

EFFECTS OF THE EXCHANGE RATE ON ECONOMIC GROWTH AND PRICES

Aghanemat Aghayev

Azerbaijan University, Baku, Azerbaijan
e-mail: Aghanemat.Aghayev@au.edu.az

Abstract. The article examines the impact of changes in the exchange rate on economic indicators, including output and inflation in different countries. The results of the study show that changes in the exchange rate have a strong impact on economic growth and prices.

Keywords: exchange rate, economic growth, inflation, consumer price index, monetary policy.

VALYUTA MƏZƏNNƏNİN İQTİSADI ARTIMA VƏ QIYMƏTLƏRİN SƏVİYYƏSİNƏ TƏSİRLƏRİ

Ağənemət Ağayev

Azərbaycan Universiteti, Bakı, Azərbaycan

Xülasə. Məqalədə valyuta məzənnəsindəki dəyişikliklərin müxtəlif ölkələrdə iqtisadi göstəricilərə, o cümlədən istehsal və inflyasiyaya təsiri araşdırılır. Araşdırmanın nəticələri göstərir ki, məzənnənin dəyişməsi iqtisadi artıma və qiymətlərə təsir göstərir.

Açar sözlər: məzənnə, iqtisadi artım, inflyasiya, istehlak qiymətləri indeksi, pul siyasəti.

ВЛИЯНИЕ ОБМЕННОГО КУРСА ВАЛЮТ НА ЭКОНОМИЧЕСКИЙ РОСТ И ЦЕНЫ

Аганемат Агаев

Университет Азербайджан, Баку, Азербайджан

Резюме. В статье исследуется влияние изменений обменного курса на экономические показатели, в том числе на объем производства и уровень инфляции в разных странах. Результаты исследования показывают, что изменение валютного курса оказывает сильное влияние на экономический рост и цены.

Ключевые слова: валютный курс, экономический рост, инфляция, индекс потребительских цен, денежно-кредитная политика.

1. Introduction

The exchange rate regime changed across countries. In many countries central banks do not allow nominal exchange rate to move freely since they feel the fear of floating. In countries that the fixed exchange rate is adopted, it is the responsibility of the central bank of the world's major economies to maintain the exchange rate, fixed by buying and selling currencies in order to correct the demand and supply of the money in the money market. The supporters of the exchange rate regime argue that this process of maintaining fixed exchange rate regimes is difficult, but keeping a stable exchange rate pralelly with macroeconomic stability boost international trade and investment that in turn enhance economic growth.

Actually, the effect of exchange rate changes on economic growth and inflation has become one of the most important research topics over the past periods. From this point of view, the traditional view states that there is a positive relationship between exchange rate depreciation and economic growth. Depreciation of local currency after an increase in the foreign exchange rate, by influencing the relative prices of domestic and foreign goods and

services, promotes exports while decreasing import level. The depreciation of the national currency both converts the demands of foreigners into the country and directs the import demands of the indigenous to the locally produced products. Thus, increases in foreign exchange rates support economic growth by encouraging net export parameters. It means that, devaluation within the effective corridor can be proposed as a rational policy tool that can be used for stimulation of economic growth.

At the same time, structuralist economists argue that the devaluation exchange rate policy will have a negative impact on the financial stability of developing countries. In this context, one of the most important structural problems in developing economies is the foreign dependency phenomenon. Most of the inputs used by such countries especially about their national production processes are provided through import side. So, the exchange rate appreciation will increase input costs of import such as machinery and intermediate goods used in the national production process. Thus, increasing production costs due to the exchange rate depreciation can have a negative impact on the national output and economic growth.

In most open and developing economies, the exchange rate leads to significant influence on economic growth and inflation dynamics. Most of oil countries is not exception in this regard. Due to the recent decline in oil prices, the exchange rate of national currencies turned out to be extremely volatile in some oil countries. Here floating regimes enable the exchange rate to act as a short term macroeconomic adjustment mechanism. At the same time, the role of the exchange rate pass-through becomes crucial in determining the potential contribution of higher exchange rate volatility on the different economies.

On the other hand, the precise determination of the exchange rate impacts is a key asset for central banks in monetary policy formulation process. The estimation of the exchange rate impacts to consumer price index components also to national output are of great importance for obtaining better inflation forecasting and for adoption of adequate macroeconomic, of which monetary decisions.

