EMPLOYMENT AND EXCHANGE RATE VOLATILITY RELATIONSHIP: THE TURKISH CASE[1]

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ABSTRACT

In this paper, exchange rate volatility and employment relationship is investigated for Turkey covering the period from January 2003 to February 2014 period. Exchange rate volatility is added to the model as an independent variable. In the previous researches, effects of exchange rate volatility have been used as an error term. Different from the previous studies, we added this variable to our model as an independent variable in order to analyze the effects of volatility on employment. In empirical analysis; firstly, co integration relationship between variables is analyzed. Then ARDL model is employed in order to investigate long and short term coefficents. In line with findings of the existing literature, the results of the ARDL model, we employed in this paper; reflect that exchange rate volatility negatively affects the employment. However, we found that the volatility coefficient is statistically insignificant. These results are thought to reflect the dynamics of the market, as the exchange markets are sensible to short term changes while labour markets are based on long term contracts.

Keywords: Exchange rate, volatility, employment, foreign trade, labour market, unemployment.
JEL Classification: J23, F16, F41.

1.INTRODUCTION

Changes in exchange rate level affect countries' foreign trade volumes through the economic integration and globalization. Increases and decreases in foreign trade volumes change the employment opportunity in labour markets, as well. That is why the changes in the macro level variables indirectly cause micro level changes.

Fixed exchange rate systems were abandoned after collapse of Bretton-Woods system in 1973 and countries left their currencies to fluctuations. Thus uncertainty in future exchange rate's value resulted in the decrease in foreign trade levels. This decrease made labour markets sensitive to these changes. Developments in exchange rate volatility was paid special attention due to its influence on real sector and indirect employment level.

The relationship between exchange rate markets, exchange rate volatility and labour market is explained theoretically by several different channels such as growth channel, macroeconomic channel, factor intensity channel, foreign market orientation channel, labour cost in export goods channel, imported input price channel and penetration of import channel (Hua (2005), Frenkel(2004), Ngandu(2008), Campa and Goldberg(1999)).

Volatility in financial markets causes important conclusions for investors and policy makers. These are; for investors; higher volatility means potentially higher risk and it causes to delay or cancellation in investment plans. For policy makers; volatility in financial markets causes to raise concerns about passing to real economy side and wrong interventions to system (Becketti and Sellon, 1989).

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[1] This paper is prepared from Fatih AYHAN's PHD dissertation which name is "The Relationship Between Exchange Rate Volatility, Foreign Trade And Employment: Turkey Case".

In this paper, effects of exchange rate volatility on employment will be investigated for Turkey. Foreign trade, industrial production and exchange rate variables used as explanatory variables parallel with works of (Kim (2005), Frenkel and Ros (2006), Alexandre et al.(2010), Chimnani et al. (2012) and Mpofu (2013)). In the previous researches, effects of exchange rate volatility have not been taken into consideration and have been considered as an error term. Unlike existing literature, we employ also exchange rate volatility as an independent variable in order to analyze the effects of exchange rate volatility on employment.

The rest of the paper is organized as follows: Section 1 presents the literature review. Section 2 introduces data and the methodology used in our model. Section 3 presents empirical results and section 4 is conclusion.

2.LITERATURE REVIEW

The researches focused exchange rate, exchange rate volatility and employment relationship is presented in Appendix.1. Most of the existing literature focuses only exchange rate and employment relationship. There are few researches which investigate effects of exchange rate volatility on employment. As shown in Appendix.1, exchange rate volatility generally affects employment level negatively. These are (Buscher and Mueller (1999), Belke and Gros (2002), Belke and Kaas (2002), Belke and Setzer (2003), Chang (2006), Chimnani et al. (2012) and Mpofu (2013)). There are some studies focused on Turkey which shows similar findings with the literature (Bilgin (2004) and Boz (2013)). Similarly Demir (2010) is added to exchange rate volatility to analysis by employing firm level data.(see Appendix 1)

3.DATA AND METHODOLOGY

In order to investigate exchange rate volatility and employment relationship, we model employment with industrial production index, export, import, real exchange rate in line with the existing literature, but unlike the existing literature we also model employment with the real exchange rate volatility.

