AEÜİİBFD Kırşehir Ahi Evran Üniversitesi İktisadi ve İdari Bilimler Fakültesi Dergisi

Cilt 5/ Sayı 2/ Aralık 2021

AEUPEAJ Politics, Economics and Administrative Sciences Journal of Kirsehir Ahi Evran University

Vol 5/ No 2 / December 2021

THE INTEREST RATE PASS-THROUGH PROCESS IN TURKEY: EMPIRICAL EVIDENCE FROM LINEAR AND NONLINEAR ESTIMATION TECHNIQUES

TÜRKİYE'DE FAİZ ORANI GEÇİŞKENLİĞİ SÜRECİ: DOĞRUSAL VE DOĞRUSAL OLMAYAN TAHMİN TEKNİKLERİNDEN BULGULAR

Burçin ÇALIŞKAN GÖK*, Ümit BULUT**

Araştırma Makalesi/Research Article

* MA Student, Economics, Institute of Social Sciences, Kirsehir Ahi Evran University
burcincaliskan1313@gmail.com

* YL Öğrencisi, İktisat, SBE, Kırşehir Ahi Evran Ünv.

ORCID ID:
0000-0002-2031-7107

** Assoc. Prof., Faculty Member, Department of Economics, FEAS, Kirsehir Ahi Evran University
ubulut@ahievran.edu.tr

** Doç.Dr. İktisat Bölümü, İİBF, Kırşehir Ahi Evran Ünv.

ORCID ID:
0000-0002-8964-0332

Başvuru Tarihi/ Received:
07.10.2021

Kabul Tarihi/Accepted:
08.11.2021

ISSN 2618-6217

Abstract

Using monthly data that span the period 2011:01-2021:03, this paper examines the interest rate pass-through mechanism in Turkey. The paper considers nonlinearity and employs both linear and nonlinear time series methods. The linear cointegration test yields the long-run interest rate pass-through coefficient is lower than unity, whereas the nonlinear cointegration test shows this coefficient is greater than unity. Theoretical and practical implications are discussed.

Keywords: Interest Rate Pass-Through, Interest Rates on Commercial Loans, Linearity, Nonlinear Smooth Transition Models.

Özet

Bu çalışma, 2011:01-2021:03 dönemine ait aylık verileri kullanarak Türkiye'de faiz oranı geçişkenliği mekanizmasını incelemektedir. Çalışma doğrusal olmama durumunu dikkate almakta ve hem doğrusal hem de doğrusal olmayan zaman serisi yöntemleri kullanmaktadır. Doğrusal eşbütünleşme testi uzun dönem faiz oranı geçişkenliği katsayısının birden küçük olduğuna işaret ederken, doğrusal olmayan eşbütünleşme testi bu katsayının birden büyük olduğuna işaret etmektedir. Teoriye ve uygulamaya yönelik çıkarımlar çalışmada tartışılmaktadır.

Anahtar kelimeler: Faiz Oranı Geçişkenliği, Ticari Kredi Faiz Oranları, Doğrusallık, Doğrusal Olmayan Yumuşak Geçişli Modeller.

To cite this article/ Atıf İçin: Çalışkan Gök, B. & Bulut, Ü. (2021). The Interest Rate Pass-Through Process in Turkey: Empirical Evidence From Linear And Nonlinear Estimation Techniques. Politics, Economics and Administrative Sciences Journal of Kirsehir Ahi Evran University, Volume: 5, Issue: 2, 114-126.

Introduction

The goal of this paper is to investigate the interest rate pass-through (IRPT) to commercial loan interest rates for the case of Turkey using monthly data covering the period 2011:01-2021:03. To that end, the paper relaxes the linearity assumption and employs both linear and nonlinear estimation methods. Besides, the paper considers a nonlinear smooth transition method rather than a sharp transition method as the smooth transition between regimes is more realistic for economic data sets.