The main finding of the paper is that in many countries the degree of the exchange rate impacts incomplete. According to our estimates, the accumulated pass-through of nominal effective exchange rate fluctuations on aggregate inflation equals from 15 to 25 percent.

We provide different important facts on the peculiarities of the different developing economies in the paper. The paper lays out theoretical framework on the exchange rate pass-through and surveys the existing literature. We describe the relevant data and develop the empirical methodology. The last section presents the empirical results and conclusions.

2. Literature Review

Impacts of exchange rate volatilities to economic growth and inflation issues are still a big debate among economists in theoretical literature. Obstfeld and Rogoff (1998) state that,

at the theoretical level uncertainty on exchange rates and monetary policies followed by the government reducing the nominal interest rate. In turn causing an appreciation of the home currency it negatively effects to the national economy [10].

On the contrary, some other authors note that the impact of exchange rate volatilities on the welfare of the economy from output and financial stability side depends on how overall prices are set. Exchange rate volatilities occurs from the macroeconomic factors fluctuations and the dynamic nature of the business environment in the national ecosystem.

The appreciation of national currency happens by an upward movement while a downward movement indicates a loss in value (depreciation) against foreign currency. Following theories explain the upward and downward movement in the exchange rate:

- the real option theory;
- the interest rate parity theory;
- purchasing power parity;
- traditional flow theory and etc.

According to the real option theory investment decisions by foreign and local investors are tightly connected with the macroeconomic uncertainty effects. So, the nominal or real exchange rate volatilities as an indicator of macroeconomic uncertainty explains the investors decision behaviors. Surely, stable exchange rate becomes more attractive for the firms that decide to increase their capital or financial investments. Therefore, the real option theory is used to examine the links between exchange rate volatilities and economic growth or inflation by researchers.

There are three channels where exchange rate volatilities can enhance economic growth. These are:

- international trade;
- foreign direct investment;
- and macroeconomic stability.

“Uncertainty regarding exchange rates has an adverse impact on trade but a positive impact on the price of products where the exporter is a risk-lover.” This conclusion was found by Hooper and Kohlhagen (1978) [4]. Their study examined the effect of exchange rate unpredictability on inflation and international trade between the USA and Germany. The work was conducted in 1965–1975. At the same time the study states that, inconsistent negative effect on prices was found in the case of importers where uncertainty is measured as the standard deviation of forward and spot exchange rates over 3 months.

By Bahmani-Oskooee and Gelan (2018) the Autoregressive Distributed Lag (ARDL) model was employed in order to investigate the short-run and long-run effects of exchange rate risk on trade flows for 12 African countries during the period of 1971–2015. This model (ARDL) has advantages in forecasting compared to other techniques based on co-integration [1].

Senadza and Diaba (2018) note that, the exchange rate volatility improves or worsens exports and imports. However in the short run, the effect is more prevalent [12].

Analyzing the effects of exchange rate changes to overall prices, the attention is mostly devoted to aggregate import prices and sectoral level rather than only on consumer price index itself. Import prices transmits shocks from exchange rate changes to the national economy through the imported goods prices.

Ca'Zorzi et al., (2007) notes that, there are differing responses to nominal and real exchange rate shocks in some developed countries. For both consumer and import prices the exchange rate impact ratios are slightly higher in the euro area than in the US [3].

International Monetary Fund (2015) state that, according to the recent estimations the exchange rate impacts to inflation in emerging economies is 22% after a year [5].

When depreciation level exceeds 20%, then the exchange rate effect to cpi becomes 45% percent after six months. Also, it was found that the exchange rate effect to cpi is 5 times higher during depreciations. There is an asymmetry in the exchange rate effect for all components of inflation.

According to Mishkin (2008) in the exchange rate impact analysis the major model specification is based on the impulse response functions obtained from VAR and error correction models. DSGE models (structural models), in some cases are employed in order to account for a wide range of possible specific shocks in line with exchange rate impacts to consumer price index [7].