Exchange rate volatility variable is generally remained in error term in previous studies (Campa and Goldberg (2001); Riberio et al.(2004), Kim (2005), Frenkel and Ros (2006)). In this study, this variable is added to the model as an independent variable to evaluate its effect on employment.

We used monthly data covering the period from January 2003 to February 2014. Employment variable includes those people aged above 15 years of age and employed in non-agricultural sectors. Exchange rate variable we used in this study reflects producer price index based real effective exchange rate. Foreign trade, employment and industrial production index variables are obtained from Turkey Statistical Institute database. Exchange rate variable is, on the other hand, taken from Turkey Central Bank database system. For exchange rate volatility, conditional heteroscadasticity of ARCH type models are computed.[2]

For empirical modeling, we firstly investigate stationarity properties of the variables by employing unit root tests in the empirical literature used widely in the empirical literature, including ADF, PP and Ng Perron tests.

After stationarity check, we investigate co-integration relationship between the variables by employing Bound test approach proposed by Peseran at. al (2001) which has superior properties form conventional co-integration models.

These superiorities are as following; cointegration relationship between series aspect of I(0), I(1) or mutually cointegrated series does not matter. With the help of Bound Test, cointegration relationship can be evaluated without considering the same level cointegration relationship. The second advantage of the model is superiority for small samples. Moreover, The Bound Test provides us with a chance to estimate short and long run parameters in the same duration. (Pesaran et al. 2001; Narayan and Narayan, 2004).

Following the co-integration checking, finally, the long and short run elasticities between variables are estimated by employing ARDL model.

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[2] EGARCH type model for real exchange rate and EGARCH type model is chosen as the best performed model in this study. Conditional variance is obtained from EGARH model is used as an exchange rate volatility variable for the model. Comparison for estimated coefficients and model forecasting performances are not presented here in order to keep the study compact. The model results could be obtained from the authors, if needed.

4.RESULTS

4.1.Stationarity Analysis

In order to determine stationarity level of series, we used ADF, PP and Ng-Perron test. Ng-Perron test has more powerful features with respect to other tests. In this study, we accepted Ng-Perron test results if there are any mixed results with respect to other studies. According to test results LL, LSAN, LX and LREER series are found I(1) and also VOL and LM series are found I(0).[3]

4.2.Cointegration Analysis

After stationarity checking, for Bound test analysis we firstly formed Unrestricted Error Correction Model (UECM). UECM model specification for our study is presented in equation (1).

$$\Delta LL_t = a_0 + \sum_{i=1}^{m} a_{1i}\Delta LX_{t-i} + \sum_{i=1}^{m} a_{2i}\Delta LM_{t-i} + \sum_{i=1}^{m} a_{3i}\Delta REER_{t-i} + \sum_{i=1}^{m} a_{4i}\Delta LSAN_{t-i}$$
$$+ \sum_{i=1}^{m} a_{5i}\Delta VOL_{t-i} + a_6 LX_{t-1} + a_7 LM_{t-1} + a_8 REER_{t-1} + a_9 LSAN_{t-1} + a_{10}VOL_{t-1} + \mu_t \tag{1}$$

In equation (1); m represents lag number.[4] After defining lag number of UECM model, we analyzed co-integration relationship.

Null hypothesis for F test is established as $H_0 = a_6 = a_7 = a_8 = a_9 = a_{10} = 0$. We compared the computed F-statistic from UECM model with table bottom and upper critical levels in Pesaran et al. (2001). If the estimated F statistics is greater than the upper bound, we reject null hypothesis of no co-integration. If the estimated F statistics is less than the bottom bound, there is no co-integration relationship between the series (Narayan and Narayan, 2004). If the calculated F statistics is between the lower and upper critical values, the result is inconclusive (Karagöl et.al.,2007).

According to F statistics (5,18) is greater than the upper bound of the critical values(4,25), and the null hypothesis of no co-integration is rejected. As a result, we found a significant long run cointegration relationship between the variables.

