Journal of History Culture and Art Research (ISSN: 2147-0626)

Tarih Kültür ve Sanat Araştırmaları Dergisi
Revue des Recherches en Histoire Culture et Art
مجلة البحوث التاريخية والثقافية والفنية

Vol. 7, No. 5, December 2018

http://kutaksam.karabuk.edu.tr

DOI: 10.7596/taksad.v7i5.1615

Citation: Isiksal, A., Samour, A., & Resatoglu, N. (2018). Monetary Policy and Exchange Rates Pre- and Post-Global Financial Crisis: The Case of Turkey. Journal of History Culture and Art Research, 7(5), 83-91. doi:http://dx.doi.org/10.7596/taksad.v7i5.1615

Monetary Policy and Exchange Rates Pre- and Post-Global Financial Crisis: The Case of Turkey

Aliya Zhakanova Isiksal[1], Ahmed Samour[2], Nil Gunsel Resatoglu[3]

Abstract

The aim of this study is to investigate the association between monetary policy and exchange rates in Turkey for two periods: Pre (December 2001-December 2007) and Post (January 2010-January 2016) global financial crisis (GFC). The ARDL, FMOLS, CCR and DOLS models are used to achieve the objective of this study. The results show that there is a significant impact of monetary policy, namely money supply and short-term interest rates, on exchange rates in Turkey before and after the GFC. The results suggest that the Central Bank of Turkey affected exchange rates after the GFC more than before the GFC.

Keywords: Monetary policy, Structural breaks, Global financial crisis, Central Bank.

[1] Assoc. Prof. Dr., Near East University, North Cyprus, via Mersin 10 Turkey.
[2] PhD Candidate, Near East University, North Cyprus, via Mersin 10 Turkey.
[3] Asst. Prof. Dr., Near East University, North Cyprus, via Mersin 10 Turkey.

1. Introduction

Many countries were impacted by the global financial crisis (GFC) that occurred in 2008. The GFC remains a major concern in the literature and the focus has been on the critical role of the central banks. The principal role of the central banks during and after the GFC was to manage the negative impacts of the crisis by using monetary policy instruments. However, the central banks were required to pay attention to the financial markets and control inflation through money supply and interest rate adjustments aimed at improving the markets, such as enhancing the value of the domestic currency against exchange rate fluctuations. Those fluctuations play a conclusive role, even in the most liquid financial markets (Holtemöller and Mallick, 2016). According to the literature, the 2008 financial crisis caused highly volatile shocks across all global markets, including exchange rates (Ehrmann and Fratzscher, 2009; Backhaus and Isiksal, 2016). In this way, the association between monetary policy and the exchange rates is considered an important issue for the literature. Studies in the literature that have examined monetary policy variables and the domestic currency have varied both theoretically and empirically (Akar and Icek, 2015; Saraç and Karagöz; 2011, Çeliköz, 2011; Shastriet et al., 2013; Sensoy and Sobaci, 2014; Andria et al., 2017). However, few studies have examined the impact of economic crises on the relationship between monetary policy and exchange rates in emerging economies like Turkey, which is considered to be one of the countries that suffered from this crisis (Yuksel, 2016). During the crisis, the Turkish Central Bank attempted to improve the markets by injecting liquidity into the financial markets to enhance the liquidity; resultantly, the central bank either increased money supply during the crisis or adjusted interest rates to improve stock market and exchange markets.

The study aims to contribute to the literature by examining the association between monetary policy and exchange rates. In order to reflect the main role of the central banks before and after the GFC, the paper uses two independent variables to measure monetary policy, namely money supply and short-term interest rates variables, which are determined directly by the central bank. The stability in any economy has a strong effect on the exchange rates as investors interpret any news about economic crisis in a negative light (Backhaus et al., 2016).