Table 1. Empirical studies on exchange rate effects

Country	Year	Models	Exchange Rate (ER)	Period	ER pass-through (estimated)
CIS	2016	Factor panel	NEER	in 6 months	28-31%
				in 12 months	49-51%
	2013	Panel VAR	USD	in 12 months	25-27%
				in the long run	56-58%
Russia	2016	Panel VAR	USD	in 12 months	14-18%
	2005	VAR	USD	in 12 and 24 months	41-43%
		Long run co-integration	NEER	in the long run	47-49%
		VAR	NEER	in 12 months	34-36%

The research shows that:

- in theoretical and empirical studies, the effects of exchange rate volatilities on economic growth and prices in different countries did not show any clear cut relation between that parameters;

- theoretical, also empirical studies made on both developing and developed countries show mixed outcomes about exchange rate fluctuation effects to economic growth and inflation.

3. Methodology

In the research we try to estimate the degree of the exchange rate impact to economic growth and cpi inflation, also its main components.

Data collection and samples

The annual data of some developed and developing countries was used to analyze the effect of exchange rate changes in economic growth and prices for the period spanning from 2002 to 2020.

The sample consisted of fourteen CEE countries – CIS, of which Russia, Iran, Turkey, Albania, Bulgaria, Croatia, Czech, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Serbia, Slovakia, Slovenia and etc.

These countries characterize by different exchange rate regimes - from hard pegs to floaters.

In the research, the data set of variables was compiled from different sources, especially from international financial institutions.

Hypotheses

Hypothesis - A. There is a statistically significant negative relationship between exchange rate volatility and economic growth; also between exchange rate volatility and cpi inflation.

Hypothesis - B. There is a statistically significant negative relationship between the interaction term of exchange rate volatility and trade openness with economic growth.

Hypothesis - C. There is a statistically significant negative relationship between the interaction term of exchange rate volatility and real interest rate with economic growth.

Definition of main variables and measurement

Economic growth

Economic growth refers to steady increases in real GDP or national product over time. In this paper was used the real growth rate of growth domestic product. It denotes the economic growth of the country.

Consumer price index

The consumer price index is a measure that examines the weighted average of prices of a consumer goods and services basket. CPI is calculated by taking price changes for each

item in the predetermined basket of goods and averaging them. Inflation are used to assess price changes associated with the cost of living.

The inflation is one of the most frequently used indicator for identifying periods of inflation or deflation. Consumer price index may be compared with the producer price index, which instead of considering prices paid by consumers looks at what businesses pay for inputs.

Consumer price index inflation and its main components was taken. The full sample contains quarterly data from 2002 to 2020 in selected countries.

Exchange rate volatility

Exchange rate was taken as real effective exchange rate (REER).

Nominal effective exchange rate (NEER) a measure of a currency against a weighted average of several foreign currencies of trade partner countries divided by a price deflator.

REER is used to calculate exchange rate volatility. Commodity prices change all the time and consumer price index is unstable. It leads the NEER movements to increase directly and affects to trade competitiveness. In this way, the REER reflects real purchasing power, also excludes inflation.

Control variables

List of control variables:

- government expenditure as a percentage of GDP;
- gross fixed capital formation;
- trade openness;
- domestic credit to private sector and etc.

Empirical Model

Fixed Effects Model. To control for heterogeneity among selected countries and to identify the relationship between time varying dependent and independent variables, panel data regression is suggested by Baltagi (2008). According to the author panel data regression reduces the problems of bias and multicollinearity.

The following regression equation is employed to estimate the effect of REER volatility on economic growth and cpi inflation.

$$Y_{it} = \alpha_i + \delta X_{it} + \beta Vol_{it} + \varepsilon_{it}$$

$$i = 1, 2, \dots, \quad t = 2002, 2003, \dots, 2019, 2020$$

Here:

Y_{it} - real GDP growth rate for country i at time t ,

X_{it} - a vector of control variables (government expenditure as a percentage of GDP; gross fixed capital formation; trade openness; domestic credit to private sector and etc.)

Vol_{it} - exchange rate volatility that is measured as a standard deviation and as z-score.

$$INF_{it} = \alpha_i + \delta X_{it} + \beta Vol_{it} + \varepsilon_{it}$$

$$i = 1, 2, \dots, \quad t = 2002, 2003, \dots, 2019, 2020$$

Here:

INF_{it} – cpi inflation rate for country i at time t ,

X_{it} - a vector of control variables (government expenditure as a percentage of GDP; gross fixed capital formation; trade openness; domestic credit to private sector and etc.)

Vol_{it} - exchange rate volatility that is measured as a standard deviation and as z-score (as the following figure).

Z-score (also called a standard score) gives you an idea of how far from the mean a data point is.

