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Türkiye'de Döviz Piyasası Baskısının Çıktı Üzerindeki Nedenselliği

The Causality Test on Exchange Market Pressure on Output in Turkey

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Öz

Bir ülkenin ulusal parasının yüksek volatiliteye sahip olması ve merkez bankası rezervlerinin yetersiz olması döviz piyasası üzerinde baskı oluşturmakta ve ekonomik aktörlerin beklentilerini olumsuz yönde etkilemektedir. Bu çalışmada Türkiye ekonomisinde döviz piyasasındaki baskıların ekonomik büyüme üzerinde etkili olup olmadığı nedensellik testleri ile incelenmektedir. 2005:01-2021:10 dönemine ait veriler kullanılarak yapılan analizlerden elde edilen bulgulara göre, uzun dönemde döviz piyasasındaki baskının ekonomik büyümeyi olumsuz etkilediği sonucuna ulaşılmıştır.

Jel Kodları: *F31, F43, E60*
Anahtar Kelimeler: *Döviz Piyasası Baskı Endeksi, Büyüme, Nedensellik*

Abstract

It puts strain on the exchange market and affects negatively the expectations of the economic actors that a country's national currency has high volatility and the central bank has inadequate reserves. In this study, causality tests are used to examine whether the pressures in the foreign exchange market are effective on economic growth in the Turkish economy. According to findings attained by analyzing data from 2005:01 to 2021:10, it is concluded that the pressure on the foreign exchange market has an adverse effect on growth in the long duration.

Jel Codes: *F31, F43, E60*
Keywords: *Foreign Exchange Market Pressure Index, Growth, Causality*

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1. Introduction

The exchange rate regime selection in developing countries gives direction to the economic growth policies. Adopting floating or fixed exchange rate regimes has an important influence on the success of fiscal and monetary policies. Preferred under the assumption of unlimited capital mobility in open economies, the floating exchange rate regime increases the efficacy of the monetary policy. Moreover, the exchange rate regime preference affects imports and exports. There are theoretical and empirical studies suggesting that the FX market is an important factor for economic growth if it works effectively.

The first reactions to financial crises can be seen in FX markets. The first counteractions of FX markets, on the other hand, can be seen in the sovereign risk premium (Kar et al., 2016). The early policies applied to reduce the effects of these crises are intervention through the interest-rate channel and reserve management. Although the interest rate rise cuts down the fluctuations in the nominal exchange rate, it nevertheless is not preferred because of adverse effects on investments. International reserve savings come into prominence at this point. The causes of currency crises are imbalances in public finances, current account deficit, decrease in real exchange rate, insufficient institutional quality in financial markets, and political instability. The first effects of the pressure in the foreign exchange markets emerge with the exchange rate pass-through effect. With the increase in exchange rate volatility, expectations for price stability deteriorate. With the general level of increasing prices, companies first consume their stocks. then it increases the capacity utilization rates. however, the increase in production with new investments comes later. Therefore, the pressure in the foreign exchange market has a lagging effect on industrial production. Another effect of the pressure in the foreign exchange market is seen in import-dependent firms. increasing nominal exchange rate increases the costs of importing companies. If the country's production structure is dependent on imports, exchange rate fluctuations affect production negatively. Under the assumption that the central bank's exchange rate policy is known by economic actors and there was no previous intervention in the exchange rate, the question of how the pressure in the foreign exchange market affects macroeconomic indicators becomes important.

If a country’s foreign exchange rate should mount or foreign reserves dismount or they both changes simultaneously, it will force up the pressure on the exchange market. In times of crisis, this pressure gets strong by spoiling the steadiness of the country and influences widely economic field negatively. According to the IMF’s 2007 report, approximately 32% of 148 countries adopted the managed float regime, and these countries intervened in the currency exchange rate to stay away from the situation of exceeding the inflation target caused by FX market pressure. As specified in the same report, 52% of 148 countries have adopted the fixed exchange rate regime, and reserves have been intervened in these countries to maintain the currency rate at the established level. This situation has encouraged the countries to develop policies that ease the pressure that comes from the exchange markets (Parlaktuna and Karpat, 2018: 4).