This paper distinguishes itself from the other studies by comparing monetary policy and exchange rates before and after the GFC in Turkey for the periods from December 2001 to December 2007 (which is the period before the GFC) and from January 2010 to January 2016 (which is the period after the GFC). The autoregressive distributed lag (ARDL) model, and the Fully Modified Ordinary Least Squares (FMOLS), Dynamic Ordinary Least Squares (DOLS), and Canonical Cointegrating Regression (CCR) are applied to estimate the association among the variables. The structure of this paper is as follows: Section 1 presents the introduction, Section 2 introduces a literature review, Section 3 presents the data and methodology, Section 4 presents the results and discussions, and Section 5 concludes the paper.

2. LiteratureReview

The literature that examines the effects of monetary policy on the exchange rates, which is measured by variables such as interest rates and money supply, varies both theoretically and empirically (Isiksal et al., 2017). Initially, theoretical models of exchange rates aimed to provide a clearer understanding of the behavior of the exchange rates. The “Chicago” theory was the first approach which indicated a positive association between exchange rates and interest rates; according to this theory, the interest rates reflect changes in the expectation of inflation indicators. Thus, any increase (decrease) in interest rates will lead to a decrease (increase) in money supply as well as appreciation (depreciation) of the domestic currency. Another approach is "Keynesian" theory, which claims that higher interest rates may lead to increased capital inflow, which contributes to the appreciation of the domestic currency (Frankel, 1979). However,

according to the theories, there is a positive correlation between interest rates and exchange rates, whereas there is a negative correlation between money supply and exchange rates.

The empirical studies on the association between monetary policy variables such as exchange rates and money supply are varied. In terms of the relationship between money supply and exchange rates, Onis and Ozmucur (1990) applied the VAR model. Their results show that the increase in money supply and high inflation rates led to the depreciation of the domestic currency in Turkey. Grauwe and Grimaldi (2001) used a sample of 100 countries covering the period from 1970 to 1999 and applied 2SLS regression. The results show that the impact of money supply (which is defined as M1) on exchange rate changes and inflation was not significant for lower inflation countries, but became significant when the sample included high inflation countries. Ojede and Lam (2017) applied the ARCH and GARCH models and examined the effect of monetary policy on exchange rates in Uganda from 1993 to 2016. The results revealed a statistically insignificant impact of money supply (M2, M3) on the exchange rates.

In terms of the relationship between interest rates and exchange rates, some empirical studies have found a positive significant relationship between interest rates and exchange rates. Sensoy and Sobaci (2014) applied the VAR model and indicated that an increase (decrease) in interest rates led to an increase (decrease) in the exchange rates in Turkey over the period 2003 to 2013. Andris et al. (2017) used wavelet-based methodologies and found a positive relationship between interest rates and exchange rates in Romania over the period 1999 to 2014. Hnatkovska et al. (2016) investigated monetary policy by measuring the interest rates and exchange rates of 72 countries from 1974 to 2010 by applying the VAR model. The outcome showed that although the response of interest rates to the domestic currency appreciated in developed countries, it depreciated in less developed countries.

In contrast, some empirical studies indicated that there is no significant relationship between interest rates and exchange rates. Choi and Park (2008) analyzed the impact of the interest rates on exchange rates in Indonesia, Korea, Malaysia and Thailand during the Asian crisis by using the VAR model. The results show that there is no relationship between high interest rates and exchange rate stability. Karagöz (2016) applied the Granger causality test for the period from 2003 to 2015. Karagöz (2016) found that there was no evidence of a significant association between interest rates and exchange rates in Turkey.

3. Model, Data Set, and Estimation Results

3. 1 Data

The currency exchange rates data (EX) were obtained from the OECD, short-term interest rates (IN), specifically the overnight interbank interest rates (Yilmazkuday, 2011) were retrieved from the central bank of Turkey, and money supply (MS) data was retrieved from the International Financial Statistics (IFS). Monthly data was used covering two periods from December 2001 to December 2007 (which is the period before the financial crisis) and from January 2010 to January 2016 (which is the period after the financial crisis).