When one examines the evolution of monetary policy strategies, he/she can notice that many central banks (CBs) have endorsed the inflation targeting (IT) strategy in recent decades by abandoning the monetary targeting strategy or the exchange rate targeting strategy. Within this scope, as Morozumi et al. (2020) denote, there are thirty-nine CBs that adopt the IT strategy currently. Besides, the monetary policy strategies of the Federal Reserve and the European Central Bank (ECB) are highly similar to the IT strategy even though they do not explicitly announce (Eichengreen et al., 2011). Hence, there appears to be a global consensus about the implementation of monetary policy under the IT strategy.

A CB that adopts the IT strategy carries out monetary policy by adjusting short-term/overnight interest rates since it considerably influences money markets (De Bondt 2002, 2005; Baugnet and Hradisky, 2004). Accordingly, monetary policy has a two-stage feature: a change in the policy rate of the CB is transmitted to money market rates/marginal costs of funds for banks/short-term interest rates at the first stage, while the change in short-term interest rates influences lending and borrowing rates for longer maturities at the second stage (De Bondt, 2005; Egert et al., 2007; Gambacorta et al., 2015). Hence, the IRPT/monetary policy pass-through measures the degree to which a change in monetary policy that alters short-term interest rates is transmitted to lending and borrowing rates (Yuksel and Ozcan, 2013; Andries and Billion, 2016). Next, the change in demand-supply dynamics for loans and deposits affects expenditures, output, and inflation as consumption, saving, and investment decisions are considered to be highly sensitive to lending and borrowing rates (Robertson, 2016; Altavilla, 2019). Therefore, an efficient IRPT mechanism implies a change in short-term interest rates is considerably transmitted to retail interest rates, whereas the impact of monetary policy responses on lending and borrowing rates will be weak if this transmission is incomplete (Egert et al., 2007; Karagiannis et al., 2010; Verheyen, 2013).

The Central Bank of the Republic of Turkey (CBRT) has used short-term interest rates as the primary monetary policy tool since 2002. It can be observed throughout the extant monetary economics literature that some studies have investigated the IRPT to lending rates in Turkey. It can also be noticed that some papers employed a linear estimation method (see e.g., Aydin, 2007; Caglarirmak-Uslu and Karahan, 2016; Binici et al. 2019; Bulut, 2020) whereas some others performed a nonlinear method considering the possible nonlinearity (see e.g., Yildirim, 2012; Yuksel and Ozcan, 2013; Sahin and Cicek, 2018). Accordingly, Yildirim (2012), Yuksel and Ozcan (2013), Sahin and Cicek (2018), and Bulut (2020) provided evidence in favour of a nearly complete IRPT to lending rates, while Aydin (2007), Caglarirmak-Uslu and Karahan (2016), and Binici et al. (2019) explored an incomplete IRPT to lending rates for Turkey.

As is clearly stressed by Enders (2015), most of the time series variables exhibit a nonlinear behaviour rather than a linear behaviour. Besides, a smooth transition model can present more efficient output in a time series model as the parameters in the model are likely to change slowly (Terasvirta, 1994; Galvao and Owyang, 2018). Hence, considering none of the previous papers has used a smooth transition model to analyse the IRPT to lending rates in Turkey so far, this paper performs smooth transition models to investigate the IRPT mechanism in Turkey. Hence, a distinguishing characteristic of this paper is that it is the first paper that runs smooth transition models while focusing on the IRPT process for the case of Turkey.

The empirical findings obtained from the linear cointegration test indicate that there is a cointegration relationship in the model and that the long-run IRPT coefficient is lower than 1. Additionally, the outputs of the nonlinear cointegration test show there occurs a cointegration relationship in the model and the long-run IRPT coefficient is greater than 1. Hence, the results imply that linear and nonlinear time series methods yield different findings for the IRPT process in Turkey.

The rest of the paper is organized as follows: The following section presents the model and data. Estimation techniques are exhibited in Section 2, while results are given in Section 3. Finally, the last section concludes the paper.

