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THE DYNAMIC INTERACTIONS BETWEEN US AND EUROPEAN ECONOMIC POLICY UNCERTAINTIES AND SELECTED MACROECONOMIC VARIABLES IN TURKEY

ABD VE AVRUPA'NIN EKONOMİK POLİTİKA BELİRSİZLİKLERİ İLE TÜRKİYE'DE SEÇİLMİŞ MAKROEKONOMİK DEĞİŞKENLER ARASINDAKİ DİNAMİK ETKİLEŞİMLERİN ANALİZİ

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Abstract

The purpose of this study is to examine the effects of economic policy uncertainties of EU (EPUEU) and US (EPUUS) on selected macroeconomic variables of Turkey, such as interest rate, stock prices, consumer price index, industrial production index, exchange rate by using ARDL bounds testing approach and monthly data over the period of 2002 January to 2015 December. According to results of the study, an increase in EPUUS causes a statistically significant decrease in industrial production in the long-run and an increase in consumer prices. On the other hand, an increase in EPUEU leads to increase in industrial production. Furthermore, the results show that no matter what the source of the policy uncertainties are, financial indicators of the Turkish economy are not significantly affected by changes in economic policy uncertainties of both EU and US. The results of the Granger causality tests indicate presence of both short-run and long-run causal relations between variables, particularly short-run causalities from EPUEU and EPUUS to industrial production reinforcing the results of ARDL estimates. Thus, Turkish policymakers should take into account of rising EU and US policy uncertainties when forming economic policies.

Keywords: Economic Policy Uncertainty, Macroeconomic Performance, Time Series Analysis,

Öz

Bu çalışmanın amacı, Avrupa Birliği (EPUEU) ve ABD (EPUUS) iktisadi politika belirsizliklerinin, Türkiye'nin, faiz oranı, hisse senedi fiyatı , tüketici fiyat endeksi, sınai üretim endeksi, döviz kuru gibi seçilmiş makroekonomik değişkenleri üzerindeki etkilerini; 2002 Ocak-2015 Aralık dönemine ait aylık veriler ve ARDL sınır testi yaklaşımını kullanarak incelemektir. Çalışmadan elde edilen ampirik sonuçlara göre, EPUUS, uzun dönemde, Türkiye'de ekonomik faaliyetin ölçülmesinde bir gösterge olan sınai üretimini azaltırken, tüketici fiyatlarında artışa neden olmaktadır. Öte yandan, EPUEU'daki artış, sanayi üretiminde artışa neden olmaktadır. Ayrıca, sonuçlar, Türkiye ekonomisinin finansal göstergelerinin, politika belirsizliğinin kaynağı ne olursa olsun, politika belirsizliklerinden önemli ölçüde etkilenmediğini göstermektedir. Granger nedensellik test sonuçları ise hem kısa hem de uzun dönemde, değişkenler arasında nedensellik ilişkilerinin varlığına işaret etmektedir. Özellikle EPUEU ve EPUUS'tan endüstriyel üretime kısa dönemde nedenselliklerin olması ARDL modelinin tahmin sonuçlarını da desteklemektedir. Bu nedenle, Türkiye'de politika yapıcılarının politika oluştururken, AB ve ABD politika belirsizliklerini dikkate almaları uygulanacak politikaların başarısı açısından önemlidir.

Anahtar Kelimeler: Ekonomi Politika Belirsizliği, Makroekonomik Performans, Zaman Serisi Analizi,

EXTENDED SUMMARY

Purpose

The purpose of this study is to examine the effects of economic policy uncertainties of EU (EPUEU) and US (EPUUS) on selected macroeconomic variables of Turkey, such as interest rate, stock exchange, consumer price index, industrial production index, exchange rate.

Method

Firstly, to test the stationarity of variables, we carry out Augmented Dickey Fuller (ADF), Philips Perron (PP) and breakpoint unit root tests. After seeing that except for the economic policy uncertainty variables, all the variables are stationary at their first differences, we used Pesaran's (2001) ARDL approach to investigate the existence of long run relationships among variables and whether the variables are integrated or not. Then we used Engle Granger (1987)'s ECM based Granger causality test to detect the existence of short and long run causality.

Findings and Conclusions

ARDL long run coefficients indicate that an increase in EPUUS causes a statistically significant decrease in industrial production, which is a proxy to measure of economic activity, in Turkey. Also, it causes an increase in consumer prices. On the other hand, an increase in EPUEU brings about to increase in industrial production. Furthermore, the results show that no matter what the source of the policy uncertainties are, financial indicators of the Turkish economy are not significantly affected by changes in economic policy uncertainties of both EU and US. The results of the Granger causality tests in both short-run and long-run indicate presence of causal relations between variables, particularly short-run causalities from EPUEU and EPUUS to industrial production reinforcing the results of ARDL estimates. Thus, both ARDL and Granger causality test results show that rising uncertainties in EU and USA creating effects on economic activities in Turkey, which is Turkish policymakers should be aware of.

1. INTRODUCTION

To increase the investment and accelerate the growth, macroeconomic policies at the "right" levels are not enough. Uncertainty about the future policies should also be minimized (Aizenman and Marion, 1993: 1). As indicated in Sum (2012), since EPU affects the perception and behavior of market participants in the goods and capital markets, examining the effects of policy uncertainties on real economic indicators has a great deal of crucial implications. Especially, if we examine the issue from the perspective of the emerging market economies such as Turkey, it can be more interesting because of the fact that they are affected not only by their own policy uncertainties but also by economic policy uncertainties of other countries, especially of USA and European Union.

Starting from the early 1980s and accelerated with the liberalization of foreign capital accounts in 1989, Turkey's economy has been almost fully integrated into global markets, especially financial markets. This increased integration of Turkey's economy has made the Turkey's economy vulnerable to different type of external shocks including foreign economic policy uncertainty (hereafter, EPU). Turkey's interaction with major developed economies in terms of exchanging the goods and services and involving heavy financial transactions and heavy reliance of Turkey's industrial sector to imports has created a perception among the academics, policy maker and market professional that 'when USA and Europe sneeze Turkey catches a cold'. Thus, the potential negative effect of external EPU shocks on domestic economic activity is an important issue for countries like Turkey.