The focus of this research is to determine how FX market pressure affects the rate of economic growth in the Turkish economy for the period of 2005:01-2021:10. After the introduction, there is a theoretical background and an evaluation of literature about the link between the

Foreign Exchange Market Pressure Index (FEMPI) and economic growth. In the second part, there are analysis results. Finally, there is the evaluation of the findings in the conclusion section.

2. Theoretical Background and Evaluation of the Literature

The FX market pressure notion was described by Girton and Roper (1977) as "the volume of intervention necessary to achieve any desired exchange rate target". According to this model, FX market pressure is a means developed solely to influence the currency rate. Weymark (1995) calculates this pressure by subtracting the change rate in currency reserves adjusted for the monetary base from the change rate in the currency rate, unlike Girton and Roper's model. Weymark evaluates the pressure as a tool that measures the demand for foreign exchange in the international market. Inspired by the model of Girton and Roper, Tanner (2001) defines theFX market pressure term as "the difference between the growth rates of money supply and demand under managed exchange rate regimes". Tanner stated that there are two major components of this pressure: “the exchange rate and international reserves”. Kumah (2007), on the other hand, stated that the most used definition for the term in the literature is “an excess money phenomenon driven by abnormally large excess domestic currency demand or supply, which forces the monetary authorities to take measures to stem disruptive appreciation or depreciation of the currency” (Dayı and Akdemir, 2016: 152-153). Exchange reserves and rates are leading indicators for policymakers because of their critical role in monetary policy and thus in a country's economic stability. Shifts in international reserves and interest rates also show a country's responsiveness to global or regional crises. These variables should be examined in aggregate with regard to the effectiveness of currency policy. Showing the shifts in international reserves and currency rates, the Foreign Exchange Market Pressure Criterion is widely used in the literature accordingly. The different reactions of international reserves and exchange rates of developing countries in the global financial crisis of 2008 have been widely covered in the economics literature. According to the studies, there is a significant and inverse association between the changes in the short-run foreign debt, the debt securities account under the balance of payments’ portfolio investments, and the volatilities of the FX market pressure. However, the number of studies on the extent to which financial variables explain the term are few (Ertem, 2011: ix). Central banks interfere in the FX market for a number of different reasons, even though the vast majority of countries employ a free-floating currency rate. Central bank intervention through various means, either directly or indirectly, affects excess demand or supply in the currency market. In such cases, the currency rate is not determined by the exchange market first-hand. The approach, known as the FEMPI, answers the question of what changes in the currency rate would have occurred if central banks had not intervened. The FEMPI can determine when the value of a national currency is under pressure. Thus, central banks can employ monetary policy more effectively. In developing countries, such as Turkey, economic crises can take place because of excessive pressures on the FX market periodically. The strain on the market can provide necessary signals to the policymakers and economists about a deterioration in the economy (Öruç, 2019: 262-278). The FEMPI is an important indicator of monetary policy. Because the imbalance in the money market and the excessive fluctuation in the currency rate can affect both the financial markets and the real economy adversely, and deteriorate price stability. Excessive currency fluctuation leads to deterioration of expectations, damage to the pricing mechanism,

and a decrease in the stock market index. The volatilities in the exchange rate - thanks to the pass-through effect - can have a distorting effect on price stability. Besides these, it disrupts the real economy with effects such as spoiling the balance sheets of companies and reducing economic growth by negatively affecting foreign trade (Kaya, 2021: 12).

In the FEMPI, as Balakrishnan et al. (2009) suggested;

$$EMPI_{i,t} = \frac{(\Delta \mathrm{REER}_{i,t} - \mu_{i,\Delta REER})}{\sigma_{i,\Delta REER}} - \frac{(\Delta \mathrm{RES}_{i,t} - \mu_{i,\Delta RES})}{\sigma_{i,\Delta RES}}$$

this formula has been applied by many researchers. EMPI stands for FX market pressure index, REER stands for the real exchange rate, RES stands for central bank gross reserves, μ stands for the arithmetic mean, and σ stands for standard deviation. The FEMPI, in theory, shows the difference between the real exchange rate and international reserves. Balakrishnan et al. (2009) standardized the index. When the index is positive, the REER rises, and the RES fall and vice versa. The term FX market pressure, which was introduced to the economics literature by Girton and Roper in 1977, has been the subject of much research. To explain the FEMPI, economists have used a variety of models in their research. In the literature review on the subject;

