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Araştırma Makalesi

Unemployment, Exchange Rate and Exchange Rate Volatility Relation: Analysis for Turkey

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Abstract

In previous studies, exchange rate fluctuations have been an important factor affecting real sector of economies as economies have become more open. Most studies have focused on its trade impact. However, through different channels, exchange rate movements can also influence unemployment. This study aims to analyze the effect of exchange rate and its volatility on unemployment for Turkey over the period from 2005 to 2019 by using quarterly data. As a solution for possible endogeneity problem, VAR analysis was performed. Results show that although exchange rate fluctuations do not affect unemployment, exchange rate volatility significantly increases unemployment. Therefore, different policy measures should be employed to reduce exchange rate volatility or its effect on unemployment or both.

Keywords: Unemployment, Exchange rate, Exchange rate volatility, Turkey, VAR model, Structural breaks.

JEL Codes: E24, F31, F41

İşsizlik, Döviz Kuru ve Döviz Kuru Oynaklığı İlişkisi: Türkiye için Analizi[1]

Öz

Birçok çalışmada, ekonomilerin daha dışa açık hale gelmesiyle birlikte, döviz kurlarındaki dalgalanmalar ekonomilerin reel kısmını etkileyen önemli bir faktör olarak dikkate alınmaktadır. Çalışmaların çoğunluğu ticaret etkisi üzerine odaklanmıştır. Fakat, döviz kurlarındaki hareketler çeşitli kanallardan işsizliği de etkileyebilmektedir. Bu çalışma, Türkiye için 2005-2019 yılları arasında 3 aylık veri kullanarak, döviz kuru ve oynaklığının işsizlik üzerine etkisini analiz etmeyi amaçlamaktadır. Olası içsellik sorununun çözümü için VAR analizi uygulanmıştır. Sonuçlar, döviz kurundaki dalgalanmaların işsizlik üzerine belirgin bir etkisinin bulunmamasına rağmen, döviz kuru oynaklığının işsizliği istatistiksel olarak anlamlı bir şekilde arttırdığını göstermektedir. Bu açıdan, döviz kuru oynaklığının azaltılması ya da işsizlik üzerindeki etkisinin azaltılması ya da her ikisin de aynı anda gerçekleşmesini sağlayabilecek çeşitli politika araçlarının kullanılması çalışmanın önerileri arasında yer almaktadır.

Anahtar Kelimeler: İşsizlik, Döviz Kuru, Döviz Kuru Oynaklığı, Türkiye, VAR modeli, Yapısal Kırılmalar.

JEL Kodları: E24, F31, F41

[1] Extended abstract is presented at the end of the article.

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1. Introduction

In open economies, countries experience real shocks through different channels, one of which is exchange rate channel (Castrén, Takalo and Wood, 2010, p. 85). As a result of globalization and liberalization policies implemented in trade and financial markets, countries have become much more vulnerable to external factors in such a way that sudden capital outflows can affect imports, exports, industrial production and employment through its effect on the real exchange rates (Galindo, Izquierdo and Montero, 2007; Ayhan, 2016). After the collapse of Bretton-Woods system, real exchange rate fluctuations have been an important phenomenon for the international arena (Burgess and Knetter, 1998). However, as discussed by Galindo et al. (2007), Feldmann (2011) and Usman and Elsalih (2018), there is not enough studies which have analyzed effect of real effective exchange rate changes and its volatility on unemployment for emerging and developing countries. The main aim of this study is to analyze impact of exchange rate and exchange rate volatility on unemployment in Turkey for the period over 2005-2019 after controlling for fundamental factors.

After the economic crisis in 2001, Turkey has abandoned currency peg regime and in addition to monetary and inflation targeting policies, been implementing floating exchange rate regime in which there can be high volatile periods. For the period after 2001, Central Bank of Turkey (CBRT) identified three main periods: implicit inflation targeting period between 2002 and 2005, inflation targeting period started in 2006 and the period after Global Financial Crisis beginning in 2010. The policies implemented in each period mainly aim price stability, but financial stability has been considered as another important issue that was addressed by new monetary policy of CBRT after Global Financial Crisis. Moreover, since the recent real depreciation of TL against major currencies in the third quarter of 2018 which can be regarded as the first large depreciation after the real devaluation of TL in year 2001, effect of exchange rate fluctuations on the real economy should be analyzed in order to implement policies to prevent adverse effect of exchange rate fluctuations.

In the literature, since 1930s and 1940s, impacts of real devaluation on employment and growth have been widely discussed based on Keynesian open macroeconomic models under the condition of involuntary unemployment (Frenkel and Ros, 2006). According to Mundell (1963) and Fleming (1962) model, through its effect on balance of payments, currency devaluation affects production and unemployment; while Helpman (1976) showed favorable effect of devaluation on employment (Choi and Choi, 2018). The studies in the literature suggested that there are three channels explaining the effect of real effective

exchange rate swings on unemployment: macroeconomic channel, labor intensity channel and development channel (Campa and Goldberg, 2001; Frenkel and Ros, 2006; Boz, 2013; Islam and Hengge, 2015).

According to macroeconomic channel, as a result of depreciation, exports increase and imports decline leading to an increase in the demand for domestic goods due to increase in the trade competitiveness of a country (i.e., increase in the relative price of foreign goods compared to home goods) and therefore, output increases along with employment (Branson and Love, 1988; Goldberg, Tracy and Aaronson, 1999; Campa and Goldberg, 2001; Nucci and Pozzolo, 2010; Goncalves and Rodrigues, 2017; Usman and Elsalih, 2018). Secondly, labor intensity channel explains effect of real effective exchange rate in the context of a gradual adjustment process. As labor cost declines following currency depreciation, labor intensive activities increase by employing labor intensive techniques and shifting factors of production to labor intensive activities. Lastly, in the development channel, after depreciation, wage declines in the tradable goods sector and profitability increases which accompany with economic growth. As revenues increase, labor demand will also increase especially for firms which are much more export-oriented and face with much more competition in imports (Goldberg et al., 1999; Galindo et al., 2007). However, depreciation may also lead to increase in unemployment by increasing cost of imported intermediate and capital goods for the case where labor and imported inputs are complements and by increasing wages due to price increase expectations as well as because of liability dollarization causing negative effect on balance sheets (Campa and Goldberg, 2001; Galindo et al., 2007; Demir, 2010; Nucci and Pozzolo, 2010; Goncalves and Rodrigues, 2017).

Previous empirical studies showed that exchange rate appreciation (depreciation) influence labor markets, significantly and negatively (positively) (see for example, Branson and Love, 1988; Edwards, 1989; Revenga, 1992; Burgess and Knetter, 1998; Gourinchas, 1998; Gourinchas, 1999; Goldberg and Tracy, 2000; Campa and Goldberg, 2001; Klein, Schuh and Triest, 2003; Bilgin, 2004; Ribeiro et al., 2004; Frenkel and Ros, 2006; Milas and Legrenzi, 2006; Galindo et al., 2007; Chang, 2010; Demir, 2010; Moser, Urban and di Mauro, 2010; Nucci and Pozzolo, 2010; Boz, 2013; Ayhan, 2016; Ay and Ayhan, 2016; Mpofu and Nikolaidou, 2018; Usman and Elsalih, 2018). In contrary to these studies, Berument, Dogan and Tansel (2006) and Bakhshi and Ebrahimi (2016) found that exchange rate devaluation and depreciation increase unemployment.

On the other hand, exchange rate volatility can also influence real economy besides exchange rate itself as shown by previous studies (Demir, 2010; Demir, 2013). According to Demir (2010), although conclusions of theoretical studies are diverse based on many different assumptions and channels through which firms' investment and employment decisions are affected by exchange rate volatility (see

for example, Darby, Hallett, Ireland, and Piscitelli, 1999), most of empirical studies have a consensus for adverse effect. After the collapse of Bretton-Woods system, increase in volatility of exchange rates affects international trade and efficiency in factor allocation adversely due to risk avoidance of producers facing with increase in uncertainty related to exchange rates. There are different channels through which exchange rate volatility affects economy such as growth (Demir, 2013), international trade (Belke and Gros, 2001; Demir, 2013), international capital flows and investment channels (Ayhan, 2016; Demir, 2013).