The latest global crises has proven that this impact especially becomes the main concern of policy makers, market professionals and academics during turmoil times renewing interest in the economic impact of policy uncertainty and leading to a number of empirical investigations to examine the effect of policy uncertainty shocks on a large set of economic variables such growth, employment and inflation (Arouri et al., 2016: 136).

It is true that because of the nature of policy decision-making and implementation processes, economic policies typically can create a significant amount of uncertainty which has high power of imposing profound impacts on the financial markets and real economy. As is indicated in Gilchrist et al. (2014) and Caldara et al. (2016), the economic uncertainty can also affect financial conditions and hence the real economy. Moreover, as it is found it in Gilchrist et al. (2010) and Pastor and Veronesi (2012), the policy uncertainty can cause an increase in the cost of finance, lowering investment and intensifying economic contraction.

Adverse effects of uncertainty on economic growth first brought up by Bernanke (1983). Bernanke (1983) indicated that in case of facing with uncertainity, firms prefer to reduce investments and wait for further information since investment costs are irreversible. The construction of EPU index by Baker et al. (2012) has accelerated the studies investigating the effects of EPU such as Sum and Fanta (2012), Antonakakis et al. (2013), Balcilar et al. (2013), Kang and Ratti (2013), Lam and Zhang (2014), Johnson and Lee (2014), Karnizova and Li (2014), Amengual and Xiu (2014), Klößner and Sekkel

(2014), Bloom (2014), Wang et al. (2015) and Brogaard and Detzel (2015). Lastly, Baker et al. (2015) argued, recent global financial crisis has proven that the uncertainties about US and European fiscal, regulatory and monetary policies contributed to steep economic decline, especially causing significant decline in the growth rates of emerging markets.

With this study, we aim to contribute this growing literature by researching the impacts of EPUs of US and EU on Turkish economy, particularly selected macroeconomic variables, by using ARDL Bounds testing approach. Since the Turkish economy is an open economy, external shocks including EPU originating from US and EU may affect the country's economy. Furthermore, any increase in EPUEU may affect imports from Turkey, since it is affecting member countries' consumption and investment decisions and EU is the most important market for Turkish exporters (44.5% of the Turkey's exports are consist of exports to EU). Thus, we expect that Turkey's production, employment and other macroeconomic variables would be affected by changes in EPUEU and EPUUS.

This paper is organized as follows. Section 2 explains how foreign EPU shocks transmitted into domestic economy. Section 3 presents the brief literature review. Section 4 explains the methodology used in the study. Section 5 presents empirical data of the study. Section 6 presents discussions based on the empirical results. Finally, section 7 summarizes and concludes the paper.

2. THE CHANNELS OF TRANSMISSION OF ECONOMIC POLICY UNCERTAINTY SHOCKS INTO DOMESTIC ECONOMY

To understand the channels of transmission of external EPU shocks of US and EU on Turkish economy, we have to first explain how heightened uncertainty in US and EU will transmitted to domestic economies through their effects on key macroeconomic variables such as employment, consumption, investment and growth. According to Ndou et al. (2017), rise in economic policy uncertainties should be considered one of the key factors responsible for the decline in global trade and economic growth. Even IMF sources suggest that EPU spillovers occur through trade channel and can have potential adverse effects on economic activity and import demand. When macroeconomic uncertainty disappears, we should expect recovery in investment and consumption of durable goods. On the other hand, heightened uncertainty can cause a significant rise in unemployment and a decrease in inflation which implies that uncertainty shocks affects the economy via the aggregate demand channel. Thus, decline in the demand for imports resulted from adverse foreign aggregate demand shocks can deteriorate economic activity of the exporting countries. Besides these effects of EPU shocks, it can cause depreciation of the exchange rate of the Turkish Lira to the US dollar and Euro which causes an extra cost for import-based producers that leads cost inflation in the country.

EPU also has a potential to increase global risk aversion and can be the major source of sudden booms and deeps in financial markets, on the strength of sudden and significant increase in capital outflows from emerging market economies such as Turkey and Brazil. As a result, we can expect temporary reduction in investment spending which negatively affects output. EPU shocks can also tighten the credit and financial conditions. Moreover, the composition of capital flows is affected by EPU. We know that the important one for the credit and financial condition is the composition of capital flows. External EPU shocks are inversely related to equity inflows. That is, heightened EPU deters equity flows into the domestic economy. Moreover, other countries' economic policy uncertainties can have negative effects on capital inflows (Ndou et al, 2017: 42). Thus, heightened EPU can cause a significant fall in the capital flows into Turkish financial markets creating adverse effect on economic growth. Obviously, this also negatively affects domestic price and financial stability.

3. LITERATURE REVIEW

According to the neoclassical growth theory, the policy uncertainty should not have any impact on the long run growth rate of per capita output implying that the policy shocks only create short term temporary effects on the economy. However, the endogenous growth theory concludes that the policies and policy disturbances can create permanent effect on the growth (Aizenman and Marion, 1993:2).

Empirical studies of the policy uncertainty's effects on the economy is dating back to the eighties with Bernanke (1983). With the onset of the global financial crisis on 2008, the interest of such effect has remerged (Dakhlaoui and Aloui, 2016: 143).

Aizenman and Marion (1993) and Hassett and Metcalf (1999) searched the effect of fiscal policy uncertainty on investment decision. To represent the fiscal policy uncertainty, they used tax policy uncertainty and they concluded that increasing uncertainty retards firm-level investment and leads to lower levels of investments and growth. By using simulated method of moments and firm level data, Bloom (2009) also concluded that higher uncertainty brings about firms to temporarily pause their investment and hiring.

Byrne and Davis (2004) estimated the impacts of monetary policy uncertainties on non-residential fixed investment by decomposing the uncertainty as permanent and temporary inflation uncertainty. They concluded that temporary component of inflation uncertainty has larger negative effect on investment than the permanent one has.