As a starting point for this study, the assumption is that exchange rates could be determinants of the interest rates and money supply. Thus, the following equation can be checked:

$$lnEX_t = \beta 0 + \beta 1\ lnIN_t + \beta 2\ lnMS_t + \varepsilon_{it} \quad (1)$$

Where $lnEX_t$ is the logarithm (0.5 USD + 0.5 EUR/TL) of Turkey (Ülke & Berument, 2015), $lnIN_t$ is the logarithm of interest rates, and $lnMS_t$ is the logarithm of the money supply (M1).

3.2 CointegrationTests

To identify the cointegration among the variables, it was initially verified whether the variables are stationary. The traditional tests like Augmented Dickey-Fuller do not consider structural breaks when identifying the order of integration of the data. Thus, the study uses unit root tests that take into account one and two structural breaks, namely Zivot and Andrews (ZA) (2002), Perron-Vogelsang (PV) (1992) and Clemente, Montanes and Reyes (CMR) (1998).

In this paper, the existence of cointegration among the variables was initially examined by the ARDL approach (Pesaran et al., 2001). The major advantage is that the regressors could be of different orders of integration, meaning that they could be at level I(0) or could be at the first difference I(1). These tests are based on *F*-statistics, which is derived from the ARDL approach. In order to determine if there is a long-term association, the *F*-statistics value was compared to the critical values that were introduced by Pesaran et al. (2001). The null hypothesis of no long-term association cannot be rejected if the *F*-statistics value is less than the lower bounds. In contrast, if the results are higher than the upper bounds, it means that the null hypothesis can be rejected and there is a long-term association among the variables. Finally, the result will be inconclusive if the *F*-statistics value falls between the lower and upper bounds (Pesaran et al., 2001).

The ARDL model among exchange rates, short-term interest rates and money supply is as follows:

$$\Delta lnEX_t = y_0 + \sum_{i=1}^{n} y_1 \Delta lnEX_{t-j} + \sum_{i=1}^{n} y_2 \Delta lnIN_{t-j} + \sum_{i=1}^{n} y_3 \Delta lnMS_{t-j} + \sigma_1 lnEX_{t-1} + \sigma_2 lnIN_{t-1} + \sigma_3 lnMS_{t-1} + \varepsilon_{1t} \quad (2)$$

Where Δ is the first difference operator, *lnEX* is the natural logarithm of the dependent variable, *lnIN* and *lnMS* are the natural logarithms of the independent variables, *n* is the maximum number of lags; and ε_{1t} is the error-disturbance of the model. The null hypothesis of the model is no co-integration, H_0=$\sigma_1 = \sigma_2 = 0$; it is tested against the alternative hypothesis, $H_a \neq \sigma_1 \neq \sigma_2 \neq 0$.

After the existence of cointegration is determined and the speed of adjustment of the dependent variable is captured, the error correction model is estimated by the following equation:

$$\Delta lnEX_t = \beta_0 + \sum_{i=1}^{n} \beta_1 \Delta lnEX_{t-j} + \sum_{i=1}^{n} \beta_2 \Delta lnIN_{t-j} + \sum_{i=1}^{n} \beta_3 \Delta lnMS_{t-j} + \omega ECT_{t-1} + u_t \quad (3)$$

Where Δ shows a change in *lnEX, lnIN, lnMS* and ECT_{t-1} is the one period lagged error correction term. It is expected that the *ECT* will be significant with a negative sign (Gujarati, 2003). ECT shows the speed of adjustment among the short-term and long-term levels of the dependent variable.

To confirm the consistency and robustness of the ARDL test outcomes, the study uses other techniques such as FMOLS, DOLS and CCR. These approaches are used to estimate the long-run association by using a single co-integrating vector. FMOLS was introduced by Phillips and Hansen (1990), DOLS was proposed by Stock and Watson (1993) and CCR by Park (1992). The ARDL resolves the problem of different integration orders; however, FMOLS, DOLS, and CCR consider the serial correlation and endogeneity problems that could appear in the presence of cointegration. Moreover, to apply FMOLS, DOLS, and CCR, the order of integration of the variables should be I (1).