Exchange rate volatility affects investment, economic growth and employment by changing relative costs of production, influencing wages, credit availability from financial markets, interest rates and inflation uncertainty (Demir, 2013). Moreover, exchange rate volatility may reduce desirability of firms' additional labor hiring directly or through investment channel as one can argue that employment decisions may be irreversible because of sunk costs associated with them (Belke and Gros, 2001; Belke and Kaas, 2004; Chang, 2011; Feldmann, 2011; Mpofu and Nikolaidou, 2018). Increased volatility may have adverse impacts on international capital flows, especially portfolio investments which are short term resulted in appreciation of domestic currency. It may decrease international trade volume as a result of increase in risk for traders (transaction risk), sunk costs, impossibilities of intra-industry trade, reallocation of production and price discrimination between domestic and foreign markets. There are also other reasons for the effect of exchange rate volatility resulted from labor market structure, itself. According to Andersen and Sørensen (1988) and Belke and Kaas (2004), strong trade unions may lead to wage increase when exchange rate becomes more volatile (Feldmann, 2011; Mpofu and Nikolaidou, 2018). For detailed explanation, one can refer to Ayhan (2016) and Demir (2013). In addition, as suggested by Belke and Kaas (2004), Belke (2005) and Demir (2010), this effect of exchange rate volatility becomes severe for emerging market countries because of many factors including for example, dollarization, inefficient financial markets, low financial development (especially in the derivatives markets), etc.

Some studies showed that exchange rate volatility affects labor markets, adversely (see for example, Stirböck and Buscher, 2000; Belke and Gros, 2001; Belke and Setzer, 2003; Belke and Kaas, 2004; Belke, 2005; Demir, 2010; Chang, 2011; Feldmann, 2011; Mpofu and Nikolaidou, 2018). The studies for Turkey showed statistically significant impacts of exchange rate fluctuations and its volatility on labor market except Selim and Güven (2014) and Kaplan (2009). Different from previous studies for Turkey, this study considers structural breaks in the time series, includes additional factor which may affect unemployment in Turkey, which is liability dollarization and employ the most recent data as of 2019. All these issues need to be examined through a deep research. First, consideration of structural breaks is important as structural breaks affect inference, forecasting

performance and accuracy of policy recommendations (Hansen, 2001). The period under investigation includes the periods of 2008 Global Financial Economic Crisis, large depreciations and exchange rate fluctuations. Therefore, one can expect highly probable existence of structural breaks in time series during this period. In addition, as discussed by Galindo et al. (2007), liability dollarization may have adverse effects on unemployment through its balance sheet effects. Ignoring this factor may lead to omitted variable bias. Lastly, as the years 2018 and 2019 witnessed large depreciation in the exchange rate and high exchange rate volatility, respectively, this calls for an analysis of their effects on macroeconomic variables. Like the studies performed by Berument et al. (2006) and Kaplan (2009), VAR model was used to consider endogeneity.

The organization of the study is as follows. After introduction, literature review is presented in the second section. Section three discusses issues related to model and methodology. Section four gives information related to data. Empirical results are presented in section five. Last section concludes with policy recommendations.

2. Effect of Exchange Rate and its Volatility on Labor Markets: Literature Review

There are many theoretical and empirical studies analyzing labor market influences of real exchange rate swings. Islam and Hengge (2015) provide a brief literature review on this relationship in the context of employment. Ay and Ayhan (2016) also reviewed empirical literature on the relationship between employment, exchange rate and exchange rate volatility. Using various models and assumptions, theoretical studies showed labor market effects of exchange rate movements and uncertainty (Rama, 1992; Obstfeld, 1997; Gourinchas, 1998; Gourinchas, 1999; O'Shaughnessy, 2000; Belke and Setzer, 2003; Belke and Kaas, 2004; Bekkers and Francois, 2014; Choi and Choi, 2018).

As highlighted by Klein et al. (2003), in order to analyze impact of adjustment costs related to trade and thus, international factors on employment, earlier studies focused on the manufacturing sector and generally found adverse effect of exchange rate appreciation on employment (see for example, Grossman, 1987; Branson and Love, 1988; Revenga, 1992; Sachs, Shatz, Deardorff, and Hall, 1994; Burgess and Knetter, 1998; Gourinchas, 1998; Goldberg and Tracy, 2000; Campa and Goldberg, 2001; Klein et al, 2003).

Among these studies, some of them focused on only one country. For example, Branson and Love (1988), Revenga (1992), Gourinchas (1998), Goldberg and Tracy (2000), Campa and Goldberg (2001) and Klein et al. (2003) analyzed the U.S. manufacturing industry for different time periods. There are also other studies performed for manufacturing sector and one country, only. For France, Gourinchas (1999) showed that real appreciation and higher interest rates decrease

tradable employment, whereas, results of this study indicate opposite effects of positive aggregate shocks. Furthermore, import competing industries were found to be more responsive to exchange rate swings compared to exporting ones. Ribeiro et al. (2004) found asymmetric effects of both trade openness and real depreciation for Brazilian manufacturing sector. Real devaluation and depreciation were found to have favorable impacts on job creation and net employment growth. The findings of one more study by Nucci and Pozzolo (2010) showed adverse and significant effects of exchange rate appreciation through revenue channel for Italian manufacturing firms. But positive effect was found if cost channel is considered. For Taiwan, Chang (2010) found that although in the long run, appreciation decreases employment; effect of exchange rate on labor demand and labor productivity is not statistically significant in the short run over the period from 1981 to 2008. Other studies for manufacturing sector analyzed country groups. For example, findings of Edwards (1989) indicated negative effect of real exchange rate appreciation on employment in the developing countries (Usman and Elsalih, 2018). For Latin American countries, although Galindo et al. (2007) found positive influence of real exchange rate depreciation on employment, especially for the industries which have high export-orientation, findings showed that with high liability dollarization, depreciation decreases employment.

Some studies considered other sectors, also. For instance, Goldberg et al. (1999) analyzed asymmetric effects of appreciations and depreciations on the probability of job and industry changing of U.S. workers in the private nonagricultural sectors covering the period from 1977 to 1996. Their result showed that effects change over time and across industry depending on the degree of export orientation and imported input usage. Overall, they found that appreciation reduces job instability when they allow for asymmetric effects of appreciations and depreciations. As another example, Burgess and Knetter (1998) investigated effect of exchange rate movements on labor employment at the industry level including 14 industries for G-7 countries over the period between 1970 and 1988. Based on a simple open economy model, they found that appreciation leads to decline in employment.

Other studies without considering sectoral differences performed their analysis at the firm level. For instance, Moser et al. (2010) found statistically significant effect of exchange rate fluctuations on employment through its effect on job creation for a sample of German firms covering the years 1993-2005.

Another group of studies employed macro level data for their analyses. For the UK, Milas and Legrenzi (2006) showed that there is a decline in the short run unemployment following depreciation because of improvement in competitiveness when real exchange rate is highly away from its equilibrium level. On the other hand, findings of Bakhshi and Ebrahimi (2016) indicated adverse long run and short run effects of exchange rate increases

(devaluation/depreciation) on labor markets, i.e., increase in unemployment for Iran over the period 1981-2012. They cannot obtain significant results for the effects of import and export. But economic growth was found to significantly increase unemployment in the short run and the long run. Usman and Elsalih (2018) showed the evidence of long run relation between unemployment and real exchange rate for Brazil between 1981 and 2015 using monthly data. In the short run, symmetric and favorable effect of depreciation was found. For the long run, findings indicated stronger effect of depreciation due to downward price rigidities.