By using 25 less developed countries' data, Lopez (1989) found that investment and real income growth are negatively affected by real exchange rate instability (Rodrik, 1991: 19). Also, by using monthly data between January 1973 and September 2008 and 926 firm, Gilchrist et al (2009) found that an anticipated increase in uncertainty generates a cyclical downturn by raising the price of credit risk that also lowers aggregate investment spending.

With using two state regime switching model, Ozoguz (2009) found a negative relationship between EPU and stock returns. Also, Dzielinski (2012) constructed a special uncertainity index and

found that high degree of uncertainity results with decline in stock returns in US. Pastor and Veronesi (2012) found that government policy uncertainty has negative effect on stock prices. Kang and Ratti (2013) found that an increase in EPU reduces real stock returns in Canada and in Europe. With constructing a dynamic conditional correlation (DCC) model, Antonakakis et al. (2013) found that increased EPU causes lower stock returns and increases stock market volatility in US. Brogaard and Detzel (2015) found that EPU is an crucial risk factor for the US equities.

Also, the effect of one specific countries' EPUs' (especially EPUUS) on other countries macroeconomic indicators is one of the widely searched topics. Colombo (2013) concludes that EPUUS influences European aggregates more than Euro-area policy uncertainty does. Klößner and Sekkel (2014) demonstrates that EPUUS spills over to influence other developed countries.

Sum's (2012a) study investigates whether there is an effect of EPUUS on the returns on stock markets in the BRIC countries. With using Granger causality test, he concluded that the EPUUS statistically significantly and negatively affect stock market returns in Brazil, India and Russia. However, although stock returns in China are negatively affected by the EPUUS, this effect is not statistically significant.

For Turkey, one of the first studies that examines the effects of policy uncertainties is done by Conway (1988) for the period of 1962-1986. His findings indicate that uncertainty causes a negative effect on transport, manufacturing, and housing sectors. The stronger effect is observed in manufacturing investment (Rodrik, 1991: 20).

One of the recent studies for Turkey is done by Sum (2012b). He researched the effect of EPUEU on selected developed and developing countries' stock market performance including Turkey. He concluded that EPUEU negatively affects all stock market returns in the EU, Croatia, Norway, Russia, Switzerland, Ukraine and Turkey.

4. METHODOLOGY

To see the cointegration relationship between the variables, many approaches has been developed like Engle and Granger's (1987) methodology which depends on the residuals, Phillips and Hansen's (1990) methodology that based on modified ordinary least square procedures and Johansen's (1996) multivariate cointegration analysis and Johansen and Juselius's (1990) maximum likelihood methods. These techniques require that all series have same ordered integrations. On the other hand, recently developed Pesaran et al.'s (2001) autoregressive-distributed lag (ARDL) approach allows that regressors may be stationary in levels (I(0)) or the first differenced (I(1)). Besides, ARDL Bounds testing approach provides super consistent results even in a small sample case and not suffering from endogeneity problem. Therefore, in this study, to obtain the long run relationship among the series, Pesaran's (2001) ARDL Bounds testing approach is used.

Firstly, both traditional unit root tests of ADF and PP as well as Breakpoint unit root test are used to see that variables have a mix of degree of integration and none of them are integrated of order

greater than one. Knowing the fact that variables have different degree of integration of one and zero, adopting the ARDL Bounds testing approach is decided to examine the dynamic relations among the variables. After carrying out this cointegration test, Granger causality test taking into account of short and long run relations among the variables is performed.

To implement ARDL Bounds testing approach, first the unrestricted error correction models are formed (UECM) as follow:

$$\Delta LIPI\_SA_t=\beta_{11}+\sum_{i=1}^{n1}\alpha_{1i}\,\Delta LIPI\_SA_{t-i}+\sum_{i=0}^{n2}\alpha_{2i}\,\Delta LCPI_{t-i}+\sum_{i=0}^{n3}\alpha_{3i}\,\Delta INT_{t-i}+\sum_{i=0}^{n4}\alpha_{4i}\Delta LBIST_{t-i}+\sum_{i=0}^{n5}\alpha_{5i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{n6}\alpha_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{n7}\alpha_{7i}\,\Delta LEU_{t-i}+\theta_{11}IPI\_SA_{t-1}+\theta_{21}INT_{t-1}+\theta_{31}LBIST_{t-1}+\theta_{41}LEXC_{t-1}+\theta_{51}LIPI\_SA_{t-1}+\theta_{61}LUS_{t-1}+\theta_{71}LEU_{t-1}+u_{1t} \quad (1)$$

$$\Delta LCPI_t=\beta_{12}+\sum_{i=1}^{m1}\partial_{1i}\,\Delta LCPI_{t-i}+\sum_{i=0}^{m2}\partial_{2i}\,\Delta INT_{t-i}+\sum_{i=0}^{m3}\partial_{3i}\Delta LBIST_{t-i}+\sum_{i=0}^{m4}\partial_{4i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{m5}\partial_{5i}\,\Delta LIPI\_SA_{t-i}+\sum_{i=0}^{m6}\partial_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{m7}\partial_{7i}\,\Delta LEU_{t-i}+\theta_{12}LCPI_{t-1}+\theta_{22}LIPI\_SA_{t-1}+\theta_{32}INT_{t-1}+\theta_{42}LBIST_{t-1}+\theta_{52}LEXC_{t-1}+\theta_{62}LUS_{t-1}+\theta_{72}LEU_{t-1}+u_{2t} \quad (2)$$