1. Model and Data

The IRPT mechanism measures the degree to which a change in short-term interest rates is transmitted to long-run interest rates. Hence, the relationship between long- and short-run interest rates in Turkey can be described as the following:

$$LR_t = \delta_0 + \delta_1 IR_t + \varepsilon_t \qquad (1)$$

where LR, IR, and ε stand for the weighted average lending rate for commercial loans in TRY, overnight lending rate at the Borsa Istanbul Interbank Repo/Reverse Repo Market, and the error term, respectively. Monthly data covering the period 2011:01-2021:03 are utilized in the paper. Data for both variables are extracted from the CBRT (2021). The degree of the IRPT is measured by the coefficient δ_1. Within this scope, the IRPT mechanism is affected by some factors, namely risk premium and competition in the banking sector, etc (De Bondt, 2005; ECB, 2007; Jobst and Kwapil, 2008). If δ_1 is equal to 1, loan markets are perfectly competitive and there exists a full IRPT to lending rates (Sander and Kleimer, 2004; De Bondt, 2005). If δ_1 is lower than 1, loan markets are not perfectly competitive and there exists an incomplete IRPT to lending rates. This may be due to the weak competition among banks in the system (De Bondt, 2002, 2005; Doojov and Kalirajan, 2016) and/or the asymmetric information between banks and customers, meaning an increase in lending rates may attract riskier borrowers for banks and banks may ration credits to avoid information asymmetries (Stiglitz and Weiss, 1981; Mishkin, 2004). Finally, if δ_1 is higher than 1, this can be interpreted as a situation where banks rise lending rates to offset higher risks stemming from asymmetric information (Sander and Kleimer, 2004; De Bondt, 2005; Egert et al., 2007). In this case, banks do not decrease the supply of loans and not ration credits. An IRPT coefficient that is greater than 1 implies lending rates include an additional risk premium (Cordemans and de Sola Perea, 2011). Hence, an overshooting pass-through indicates that banks consider a risk premium, which relies on the economic environment, while they are adjusting lending rates (Yuksel and Ozcan, 2013). Last but not least, the monetary policy stance cannot be fully reflected by lending rates when the IRPT coefficient is different from 1 (Blot and Labondance, 2013).

Table 1: Descriptive statistics and correlation matrix

	LR	IR
Mean	15.379	11.506
Median	14.400	10.748
Maximum	34.480	25.133
Minimum	8.415	4.657
Std. deviation	4.979	4.896
Correlation matrix		
LR	1	
IR	0.910	1

Table 1 demonstrates descriptive statistics and the correlation matrix. Accordingly, all descriptive statistics of LR are greater than those of IR. Besides, there exists a positive and high correlation between LR and IR.

Figure 1: The trends of LR and IR

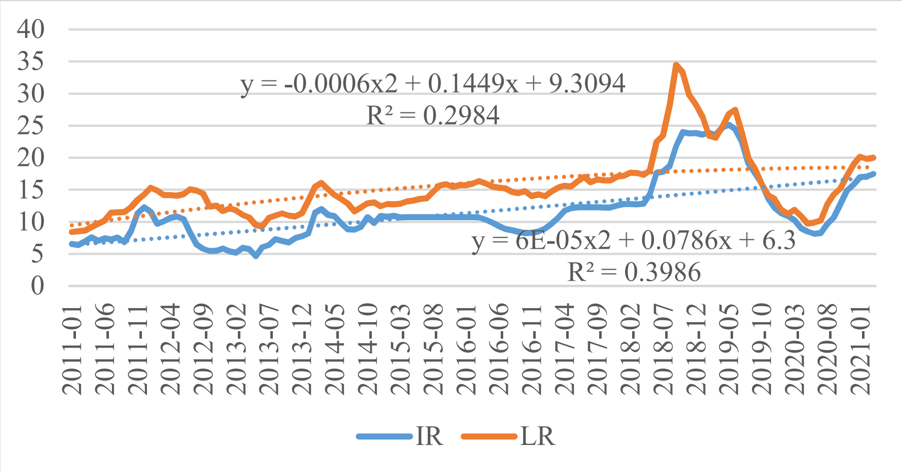

Figure 1 demonstrates the trends of LR and IR to provide preliminary information about the co-movement of LR and IR. As is seen, the variable LR is described by the polynomial equation of $y = -0.0006x^2 + 0.1449x + 9.3094$ and the variable IR is predicted by $y = 6E\text{-}05x^2 + 0.0786x + 6.3$. Additionally, R^2 values for LR and IR are respectively 0.2984 and 0.3986. As is seen in the figure, the trends indicate the existence of a unit root in LR and IR along with a strong co-movement between them, implying there can be a cointegration relationship between them.