Studies for Turkey at the macro level showed statistically significant impacts of exchange rate fluctuations except Selim and Güven (2014). Berument et al. (2006) examined effects of various macroeconomic variables on unemployment differentiating by gender and educational level. They used VAR model and quarterly data over the period from 1988 to 2003. They found that exchange rate depreciation affects unemployment significantly and positively only for subgroups of female with less than primary school education and primary school education and male with high school education following initial periods after the shocks. Other findings showed short run effect of interbank interest rate, long run effects of price shocks and both short run and long run effects of income shocks. Another study by Bilgin (2004) showed that 1% change in exchange rate decreases unemployment rate by 0.0307 unit and 1 unit increase in real exchange rate (appreciation) increases unemployment rate by 0.125 units for the period 1995-2004. Boz (2013) employed quarterly data over the period between 2003 and 2012 in order to analyze effects of real exchange rate, national income and labor force capacity on unemployment rate. Results indicate negative effects of real exchange rate, national income and labor force capacity on unemployment, but effect of depreciation on unemployment was found to be realized with 2 period lags. Selim and Güven (2014) investigated short run and long run relations between unemployment, real exchange rate and inflation covering the years 1990-2012. They found that unemployment causes inflation. In the long run, findings indicated absence of any long run relation among the variables considered. Granger Causality test results showed that there is only causality running from real exchange rate to CPI.

There are also cross-country studies that employed macro level data. However, among them, Caporale and Pittis (1995) and Feldmann (2013) analyzed impact of exchange rate regimes on unemployment. Caporale and Pittis (1995) performed their analysis for 18 OECD countries for the period between 1960 and 1991 using monthly data. Their result showed the invalidity of neutrality hypothesis in the context of nominal exchange rate regime; higher persistency in unemployment and real interest rate under floating exchange rate; and, higher unemployment volatility in post-Bretton Woods period. Frenkel and Ros (2006) investigated effect of real effective exchange rate on unemployment for a panel of 17 Latin American and Caribbean countries over the period from 1990 to 2002. They also

analyzed Argentina, Brazil, Chile and Mexico, separately, between 1980 and 2003. Their results showed that depreciation results in unemployment decline. Feldmann (2013) analyzed effect of exchange rate regimes on unemployment for 78 countries over the period 1980-2008. This study found that as a result of decline in transaction costs and policy uncertainty, unemployment declines by changing the regime from floating to pegged or intermediate which also promote growth, trade, investment and labor demand. Findings of this study further showed desirable effects of GDP growth, inflation and real interest rate decrease on unemployment. However, regulation, taxes, openness, real effective exchange rate shock and terms of trade shock were found to have insignificant impacts.

Another group of studies included also exchange rate volatility into their analysis. Most of the studies showed adverse effect of it on labor markets (see, Stirböck and Buscher, 2000; Belke and Gros, 2001; Belke and Setzer, 2003; Belke and Kaas, 2004; Belke, 2005; Demir, 2010; Chang, 2011; Feldmann, 2011; Mpofu and Nikolaidou, 2018).

For Turkey, Kaplan (2009) analyzed impacts of real exchange rate volatility on unemployment and growth between 1989 and 2007 by employing a VAR model. The effect of volatility was found to be statistically significant only on manufacturing industry growth rate. Demir (2010) found negative effect of real exchange rate volatility and appreciation on employment growth using panel data on 691 private firms in Turkey between 1983 and 2005. The results further indicated that negative effect becomes much more severe as export shares and leverage ratio increase. Ay and Ayhan (2016) found negative but statistically insignificant long run and short run impacts of exchange rate volatility on employment for Turkey over the period from 2003 to 2014. Their results showed presence of cointegration among employment, import, export, industrial production, real exchange rate and real exchange rate volatility. Their findings indicated favorable and statistically significant effects of industrial production index and export, however, adverse effect of real exchange rate.

For Germany, Jung (1996) examined causal relationship between exchange rate volatility and unemployment using Granger Causality Test between 1978 and 1996. This study obtained the following result that direction of causality runs from change in unemployment rate to exchange rate volatility. By employing both AR models and dynamic version of Okun's Law as well as different exchange rate volatility measures for short-term and long-term volatility, Stirböck and Buscher (2000) found that exchange rate volatility increases unemployment for Germany between 1973 and 1997.

Belke and Gros (2001) showed that short run exchange rate volatility lead to higher unemployment and lower employment and investment for European Monetary Union countries covering the period from 1973 to 1996. Seemingly Unrelated Regression (SUR) estimation of model shows importance of investment

channel for the impact of exchange rate variability on other variables. For Visegrád countries, findings of Belke and Setzer (2003) indicated positive effect of exchange rate volatility on unemployment controlling for real wage growth and real GDP growth rates over the period 1991-2001. In order to understand benefits of monetary integration with euro zone or alternatively, fixing exchange rates against euro for Central and Eastern European countries, Belke and Kaas (2004) investigated influence of exchange rate volatility on employment for the years 1992-2001. Controlling for economic growth, real wage growth and labor market rigidities and using different volatility measures, they found negative effect of exchange rate volatility on employment growth. This result was shown to be robust when homogeneous group of countries with similar labor market regulations was analyzed. As trade openness increases and economic ties become stronger with euro zone, their results further showed that adverse effects of volatility become stronger. Belke (2005) analyzed effect of exchange rate volatility on unemployment for 10 Central European countries for the period between 1990 and 2001. The results showed significant effects of real GDP growth and exchange rate volatility on unemployment. Finding of further analysis indicated that as trade openness increases, effect of exchange rate volatility becomes much more significant.

For South Korea and Taiwan, Chang (2011) examined interrelations between exchange rate uncertainty and unemployment over the period from 1984 to 2004. Findings of this study indicated that there is evidence of cointegrating relation between exchange rate volatility and unemployment. Also, short run positive effect of exchange rate uncertainty on unemployment was found for South Korea. Moreover, results showed the other direction of short run effect, i.e., from unemployment to exchange rate uncertainty for both countries.

Feldmann (2011) investigated effects of exchange rate volatility on unemployment for 17 industrial countries over the period from 1982 to 2003. The study's results showed unfavorable effect. This study considered also other factors influencing unemployment, such as, structural factors related to labor, money and goods markets, output gap, interaction of exchange rate volatility and output gap, openness, total factor productivity shock, terms of trade shock and interest rate shock. The results indicated the significance and importance of the other factors.

For South Africa, Mpofu and Nikolaidou (2018) analyzed impact of exchange rate volatility and exchange rate fluctuations on employment level. For the period from 1995: Q3 to 2015: Q2, their results showed negative effects of real exchange rate volatility. Besides, they found negative short run effects of real appreciation, export increase, tax increase and real wage growth on employment growth, as well as, positive short run impacts of manufacturing output growth and unemployment growth. Their findings also indicated long run negative effects of increases in the long-term interest rates and exports on employment level. Long

run positive effects of manufacturing output and tax increases were found, also. Further, their results showed that 2008/2009 Global Financial Crisis and technological progress adversely affect employment in South Africa, however, they found favorable effects of hedging on both employment and its growth.

3. Methodology and Data

There are many factors causing unemployment which are explained by Modigliani (1996), such as insufficient aggregate demand and some other supply side factors, for example, high real wages, provision of unemployment benefits, mismatch of qualifications, long-term unemployment, minimum wages, and foreign trade. Based on data availability, in order to analyze effect of exchange rate movements and its volatility on unemployment, model in equation (1) was used;

$$unempgap_t = \alpha_0 + \alpha_1 lgdpgap_t + \alpha_2 inflation_t + \alpha_3 libdollar_t + \alpha_4 lreexcr_t + \alpha_5 vol_t + \alpha_6 openness_t + \alpha_7 interest_t^{TR} + \alpha_8 interest_t^{EU} + \varepsilon_t \quad (1)$$

In equation (1), unemployment gap (unempgap) was given as a function of output gap (lgdpgap), inflation rate (inflation), liability dollarization (libdollar), real effective exchange rate (lreexcr), exchange rate volatility (vol), trade openness ratio (openness), domestic interest rate ($interest^{TR}$) and foreign interest rate ($interest^{EU}$). However, to account for endogeneity among the variables, VAR analysis was performed. Exchange rate volatility was calculated using GARCH models. Detailed information on VAR analysis and GARCH models can be found in Enders (2010). However, as VAR analysis is main technique used in this study, brief information can be provided as follows. Main advantages of VAR analysis are consideration of dynamics, endogeneity and feedback effects among the variables. A priori, there is not any need to determine exogenous variables. All variables are taken as endogenous. For analysis and forecasting of economic activity at macro level, it is mentioned as a useful tool (Greene, 2003). It allows for testing causal effects and impacts of policies by employing Granger causality test and impulse-response functions. A typical VAR model can be shown in equation (2);

$$y_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 y_{t-2} + ... + \beta_p y_{t-p} + u_t \quad (2)$$

In equation (2), y_t is a vector of variables shown in equation (1) which are unempgap, lgdpgap, inflation, libdollar, lreexcr, vol, openness, $interest^{TR}$ and $interest^{EU}$. OLS estimations of each equation provide consistent and asymptotically efficient estimates of coefficients (Enders, 2010).