$$\Delta INT_t=\beta_{13}+\sum_{i=1}^{y1}\omega_{1i}\,\Delta INT_{t-i}+\sum_{i=0}^{y2}\omega_{2i}\,\Delta LIPI\_SA_{t-i}+\sum_{i=0}^{y3}\omega_{3i}\,\Delta CPI_{t-i}+\sum_{i=0}^{y4}\omega_{4i}\Delta LBIST_{t-i}+\sum_{i=0}^{y5}\omega_{5i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{y6}\omega_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{y7}\omega_{7i}\,\Delta LEU_{t-i}+\theta_{13}INT_{t-1}+\theta_{23}LIPI\_SA_{t-1}+\theta_{33}LCPI_{t-1}+\theta_{43}LBIST_{t-1}+\theta_{53}LEXC_{t-1}+\theta_{63}LUS_{t-1}+\theta_{73}LEU_{t-1}+u_{3t} \quad (3)$$

$$\Delta LBIST_t=\beta_{14}+\sum_{i=1}^{r1}\varphi_{1i}\,\Delta LBIST_{t-i}+\sum_{i=0}^{r2}\varphi_{2i}\,\Delta LIPI\_SA_{t-i}+\sum_{i=0}^{r3}\varphi_{3i}\,\Delta CPI_{t-i}+\sum_{i=0}^{r4}\varphi_{4i}\Delta INT_{t-i}+\sum_{i=0}^{r5}\varphi_{5i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{r6}\varphi_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{r7}\varphi_{7i}\,\Delta LEU_{t-i}+\theta_{14}LBIST_{t-1}+\theta_{24}LIPI\_SA_{t-1}+\theta_{34}LCPI_{t-1}+\theta_{44}INT_{t-1}+\theta_{54}LEXC_{t-1}+\theta_{64}LUS_{t-1}+\theta_{74}LEU_{t-1}+u_{4t} \quad (4)$$

$$\Delta LEXC_t=\beta_{15}+\sum_{i=1}^{s1}\mu_{1i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{s2}\mu_{2i}\,\Delta LIPI\_SA_{t-i}\sum_{i=0}^{s3}\mu_{3i}\,\Delta CPI_{t-i}+\sum_{i=0}^{s4}\mu_{4i}\Delta INT_{t-i}+\sum_{i=0}^{s5}\mu_{5i}\,\Delta LBIST_{t-i}+\sum_{i=0}^{s6}\mu_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{s7}\mu_{7i}\,\Delta LEU_{t-i}+\theta_{15}LEXC_{t-1}+\theta_{25}LIPI\_SA_{t-1}+\theta_{35}LCPI_{t-1}+\theta_{45}INT_{t-1}+\theta_{55}BIST_{t-1}+\theta_{65}LUS_{t-1}+\theta_{75}LEU_{t-1}+u_{5t} \quad (5)$$

where $\beta_{11},\beta_{12},\beta_{13},\beta_{14}$ and β_{15} are the drift components and u_ts are white noise error term. Moreover, the term with summation sign corresponds to the error correction dynamics and the second part of the equation with θs show long run relationship.

Before carrying out cointegration test, the following ARDL models are determined, based on optimal lag lengths which are determined by Shwarz criterion.

$$\Delta LIPI\_SA_t=\beta_{11}+\sum_{i=1}^{n1}\alpha_{1i}\,\Delta LIPI\_SA_{t-i}+\sum_{i=0}^{n2}\alpha_{2i}\,\Delta LCPI_{t-i}+\sum_{i=0}^{n3}\alpha_{3i}\,\Delta INT_{t-i}+\sum_{i=0}^{n4}\alpha_{4i}\Delta LBIST_{t-i}+\sum_{i=0}^{n5}\alpha_{5i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{n6}\alpha_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{n7}\alpha_{7i}\,\Delta LEU_{t-i}+\varepsilon_{1t} \quad (6)$$

$$\Delta LCPI_t=\beta_{12}+\sum_{i=1}^{m1}\partial_{1i}\,\Delta LCPI_{t-i}+\sum_{i=0}^{m2}\partial_{2i}\,\Delta INT_{t-i}+\sum_{i=0}^{m3}\partial_{3i}\Delta LBIST_{t-i}+\sum_{i=0}^{m4}\partial_{4i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{m5}\partial_{5i}\,\Delta LIPI\_SA_{t-i}+\sum_{i=0}^{m6}\partial_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{m7}\partial_{7i}\,\Delta LEU_{t-i}+\varepsilon_{2t} \quad (7)$$

$$\Delta INT_t=\beta_{13}+\sum_{i=1}^{y1}\omega_{1i}\,\Delta INT_{t-i}+\sum_{i=0}^{y2}\omega_{2i}\,\Delta LIPI\_SA_{t-i}+\sum_{i=0}^{y3}\omega_{3i}\,\Delta CPI_{t-i}+\sum_{i=0}^{y4}\omega_{4i}\Delta LBIST_{t-i}+\sum_{i=0}^{y5}\omega_{5i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{y6}\omega_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{y7}\omega_{7i}\,\Delta LEU_{t-i}+\varepsilon_{3t} \quad (8)$$

$$\Delta LBIST_t=\beta_{14}+\sum_{i=1}^{r1}\varphi_{1i}\,\Delta LBIST_{t-i}+\sum_{i=0}^{r2}\varphi_{2i}\,\Delta LIPI_{SA_{t-i}}+\sum_{i=0}^{r3}\varphi_{3i}\,\Delta CPI_{t-i}+\sum_{i=0}^{r4}\varphi_{4i}\Delta INT_{t-i}+\sum_{i=0}^{r5}\varphi_{5i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{r6}\varphi_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{r7}\varphi_{7i}\,\Delta LEU_{t-i}+\varepsilon_{4t} \quad (9)$$

$$\Delta LEXC_t=\beta_{15}+\sum_{i=1}^{s1}\mu_{1i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{s2}\mu_{2i}\,\Delta LIPI\_SA_{t-i}\sum_{i=0}^{s3}\mu_{3i}\,\Delta CPI_{t-i}+\sum_{i=0}^{s4}\mu_{4i}\Delta INT_{t-i}+\sum_{i=0}^{s5}\mu_{5i}\,\Delta LBIST_{t-i}+\sum_{i=0}^{s6}\mu_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{s7}\mu_{7i}\,\Delta LEU_{t-i}+\varepsilon_{5t} \quad (10)$$

where, $\Delta LIPI\_SA_t$, $\Delta LCPI_t$, ΔINT_t, $\Delta LBIST_t$ and $\Delta LEXC_t$ are the dependent variables, α_{1i},.., α_{7i}; μ_{1i},…, μ_{7i} are the short run coefficients, and n_1, …n_7; m_1, …,m_7, … s_1, …, s_7 are the optimal length of lags of the ARDL models.