2. Estimation methods

2.1. Linear unit root tests

The present paper performs some linear unit root tests to check whether the series under consideration are stationary. Accordingly, the paper employs the unit root tests propounded by Dickey and Fuller (1981, hereafter ADF) and Phillips and Perron (1988, hereafter PP). Both unit root methods test the null hypothesis of non-stationarity.

2.2. ARDL cointegration test

The autoregressive distributed lag (ARDL) cointegration test is commonly employed in econometric analyses. According to this approach, first, the null hypothesis of the non-existence of cointegration is tested via the bounds testing approach produced by Pesaran et al. (2001). While investigating the existence of cointegration, researchers compare a test statistic to lower bound and upper bound critical values. If the computed test statistic is greater than the upper bound critical value, then there is a cointegration relationship between variables in the empirical model. Second, if there is cointegration in the model, long- and short-run coefficients are computed using the regression model propounded by Pesaran and Shin (1999). The ARDL model is demonstrated as below:

$$Y_t = \alpha + \sum_{i=1}^{p} \alpha_i Y_{t-i} + \sum_{i=0}^{q} \beta_i X_{t-i} + u_t \qquad (2)$$

Utilizing this model, long-run coefficients are calculated as follows:

$$\alpha^{*}= \frac{\alpha}{\left(1-\sum_{i=1}^{p} \alpha_i\right)} \tag{3}$$

$$\beta^{*}= \frac{\left(\sum_{i=0}^{q} \beta_i\right)}{\left(1-\sum_{i=1}^{p} \alpha_i\right)} \tag{4}$$

Using Equations (3-4), the cointegration model can be expressed as below:

$$\widehat{Y}_t = \alpha^{*} + \beta^{*} X_t \tag{5}$$

After computing long-run coefficients, the short-term relationship is estimated through the error correction model exhibited as

$$\Delta Y_t = \theta_0 + \theta_1 EC_{t-1} + \sum_{i=1}^{p} \delta_i \Delta Y_{t-i} + \sum_{i=0}^{q} \lambda_i \Delta X_{t-i} + u_t \tag{6}$$

EC_{t-1} shows the degree to which a deviation in the short run is mended in the long-run. Therefore, the parameter of the lagged error correction term, namely θ_1, must be statistically significant and negative to support cointegration.

2.3. Nonlinear unit root test

Kruse (2011) propounds a nonlinear unit root test to examine whether a time series variable has a unit root. The null hypothesis of this test indicates the series has a unit root, while the alternative hypothesis implies there exists a nonlinear exponential smooth transition autoregressive process. Kruse (2011) extends the unit root test of Kapetanios et al. (2003) by relaxing the assumption of the zero-location parameter. Hence, Monte Carlo simulations indicate that this test is superior in terms of power compared to the test of Kapetanios et al. (2003). Accordingly, the following nonlinear time series model is first considered:

$$\Delta y_t = \phi y_{t-1} \left(1 - \exp\left\{-\gamma\left(y_{t-1} - c\right)^2\right\}\right) + \varepsilon_t \tag{7}$$

Then, a first-order Taylor approximation is applied, and the test regression below is obtained:

$$\Delta y_t = \beta_1 y_{t-1}^3 + \beta_2 y_{t-1}^2 + \beta_3 y_{t-1} + u_t \tag{8}$$

Afterwards, $\beta_3 = 0$ is established to advance the power of the test and the model below is presented:

$$\Delta y_t = \beta_1 y_{t-1}^3 + \beta_2 y_{t-1}^2 + u_t \tag{9}$$

The null hypothesis of the presence of a unit root defined as H0: $\beta_1 = \beta_2 = 0$ is tested against the alternative hypothesis of stationarity described as H1: $\beta_1 < 0, \beta_2 \neq 0$. If the computed statistic is higher than the critical values reported by Kruse (2011), the null hypothesis that there is a unit root is rejected, meaning the series under consideration is stationary.