Akkaya (2021) studied the validity of the FEMPI, developed by Kaminsky and Reinhart (1999), in the Turkish economy. According to the results of the investigation conducted with the data for the period of 1999:Q1-2019:Q12, the findings are statistically significant. It has been determined that there is a significant relationship between Borsa Istanbul Stock Exchange Index (BIST100), Domestic Debt Stock (DDS), Equities by Foreign Residents (EFR) and the FEMPI. The link between monetary policy arguments and FX market pressure in BRICS (without China but including Turkey) and selected Eastern European countries was studied by Karakaş and Kaya (2020). In the study, the VAR analysis method was used with data from 2001:12 to 2018:12. Monetary policy arguments, according to the findings, are more effective in the countries in the first group than in the second group. The reactions of the two country groups to the shock to FX market pressure contradicted with regard to the difference in interest rates, whereas the reactions to domestic credit growth were largely similar. Uğurlu and Aksoy (2017) examined whether there is seasonal cointegration between the FEMPI and the variables affecting this index after the 2008 global financial crisis for the Turkish economy. In the study -with data from 2004 to 2012- the link between the current account deficit, the benchmark interest rate, total liabilities, the Volatility Index, and the FEMPI was investigated. According to the findings, the series contain seasonal unit roots and are cointegrated. It has been determined that there is a positive relationship between the independent variables and the FEMPI according to the ±5 /6 frequency, which determines the cointegration result in all models. Kaya and Köksal (2018) investigated the relationship between the Turkish stock market and the FEMPI. The analysis includes the data for the period of 2015:Q12-2017:Q11. VAR and Granger causality tests reveal that there is a one-sided causality relationship from the stock market to the FEMPI. The causality relationship in the period shows that the portfolio-balance approach is valid for Turkey. Katırcıoğlu and Feridun (2011) examined the relationship between FX market pressure and macroeconomic variables in Turkey. ARDL and VECM tests were used as analysis methods in the study, in which monthly data including the

period of 1989:08 - 2006:06 were used. The findings show that there is a one-sided causality relationship from macroeconomic variables to the FEMPI. Feldkircher et al. (2014) investigated the pressure on the FX market caused by leading indicators during the financial crisis. The study with the data for the period of 2006:Q1-2011:Q2 covers 149 countries and 58 indicators. According to the results of the Markov Chain Monte Carlo analysis, the increase in domestic savings reduces the severity of pressures in countries with low inflation before the crisis. Feridun (2010) examined the relationship between capital outflows and FX market pressure in Turkey. The analysis using ARDL and Granger causality tests includes monthly data for the period of 1991:12-2006:8. The findings show the presence of a long-run balanced relationship between capital outflows and FX market pressure. It has been determined that there is a Granger causality relationship from capital outflows to FX market pressure. Ersoy (2013) investigated the effects of different private capital inflows and FX market pressure on the real effective exchange rate in Turkey. The analysis covers the data for the period of 1992:01-2007:9. According to ARDL and Granger causality analyses, it has been found that there is a one-sided causality relationship from different private capital inflows and FX market pressure to the real effective exchange rate. Akçoraoğlu (2000) examined the relationship between FX market pressure and monetary policy in Turkey. The VAR analysis method was used with the data for the period of 1990:3-1998:12. According to the findings, domestic credit expansion has a significant and positive effect on FX market pressure. The results are consistent with the Girton-Roper monetary model. Bird and Mandilaras (2006) examined the relationship between fiscal imbalances and FX market pressures using data from 1970 to 2000. The panel method was used to analyze the data from Latin America and the Caribbean (LAC) and East Asia and Pacific (EAP) regions. As a result, fiscal imbalances are found to have a considerable effect on FX market pressure in Latin America and the Caribbean but not in East Asia and the Pacific. Aizenman and Binici (2016) investigated the impact of selected factors on the FEMPI in some OECD and developing-country economies before and after the global financial-economic crisis. The panel data analysis method was carried out by applying quarterly data for the period of 2000:Q1-2014:Q3. The results show that external factors have a considerable impact on FX market pressure in both OECD countries and emerging markets. Ertem (2011) examined the factors affecting the FX market pressure with the data from 28 developing countries, including Turkey. The study employed panel data and multiple regression methods, with quarterly data spanning the years 2000-2010. According to the findings, the U.S. Treasury Yield Curve has an inversely proportional relationship with the FX market pressure in Turkey as in the developing countries. Unlike in developing countries, in Turkey, outflows from the Equity Securities in the balance of payments and the foreign trade balance have a stronger relationship with FX market pressure.