In order to test for the existence of a long-run relationship between the variables, all the equations (1), …, (5) are estimated by ordinary least squares (OLS) and then an F-test is conducted for the joint significance of the coefficients of the lagged levels of the variable. Calculated F-statistics should be compered with the upper bound and lower bound critical values that is generated by Pesaran et al (2001). If the calculated F statistic is bigger than the upper bound critical value I(1), null hypothesis will be rejected that means there is a cointegration relation between the variables. On the other side, if the F statistic is lower than the lower bound critical value I(0), null hypothesis cannot be rejected which means that variables are not cointegrated. If F-statistic is remain in between critical bounds, result changes whether series are stationary at their level or first difference. Thus, the null hypothesis of no co-integration among the variables in the equation 1 is:

$H_0: \theta_{11}=\theta_{21}=\theta_{31}=\theta_{41}=\theta_{51}=\theta_{61}=\theta_{71}=0$ against the alternative hypothesis of cointegration $H_1: at\ least\ one\ of\ them\ is\ different\ than\ zero$

For equation 2:

$H_0: \theta_{12} = \theta_{22} = \theta_{32} = \theta_{42} = \theta_{52} = \theta_{62} = \theta_{72} = 0$ against the alternative hypothesis of cointegration $H_1: at\ least\ one\ of\ them\ is\ different\ than\ zero$

For equation 3:

$H_0: \theta_{13} = \theta_{23} = \theta_{33} = \theta_{43} = \theta_{53} = \theta_{63} = \theta_{73} = 0$ against the alternative hypothesis of cointegration $H_1: at\ least\ one\ of\ them\ is\ different\ than\ zero$

For equation 4:

$H_0: \theta_{14} = \theta_{24} = \theta_{34} = \theta_{44} = \theta_{54} = \theta_{64} = \theta_{74} = 0$ against the alternative hypothesis of cointegration $H_1: at\ least\ one\ of\ them\ is\ different\ than\ zero$

For equation 5:

$H_0: \theta_{15} = \theta_{25} = \theta_{35} = \theta_{45} = \theta_{55} = \theta_{65} = \theta_{75} = 0$ against the alternative hypothesis of cointegration $H_1: at\ least\ one\ of\ them\ is\ different\ than\ zero$

By using ARDL approach, the short and long-run dynamic relationships can be estimated. Also, since Granger (1988) point out that existence of cointegration relation indicates the short and long run causality between the variables, Granger causality within the ECM framework is preferred. This approach is first used by Sargan (1964) then developed by Davidson et al (1978) and become widespread with Engle Granger (1987). With this method, both short run and long run causality can be observed. Also, this system allows the predicted variable to explain itself both by its own lags and lags of other variables as-well-as the error correction term and by residual term (Shahbaz et al, 2013: 114). Therefore, equations (1,2,3,4,5) can be rewritten as the error correction version of ARDL model as follow:

$$\Delta LIPI\_SA_t = \beta_{11} + \sum_{i=1}^{n1} \alpha_{1i}\, \Delta LIPI\_SA_{t-i} + \sum_{i=0}^{n2} \alpha_{2i}\, \Delta LCPI_{t-i} + \sum_{i=0}^{n3} \alpha_{3i}\, \Delta INT_{t-i} + \sum_{i=0}^{n4} \alpha_{4i} \Delta LBIST_{t-i} + \sum_{i=0}^{n5} \alpha_{5i}\, \Delta LEXC_{t-i} + \sum_{i=0}^{n6} \alpha_{6i}\, \Delta LUS_{t-i} + \sum_{i=0}^{n7} \alpha_{7i}\, \Delta LEU_{t-i} + \gamma_1 ecm_{t-1} + u_{1t} \quad (11)$$

$$\Delta LCPI_t = \beta_{12} + \sum_{i=1}^{m1} \partial_{1i}\, \Delta LCPI_{t-i} + \sum_{i=0}^{m2} \partial_{2i}\, \Delta INT_{t-i} + \sum_{i=0}^{m3} \partial_{3i} \Delta LBIST_{t-i} + \sum_{i=0}^{m4} \partial_{4i}\, \Delta LEXC_{t-i} + \sum_{i=0}^{m5} \partial_{5i}\, \Delta LIPI\_SA_{t-i} + \sum_{i=0}^{m6} \partial_{6i}\, \Delta LUS_{t-i} + \sum_{i=0}^{m7} \partial_{7i}\, \Delta LEU_{t-i} + \gamma_2 ecm_{t-1} + u_{2t} \quad (12)$$

$$\Delta INT_t = \beta_{13} + \sum_{i=1}^{y1} \omega_{1i}\, \Delta INT_{t-i} + \sum_{i=0}^{y2} \omega_{2i}\, \Delta LIPI\_SA_{t-i} + \sum_{i=0}^{y3} \omega_{3i}\, \Delta CPI_{t-i} + \sum_{i=0}^{y4} \omega_{4i} \Delta LBIST_{t-i} + \sum_{i=0}^{y5} \omega_{5i}\, \Delta LEXC_{t-i} + \sum_{i=0}^{y6} \omega_{6i}\, \Delta LUS_{t-i} + \sum_{i=0}^{y7} \omega_{7i}\, \Delta LEU_{t-i} + \gamma_3 ecm_{t-1} + u_{3t} \quad (13)$$