2.4. Nonlinear cointegration test

Kapetanios et al. (2006) suggest a test to examine the possible presence of cointegration by utilizing the nonlinear exponential smooth transition error correction model. They investigate whether there exists an exponential smooth transition cointegration in an empirical model. They employ the models below:

$$\Delta y_t = \phi u_{t-1} + \gamma u_{t-1}\left(1 - e^{-\theta(u_{t-1} - c)^2}\right) + \omega'\Delta x_t + \sum_{i=1}^{p} \psi_i'\Delta z_{t-i} + e_t \quad (10)$$

$$\Delta x_t = \sum_{i=1}^{p} \Gamma_{xi}\Delta z_{t-i} + \varepsilon_{xt} \quad (11)$$

$$\hat{u}_t = y_t - \hat{\beta}_x' x_t \quad (12)$$

where $\hat{\beta}_x'$ is the ordinary least squares (OLS) estimation for β_x. They produce some test statistics to test for cointegration in an empirical model. One of these statistics is the t_{NEG} test statistic which is the nonlinear analogue of the Engle and Granger (1987) cointegration statistic. The following model is estimated to obtain the t_{NEG} statistic:

$$\Delta\hat{u}_t = \delta\hat{u}_{t-1}^3 + \sum_{i=1}^{p} \varphi_i\Delta\hat{u}_{t-i} + \varepsilon_t \quad (13)$$

The null hypothesis of no cointegration is indicated as H0: $\delta = 0$. If the tNEG statistic is higher than the critical values computed by Kapetanios et al. (2006), then the null hypothesis of no cointegration is rejected.

3. Estimation results

In this section, the paper first presents the results of the ADF and PP unit root tests. The results of these tests are exhibited in Table 2. As is seen, both tests indicate the null hypothesis that there is a unit root is not rejected at level, while it can be rejected at the first difference. These results mean that both variables are stationary at their first difference forms, implying the possible existence of cointegration in the empirical model could be tested via the ARDL cointegration test.

Table 2: ADF and PP unit root tests

Variable	Statistic for the ADF test		Statistic for the PP test	
	Level	1st dif.	Level	1st dif.
LR	-2.229	-6.221*	-2.273	-6.087*
IR	-2.071	-6.110*	-1.913	-6.070*

Note: * Indicates 1% statistical significance.

Table 3 presents the results of the ARDL cointegration test along with the long-run coefficient. Accordingly, as is seen in panel A of the table, the null hypothesis of no cointegration can be rejected by the test statistic at 1% level of significance. This finding supports Figure 1 which shows there exists a strong co-movement between LR and IR. It also indicates that the long-run IRPT coefficient could be estimated. Therefore, after determining the existence of cointegration, panel B of the table reports the long-run IRPT coefficient. As is seen, the IRPT coefficient is lower than 1.

Table 3: ARDL cointegration test

Panel A: Bounds test			
Test statistic		6.328*	
Panel B: Long-run parameter			
Variable	Coefficient	Std. error	t-statistic
IR	0.784*	0.104	7.544

Notes: To save space, short- and long-run models of the ARDL cointegration test are not presented in the paper. It must be noted that the parameter of the one-period lagged error correction term is negative and significant in the short-run model, supporting the presence of cointegration in the empirical model. * Indicates 1% statistical significance.

Next, the paper relaxes the assumption of linearity and performs a linearity test to test whether the series under consideration exhibit nonlinear behaviours. Prior to employing nonlinear unit root and cointegration tests that use the smooth transition method, the paper tests whether the series under consideration exhibit nonlinear behaviours. The paper performs the Harvey et al. (2008) test to examine whether LR and IR demonstrate nonlinear behaviours. This test has better finite sample size properties and improved power compared to the Harvey and Leybourne (2007) test. The null hypothesis of linearity is tested against the alternative hypothesis of nonlinearity for this test.

Table 4: Harvey et al. (2008) linearity test

Variable	Test statistic
LR	20.17*
IR	4.11

Note: * Indicates 1% statistical significance.

Table 4 reports the empirical outputs of the Harvey et al. (2008) linearity test. As is seen, the null hypothesis of linearity is rejected for LR, but it is not rejected for IR. Hence, the analysis yields that LR exhibits a nonlinear behaviour, whereas IR demonstrates a linear behaviour. Therefore, the paper employs the Kruse (2011) test for LR.

