Test Results

λ_{trace} *statistics*

Hypotheses	***Eigenvalue*** (λ_i)	λ_{trace}	***Critical Value % 5***
H_0: *r = 0,* H_1: *r = 1*	0.302456	131.5656	**103.8473***
H_0: $r \leq 1$, H_1: $r = 2$	0.147445	73.21491	76.97277
H_0: $r \leq 2$, H_1: $r = 3$	0.129038	47.37298	54.07904
H_0: $r \leq 3$, H_1: $r = 4$	0.082499	24.99159	35.19275

λ_{max} *statistics*

Hypotheses	***Eigenvalue*** (λ_i)	λ_{max}	***Critical Value % 5***
H_0: $r = 0$, H_1: $r \geq 1$	0.302456	58.35071	**40.95680***
H_0: $r \leq 1$, H_1: $r \geq 2$	0.147445	25.84193	34.80587
H_0: $r \leq 2$, H_1: $r \geq 3$	0.129038	22.38139	28.58808
H_0: $r \leq 3$, H_1: $r \geq 4$	0.082499	13.94841	22.29962

* Significant at the 5 % level.

Critical values are MacKinnon-Haug-Michelis (1999) p-values. When the above values are compared with these values, it is seen that the null hypotheses of the maximum eigenvalue and trace test statistics are rejected according to the level of 5% significance level. Variables in the model are cointegrated. Since the matrix of Π is equal to the rank one, there is one cointegrating relationship between variables.

The weak exogeneity test was applied. Weak exogeneity means that a variable is only affected by its lagged values. In order to make LNUSD, INF, POL, SUE, KO and LNPET variables weakly exogenous: it is necessary that LNUSD variable in the first equation, INF variable in the second equation, POL variable in the third equation, SUE variable in the fourth equation, KO variable in the fifth equation and LNPET variable in the sixth equation be a function of their own lagged values respectively. Thus, if the matrix α is zero, then the variables are weakly exogenous because the effect of the parameters of the cointegration vector will be reduced from the corresponding equation. The results of the weak exogeneity test are given in Table 6. According to the results of the weak exogeneity test, LNUSD, INF, and SUE variables are endogenous, while POL, KO and LNPET variables are exogenous.

Table 6: Weak exogeneity test results

Variables	Null Hypothesis	LR (rank=1)	Prob.
LNUSD	**H_0: a_{11} = 0**	3.913450	0.046871
INF	**H_0: a_{21} = 0**	24.47610	0.000001
POL	**H_0: a_{31} = 0**	**1.748413**	**0.186076**
SUE	**H_0: a_{41} = 0**	10.17559	0.001423
KO	**H_0: a_{51} = 0**	**0.583107**	**0.445097**
LNPET	**H_0: a_{61} = 0**	**0.165049**	**0.684550**

* Significant at the 5 % level.

According to the above results, it has been found that there is a long-run relationship between LNUSD, INF, POL, SUE, KO, and LNPET that this relationship can be presented with a single cointegrating vector. Since the variables LNUSD, INF, and SUE are endogenous and POL, KO, and LNPET are exogenous, three equations are established. The long-run relationship is normalized by multiplying the coefficient of the endogenous variable by the opposite sign. Normalized coefficients show the long-run relationship.

Table 7: Normalized cointegrating coefficients

	LNUSD	INF	POL	SUE	KO	LNPET	C
			LNUSD				
Normalized Coefficients	1.0000	**-0.039655***	**0.015600***	**-0.013510***	-0.000746	**0.284514***	-0.573567
Standard Error		(0.00747)	(0.00309)	(0.00080)	(0.00251)	(0.03989)	(0.30621)
			INF				
Normalized Coefficients	**-25.21770***	1.0000	**-0.393401***	**0.340681***	0.018822	**-7.174786***	14.46405
Standard Error	(2.97053)		(0.08158)	(0.05024)	(0.06339)	(1.23018)	(7.65104)
			SUE				
Normalized Coefficients	**-74.02144***	**2.935298***	**-1.154749***	1.0000	0.055249	**-21.06013***	42.45628
Standard Error	(3.76006)	(0.59300)	(0.24999)		(0.18563)	(3.23024)	(22.5216)

* Significant at the 5 % level.

When LNUSD model was examined, all variables except KO were statistically significant. The increasing difference in the CPI between the two countries (CPI_{turkey} - CPI_{usa}) causes the depreciation of domestic currency. A 1 unit increase in the INF increases the LNUSD by 3.96%. A rise in the policy interest rate increases the capital inflow and money demand and makes the domestic currency more valuable. A 1 unit increase (100 points) in the POL leads to a 1.56% decrease in the LNUSD. The increase in SUE leads to a further rise in imported goods, making the domestic currency invaluable. A 1 unit increase in the SUE increases the LNUSD by 1.35%. Moreover, a 1% increase in the LNPET leads to 0.28% decrease in the LNUSD. The variables are statistically significant and theoretically significant.

According to the INF model, while a rise in the LNUSD, POL, and LNPET have a positive effect on the INF, a rise in the SUE has a negative effect on the INF. A 1 unit increase in the POL increases the INF by 0.39 unit, a 1 unit increase in the SUE decreases the INF by 0.34 unit, a 1% increase in the LNPET leads to a 0.071 unit increase in the INF and a 1% increase in the LNUSD leads to a 0.252 unit increase in the INF.

According to the SUE model, while a rise in the INF has a negative effect in the SUE, a rise in the LNUSD, LNPET and POL have a positive effect on the SUE. A 1 unit increase in the INF decreases the SUE by 2.93 units, a 1 unit increase in the POL increases the SUE by 1.15 units, a 1% increase in the LNPET leads to a 0.21 unit increase in the SUE and a 1% increase in the LNUSD leads to a 0.74 unit increase in the SUE.