The expectations can be explained related to the effects of different factors, as follows. Okun's (1962) Law conjectures a negative relation between

unemployment and output. Therefore, a priori, as output increases, unemployment is expected to decrease. Furthermore, although according to Phillips curve concept, there is an inverse relationship between unemployment and inflation, during 1970's high unemployment was occurred simultaneously with high inflation, which is known as situation of stagflation. Therefore, inflation may decrease or increase unemployment. There are three different channels through which inflation can affect unemployment as discussed by Feldmann (2013). Firstly, inflation causes distortions in relative prices and price signals, therefore, because of inefficient resource allocation, unemployment increases. Secondly, through its adverse effect on real net return on investment which leads to decline in investment and growth, long run unemployment may increase. Thirdly, based on downward rigidity of nominal wages, inflation may lead to adjustment in real wages which may reduce unemployment.

Real effective exchange rate appreciation affects price competitiveness of exports adversely, therefore may increase unemployment. But it decreases cost of imported inputs and thus, may decrease unemployment. As real exchange rate volatility increases, unemployment is expected to increase through its negative effect on growth, investment, international trade, international capital flows and employment.

Another factor is trade openness ratio in the model. Grossman and Rossi-Hansberg (2008) discussed that trade openness may reduce unemployment by ensuring efficient allocation of labor, internationally (Feldmann, 2013). In addition, Dutt, Mitra and Ranjan (2009) found that increase in trade openness significantly reduces unemployment. They stated that this is in line with Ricardian prediction in which comparative advantage is based on relative technological differences in countries. This dominates Heckscher-Ohlin effect in which comparative advantage is based on relative factor endowment differences across countries. According to Heckscher-Ohlin prediction, there will be a positive effect of trade openness on unemployment for capital-abundant countries, however, negative effect will be found for labor-abundant countries (Dutt et al., 2009). Felbermayr, Prat and Schmerer (2011) found that in the long run, increase in total trade openness is associated with reduction in aggregate structural unemployment rate for 20 OECD countries over the period 1983-2003 and for 62 countries between 1990 and 2007.

Following Galindo et al. (2007), dollarization of liabilities is included to examine balance sheet effects. According to them, if portion of debt denominated in foreign currency is high, depreciation will lead to an increase in financial burden which can also cause liquidity constraint. Also because of currency mismatch, net worth of firm will decline. Therefore, negative consequences of dollarization can be resulted such as unemployment increase which is our focus.

As discussed by Gourinchas (1999), in order to control for the shifts in domestic and foreign monetary policy on exchange rate fluctuations and aggregate demand, 3 months T-bill rate of Turkey and US Federal Fund rate or Eurozone or EU T-bill rate can be included into the model. Furthermore, money supply and money market interest rates can be used as a proxy for monetary policy shocks (Klein et al., 2003; Nucci and Pozzolo, 2010). Money market interest rates can also be added as a proxy for cost of capital (Galindo et al., 2007). The expectation is adverse impact of domestic interest rate increase based on Keynesian model. As, low foreign interest rate causes capital inflows and thus, appreciation, this will lead to decrease in the competitiveness of a country but decreases cost of imported inputs. Therefore, effect of changes in foreign interest rate is ambiguous.

In the analysis, quarterly data were employed. Data cover the period from 2005: Q4 to 2019: Q1. All the data were obtained from Eurostat except liability dollarization and seasonally adjusted by Census X-13 and X-12. Liability dollarization was calculated based on data taken from Electronic Data Delivery System of CBRT. Following set of time series was employed: monthly real effective exchange rate (consumer price index (CPI) based, 2010=100, 42 trading partners), quarterly real effective exchange rate (CPI based, 2010=100, 42 trading partners), Group of Twenty CPI (2010=100), gross domestic product (chain linked volumes, 2010 based, million Euro, unadjusted data), exports of goods and services (percentage of gross domestic product (GDP), unadjusted data), imports of goods and services (percentage of GDP, unadjusted data), total unemployment rate (percentage of active population, unadjusted data), money market interest rates (day-to-day rates), foreign currency denominated credits and total credits, foreign currency denominated or indexed domestic debt, foreign debt stock and nominal GDP (by consumer prices).

Real GDP and real effective exchange rate series were transformed into natural logarithms. Increase in the real effective exchange rate implies appreciation of TL against currencies of 42 trading partners. Inflation rate was obtained using CPI. Trade openness ratio was calculated by summing exports and imports of goods and services as a share of GDP.

As defined in Metin-Özcan and Us (2009) and Akıncı, Özer and Usta (2005), liability dollarization was obtained by taking arithmetic averages of following ratios: ratios of foreign currency denominated credits to total credits, foreign currency denominated or indexed domestic debt to total debt stock and share of foreign debt stock in GDP. In order to obtain unemployment and output gaps, HP filter was used.

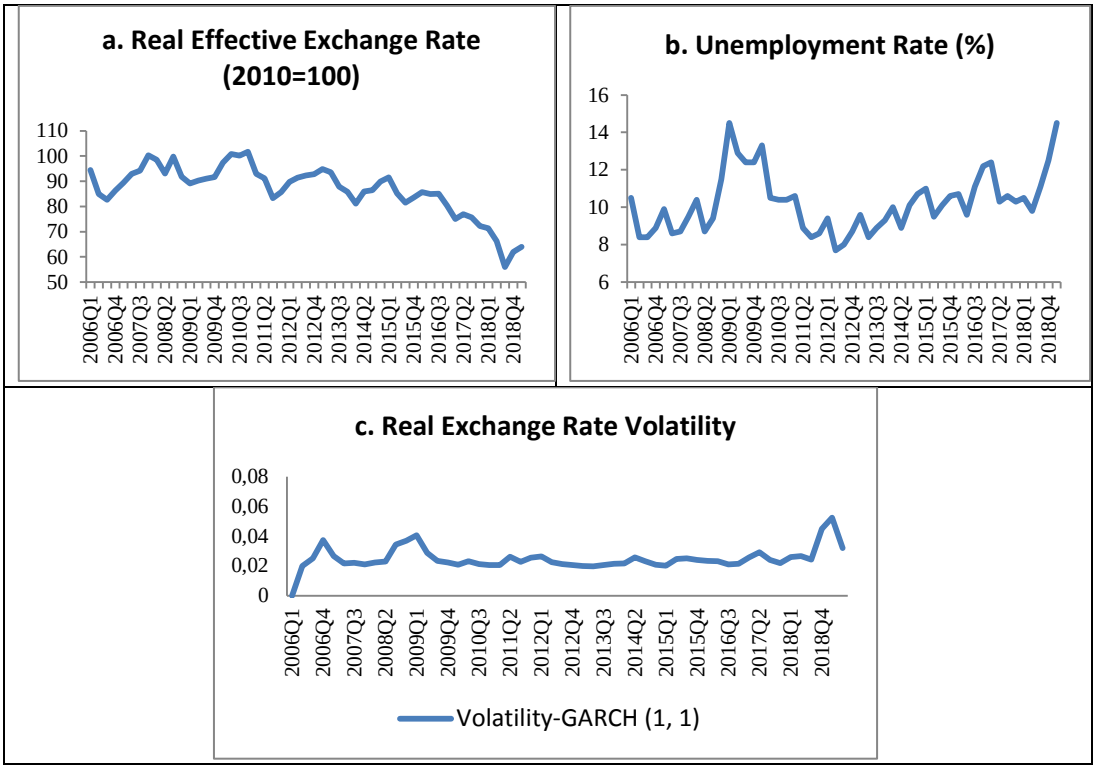

Figure 1: Real Effective Exchange Rate, Unemployment Rate and Real Exchange Rate Volatility (2006-2019)

Volatility calculation was based on monthly data, but averages were taken to obtain quarterly volatility series as high frequency data can give better volatility estimates. In order to obtain volatility measure, conditional variance obtained from GARCH models was employed. Based on Box-Jenkins methodology, first ARMA model was estimated and as there is evidence of ARCH effects in the residuals, GARCH models were estimated. The information criteria and diagnostic tests (such as autocorrelation, ARCH and leverage effects tests) showed that ARMA (8, 3)-GARCH(1, 1) model[2] is suitable for volatility (vol) calculation.