Table 5: Kruse (2011) unit root test

Variable	Kruse (2011) test statistic	
	Level	1st dif.
LR	7.114	16.443*

Note: * Indicates 1% statistical significance.

The result of the Kruse (2011) unit root test is demonstrated in Table 5. Accordingly, the null hypothesis that there is a unit root cannot be rejected at level, while it can be rejected at the first difference for LR according to the Kruse (2011) unit root test. This result means that LR is stationary at the first difference form, implying the possible existence of cointegration in the empirical model could be tested via the Kapetanios et al. (2006) cointegration test.

Table 6: Kapetanios et al. (2006) cointegration test

Panel A: Cointegration test			
Test statistic		-3.158**	
Panel B: Long-run coefficient			
Variable	Coefficient	Std. error	t-statistic
IR	1.274*	0.020	63.814

Note: * and ** respectively illustrate 1% and 5% statistical significance levels.

Finally, the empirical outputs obtained from the cointegration test of Kapetanios et al. (2006) and the long-run IRPT coefficient are reported in Table 6. Accordingly, panel A of the table shows that the null hypothesis of the non-existence of cointegration is rejected at 5% level of significance. This finding supports Figure 1 which shows there exists a strong co-movement between LR and IR. It also indicates the long-run IRPT coefficient could be estimated. Hence, after detecting the presence of cointegration, panel B depicts the long-run IRPT coefficient. As is seen, the IRPT coefficient is greater than 1.

The results obtained from the ARDL cointegration test and the Kapetanios et al. (2006) cointegration test present highly different empirical findings. Accordingly, the ARDL cointegration test's findings imply that the pass-through of monetary policy to commercial loan interest rates is incomplete, whereas the findings indicated by the Kapetanios et al. (2006) cointegration test show the banks in the Turkish banking sector over-adjust the interest rates on commercial loans as a response to a change in short-term interest rates.

Conclusion

The IRPT process measures the degree to which a change in short-term interest rates is transmitted to long-run interest rates. On one hand, an efficient IRPT mechanism implies the CB can control long-term interest rates by adjusting short-term interest rates, which in turn can affect output and inflation. On the other hand, an incomplete or excessive IRPT process indicates the CB cannot fully control long-term interest rates, which in turn can negatively influence the effectiveness of monetary policy in terms of affecting output and inflation.

This paper examines the pass-through of monetary policy to commercial loan interest rates in Turkey by employing monthly data for the period 2011:01-2021:03. While doing that, the paper first performs linear estimation methods and then carries out nonlinear estimation methods. The nonlinear methods employed by the paper rely on the smooth transition models, implying they are likely to produce more efficient output compared to sharp transition models. On one hand, the linear cointegration test discovers that there is a cointegration relationship in the model and that the long-run IRPT coefficient is lower than 1. On the other hand, the nonlinear cointegration test explores there exists a cointegration relationship in the empirical model and the long-run IRPT coefficient is greater than 1. Hence, the linear test presents evidence that there exists a weak competition among banks in Turkey, meaning some banks may have a market power. Besides, the findings of the linear cointegration test indicate that the banks in the Turkish banking sector tend to increase commercial loan interest rates fewer compared to the increase in short-term interest rates and also to ration credits because of asymmetric information. Additionally, the nonlinear test yields that the banks in the Turkish banking system do not ration credits because of asymmetric information and appear to increase commercial loan interest rates to compensate great risks occurring due to asymmetric information. Therefore, the findings obtained from the nonlinear analysis shows that the banks take a risk premium into account while setting lending rates, meaning there exists an additional risk premium in commercial loan interest rates in Turkey. Besides, according to both linear and nonlinear methods, the monetary policy stance is not completely reflected by interest rates on commercial loans in Turkey as the IRPT coefficient is found to be different from 1. Overall, the empirical analyses indicate that the findings can highly differ with regard to the estimation methods. As the linearity test presents evidence in favour of nonlinear methods, the paper considers the nonlinear method while discussing the empirical findings.