3. Empirical Results

In this study, the period of January 2005-October 2021 is examined. In the analysis, the variables foreign exchange market pressure index (FEMPI) and industrial production index (IPI) were used. The Central Bank of the Republic of Turkey provides both the variables through its Electronic Data Delivery System, and we got them from there. Dickey-Fuller (1981) and Phillips-Perron (1988) tests were used for unit root analysis, to begin with. Then, for causality analysis, Hatemi and Roca (2014) Asymmetric Causality Test, Breitung and Candelon (2006)

Frequency Domain Causality Test, and finally, Balcılar et al. (2010) Rolling Window Causality Tests were applied.

Figure 1: FX Market Pressure Index for the Period of February 2005-October 2021

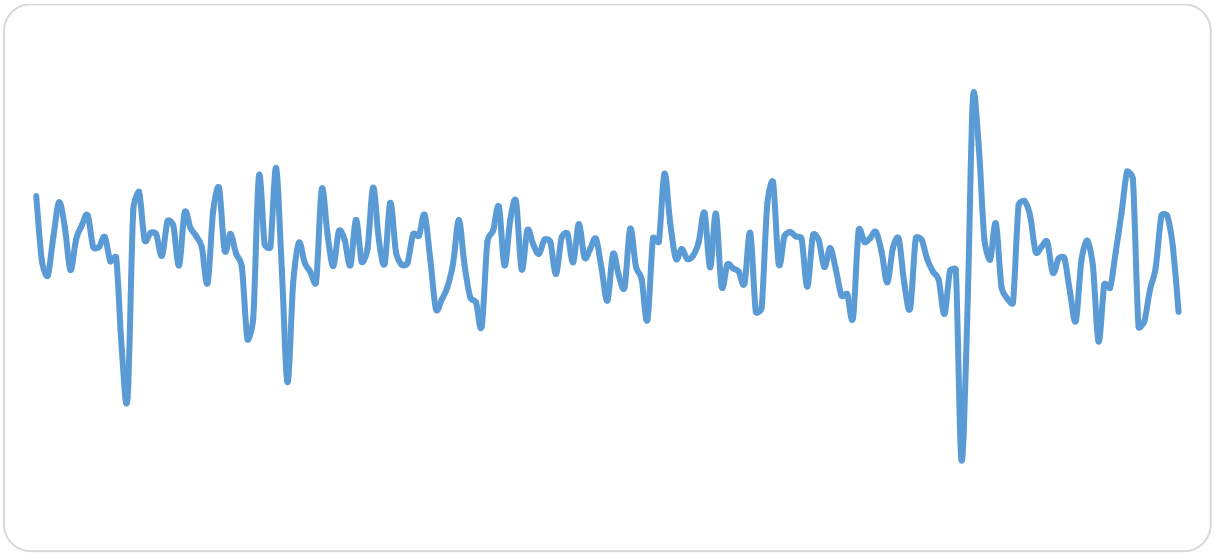


Figure 1 shows the FEMPI in the Turkish economy between February 2005 and October 2021. The regions where the index is negative suggest that the pressure is increasing, while the regions where the index is positive show that the pressure is decreasing. It can be seen that the FEMPI increased in February 2006-August 2008, and August 2018. On the other side, it can be observed that the pressure has dropped since August 2018. It is understood that the foreign exchange market pressure index is in a certain band range, which means that the international reserves and the nominal exchange rate are kept under pressure and are not exposed to economic shocks.