$$\Delta LBIST_t = \beta_{14} + \sum_{i=1}^{r1} \varphi_{1i}\, \Delta LBIST_{t-i} + \sum_{i=0}^{r2} \varphi_{2i}\, \Delta LIPI\_SA_{t-i} + \sum_{i=0}^{r3} \varphi_{3i}\, \Delta CPI_{t-i} + \sum_{i=0}^{r4} \varphi_{4i} \Delta INT_{t-i} + \sum_{i=0}^{r5} \varphi_{5i}\, \Delta LEXC_{t-i} + \sum_{i=0}^{r6} \varphi_{6i}\, \Delta LUS_{t-i} + \sum_{i=0}^{r7} \varphi_{7i}\, \Delta LEU_{t-i} + \gamma_4 ecm_{t-1} + u_{4t} \quad (14)$$

$$\Delta LEXC_t=\beta_{15}+\sum_{i=1}^{s1}\mu_{1i}\,\Delta LEXC_{t-i}+\sum_{i=0}^{s2}\mu_{2i}\,\Delta LIPI\_SA_{t-i}\,\sum_{i=0}^{s3}\mu_{3i}\,\Delta CPI_{t-i}+\sum_{i=0}^{s4}\mu_{4i}\Delta INT_{t-i}+\sum_{i=0}^{s5}\mu_{5i}\,\Delta LBIST_{t-i}+\sum_{i=0}^{s6}\mu_{6i}\,\Delta LUS_{t-i}+\sum_{i=0}^{s7}\mu_{7i}\,\Delta LEU_{t-i}+\gamma_5 ecm_{t-1}+u_{5t} \quad (15)$$

Where $u_{1t}, u_{2t}, u_{3t}, u_{4t}, u_{5t}$ are residuals assumed to be normally distributed and white noise. ecm_{t-1} is the error correction term that has to be negative and statistically significant. It shows the speed of adjustment to long run equilibrium following a short run shock. Moreover, for the short run Granger causality, following hypothesis are tested:

H_{01}: $\alpha_{2i} = 0$ implying that ΔLCPI does not Granger cause ΔLIPI_SA

H_{02}: $\alpha_{6i} = 0$ implying that ΔLUS does not Granger cause ΔLIPI_SA

H_{03}: $\alpha_{7i} = 0$ implying that ΔLEU does not Granger cause ΔLIPI_SA

H_{04}: $\partial_{6i} = 0$ implying that ΔLUS does not Granger cause ΔLCPI

H_{05}: $\partial_{7i} = 0$ implying that ΔLEU does not Granger cause ΔLCPI

H_{06}: $\omega_{6i} = 0$ implying that ΔLUS does not Granger cause ΔINT

H_{07}: $\omega_{7i} = 0$ implying that ΔLEU does not Granger cause ΔINT

H_{08}: $\mu_{6i} = 0$ implying that ΔLUS does not Granger cause ΔLEXC

H_{09}: $\mu_{7i} = 0$ implying that ΔLEU does not Granger cause ΔLEXC

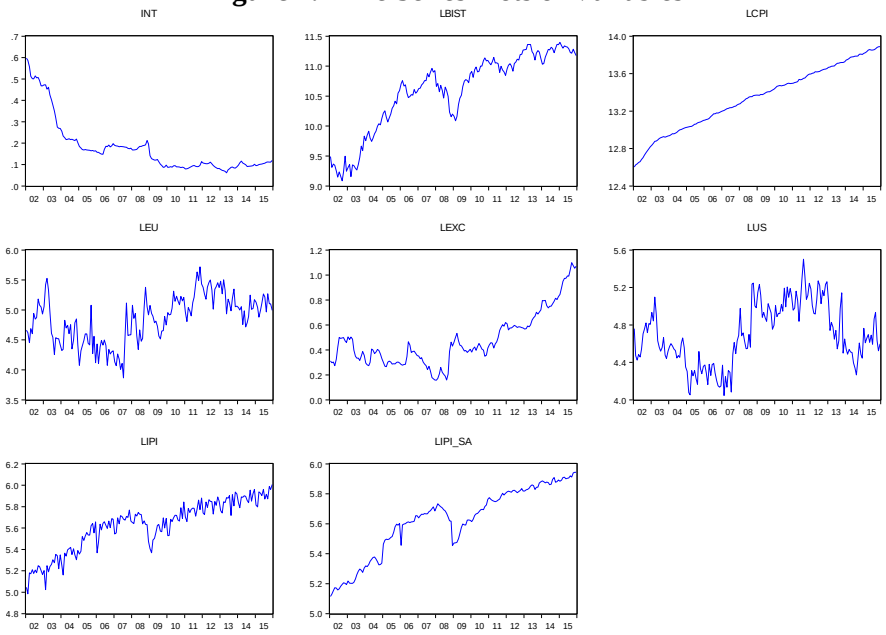
and so on for other variables.

5. DATA AND EMPIRICAL ANALYSIS

Empirical estimation is based on monthly observations from 2002 January to 2015 December. Variables used in the study are interest rate (effective maximum interest rates for TL deposits of banks-up to 3 months), stock exchange, consumer price index (CPI), industrial production index (proxy for economic activity level), exchange rate (USA Dollar/Turkish lira effective exchange rate), economic policy uncertainty index of US, and economic policy uncertainty index of EU. Inside of them; interest rate, CPI, stock exchange, PPI and exchange rate data are obtained from Turkish Central Bank database. EPU index of EU and US is obtained from Baker, Bloom and Davis's (2015) EPU index developed by themselves (available at www.policyuncertanity.com).

In the analysis, we used the logarithmic values of variables except interest rate and Figure 1 shows time series plots of variables.

Figure 1. Time Series Plots of Variables



Source: Authors' calculation

As can be seen easily from the Figure 1, since industrial production index exhibits strong seasonality, we use TRAMO/SEATS method to remove the seasonality in series. Because of the structural breaks in the variables, we also carry out structural break unit root tests.

To test the stationarity of variables, we carry out Augmented Dickey Fuller (ADF), Philips Perron (PP) and breakpoint unit root tests. Table 1 presents the results of unit root tests.