The paper argues that the risk premium indicated by the nonlinear smooth transition method may exist because of some considerable developments in the world and Turkey, such as the depreciation of Turkish Lira against foreign currencies in the last periods, the great inflation uncertainty that stems from high inflation rates in Turkey (see e.g., Apergis et al., 2021), and the uncertainty created by the COVID-19 pandemic, etc. Hence, this paper argues that if the factors creating the risks are removed, (i) the control of the CBRT on lending rates can improve, (ii) lending rates can give information about the CBRT's monetary policy stance, and (iii) the effectiveness of the IRPT mechanism can increase in Turkey.

References

Altavilla, C., Canova, F. & Ciccarelli, M. (2019). Mending the broken link: heterogeneous bank lending rates and monetary policy pass-through. *Journal of Monetary Economics*, 110, 81-98.

Andries, N. & Billon, S. (2016). Retail bank ınterest rate pass-through in the Euro Area: an empirical survey. *Economic Systems*, 40, 170-194.

Apergis, N., Bulut, U., Ucler, G., & Ozsahin, S. (2021). The causal linkage between inflation and inflation uncertainty under structural breaks: Evidence from Turkey. *The Manchester School*, 89, 259-275.

Aydin, H. I. (2007). Interest rate pass-through in Turkey. *CBRT Working Paper*. 07/05.

Baugnet, V. & Hradisky, M. (2004). Determinants of Belgian bank lending interest rates. *Economic Review*, 3, 43-49.

Binici, M., Kara, H., & Ozlu, P. (2019) Monetary transmission with multiple policy rates: evidence from turkey. *Applied Economics*, 51(17), 1869-1893.

Blot, C. & Labondance, F. (2013). Business lending rate pass-through in the Eurozone: monetary policy transmission before and after the financial crash. *Economics Bulletin,* 33(2), 973-985.

Bulut, U. (2020). Para politikasının kredi faiz oranlarına geçişkenliği: Türkiye örneği. *Bankacılar Dergisi*, 114, 17-29.

Caglarirmak-Uslu, N. & Karahan, P. (2016). Para politikasının kredi faiz oranlarına geçişkenliği üzerine dinamik bir analiz: Türkiye örneği. *Yönetim ve Ekonomi Dergisi*, 23(3), 671-690.

CBRT (2021). Electronic data delivery system. https://evds2.tcmb.gov.tr. Date of access: June 7, 2021.

Cordemans, N. & de Sola Perea, M. (2011). Central bank rates, market rates and retail bank rates in the euro area in the context of the recent crisis. *National Bank of Belgium Economic Review*, 1, 27-52.

De Bondt, G. (2002). Retail bank ınterest rate pass-through: new evidence at the Euro Area level. *ECB Working Paper*, 136.

De Bondt, G. J. (2005) Interest rate pass-through: empirical results for the Euro area. *German Economic Review*, 6(1), 37-78.

Dickey, D. A. & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49(4), 1057-1072.

Doojav, G.O. & Kalirajan, K. (2016). Interest rate pass-through in Mongolia. *The Developing Economies*, 54(4), 271-291.

ECB (2007). Monthly bulletin, July. https://www.ecb.europa.eu/pub/pdf/mobu/mb200707en.pdf. Date of access: August 12, 2021.

Egert, B., Crespo-Cuaresma, J., & Reininger, T. (2007). Interest rate pass-through in Central and Eastern Europe: reborn from ashes merely to pass away? *Journal of Policy Modeling*, 29(2), 209-225.

Eichengreen, B., El-Erian, M., Fraga, A., Ito, T., Pisani-Ferry, J., Prasad, E., Rajan, R., Ramos, M., Reinhart, C., Rey, H., Rodrik, D., Rogoff, K. Shin, H. S., Velasco, A., Weder di Mauro, B., & Yu, Y. (2011). Rethinking central banking. https://www.brookings.edu/wp-content/uploads/2016/06/Rethinking-Central-Banking.pdf. Date of access: August 13, 2021.

Enders, W. (2015). Applied econometric time series (fourth edition). USA: Wiley.