Figure 1 demonstrates historical evolution of real effective exchange rate, unemployment rate and real exchange rate volatility measures. In year 2009, one can witness sharp increase in unemployment as a result of 2008 Global Financial Crisis which is associated with also real depreciation of exchange rate and increase in its volatility. During the whole period under investigation, there are periods of appreciation and depreciation. However, after the second quarter of 2017, TL depreciated continuously until the fourth quarter of 2018. The reflection of this was first a tendency of decline in unemployment but then, unemployment started to increase after second quarter of 2018. Also, exchange rate volatility

[2] For the estimation and selection of models, detailed results can be obtained from the author upon request.

reached the highest level at the first quarter of 2019. Therefore, without further analysis, it is difficult to determine the effects of exchange rate and its volatility on unemployment.

4. Empirical Results

Results of unit root tests given in Table 1 show that all the variables are stationary when one considers structural breaks in the time series by employing Fourier ADF and KPSS tests except $interest^{TR}$ and lreexcr. Domestic interest rate and real effective exchange rate were found to be I(1) linear series regardless of the consideration of structural breaks and nonlinearity.[3] Moreover, Johansen multivariate cointegration test indicates that there is not any evidence of long run relation between I(1) variables.[4] Therefore, analysis is performed by taking first difference of nonstationary variables, which are domestic interest rate and real effective exchange rate.

VAR model was estimated including all the variables given in equation (1),[3] but due to serious collinearity problem, $interest^{EU}$ was excluded from the model. Estimation of VAR model was performed by determining lag length as 2 based on the information criteria (FPE and LR test statistic) as shown in Table 2. Also, in order to account for heteroscedasticity problem and structural change, dummy variable was added for 2009: Q1 (dum0901). After the 2008 Global Financial Crisis, as a reflection on the economy of Turkey, unemployment rate increased rapidly to its peak level of 14.5% in the first quarter of 2009 accompanied by real depreciation of TL and sharp increase in real exchange rate volatility as seen in Figure 1. Figure 2 demonstrates that VAR stability condition is satisfied.

[3] For these time series, various nonlinear unit root tests were performed such as Kapetanios, Shin and Snell (2003) (KSS), Leybourne, Newbold, and Vougas (1998) (LNV), Sollis (2004) and Sollis (2009). KSS test indicates that series are linear with unit root against stationarity with ESTAR type nonlinearity. Test statistics were found to be as -2.225 and -2.088 for lreexcr and $interest^{TR}$, respectively. Critical values for KSS tests are -3.13, -3.4 and -3.93 at 10%, 5%, 1% statistical significance levels. LNV tests validate results of KSS tests but alternative hypothesis is stationarity with LSTAR type nonlinearity in this case. Allowing for nonlinearity in intercept (model B) and both intercept and trend (model C), test statistics are as follows: -4.386 and -3.575 for lreexcr and -3.749 and -3.508 for $interest^{TR}$. Critical values for model B (model C) are -4.636, -5.053, -5.77 (-4.99, -5.395, -6.135) at 10%, 5%, 1% statistical significance levels. Sollis (2004) also developed a nonlinear unit root test statistic, t_{max} and F statistics in order to test Smooth transition TAR stationarity. Results related to t_{max} (F) statistics can be given for already mentioned model B and C as follows: -3.9727 (14.6694) and -3.7782 (15.3610) for lreexcr and -2.4949 (6.9436) and -2.0355 (6.7953) for $interest^{TR}$. Critical values of t_{max} statistics for model B (model C) are -3.789, -4.075, -4.737 (-4.045, -4.365, -4.967) at 10%, 5%, 1% statistical significance levels. Critical values of F statistics for model B (model C) are 11.437, 13.442, 17.635 (13.203, 15.151, 19.74) at 10%, 5%, 1% statistical significance levels. Based on asymmetric ESTAR model, Sollis (2009) introduced another unit root test statistics ($F_{AE,t}$). Test statistics were found as 2.609 for lreexcr and 2.366 for $interest^{TR}$. Critical values of $F_{AE,t}$ statistics are 5.67, 6.593 and 8.711 at 10%, 5%, 1% statistical significance levels. In summary, these series are linear nonstationary processes. KSS tests show that other series except $interest^{EU}$ are also linear I(1) series without considering structural breaks. Test statistics for lgdpgap, lreexcr, openness, libdollar, $interest^{TR}$ and $interest^{EU}$ are -3.644, -2.225, -2.182, -2.328, -2.088 and -4.067, in order. Therefore, analysis was performed under the consideration that all series are linear for the period analyzed.

[4] Results were not presented in order to save space but can be available upon request.

Table 1: Unit Root Tests

	ADF	PP	KPSS	Ng-Perron		Fourier	Fourier
				MZ_a	MZ_t	ADF	KPSS
inflation	-6.737***	-6.727***	0.141*	-25.96***	-3.555**	-7.727*** {1} [3.882]	0.332*** {1} [3.882]
Δinflation	-9.223***	-24.31***	0.161	-20.28***	-2.878***		
lgdpgap	-2.930	-2.647	0.076	-26.52***	-3.606***	-3.360** {2} [5.179**]	0.042 {2} [5.179**]
Δlgdpgap	-7.343***	-7.343***	0.065	-12.79**	-2.509**		
lreexcr	-1.782	-1.782	0.205**	-6.832	-1.698	-3.079 {1} [49.2***]	0.062** {1} [49.2***]
Δlreexcr	-6.949***	-6.949***	0.157	-21.03***	-3.200***		
openness	-2.169	-2.324	0.097	-9.453	-2.078	-3.601** {2} [37.8***]	0.125* {2} [37.8***]
Δopenness	-6.926***	-6.931***	0.090	-0.085	-0.059		
unempgap	-3.699**	-2.455	0.053	-54.83***	-5.180***	-3.985*** {2} [10.1***]	0.039 {2} [10.1***]
Δunempgap	-3.097**	-3.305**	0.082	-14.42***	-2.320**		
vol	-4.227***	-3.442**	0.191	-44.56***	-4.690***	-5.278*** {1} [6.87***]	0.211** {1} [6.87***]
Δvol	-6.769***	-6.189***	0.141	-66.29***	-5.420***		
libdollar	-2.322	-0.935	0.069	-28.50***	-3.274**	-4.205*** {2} [59.6***]	0.075 {2} [59.6***]
Δlibdollar	-5.587***	-5.587***	0.290	-24.44***	-3.414***		
$interest^{TR}$	-0.793	0.753	0.223	-7.305	-1.611	-3.354 {1} [55.3***]	0.055** {1} [55.3***]
$\Delta interest^{TR}$	-4.270***	-4.308***	0.391*	-19.99***	-3.155***		
$interest^{EU}$	-2.508	-2.028	0.146*	-19.48**	-3.101**	-5.025*** {1} [57.2***]	0.044 {1} [57.2***]
$\Delta interest^{EU}$	-3.303**	-3.419**	0.076	-53.81***	-5.186***		

As visual inspection of all the series indicate that series contain intercept and trend except vol series which contain only intercept, these deterministic terms are included to the unit root test equations. In all tests, null hypothesis is non-stationarity except KPSS and Fourier KPSS. Critical values for ADF and PP are obtained from MacKinnon (1996). Critical values of KPSS test, Ng-Perron, Fourier ADF and Fourier KPSS tests can be found in Table 1 of Kwiatkowski-Phillips-Schmidt-Shin (1992), Table 1 of Ng-Perron (2001), Table 1 of Christopoulos and León-Ledesma (2010) and Table 1 of Becker et al. (2006), respectively. Lag length selection is based on SIC by taking maximum lag length as 10 for ADF and Ng-Perron tests. PP and KPSS tests were performed using Bartlett kernel spectral estimation method and bandwidth was automatically selected based on Newey-West Bandwidth. *, **, *** show statistical significance of test statistics at 10%, 5%, and 1%, respectively. Δ indicates first difference. Significance of Fourier terms is tested, and test statistics are given in square brackets. Frequency selected by minimizing SSR is shown in curly brackets.