Table 1: ADF (1981) and PP (1988) Unit Root Test Results

		Variables	ADF	PP		ADF	PP
Level	*Constant*	**EMPI**	-11.562 (1) [0.00]***	-10.170 (14) [0.00]***	*First Difference*	-10.300 (6) [0.00]***	-55.922 (66) [0.00]***
		IPI	0.481 (12) [0.985]	-2.419 (13) [0.137]		-5.485 (11) [0.00]***	-57.566 (66) [0.00]***
	Constant+Trend	**EMPI**	-11.722 (1) [0.00]***	-10.506 (16) [0.00]***		-10.272 (6) [0.00]***	*56.164 (66) [0.00]***
		IPI	-2.055 (12) [0.566]	-9.591 (5) [0.00]***		-5.572 (11) [0.00]***	-63.661 (63) [0.00]***

Notes: The lag length chosen according to the Schwarz criteria is indicated by the numbers in parentheses**.*** indicates stationary at the 1% significance level, ** at the 5% significance level, and * at the 10% significance level.

Both unit root tests show that the FEMPI is stationary at the level. The IPI, on the other hand, was analyzed by taking the first difference, assuming it has the long memory behavior.

Table 2: Hatemi J-Roca (2014) Asymmetric Causality Test Results

Hypothesis	**MWALD**	**%1**	**%5**	**%10**
$(EMPI)^{+} \neq > (IPI)^{+}$	1.361 (0.243)	8.402	3.931	2.657
$(EMPI)^{+} \neq > (IPI)^{-}$	3.812 (0.051)*	8.060	4.221	2.697*
$(EMPI)^{-} \neq > (IPI)^{-}$	0.565 (0.452)	7.604	4.063	2.891
$(EMPI)^{-} \neq > (IPI)^{+}$	0.042 (0.837)	8.829	4.157	3.012

Notes: The ≠> sign stands for the null hypothesis of no causation.*** indicates causality at 1% significance level, ** at 5% significance level, and * at 10% significance level. The number of bootstrap iterations is 10.000. The optimal lag length found using the vector autoregression model was 2.

The influence of the positive and negative components of the FEMPI on the positive and negative components of the IPI was determined using the causality test devised by Hatemi and Roca (2014). There is causality from the positive component of the FEMPI (increase in pressure) to the negative component of the IPI (decrease in output) at a 10% significance level.

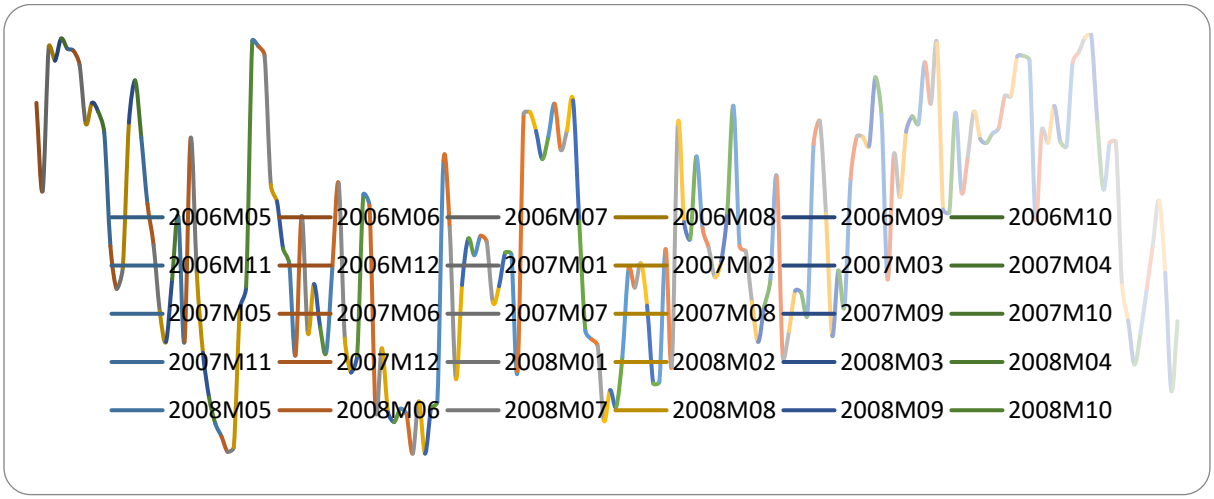
Table 3: Breitung and Candelon (2006) Frequency Domain Causality Test Results