Engle, R. F. & Granger, C. W. (1987). Co-integration and error correction: representation, estimation, and testing. *Econometrica*, 55(2), 251-276.

Galvao, A. B. & Owyang, M. T. (2018). Financial stress regimes and the macroeconomy. *Journal of Money*, Credit and Banking, 50(7), 1479-1505.

Gambacorta, L., Illes, A., & Lombardi, M. J. (2015). Has the transmission of policy rates to lending rates changed in the wake of the global financial crisis? *International Finance*, 18(3), 263-280.

Harvey, D. I. & Leybourne, S. J. (2007). Testing for time series linearity. *The Econometrics Journal*, 10(1), 149-165.

Harvey, D. I., Leybourne, S. J., & Xiao, B. (2008). A powerful test for linearity when the order of integration is unknown. *Studies in Nonlinear Dynamics & Econometrics*, 12(3).

Jobst, C. & Kwapil, C. (2008). The interest rate pass-through in Austria–effects of the financial crisis. *Monetary Policy & the Economy*, 4, 54-67.

Kapetanios, G., Shin, Y., & Snell, A. (2003). Testing for a unit root in the nonlinear STAR framework. *Journal of Econometrics*, 112(2), 359-379.

Kapetanios, G., Shin, Y., & Snell, A. (2006). Testing for cointegration in nonlinear smooth transition error correction models. *Econometric Theory*, 22(2), 279-303.

Karagiannis, S., Panagopoulos, Y., & Vlamis, P. (2010). Interest rate pass-through in Europe and the US: monetary policy after the financial crisis. *Journal of Policy Modeling*, 32(3), 323-338.

Kruse, R. (2011). A new unit root test against ESTAR based on a class of modified statistics. *Statistical Papers*, 52(1), 71-85.

Mishkin, F. S. (2004). The economics of money, banking, and financial markets (seventh edition). USA: The Addison-Wesley Series in Economics.

Morozumi, A., Bleaney, M., & Mumuni, Z. (2020). Inflation targeting in low-income countries: Does IT work? *Review of Development Economics*, 24(4), 1529-1550.

Pesaran, M. H, & Shin, Y. (1999). An autoregressive distributed lag modelling approach to cointegration analysis. In S. Strom (Ed) *Econometrics and econometric theory in the 20th century: the Ragnar Frisch centennial symposium*, Cambridge: Cambridge University Press, p. 371-413.

Pesaran, M. H., Shin, Y., & Smith, R. J. (2001). Bounds testing approach to the analysis of level relationships. *Journal of Applied Econometrics*, 16, 289-326.

Phillips, P. C. & Perron, P. (1988). Testing for a unit root in time series regression. *Biometrika*, 75(2), 335-346.

Robertson, M. L. (2016) Securitization and financial markets: the ımplications for ınterest rate pass-through*. Journal of Financial Economic Policy*, 8(4), 472-498.

Sander, H. & Kleimeier, S. (2004). Convergence in Euro-Zone retail banking? What ınterest rate pass-through tells us about monetary policy transmission, competition and ıntegration. *Journal of International Money and Finance*, 23(3), 461-492.

Sahin, S. & Cicek, S. (2018). Interest rate pass-through in Turkey during the period of unconventional interest rate corridor. *Quantitative Finance and Economics*, 2(4), 837-859.

Stiglitz, J. E. & Weiss, A. (1981). Credit rationing in markets with ımperfect ınformation. *The American Economic Review*, 71(3), 393-410.

Terasvirta, T. (1994). Specification, estimation, and evaluation of smooth transition autoregressive models. *Journal of the American Statistical Association*, 89(425), 208-218.

Verheyen, F. (2013). Interest rate pass-through in the EMU–New evidence using the nonlinear ARDL framework. *Economics Bulletin*, 33(1), 729-739.

Yildirim, D. (2012). Interest rate pass-through to Turkish lending rates: a threshold cointegration analysis. *ERC Working Papers in Economics*, 12(07).

Yuksel, E. & Ozcan, K. M. (2013). Interest rate pass-through in Turkey and impact of global financial crisis: asymmetric threshold cointegration analysis. *Journal of Business Economics and Management*, 14(1), 98-113