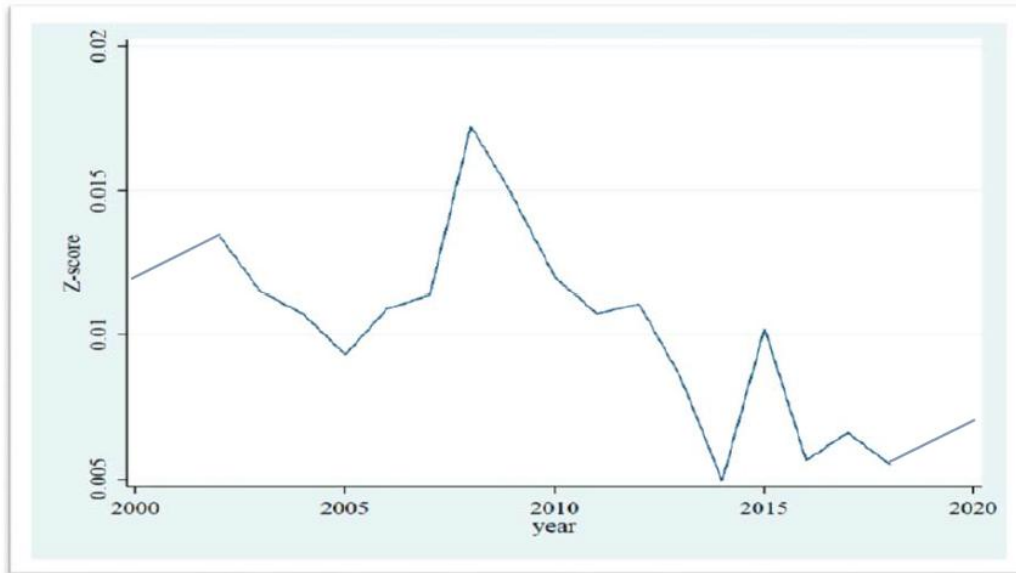


Figure 1. Z-score measure of ER volatility

The full sample contains quarterly data from 2002 to 2020. There are four variable (domestic inflation, trading partners' inflation, nominal effective exchange rate and government revenue components) VAR model similar to those developed by Ca Zorzi in 2007 [3]. The variables are seasonally adjusted through census/x12 procedure. They transformed into logarithmic form. Based on unit root test results, the variables are non-stationary, so it was run var model in first differences.

4. Empirical evidence and discussion

Research analyzes result was described in the following tables. They presents the descriptive statistics of the variables of interest.

The average mean of GDP growth is 3.3%. The maximum value is 11.9%. The average mean of Inflation is 3.4% and the maximum value is 22.5%.

Table 2. Variables of interest's descriptive statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
GDP	238	0.033	0.038	-0.148	0.119
lreer	224	0.011	0.045	-0.173	0.17
GEXP	238	0.18	0.026	0.104	0.229
GFCF	238	0.238	0.047	0.159	0.381
INF	238	0.034	0.035	-0.015	0.225
OPEN	238	1.129	0.338	0.537	1.923
DOMCR	238	0.466	0.181	0.002	1.046
INT	210	0.047	0.047	-0.125	0.287

Here: Variable Definition: Economic Growth (GDP), lreer log of real e_ective exchange rate, Government expenditure (GEXP). Gross fixed capital formation (GFCF), Inflation (INF), Trade Openness (OPEN), Domestic credit to the private sector (DOMCR) Interest rate (INT).

Table 2 shows the correlation between independent variables.

The result shows that all coefficients are less than the threshold of 0,8. It means that there is no problem of multicollinearity between given variables.

We see the negative correlation between exchange rate volatility and economic growth.

Table 3. Matrix of correlation (*significance at the 0,05 level)

Variables	GDP	Vol	z-score	GEXP	GFCF	INF	OPEN	DOMCR	INT
(1) GDP	1.000								
(2) Vol	-0.110	1.000							
(3) z-score	-0.044	0.980 *	1.000						
(4) GEXP	-0.172 *	0.175 *	0.170 *	1.000					
(5) GFCF	0.291 *	-0.004	0.031	-0.354 *	1.000				
(6) INF	0.161 *	0.304 *	0.345 *	0.053	0.169 *	1.000			
(7) OPEN	-0.029	-0.220 *	-0.247 *	0.340 *	-0.095	-0.277 *	1.000		
(8) DOMCR	-0.393 *	-0.206 *	-0.232 *	0.247 *	0.002	-0.131 *	0.387 *	1.000	
(9) INT	-0.457 *	-0.010	-0.047	-0.229 *	-0.112	-0.388 *	-0.124	-0.011	1.000

The test of Levin in 2002 was used here to check for variables stationarity, before running the regression. In the Table 4 the panel unit root test indicates that all variables are stationary in level since the probability values are lower than the 5 percent significance level by rejecting the null hypothesis in favor of the alternative hypothesis.