Table 2: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SIC	HQ
0	-68.75491	NA	4.72e-09	3.531455	4.155188	3.767164
1	66.89789	214.7836	2.50e-10	0.545921	3.664589*	1.724470*
2	144.5189	97.02622*	1.84e-10*	-0.021620	5.591983	2.099769
3	222.1214	71.13562	2.16e-10	-0.588390	7.520148	2.475838
4	311.1310	51.92231	4.48e-10	-1.630460*	8.973012	2.376608

* shows lag order selected by the criterion. LR: sequential modified LR test statistic (each test at 5% level), FPE: Final prediction error, AIC: Akaike information criterion, SIC: Schwarz information criterion, HQ: Hannan-Quinn information criterion. Endogenous variables are Δlreexcr, vol, $\Delta interest^{TR}$, unempgap, inflation and variables that are transformed by Fourier approximation (fopenness, flgdpgap and flibdollar). Exogenous variables are constant and dum0901.

Table 3: Autocorrelation and Heteroscedasticity Tests

VAR Residual Serial Correlation LM Tests		
Lag	LM statistic	Probability
1	61.24638	0.5745
2	52.66906	0.8432
3	60.36790	0.6057
VAR Residual Heteroskedasticity Test (Levels and Squares)		
Df	Chi-square Statistic	Probability
1188	1184.708	0.5215

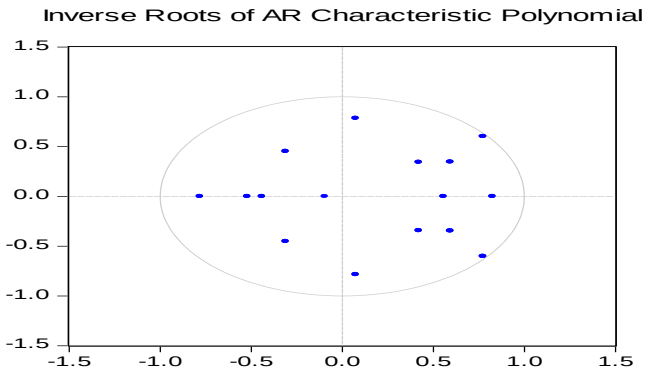

Figure 2: VAR Stability Condition

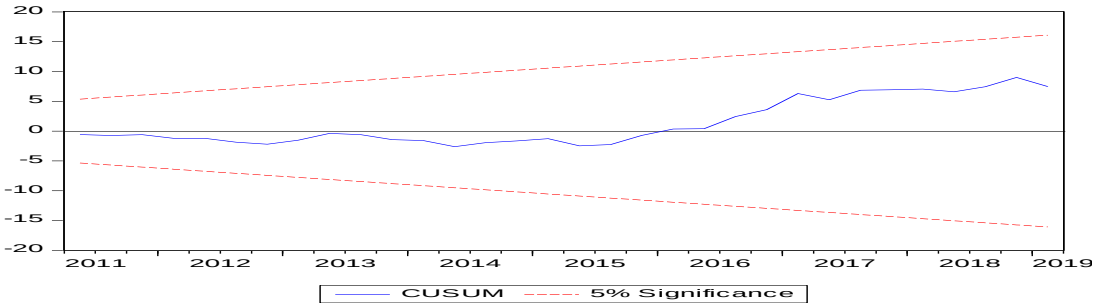

Figure 3: CUSUM Test for the stability of coefficients in unempgap equation

Table 3 and Figure 3 show that there is not any evidence of autocorrelation, heteroscedasticity, nonlinearities and structural breaks. Therefore, further analysis is based on this model.

Figure 4 illustrates orthogonalized impulse responses of one standard innovation for 10 periods. Cholesky ordering is based on the results of block exogeneity test presented in Table 4. Ordering is as follows: fopenness, Δlreexcr, flgdpgap, vol, $\Delta interest^{TR}$, unempgap, flibdollar and inflation. Table 4 shows that the most exogenous variable is fopenness, whereas inflation is the least exogenous. In Figure 4, confidence bands for the impulse responses are given within 2 standard error range corresponding to 95% confidence interval. Standard errors are calculated using Monte Carlo simulations with 1000 repetitions. Figures show impulse responses to shocks from the following variables: trade openness ratio (fopenness), real effective exchange rate (Δlreexcr), real GDP gap (flgdpgap), real exchange rate volatility (vol), domestic interest rate ($interest^{TR}$), unemployment gap (unempgap), liability dollarization (flibdollar) and inflation rate (inflation). Therefore, one can analyze effect of one standard deviation shock from these variables on the pattern of unemployment rate in the future. Figure 4 indicates that responses of unemployment tend to zero to different shocks and responses show cyclical pattern. Unemployment gap responds statistically significantly and positive to its own innovation for the first 2 quarters and this response declines over time. As expected, exchange rate volatility shocks increase unemployment statistically significant up to the quarter 3. Response of unemployment is positive and statistically significant to one standard deviation inflation shock for the first quarter, only. Furthermore, unemployment gap responds statistically insignificant to trade openness ratio, real effective exchange rate, real GDP gap, domestic interest rate and liability dollarization. Trade openness ratio, domestic interest rate and liability dollarization (real effective exchange rate and real GDP gap) shocks increase (decrease) unemployment first, and then decrease (increase) it.

The orthogonalized forecast error variance decomposition for variable unempgap is given in Figure 5. From Figure 5, one can see percentage of forecast error which can be explained by innovations in itself and in all other variables at different horizons. In the short run, most of the variability in unempgap can be attributed to its own shocks and they account for 61.69% of variance in the first period and this gradually reduces to 15.18% in 10 periods. Therefore, current shock on unemployment gap has effect on both short run and long run unemployment gap.