Table 8: Vector error-correction model prediction results: VECM (2)

	USD	INF	POL	SUE	KO	PET
VECM Coefficients	**-0.2559***	**-0.219131***	-0.059223	**-0.319081***	0.1420	-0.035817
Standard Error	(0.126)	(0.03508)	(0.03931)	(0.08787)	(0.00330)	(0.08334)

* Significant at the 5 % level.

In the vector error correction model, it is proved that shocks that can occur in the long-run equilibrium can be corrected. The USD, INF and SUE coefficients in the error correction model were negative and statistically significant as expected. These coefficients indicate the rate at which the short-run deviations resulting from the non-stationary series are adjusted in the next period. The short-run imbalance that occurs in USD is adjusted approximately in four months, the short-run imbalance that occurs in INF is adjusted in about five months, and the short-run imbalance that occurs in SUE is adjusted in about three months to the long-run equilibrium level.

According to test results, many findings have emerged. However, for the purpose of the study, only the determinants of the nominal exchange rate were emphasized. The first finding is that the most important determinant of USDTRY is the CPI difference between Turkey and USA. The high inflation gap causes the USDTRY to rise continuously. The central bank may use the policy interest rate as a policy tool to halt the continuous rise in the USDTRY. In addition, as the increase in industrial production is dependent on imported inputs, it leads to a depreciation in TRY. On the other hand, changes in oil prices have little impact on the USDTRY.

Another finding is that there is a mutual causality between inflation gap and USDTRY.The increase in the inflation gap causes the USDTRY to rise, while the increase in USDTRY leads to an increase in the inflation gap. For this reason, the difference in inflation should be reduced. According to the inflation model, inflation can only be reduced by the increase in industrial production. In addition, short-term shocks that occurred in the USDTRY, inflation gap and industrial production are resolved in about 4 months to the long-term equilibrium level.

As a result, in order to prevent the depreciation of the domestic currency, the central bank should first reduce inflation. The 10 unit inflation gap (CPI_{tur}-CPI_{usa}), causes a %40 rise in USDTRY. The central bank can use the interest rate as a policy tool to control this unexpected rise. Although not within the scope of the study, according to the findings, the inflation gap falls only if there is an increase in industrial production.

REFERENCES

Aktaş, C. (2012). Türkiye'de reel döviz kuru ile ihracat ve ithalat arasındaki ilişkinin VAR tekniğiyle analizi. *Uluslararası Yönetim İktisat ve İşletme Dergisi*, *6*(11), 123-140.

Gül, E., & Ekinci, A. (2006). Türkiye'de Reel Döviz Kuru İle İhracat Ve İthalat Arasindaki Nedensellik İlişkisi: 1990-2006. *Dumlupınar Üniversitesi Sosyal Bilimler Dergisi*, (16), 165-190.

Gül, E., & Ekinci, A. (2006). Türkiye'de enflasyon ve döviz kuru arasındaki nedensellik ilişkisi: 1984-2003.*Dumlupınar Üniversitesi Sosyal Bilimler Dergisi*, (16), 91-106.

Işık, N., Acar M., ve Işık, H. (2004). Enflasyon ve döviz kuru ilişkisi: bir eşbütünleşme analizi. *Süleyman Demirel Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi*, *9*(2), 325-340.

Johansen, S. (1988). Statistical analysis of cointegration vectors. *Journal of economic dynamics and control*, 12(2-3), 231-254.

Johansen, S. (1995). Identifying restrictions of linear equations with applications to simultaneous equations and cointegration. *Journal of econometrics*, 69(1), 111-132.

Kara, H., & Öğünç, F. (2012). Döviz kuru ve ithalat fiyatlarının yurt içi fiyatlara etkisi. *İktisat İşletme ve Finans*, *27*(317), 9-28.

Öncel, A., & İnal, V. (2016). Türkiye'de Reel Döviz Kuru ile Dış Ticaret Dengesi Arasındaki İlişki: 2000-2015 Dönemi için ARDL Modeli ile Amprik Bir Analiz.*Balkan Sosyal Bilimler Dergisi*, 786-799.

Pantula, S. G. (1989). Testing for unit roots in time series data. *Econometric Theory*, 5(02), 256-271.

Tapşin, G., & Karabulut, A. T. (2013). Reel Döviz Kuru, İthalat ve İhracat Arasındaki Nedensellik İlişkisi: Türkiye Örneği. *Akdeniz İİ BF Dergisi,(26)*, 190-205.

Yilmaz, A., & Altay, H. (2016). Ithal Ham Petrol Fiyatlari ve Döviz Kuru Arasindaki Esbütünlesme ve Oynaklik Yayilma Etkisinin Incelenmesi: Türkiye Örnegi/Examining The Cointegration Relationship and Volatility Spillover Between Imported Crude Oil Prices and Exchange Rate: The Turkish Case. *Ege Akademik Bakis*, *16*(4), 655-671.

Yurdakul, F. (2016). Döviz Kuru Modellemesi: Türkiye Üzerine Bir Uygulama. *Döviz Kurunun Belirleyicileri*, Ed. Yurdakul, F., Ankara, Gazi Kitabevi, 1-50.

Zengin, A., & Çaycuma, İ. İ. B. F. (2001). Reel Döviz Kuru Hareketleri ve Dış Ticaret Fiyatları (Türkiye Ekonomisi Üzerine Ampirik Bulgular). *Cumhuriyet Üniv. Iktisadi ve Idari Birimler Dergisi*, *2*(2), 27-41.