4.3.ARDL Model

After co-integration check, we investigate the long and short run static relationship between the variables employing the ARDL model. ARDL model specification for our study is presented in equation 2.

$$LL_t = a_0 + \sum_{i=1}^{m} a_{1i}LX_{t-i} + \sum_{i=1}^{n} a_{2i}\Delta LM_{t-i} + \sum_{i=1}^{k} a_{3i}REER_{t-i} + \sum_{i=1}^{l} a_{4i}LSAN_{t-i}$$
$$+ \sum_{i=1}^{p} a_{5i}VOL_{t-i} + \mu_t \tag{2}$$

k, l, m, n and p refer to lag numbers in eq.2. ARDL(2,1,0,1,0,0) is chosen as the best ARDL model . The estimated long and short term coefficient using ARDL (2,1,0,1,0,0) model are shown in Appendix.2. According to diagnostic checks which could also be seen in Appendix.2, error terms in ARDL model are normally distributed. Moreover, there are no serial correlation, heteroscedasticity and misspecification problems in the model.

According to long term coefficients obtained from ARDL (2,1,0,1,0,0) model, industrial production index and export have positive effect on employment, while import and real exchange rate variables have negative effect on employment. The results are compatible with the expectations. Exchange rate volatility variable also

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[3] We did not report stationarity test results to keep the article compact. The unit root test results could be obtained from the authors.

[4] Maximum length is accepted as 8 and according to Akaike and Schwarz criterions lag number is accepted as 1 in this paper. And also it's examined whether or not autocorrelation problem through LM test in UECM model which formed with 1 lag number, autocorrelation isn't defined with 1 lag number.

negatively effects employment as expected in line with the existing literature.[5] However exchange rate volatility coefficient is statistically insignificant.

According to short run results, signs of coefficients are also compatible with the expectations. Export and industrial growth affect employment positively while import and real exchange rate growth have negative impact on it. And volatility variable influences the employment level negatively in short term. But volatility coefficient is found statistically insignificant.

Error correction coefficient is found -0,14. This means that when a deviation occurs between short and long run equilibrium, this instability can be dissolved 14% in every period. The system will come back again equilibrium level approximately 7,1 period (month) later.

5.CONCLUSION

We tried to investigate effects of exchange rate volatility on employment employing the monthly data which captured the period from January 2003 to February 2014. We have found a long term cointegration relationship between employment and export, import, industrial production, real exchange rate and exchange rate volatility. After cointegration check, ARDL model is used in order to analyze long and short run relationship between series. Long and short term coefficients from ARDL model results are compatible with expectations and error correction coefficient is also found negative and statistically significant. When volatility added to the model, it's found that volatility influenced employment negatively in accordance with the expectations and findings of the literature. But volatility's coefficient is statistically insignificant. This result is explained with the difference of exchange rate and labour market structures. Since exchange rate markets are sensitive to the short run changes and this situation influences volatility. However, labour markets are based on the long term contracts. Thus volatility cannot influence the labour market in short run.

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[5] Equation also estimated without volatility in line with the existing literature. But it's found that there is not important difference about coefficient sign and significance level. The results can be obtained from authors, if needed.

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Appendix 1: The Empirical Literature Review For The Relationship Between Exchange Rate, Exchange Rate Volatility And Employment