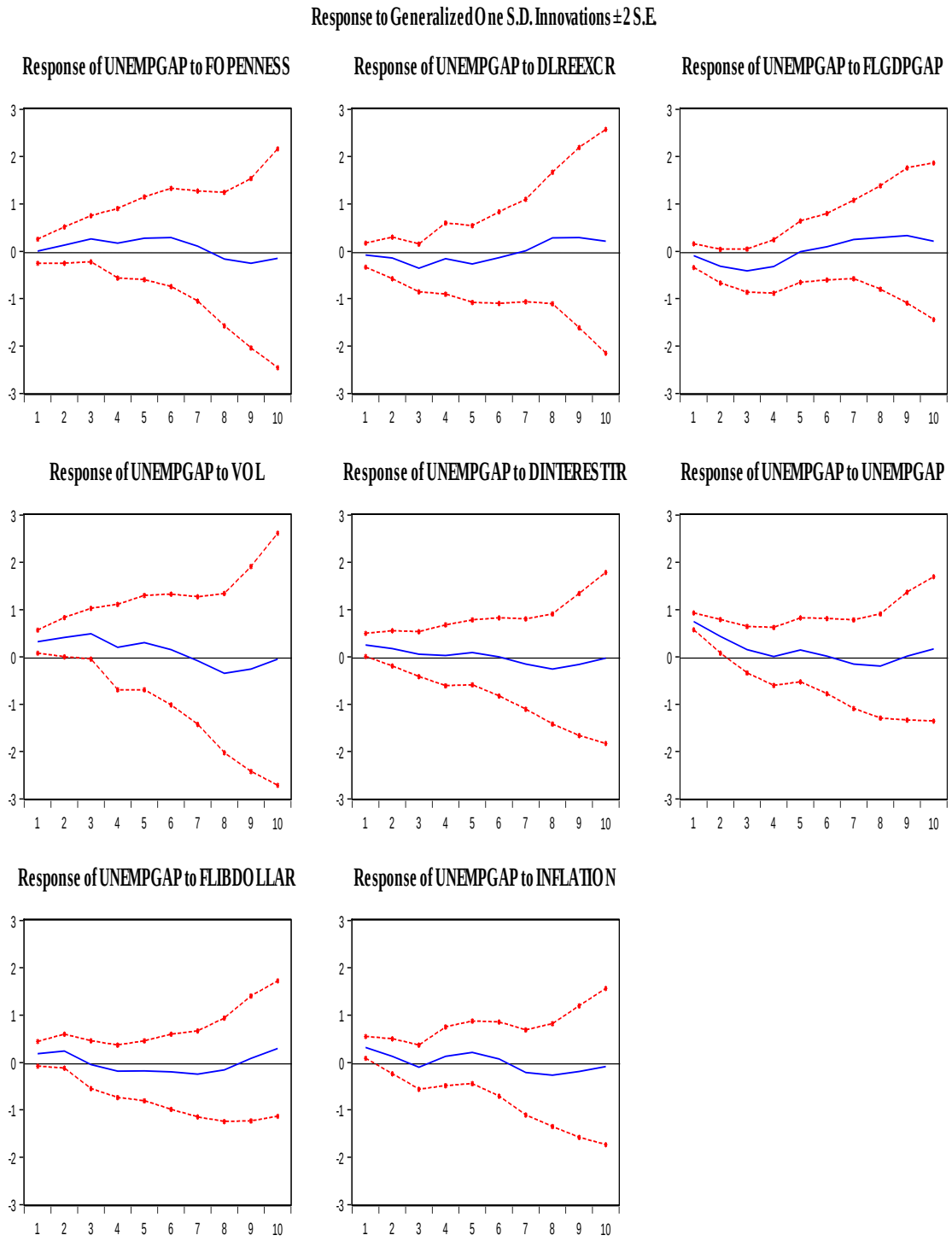

Figure 4: Impulse-Response Functions for unempgap

Table 4: Block Exogeneity Tests

Dependent variable	Chi-sq	Df	Prob.
fopenness	7.033763	14	0.9334
Δlreexcr	14.90371	14	0.3848
flgdpgap	23.28894	14	0.0557
vol	24.36467	14	0.0414
$\Delta interest^{TR}$	32.47281	14	0.0034
unempgap	41.89918	14	0.0001
flibdollar	51.63486	14	0.0000
inflation	51.49784	14	0.0000

Shocks to exchange rate volatility explain the second largest portion of variance (31.28%) in the first quarter. This portion increases to 35.43% in the second quarter, decreases after that to 15.97% in the 9th quarter and slightly increases to 16.95% in the last quarter under investigation. Although in the short run, most of the variability can be explained by its own innovations, in the long run, exchange rate volatility innovations were found to have large impact. Moreover, shocks to output gap explain only very small portion of variability in unemployment gap in the short run, however, innovations to output gap also affect unemployment gap much more in the long run. In addition, inflationary shocks were found to contribute to forecast error variance, especially in the long run.

Overall, findings show statistically significant and positive effect of exchange rate volatility on unemployment which is also found by various studies using different methods and/or data set for different countries or country groups (see for example, Stirböck and Buscher, 2000; Belke and Gros, 2001; Belke and Setzer, 2003; Belke and Kaas, 2004; Belke, 2005; Demir, 2010; Chang, 2011; Feldmann, 2011; and Mpofu and Nikolaidou, 2018). On the other hand, finding of Ay and Ayhan (2016) shows insignificant effect of volatility.

Negative response of unemployment to output shock is in line with Okun's Law as well as the findings of Berument et al. (2006) and Boz (2013) for Turkey and Feldmann (2011), Feldmann (2013), Belke (2005) for different country groups. However, it is found to be insignificant like some previous studies performed by Herman (2012) and Tunah (2010) (Folawewo and Adeboje, 2017, s. 198). But, forecast error variance decomposition analysis indicates importance of output shocks in the long run. Sustainable economic growth is essential for the reduction in unemployment. Therefore, one should consider time lag for employment increase due to economic growth.

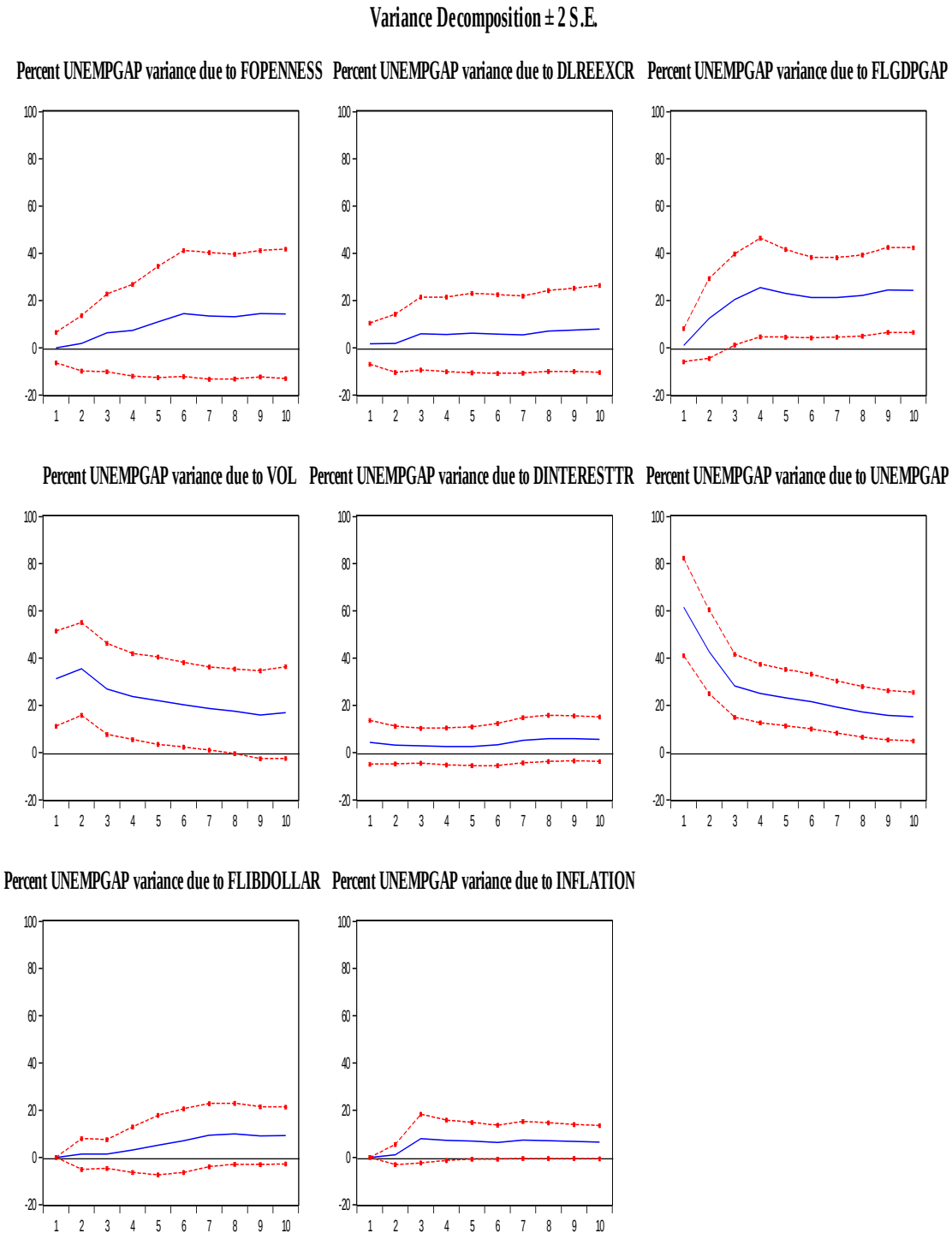

Figure 5: Forecast Error Variance Decomposition for unempgap

Inflationary shocks were found to increase unemployment. This is contrary to Phillips curve hypothesis. Although results of some recent studies (such as, Berentsen, Menzio, and Wright, 2011; Umoru and Anyiwe, 2013; Folawewo and Adeboje, 2017; Tenzin, 2019) show positive impact of inflation on unemployment, findings of Feldmann (2013) indicate validity of Phillips curve hypothesis for 78 countries. Regardless of the reason for the continuous increase in prices (i.e., cost-push or demand-pull), inflation may cause real wage declines, decrease aggregate supply and employment level because of decline in labor supply. Based on this finding, one may argue that inflation targeting policies should be continued without any disruption. As suggested by Vermeulen (2015), low inflation is essential for increase in employment opportunities.