4. Results and Discussions

Table 1, Table 2 and Table 3 report the ZA unit root test, PV unit root and CMR unit root test results for the considered variables. These unit root tests suggest one and two structural breaks in the variables.

These break dates were taken into account and it was revealed by these unit root tests that all the series are nonstationary at level, but they are stationary at the first difference. Thus, the null hypothesis of the unit root is rejected for all the variables; *lnEX, lnIN,* and *lnMS* variables have I(1) order of integration.

Table 1. Zivot Andrews unit root test with one structural break.

	Pre-GFC		Post -GFC	
ZA	*t-Statistics*	BD	*t-Statistics*	BD
lnEX	-4.843	2006M05	-4.167	2012M04
lnIN	-3.807	2004M12	-5.177*	2011M08
lnMS	-2.525	2006M08	-6.119*	2012M01
ΔlnEX	-5.879**	2003M09	-6.446**	2013M07
ΔlnIN	-6.183**	2006M06	-8.339**	2013M07
ΔlnMS	-6.542**	2005M07	-5.072**	2012M02

*, ** indicate the significance of variables at 1% and 5% level.

Table 2. Perron-Vogelsang unit root test with one structural break.

	Pre-GFC		Post-GFC	
ZA	*t-Statistics*	BD	*t-Statistics*	BD
lnEX	-4.585	2004M06	-4.582	2012M09
lnIN	-4.470	2005M06	-4.605	2014M01
lnMS	-4.119	2005M11	-4.203	2010M05
ΔlnEX	-7.581**	2002M06	-6.779**	2014M01
ΔlnIN	-5.773**	2006M07	-9.812**	2011M08
ΔlnMS	-17.621**	2005M12	-12.237**	2010M12

*, ** indicate the significance of variables at 1% and 5% level.

Table 3.CMR with two structural breaks.

	Pre-GFC			Post-GFC		
ZA	t-stat	BD1	BD2	t-stat		BD 1
lnEX	-3.915	2003m2	2006m3	-2.689	2013m3	2014m12
lnIN	-5.181	2003m3	2006m6	-6.257	2010m9	2011m6
lnMS	-4.558	2003m4	2005m10	-2.676	2013m1	2015m2
ΔlnEX	-8.268**	2002m8	2006m4	-6.784**	2013m12	2014m12
ΔlnIN	-6.020**	2003m9	2006m5	-13.423**	2011m7	2013m12
ΔlnMS	-18.064**	2002m12	2005m11	-10.606**	2011m9	2012m3

*, ** indicate the significance of variables at 1% and 5% level.

The results from the ARDL bounds test of cointegration are reported in Table 4. The results show that the *F*-statistics exceeds the 5% upper limit critical values provided by Pesaran et al. (2001). Thus, the null hypothesis of no long-term association is rejected and there is cointegration among the variables before and after the GFC.

Table 4. ARDL bounds test of cointegration.

Period	Model	Lag	F-statistics	Decision
Before GFC	EX, IN, MS	(2, 1, 5)	15.29128***	Co-integration exist
After GFC	EX, IN, MS	(1, 1, 0)	10.0512***	Co-integration exist
Critical Values				
Level *I(0)* *I(1)*				
10% *3.38*	*4.02*			
5% *3.88*	*4.61*			
2.5% *4.37*	*5.16*			
1% *4.99*	*5.85*			

**indicates the significance of variables at 5% level, when t-statisticsless than critical value at level 5% (-4.92)

The short-term coefficients have been determined by the ARDL model in Table 5. To test for the robustness and also the consistency of the results of the long-run coefficients, this paper employs ARDL, FMOLS, DOLS and CCR, which are displayed in Table 6.