Variable	t-Statistic	Probability
Standard Deviation	-1.9732	0.0242
Z-score	-3.7001	0.0001
GEXP	-4.45342	0.0000
GFCF	-1.95738	0.0252
INF	-3.3485	0.0004
OPEN	-2.63091	0.0043
DOMCR	-6.57223	0.0000
INT	-2.06466	0.0195

5. Conclusions

- In the paper was examined the exchange rate effects to economic growth and inflation. The VAR model was employed in first differences. Identification in the model is achieved through Cholesky decomposition.
- By running stability tests also was evaluated the performance of the given model. As the result, the model passes successfully for all stability tests.
- There is significant effect of exchange rate shocks to economic growth and domestic prices by using quarterly data for the long period. Exchange rate effect to economic growth and inflation appears to be fast and significant approximately in all observed countries.
- The following ideas about inflation issues are the major policy implications of the research: taking into account the greater exchange rate effects, the policymakers should carefully consider its lag and size impacts on monetary policy decisions. It will take time for nominal exchange rate shocks to have the maximum effect on domestic consumer prices. In the countries that move toward inflation targeting regime increases the relevance of the exchange rate effects in improving forecasting opportunities of the structural models.
- CIS and Central and Eastern European countries operate under different exchange rate regimes from hard pegs to floating. Fluctuation in the nominal and real exchange rates affect to real economic growth and inflation mainly by international trade channel in all observed countries.
- Exchange rate rationality is the main source of economic growth and financial stability. Also it is important that central banks and government of the countries should pay attention to exchange rate by adopting an monetary and exchange rate policy that leads to comfortable exchange rates.
- The policy implication of this research is to minimize exchange rate volatilities where it has a relevant role on economic growth and inflation rate as main parameter for financial stability. Policymakers should keep cpi and interest rates under control for help to mitigate the negativity of exchange rate volatilities on major macroeconomic parameters.

References

1. Bahmani-Oskooee M., Gelan A. (2018). Exchange-rate volatility and international trade performance: Evidence from 12 African countries. *Economic Analysis and Policy*, 58, 14-21.
2. Baltagi B.H. (2008). *Econometric analysis of panel data* (Vol. 4). Chichester: John Wiley & Sons.
3. Ca'Zorzi M., Hahn E., & Sánchez M. (2007). Exchange rate pass-through in emerging markets. *European Central Bank, Working Paper Series 0739*.
4. Hooper P., Kohlhagen S. W. (1978). The effect of exchange rate uncertainty on the prices and volume of international trade. *Journal of International Economics*, 8(4), 483-511.
5. International Monetary Fund. <https://www.imf.org/en/Publications>
6. Karimli T., Jafarova N., Aliyeva H., Huseynov S. (2016). Oil price pass-through into inflation: The evidence from oil exporting countries (No. 01-2016). Graduate Institute of International and Development Studies Working Paper.
7. Mishkin F.S. (2008). *Financial Markets and Institutions* by Frederic S. Mishkin (2008-03-07), Pearson.
8. Obstfeld M., Rogoff K. (2000). The six major puzzles in international macroeconomics: is there a common cause?. *NBER macroeconomics annual*, 15, 339-390.
9. Obstfeld M., Rogoff K. (1995). Exchange rate dynamics redux. *Journal of political economy*, 103(3), 624-660.
10. Obstfeld M., Rogoff K.S. (1998). Risk and exchange rates. *National Bureau of Economic Research*.
11. Rahimov V., Jafarova N., & Ganbarov F. (2017). The exchange rate pass-through to CPI and its components in oil-Exporting CIS countries (No. 06-2017). Graduate Institute of International and Development Studies Working Paper.
12. Senadza B., Diaba D.D. (2017). Effect of exchange rate volatility on trade in Sub-Saharan Africa. *Journal of African Trade*, 4(1-2), 20-36.