Effects of other factors were found to be insignificant: trade openness ratio (fopenness), real effective exchange rate (Δlreexcr), domestic interest rate ($interest^{TR}$) and liability dollarization (flibdollar). Trade openness ratio includes both imports and exports as a share of GDP. Because of this, this factor may not affect unemployment ratio as favorable and unfavorable effects of imports of final goods, raw materials and intermediate products and exports may cancel out each other. Moreover, trading activities may be much more concentrated on capital intensive sectors. This may also be one reason for the absence of its effect. Similar result was obtained by Feldmann (2013). As discussed before, real effective exchange rate can affect unemployment through its impact on exports and imports. Similar arguments with the trade openness ratio may apply here also for the insignificant effect of this factor. This result is also supported by the findings of Selim and Güven (2014) for Turkey, Chang (2010) and Feldman (2013). Moreover, Burgess and Knetter (1998) explained the lesser influence of exchange rate movements on labor markets of some countries by the differences in market structure, labor and trade market regulations and as a result of adjustment of markups specific to destination.

Similar to the finding of Berument et al. (2006), according to the results, domestic interest rate ($interest^{TR}$) does not affect unemployment. However, Feldmann (2013) and Mpofu and Nikolaidou (2018) found statistically significant effect of it. Result of this study can be due to the possibility that there is not any complementarity or substitutability between factors of production (labor and capital) throughout the period under investigation. Moreover, one expects that increase in interest rate decrease investment and thus, increase production and employment according to Keynesian model. But, in the case of liquidity trap, because of high sensitivity of money demand to interest rate, LM curve becomes horizontal and monetary policy does not have any effect on income level. This ineffectiveness of monetary policy can also be observed when investment is not sensitive to interest rate. This finding is also in line with the view of new classical economists, such as Lucas (1975) and Sargent and Wallace (1975) who claimed absence of monetary policy influence on the real economy, i.e., neutrality of

money which is also called as classical dichotomy (Bierens and Broersma, 1993). However, one cannot claim any certain judgement about this. Therefore, further analysis is important, but this is beyond the scope of this study.

Lastly, liability dollarization (flibdollar) was found to have insignificant effect on unemployment. This result indicates absence of balance sheet effect. This effect might have been prevented by using hedging instruments by the economic agents holding debts or credits in foreign currency. This also calls for additional analysis. As also pointed out by Aurangzeb and Khola (2013), different results in the literature and also in this study can be related to the business cycle fluctuations, measurement errors, structure of labor market, demographic factors, some macroeconomic factors including poverty and low level of foreign investment (Folawewo and Adeboje, 2017).

5. Conclusion

This study aims to analyze impact of exchange rate fluctuations and exchange rate volatility on unemployment for Turkey using quarterly data over the period 2005-2019. Exchange rate itself was not found to significantly affect unemployment from the results of VAR analysis. By finding similar result for employment, Chang (2010) concluded that labor market is not responsive to exchange rate changes; therefore, expansionary monetary policy is ineffective to promote labor demand growth by accelerating investment.

However, results showed important and adverse effect of exchange rate volatility on the labor market. Therefore, hedging instruments need to be employed in order to avoid from the negative consequences of exchange rate volatility. Another suggestion is monetary union made by Rose (2000). As monetary union may decrease exchange rate volatility, impact of exchange rate movements and its volatility on unemployment can be reduced as suggested by Rose (2000) and Belke and Gros (2001). If there is high level of dollarization in an economy, other suggestions made previously by Galindo and Leiderman (2005) related to the finding of this study are the implementation of flexible exchange rate accompanied by CPI-indexed instruments, hedging for currency risk, development of derivative markets and local currency bond markets. Moreover, according to Aghion, Bacchetta, Rancière, and Rogoff (2009), countries are suggested to implement flexible exchange rate policies when volatility of real shock is higher than financial shocks, but with caution because exchange rate flexibility have adverse growth effects in the case of low financial development. Their results suggest that as countries become more financially developed, adverse effects of exchange rate movements decline. Thus, improvement of financial system of a country is another important issue to reduce the effect of exchange rate volatility which was also previously discussed by Demir (2010). In addition to this, Demir (2010) recommended many policy instruments to reduce exchange rate volatility

which can be another solution to decrease impact of exchange rate volatility on the real sector. These include capital controls; incentives for Foreign Direct Investment; reserve accumulation; limitations on fiscal deficits, current account imbalances, public and private debt denominated in foreign currency; and fiscal and monetary policies following business cycle movements. The implementation of capital controls was also suggested by Islam and Hengge (2015). According to them, although it is widely accepted that real exchange rate depreciations are associated with decline in unemployment, favorable effect can be reversed by the adverse impact of high level of liability dollarization in a country. Therefore, in this case, capital flows, especially short run flows need to be controlled by taxes or price-based precautions in the context of prudential policies which is highly recommended and has successful country implementations. Belke (2005) emphasizes the importance of central bank independence, anti-inflationary monetary policy and labor market policies for the mitigation of the effects of exchange rate volatility. Moreover, this study mentions that integration of EU monetary policy can be an alternative optimal strategy. Usman and Elsalih (2018) also focus on the importance of monetary policy when unemployment is responsive to real exchange rate changes. On the other hand, Berument et al. (2006) concluded that there is not much evidence for the significant effect of monetary policy shocks; however, income policies (fiscal policies and unemployment itself reflected by income and price shocks) have significant impacts for Turkey. Following the suggestion of Belke (2005), as exchange rate volatility is found to be an important determinant for unemployment, similar argument for the importance of monetary policy can be made for the case of Turkey. Therefore, in addition to expansionary fiscal policy, expansionary monetary policy can be implemented associated with floating exchange rate or devaluation in the case of fixed exchange rate regime but with caution. This may lead to price increase and inflationary spiral which can be prevented by limiting the wage increase based on productivity increase as discussed by Modigliani (1996). One should not forget that price stability and financial stability are the important priorities of Central Bank of Turkey. In addition, other important solutions for unemployment include automatic stabilizers, structural transformation, capacity enhancement for the implementation of counter-conjuncture and business cycle reformative policies, improvement of financial inclusiveness, infrastructural development and pro-growth exchange rate policies (Islam and Hengge, 2015, p. 94). Furthermore, Van Der Ploeg (1992) provides a theoretical analysis of different policy implementations under different exchange rate regimes focusing on European countries and considering interactions between the United States of America and Europe. The effects and policy response of countries may change largely based on exchange rate regimes, wage rigidity, and wage indexation. As every country has its own dynamics, all these should be considered, very carefully.

There are some limitations of this study; however, all these can be considered in future studies. In the analysis, real effective exchange rate was used. But, instead of using a composite index, one may use bilateral real exchange rate in order to determine which currency's fluctuations have much more effect on real economy of a country. Institutional factors (such as, labor market regulations and laws) should also be considered based on data availability. Furthermore, as a future study, by using the most recent data, firm level or industry specific analysis can be performed in order to gain further insight for the effect of real exchange rate movements on labor market and to understand which sectors are mostly affected by exchange rate shocks. One more suggestion is the use of another measure reflecting long term uncertainty, as discussed by Stirböck and Buscher (2000). In addition, Klein et al. (2003) claimed that as trade openness increases, effect of exchange rate fluctuations becomes much more significant on job flows. Therefore, trade openness may also increase impact of exchange rate fluctuations and volatility on the unemployment, and more generally on the labor market (Goldberg and Tracy, 2000; Moser et al., 2010; Mpofu and Nikolaidou, 2018). This can also be tested. Moser et al. (2010) used interaction term obtained by multiplying real exchange rate index based on unit labor costs by trade openness. As an indicator for openness, they emphasized on the consideration of three channels based on theory, which are export share out of total revenues, import share in industry and intermediate input cost share in the total costs. Similarly, Goldberg and Tracy (2000) mentioned the importance of these three channels for the degree of influence of exchange rate movements on the labor demand in addition to labor intensive industry structure and high level of competition among firms. Lastly, there can be shift from exporting to non-exporting sector which can diminish the effect of real exchange rate swings on the overall unemployment as discussed by Moser et al. (2010). This also needs further analysis.

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