Table 5. Long-run and short-run coefficients of ARDL model.

	Pre-GFC		Post-GFC	
Variable	Coefficient	t-statistic	Coefficient	t-statistic
lnIN	0.024927	0.728345	0.016939	0.518252
lnMS	-0.405073*	-4.635617	-1.576175***	-3.755762
ΔlnIN	-0.192807	-2.128194	-0.013059	-1.157066
ΔlnMS	0.117222***	2.632165	-0.306836***	-4.615732
ECT_{t-1}	-0.457915	-8.027566	-0.194671	-6.483221
Normality	0.954 P(0.620)		5.072(0.791)	
Serial correlation (LM)	1.862(0.105)		2.777(0.10)	
Heteroscedasticity	1.1749(0.325)		1.225(0.307)	
ARCH	0.5504(0.737)		0.4529(0.503)	
Ramsey	0.8683(0.508)		1.6701(0.099)	

Note: *, **, ***indicate significance of variables at 1%, 5%, 10% level respectively.

Table 6. Long-term coefficients of FMOLS, DOLS and CCR models.

Long-run coefficients of FMOLS, DOLS, CCR Models Pre-GFC			
Variable	FMOLS	DOLS	CCR
lnINT	0.005374	0.006563	0.010159
*ln*MS	-0.094969***	-0.095544*	-0.102746***
R^2	0.785562	0.872953	0.781409
Long-run coefficients of FMOLS, DOLS, CCR Models Post-GFC			
lnINT	0.007916*	0.011756**	0.008875**
*ln*MS	-0.061297***	-0.085598***	-0.061372***
R^2	0.987222	0.989937	0.987386

Note: *, **, ***indicate significance of variables at 1%, 5%, 10% level respectively.

The results in the short-run reflect a positive and insignificant impact of interest rates on exchange rates before and after the GFC and a negative significant impact of money supply on exchange rates after the GFC. The outcomes of the long-term coefficients estimated in Table 6 show that there is positive association between interest rates and exchange rates in Turkey before and after the GFC, but the

coefficient was significant only after the GFC. Thus, an increase (decrease) in interest rates by central bank leads to an increase (decrease) in the exchange rates. The coefficient of money supply before and after the GFC is negative and significant, thus there is a negative relationship between money supply and exchange rates in both periods. Therefore, an increase (decrease) in money supply leads to a decrease (increase) in exchange rates. This suggests that the central bank of Turkey had a stronger effect on exchange rates after the GFC than before the GFC.

5. Conclusion

The aim of this paper is to contribute to the literature by investigating the relationship between monetary policy and exchange rates. In order to reflect the main role of the central banks before and after the GFC, the paper uses two independent variables to measure monetary policy, namely money supply and short-term interest rates variables, which are determined directly by the central bank. The ARDL, FMOLS, DOLS, and CCR tests were used in this study to achieve the objective of the consistency in the estimation results.

The results suggest that the increase (decrease) in the interest rates of Turkey led to the appreciation (depreciation) of the domestic currency after GFC. Thus, the central bank had a significant impact on the domestic currency after the GFC. Moreover, the results suggest that the increase in money supply both before and after the GFC had a negative impact on the domestic currency. These results are consistent with exchange rate theories and some empirical studies such as those by Öniş and Özmucur (1990), Sensoy and Sobaci (2014) and Andries et al. (2017).

References

Akar, C. & Çiçek, S. (2016). New monetary policy instruments and exchange rate volatility. *Empirica*, *43*(1), 141-165.

Andries, A. M.; Căpraru, B.; Ihnatov, I. & Tiwari, A. K. (2017).The relationship between exchange rates and interestrates in a small open emerging economy: The case of Romania. *Economic Modelling, 67*, 261-274.

Backhaus, A.; Isiksal, A. Z. (2016). The impact of momentum factors on multi asset portfolio. *Romanian Journal of Economic Forecasting*, *19*(4): 146-169.