Table 1. Results of The Unit Root Tests

Variables	ADF		PP		Breakpoint Unit Root	
	Intercept	Trend and Intercept	Intercept	Trend and Intercept	Intercept	Trend and Intercept
LIPI_SA	-1.760844 (0.3989)	-2.435253 (0.3601)	-1.795761 (0.3817)	-2.390796 (0.3830)	-2.9510 (0.7124)	-4.4311 (0.2424)
⊿LIPI_SA	-14.03137 (0.0000)	-14.06635 (0.0000)	-14.01796 (0.0000)	-14.07399 (0.0000)	-16.3120 (<0.01)	-14.585 (<0.01)
LEXC	0.462678 (0.9850)	-1.006586 (0.9393)	0.337555 (0.9796)	-1.171611 (0.9123)	-1.69721 (>0.99)	-4.49852 (0.2157)
⊿LEXC	-9.349238 (0.0000)	-9.512676 (0.0000)	-8.894753 (0.0000)	-8.907285 (0.0000)	-10.2606 (<0.01)	-9.7022 (<0.01)
INT	-4.539809 (0.0000)	-3.234234 (0.0814)	-5.233849 (0.0000)	-3.292774 (0.0710)	-5.0217 (<0.01)	-3.0447 (0.8484)
⊿INT	-8.002451 (0.0000)	-8.776992 (0.0000)	-8.002451 (0.0000)	-8.745191 (0.0000)	-9.983189 (< 0.01)	-9.120682 (< 0.01)
LCPI	-4.756487 (0.0001)	-6.337714 (0.0000)	-3.381947 (0.0130)	-5.796281 (0.0000)	-5.903167 (< 0.01)	-3.720215 (0.5982)*

LBIST	-1.457739 (0.5526)	-1.877298 (0.6618)	-1.444978 (0.5590)	-1.928779 (0.6350)	-3.178000 (0.5787)	-3.769809 (0.5741)
⊿LBIST	-13.91950 (0.0000)	-13.96703 (0.0000)	-13.91280 (0.0000)	-13.96531 (0.0000)	-14.52338 (< 0.01)	-14.26580 (< 0.01)
LUS	-3.304890 (0.0162)	-3.531236 (0.0393)	-3.127176 (0.0265)	-3.531236 (0.0393)	-4.809954 (0.0173)	-5.659789 (0.0124)
LEU	-3.051942 (0.0323)	-4.673826 (0.0011)	-3.570752 (0.0074)	-4.451203 (0.0024)	-5.733599 (< 0.01)	-6.897415 (< 0.01)
Test critical values at 5% level	-2.878723	-3.436957	-2.878723	-3.436957	-4.443649	-5.155006

Notes: *For CPI variable, only break point unit root test with constant and trend shows nonstationary. Therefore, CPI will be accepted as level stationary.

Values in the parenthesis are probability values.

Source: Authors' calculation

The results of the unit root tests in Table 1 indicate that except for the economic policy uncertainty variables, all variables are stationary at their first differences. Therefore, we used ARDL approach to investigate the existence of long run relationships among variables and whether the variables are integrated or not. Table 2 presents the results of cointegration tests.

Table 2. The Results of ARDL Cointegration Test

Series Models	F statistics	Significance level	Bound critical values		Decisions
			I(0)	*I(1)*	
ΔLIPI_SA	7.2075	1%	2.88	3.99	Co-integrated
ΔLCPI	49.93290	1%	2.88	3.99	Co-integrated
ΔINT	12.94818	1%	2.88	3.99	Co-integrated
ΔLBIST	4.337253	1%	2.88	3.99	Co-integrated
ΔLEXC	2.498040	1%	2.88	3.99	Not co-integrated

Source: Authors' calculation

The results of ARDL bounds test indicate the existence of cointegration among the variables except for exchange rate. Therefore, this means that there is a long-term relationship among the variables so long-run coefficients are estimated in next step. Table 3 shows these coefficients:

Table 3. Long Run Coefficients

Models	Constant	$LIPI\_SA_{t-1}$	$LCPI_{t-1}$	INT_{t-1}	$LBIST_{t-1}$	$LEXC_{t-1}$	LEU_{t-1}	LUS_{t-1}	X^2_{LM} p-values	X^2_{white} p-values
ΔLIPI_SAt	8.90	-	-0.5337[c]	-1.679[c]	0.367[c]	0.508[c]	0.076[a]	-0.092[b]	0.41	0.26
ΔLCPIt	5.93	1.0510[c]	-	1.118[a]	0.045	0.499[c]	0.031	0.161[a]	0.11	0.92
ΔINTt	4.28	0.3778[b]	-0.4981[c]	-	0.012	0.227[c]	0.020	-0.005	0.17	0.07
ΔLBISTt	13.6	1.0868	-0.641	-4.336[b]	-	1.206	-0.418	0.383	0.44	0.31

[a] Denotes statistically significant at 10%
[b] Denotes statistically significant at 5%
[c] Denotes statistically significant at 1%

Source: Authors' calculation

Notes: X^2_{LM} indicates Breusch-Godfrey LM test and X^2_{white} indicates white test.

According to the coefficient estimates, when there is one percent increase in EPUUS, industrial production decreases about 0.09%. Moreover, if there is one percent increase in EPUEU, industrial production increases 0.07%. This result is surprising but the reasons of this may be stem from the export substitution effect. Since Turkey is an important trade partner for the EU, while an increase in EPUEU decreases European production, import from other countries may increase. Namely, demand for Turkish products can increase. This causes to increase industrial production in Turkey. Moreover, this dual model says that if there is 1% increase in EPUUS, CPI increases 0.16%. In terms of diagnostic tests, Breusch-Godfrey LM test shows that models do not suffer from serial correlation problem. White test also shows that models don't have heteroscedasticity problem.

As Granger (1988) indicated that the presence of cointegration implies at least one way of Granger causality between the variables, we used Granger causality test within the ECM framework. Table 8 shows the both short and long run Granger causality test results.