Author	Country	Subject	Results
Buscher and Mueller (1999)	West Germany (1973-1997)	The effects of exchange rate volatility on unemployment.	An increase in Mark volatility increases the unemployment in West Germany.
Goldberg, Tracy and Aaronson (1999)	USA (1977-1996)	The Effects of volatility in Dollar on employment variable.	There are no important effects on volatility in Dollar on employment variable.
Campa and Goldberg (2001)	USA (1972-1995)	The relationship between exchange rate and employment.	An increase in exchange rate value causes negative effects on employment level.
Belke and Gros (2002)	Germany (1973-1999)	The effects of exchange rate volatility on employment growth and unemployment.	A 1% increase in exchange rate volatility causes the 0,6% increase in unemployment and 1,3% decrease in employment.
Belke and Setzer (2003)	The Czech Republic, Bulgaria, Poland and Slovakia	The effects of exchange rate volatility on unemployment.	An increase in exchange rate volatility causes an increase in unemployment and decrease the employment according to the panel data analysis result.
Klein, Schuh and Triest (2003)	USA (1973-1993)	The effects of real exchange rate on job creation and destruction.	An 10% increase in exchange rate causes to 0,33% increase in job destruction and also decrease the net unemployment with the same. Moreover, it causes to 0,02% job creation but it's statistically insignificant.
Ribero et al. (2004)	Brazil (1991-2000)	The effects of exchange rate on employment.	An increase in exchange rate negatively and significantly effects the employment in manufacturing.
Belke and Kaas (2002)	Europe and USA (1973-2001)	The effects of exchange rate volatility on labour markets.	Exchange rate volatility increases the unemployment and decreases employment both in European countries and USA.
Kim (2005)	Korea (1970-1995)	The relationship between exchange rate and employment in manufacturing sector.	Employment reacts to exchange rate positively in economies with higher openness rate and with lower imported input user sectors. It's found that a 1% decrease in exchange rate level, results in an increase in employment by 0,6%.
Chang (2006)	Taiwan and South Korea (1984-2004)	The effects of exchange rate uncertainty on unemployment.	The exchange rate uncertainty effects unemployment negatively for countries both short and long run.
Galindo et.al. (2006)	9 Latin American Countries	The effects of exchange rate on employment.	Decrease in real exchange rates effect employment negatively in higher dollarization countries.
Frenkel and Ros (2006)	17 Latin American Countries	The relationship between real exchange rate and unemployment.	There is negative relationship between unemployment and real exchange rate. According to results 1% change in exchange rate decreases unemployment by 0,57%.
Galindo et.al. (2006)	9 Latin American Countries	The effects of exchange rate on employment.	Decrease in real exchange rates effect employment negatively in higher dollarization countries.
Xiangquan et al. (2011)	China (1985-2007)	The relationship among real exchange rate, foreign trade and employment.	Devaluation in China national currency induces the employment while depreciation in exchange rate causes inverse effect.
Chimnani et al. (2012)	10 Asian Countries (1995-2005)	The relationship between exchange rate volatility and unemployment	It's found that exchange rate volatility effects to unemployment positively and statistically significant way.
Alexandre et al. (2010)	23 OECD Countries	The effects of changes in exchange rate on	When openness increases, the employment to exchange rate elasticity increases. It is found that

	(1988-2006)	employment.	the employment exchange rate elasticity is positive and statistically significant level. For example a decrease in exchange rate an results in increasing in employment. A 1% exchange rate decrease causes to 0,61% increase in employment.
Mpofu (2013)	South Africa (1995-2010)	The effects of real exchange rate volatility on employment in manufacturing sector.	Real exchange rate causes significantly contractionary effect on manufacturing sector employment in short run. It's found that depreciation causes to increase in manufacturing sector employment.
Bilgin (2004)	Turkey (1995-2004)	The relationship between exchange rate and unemployment.	It's found that %1 increase in exchange rate causes to 0,03% decrease in unemployment.
Demir (2010)	Turkey (1983–2005)	Exchange rate and employment relationship.	Exchange rate volatility effects the employment positively and significant level in manufacturing sector firms. According to results 1% increase in exchange rate volatility causes a decrease by 1,4-2,1% in employment.
Boz (2013)	Turkey (2003-2012)	The relationship between real exchange rate level and unemployment rate.	There is a negative relationship between real exchange rate level and unemployment rate.

Appendix 2: ARDL (2,1,0,1,0,0) Model Long And Short Term Coefficients

ARDL (2,1,0,1,0,0) Model's Long Term Coefficients		
Variables	**Coefficients**	**t Statistic**
LSAN	0.46	4.012*
LX	0.06	1.819*
LM	-0.03	-0.566
LREER	-0.14	-1.960**
VOL	-33.18	-1.065
ARDL (2,1,0,1,0,0) Model's Error Correction Coefficient		
Variables	**Coefficients**	**t Statistic**
ECMT(-1)	-0.14	-4.806*
ARDL (2,1,0,1,0,0) Model's Diagnostic Checks		
$X^2{}_{BG}$	1.055[0,35]	
χ^2_{NORM}	3.069[0,14]	
χ^2_{WHITE}	0.701[0,89]	
$X^2{}_{RAMSEY}$	1,151[0,25]	

$X^2{}_{BG}$, χ^2_{NORM}, χ^2_{WHITE}, $X^2{}_{RAMSEY}$ are accordingly shows autocorrelation, normality, heteroscadasticity and Ramsey tests.
Probability values are in brackets.
Note: *%1,**%5 shows significance level.