Backhaus, A.; Zhakanova, A. & Fiedler, M. (2016). The robustness of momentum as an asset allocation instrument. *Asia Life Sciences: The Asian International Journal of Life Sciences, 25*(1): 349-366.

Çeliköz, Y. S. & Arslan, Ü. (2011). The effects of the interest rate volatility on Turkish money demand. *International Business Research*, *4*(4), 286.

Choi, I. & Park, D. (2008). Causal relation between interest and exchange rates in the Asian currency crisis. *Japan and the World Economy, 20*(3), 435-452.

Clemente, J.; Montanes, A. & Reyes, M. (1998). Testing for a unit root in variables with a double change in the mean. *Economics Letters, 59*(2), 175–182.

Grauwe, P. & Grimaldi, M. (2001). Exchange rates, prices and money: A long-run perspective. *International Journal of Finance & Economics, 6*(4), 289-313.

Ehrmann, M. & Fratzscher, M. (2009). Global financial transmission of monetary policy shocks. *Oxford Bulletin of Economics and Statistics, 71*(6), 739-759.

Frankel, J. A. (1979). On the mark: A theory of floating exchange rates based on real interest differentials. *The American Economic Review, 69*(4), 610-622.

Gujarati, D. N. (2003). *Basic Econometrics*. McGraw-Hill, USA, 4th. Ed.

Hnatkovska, V.; Lahiri, A. & Verge, C. A. (2016). The exchange rate response to monetary policy ınnovations. *American Economic Journal: Macroeconomics, 8*(2), 137-181.

Holtemöller, O. & Mallick, S. (2016). Global food prices and monetary policy in an emerging market economy. The case of India. *Journal of Asian Economics, 46*(3), 56-70.

Isiksal, A. Z.; Isiksal, H. & Jalali, H. (2017). The impact of foreign direct investment on Turkish economy 2010–2016, *Economics*, *5*(2), 69-81.

Ojede, A. & Lam, E. (2017).The impact of changes in monetary aggregates on exchange rate volatility in a developing country: Do structural breaks matter? *Economics Letters*, *155*(1), 111-115.

Öniş, Z. & Özmucur, S. (1990). Exchange rates, inflation and money supply in Turkey: testing the vicious circle hypothesis. *Journal of Development Economics, 32*(1), 133-154.

Perron, P. & Vogelsang, T.J. (1992). Non-stationarity and level shifts with application to purchasing power parity. *Journal of Business and Economic Statistics, 10*(3), 301–320.

Pesaran, M. H.; Shin, Y. & Smith, R.J. (2001). Bounds testing approaches to the analysis of level relationships. *Journal of Applied Econometrics, 16*(3), 289-326.

Phillips, P. C. B. & Hansen, B. E. (1990). Statistical inference in instrumental variables regression with I(1) processes. *Review of Economic Studies, 57*(1), 99-125.

Saraç, T. B. & Karagöz, K. (2016). Impact of short-term interest rate on exchange rate: the case of Turkey. *Procedia Economics and Finance, 38*(1), 195-202.

Sensoy, A. & Sobaci, C. (2014). Effects of volatility shocks on the dynamic linkages between exchange rate, interest rate and the stock market: The case of Turkey. *Economic Modelling, 43*(3), 448-457.

Stock, J. H. & Watson, M. W. (1993). A simple estimator of cointegrating vectors in higher order integrated systems. *Econometrica, 61*(4), 783-820.

Yilmazkuday, H. (2011). Monetary policy and credit cards: Evidence from a small open economy. *Economic Modelling, 28*(1), 201-210.

Yuksel, A. (2016). The relationship between stock and real estate prices in Turkey: evidence around the global financial crisis. *Central Bank Review, 1*6(1), 33-40.

Zivot, E. & Andrews D.W. K. (2002). Further evidence on the great crash, the oil-price shock, and the unit-root hypothesis. *Journal of Business & Economic Statistics, 20*(1), 25–44.