	Long Term		**Medium Term**		**Short Term**	
ω_i	0.01	0.05	1.00	1.50	2.0	2.50
EMPI≠>IPI	2.447*	2.449*	1.993	0.296	0.061	0.616

Notes: For 1% , 5%, and 10%, the F table value with (2.N-2p) degrees of freedom is 4,701, 3,036, and 2,326 correspondingly. *** indicates causality at 1% significance level, ** at 5% significance level, and * at 10% significance level.

In the frequency domain causality test developed by Breitung and Candelon (2006), if the test statistics are higher than the F table critical values, there is a causal relationship between the variables. Accordingly, there is a long-term causality at the 10% significance level from the FEMPI to the IPI. However, there is no causality in the short and medium-term from the FEMPI to the IPI.

Figure 2: Balcılar vd. (2010) Rolling Window Causality Test Results



Probability values are used in the decision stage in the frequency domain causality test developed by Balcılar et al. (2010). There is a causal relationship between the variables if the probability values are smaller than 10% (0.1). Accordingly, there is causality relationship from the FEMPI to the IPI in the period of October 2008-January 2009 and June 2011. According to the impossible triple hypothesis in international economic theory, a country cannot be expected to implement a fixed (managed) exchange rate and independent monetary policy at the same time if capital movements are free. In developing countries, money supply increases faster than money demand, reasons such as financing public budget deficits with central bank resources and domestic savings inadequacies cause the crisis in the foreign exchange market to be felt more. Examples of this situation emerged in the 1994 Mexican Peso Crisis, 1997 Asian Crisis, and November 2000-February 2001 Turkish crises. Therefore, in order to implement an independent monetary policy in the Turkish economy, the requirements of the floating exchange rate should be applied. However, the central bank must have an optimal reserve level in order to avoid the fear of fluctuations. Thus, it is expected that macroeconomic crises arising from unexpected movements in the foreign exchange market will be prevented. At this point, the central bank should implement a rule-based monetary policy. Because, if there was no intervention by the central bank in the foreign exchange market under the expectation of the exchange rate policy, the change to be experienced in the exchange rate due to the excess demand in the foreign exchange market would again be towards the balance.

4. Conclusion

As global economic integration develops, emerging economies are turning to the free-floating currency system. In this process, the currency rate level has become an important component in guiding the expectations of economic actors in the monetary policy practices of central banks. As a result, global economic crises force central banks to employ other monetary policy tools (Şentürk et al., 2016). In this paper, the link between FX market pressure and economic growth after the transition to full-fledged inflation targeting in Turkey was examined. The analysis period covers data for the period of 2005:01-2021:10.That the FEMPI includes both the real exchange rate and international reserves illustrates the impact of currency crises on macroeconomic indicators. The result of this work is that the pressure in the FX market has no effect on growth in the short and medium-term. In other words, the reduction of pressure in the FX market has no effect on growth. Exchange rate volatility and central bank gross reserves, on the other hand, have an indirect influence on growth in the longterm. This effect occurs because the nominal exchange rate affects the output through exports and imports, and as a result, the gross reserve level prevents the fear of floating in the nominal exchange rate. Examining the effect of the FEMPI on imports, exports and financial development will provide important contributions to policymakers as it will be the subject of future studies.

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Etik Beyanı: Bu çalışmanın tüm hazırlanma süreçlerinde etik kurallara uyulduğunu yazarlar beyan eder. Aksi bir durumun tespiti halinde Fiscaoeconomia Dergisinin hiçbir sorumluluğu olmayıp, tüm sorumluluk çalışmanın yazarlarına aittir.

Ethics Statement: The authors declare that ethical rules are followed in all preparation processes of this study. In case of detection of a contrary situation, Fiscaoeconomia has no responsibility and all responsibility belongs to the authors of the study.