Table 8. The Results of Granger Causality Tests

Dependent Variable	F-statistics [p-values]							ecm_{t-1} [p-values]
	$\Delta LIPI\_SA_t$	$\Delta LCPI_t$	ΔINT_t	$\Delta LBIST_t$	$\Delta LEXCt$	ΔLEU_t	ΔLUS_t	
$\Delta LIPI\_SA_t$	-	3.1092 [c] [0.0011]	3.6667 [c] [0.0004]	5.6758 [c] [0.0000]	5.6985 [c] [0.0000]	2.0734 [b] [0.0277]	4.1964 [c] [0.0002]	-0.4078 [c] [0.0000]
$\Delta LCPI_t$	0.4112 [0.5223]	-	4.2259 [b] [0.0415]	0.3701 [0.5438]	0.8792 [0.3498]	0.0024 [0.9609]	0.1437 [0.7051]	- 0.0206 [c] [0.0000]
ΔINT_t	0.8570 [0.3928]	6.5147 [c] [0.0004]	-	3.5469 [b] [0.0312]	3.3666 [c] [0.0010]	0.4850 [0.6283]	-0.5192 [0.6043]	-0.0673 [c] [0.0000]
$\Delta LBIST_t$	0.3116 [0.7557]	-0.7601 [0.4483]	-2.2838 [b] [0.0237]	-	-0.4214 [0.6740]	-2.1438 [b] [0.0336]	0.3520 [0.7253]	-0.13027 [c] [0.0000]
$\Delta LEXC_t$	0.2113 [0.8329]	1.0089 [0.3146]	1.2185 [0.2249]	9.5288 [c] [0.0001]	-	0.9951 [0.3212]	1.7124 [a] [0.0888]	-

[a] Denotes statistically significant at 10%
[b] Denotes statistically significant at 5%
[c] Denotes statistically significant at 1%

Source: Authors' calculation

Since the coefficients of error correction terms in each equation are statistically significantly less than one, they indicate existence of long-run causality between left hand side variable in each equation and right hand side variables. These results also support the findings of the bounds test that showed the existence of co-movement of the variables in the long run.

On the other hand, the results of short-run Granger causality tests indicate few causalities running from EPUEU and EPUUS to macroeconomic variables. They are industrial production and consumer price index. For example, whereas EPUUS only Granger causes industrial production, EPUEU Granger causes both industrial production and stock prices at 5% significance level. In addition to these, interest rate, stock exchange, consumer prices and exchange rate have one-way causality to industrial production. Also, CPI, stock exchange and exchange rate variables have bi directional causality with interest rate.

Based on the empirical results of the study, we can easily conclude that whatever the source of the policy uncertainties, financial indicators of the Turkish economy are not affected by changes in economic policy uncertainties of both EU and US. However, because of the Turkish economy's integration into the EU through trade flows industrial production is significantly affected by policy uncertainties of EU.

6. RESULTS AND DISCUSSION

One of the most important aspects belonging to the crisis is uncertainty. During the crises, both consumers and investors lose their confidence and struggle to predict the future developments in the economy. Thus, they behave timidly in their consumption and investment decisions. Because of rising uncertainty, not only investors, but also consumers can delay their economic decisions. They behave so carefully in their spending decisions, particularly on consumer durables, like cars and major appliances. Thus, as Baker et al, (2012) indicated, because of high uncertainty, people spend less and accumulate liquid assets against any damaging shocks. Also, Rodrik (1991) stated that even though most of the developing countries have undertaken some comprehensive economic measures, the private investment response to these reforms has been disappointing owing to the high degree of uncertainty regarding future economic policy. Therefore, examining the responses of consumers and investors against economic policy uncertainties will avail to policymakers about identifying the problem and what can be done in this process.

It is one of the well accepted arguments that Turkey is a relatively open economy and its key macroeconomic variables can be also affected by the economic policy uncertainties of US and EU. The main findings of the study indicate that the economic policy uncertainties of US and EU have significant effects on the price level and the industrial production of Turkey. These results show that both the changes in price level and level of industrial production are very sensitive to foreign shocks. First of all, both the price level and industrial production are significantly affected by exchange rate movements (exchange rate pass through), partially reflected in increase in the economic policy uncertainties of US and EU, because of the economy's heavy reliance on imports of intermediate goods and inputs. Therefore, policymakers of Turkey should always take economic policy uncertainties of US and

European Union into account to form any policies designed to affect the levels of price and industrial productions.

Secondly, even though the results of the study do not indicate any direct dynamic interactions between policy uncertainties and other key economic variables; but due to the significant relationships between price level, industrial production and other macroeconomic variables, the policy makers will have to be aware of these indirect effects of policy uncertainties on the variables.

7. CONCLUSION

Since economic policy uncertainties have an important impact on consumers and investors decisions, searching the volume of this impact on specific variables is crucial for policymakers for decision making process. Therefore, the effects of economic policy uncertainty on the countries' some real and financial indicators have been widely searched topics. In the literature, both a countries' own EPUs effect and other countries' EPUs effect on its macroeconomic indicators are investigated. Especially, the effects of developed countries' EPU on developing countries macroeconomic indicators have made a sensation. Since there are only a few studies that search Turkey's macroeconomic variables responses to EPUs of developed countries, this study aimed to contribute to the literature with examining five macroeconomic variables responses to EPU of EU and US.

In this study, the dynamic interactions between economic policy uncertainties of US and EU and selected macroeconomic variables in Turkey over the period of 2002 January to 2015 December is examined by using autoregressive distributed lag approach (ARDL) and ECM based Granger causality. Selected macroeconomic variables are interest rate, stock exchange, consumer price index, industrial production index and exchange rate. The results of ARDL bounds tests show the existence of long run relationship among variables. Also, the results of ARDL long-run coefficients and Granger causality test results indicate significant dynamic interactions between economic policy uncertainties and selected macroeconomic variables of Turkey both in the short-and long-run implying that important macroeconomic variables of Turkish economy are vulnerable to foreign economic policy uncertainty shocks. Therefore, it will be better for Turkish policymakers taking into consideration not only effects of internal economic policy uncertainties but also external economic policy uncertainties.

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