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Exchange Rate Gap Effect on Economic Growth in Iran

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The purpose of this article is examining the effect of exchange rate gap (difference between official and parallel market rates) on economic growth in Iran during 1961-2007 based on the Error Correction Model. The empirical result indicates that, there is a significant long run relationship between exchange rate gap and economic growth. So, adopting a suitable exchange rate policy to adjust the real exchange rate may have an important role to increase output capacity and achieving higher economic growth.

Field of Research: Economic Growth, Business

1. Introduction

Economic in Iran has experienced a considerable fluctuation during the last 50 years. Exchange rate gap (difference between official and parallel market rates) is one of the most important variables that could have influenced the economic growth. Official exchange rates and the parallel markets are related with most of the macroeconomic variables such as inflation, employment, production and productivity. As indicated in

Edwards(1989), Haile(1996), Domac and Shabsigh(1999), Avellan(2004), Gala and Lucinda(2006), Toulaboe(2006), Holzner(2006), and Saidon(2009), the policy affecting the exchange rates, also will affect other economic variables and inevitably create a chain reactions so that misleading resource distribution, deteriorating various economic sectors operation, increasing capital flight, decreasing economic efficiency, and at the end leads to reduction of economic growth.

After Islamic revolution in Iran, due to exchange limitation policy, there has been excess demand in official exchange market causing the expansion of parallel market. The difference between official and parallel market rates have increased remarkably. This gap has increased due to other factors including Iraq-Iran war, economic sanction, oil revenue reduction, budget deficit, the changes in import rules and regulations, and the government monetary and fiscal policies. The main aim in this paper is to explain the variation of economic growth concerning exchange rate gap.

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After the introduction, section 2 is devoted to literature reviews. Section 3 provides the methodology including the model specification and introduction of the trend of economic growth and exchange rate gap in Iran during 1961-2007. Then Sections 4 provide empirical results and finally section 5 presents a summary of main conclusion.

2. Review of Literature

Several studies have tried to identify the relationship between growth and misaligned or overvalued currencies. Edwards (1986) examined the effect of depreciation on production in 12 developing countries during 1965-1980, using the following regression:

$$\log Y_t = \alpha + \gamma_1 time + \beta_1 \log GE/Y + \beta_2 \left[\Delta \log M - \Delta \log M^e \right]_t + \beta_3 \log TOT + \beta_4 \log RE_t + u_t$$

In which *Y* is the real aggregate production, γ_1 trend rate of real growth rate, *GE/Y* ratio of nominal government spending, *ΔLog M* real rate of nominal money growth, *Δlog M*^{e} expected rate of nominal money growth, ΔLogM - ΔlogM^e non expected rate of nominal money growth, *TOT* term of trade, *RE* real exchange rate and *u* error term. He concluded that depreciation of money had contracting effect on production in short run, expansionary effect after a year and nothing in long run. The author cited theoretical and logical reasons as follows; Undervaluation of currency leads to increase in the price level, decreasing effect on household consumption spending (Pigou effect); redistribution of income from low to high saving rate, deteriorating trade balance and creating stagnation. All of these caused to reduced aggregate demand and production. In addition to these demand side effects, currency undervaluation would influence supply side via increasing import inputs prices, decreasing aggregate supply and finally reduction of production.

Ironically, one of the important empirical works that tries to measure the impacts of exchange rate misalignment on growth based on the notion of internal and external equilibrium was Cavallo, Cottani and Kahn (1990). The authors build an index of exchange rate disequilibrium for developing countries in the period 1960-1983. They correlate per capita income growth rates with this index that represents exchange rate deviations in relation to a supposed equilibrium position to reach the typical result of this literature; exchange rate overvaluations associate with lower per capita growth rates in developing countries. They also found the higher exchange rate volatility associate with lower rates of per capita growth. The index constructed by the authors takes into account some measures to identify real exchange equilibrium positions, excessive currency and credit creation by the government, excessive capital inflows or external indebtedness and protectionist policies. They argue that absence of these factors lead the real exchange rate closer to equilibrium. Regarding real exchange rate volatility, they point out to the negative consequences of uncertainty on production and investment decisions.

Razin and Collins (1997) explore the relation between exchange rate misalignment and per capita growth rates. They build a measure of misalignment for 93 countries from 1975 until 1993 based on the concepts of

internal and external equilibrium that resembles Cavallo, Cottani and Kahn's (1990) index. According to the methodology used, the long run equilibrium exchange rate would be capable of generating sustainable current account dynamics at full employment levels. Misalignments are represented by deviations of the real exchange rate to this supposedly neutral level. Based on this misalignment index, Razin and Collins (1997) make regression analyses in order to estimate the relation between per capita growth rates and real exchange rate levels. They find that strongly appreciated currencies are associated to lower per capita growth rates whereas moderately devaluated currencies are associated to higher rates. Their work concentrates on misalignment measures, not worrying about the theoretical explanations for the empirical findings.

Fajnzylber, Loayza and Calder (2002) report similar results when comparing growth in Latin American economies and other countries during the period 1960-99. They have used the real exchange rate overvaluation index constructed by Easterly (2001). After controlling the regressions for the traditional variables in the literature, they also come to the conclusion that exchange rate overvaluations have a significant negative impact on growth. About possible theoretical explanations for the empirical findings, they point out to the increasing probability of balance of payment crises associated with exchange rate overvaluations.

Rodrik (2008) provide evidence from 184 countries over eleven 5-year periods from 1950-54 through 2000-04 and analyzed the effect of undervaluation and overvaluation of currencies on stimulating economic growth. He concludes that against overvaluation that hurts growth, undervaluation is good for growth. For most countries, high growth periods are associated with undervalued currencies. Also he noted, there is a little of nonlinearity in the relationship between a country's real exchange rate and and its economic growth. He represented that an increase in undervaluation boosts economic growth just as well as a decrease in overvaluation. But this relationship holds only for developing countries. The relative price of tradable to non tradable (the real exchange rate) seems to play a more fundamental role in the growth process. Recently, Gala (2007) and Gulzmann, Eduardo and Fedrico (2007) have made similar argument as well.

Ildiko and Alter (2008) investigate the existence of relationship between real exchange rate misalignment and economic growth in four Central and Eastern European countries (CEEC): the Czech Republic, Hungary, Poland and Romania, during 1998-2007. They have estimated the equilibrium exchange rate of these countries against the euro in order to compute the real exchange rate misalignment and used time series and panel analysis to show that exchange rate undervaluation could stimulate economic growth. The estimation results emphasize an increase in the real exchange rate misalignment can easily slow economic growth. But, after dividing the RER misalignment into over- and undervaluation indicator in order to control for their individual effect on growth, it has been found a negative relation between the overvaluation indicator and the growth rate of the real GDP in the four CEEC countries.

Jongwanich (2009) examined the equilibrium real exchange rate and real exchange rate misalignments in developing Asian countries during the period 1995–2008. The RER misalignments assessed using the deviation of the actual RER from its equilibrium level. They have then investigated the relationship between real exchange rate misalignment and export performance based on GSM procedure. He concludes that real exchange rate misalignment could have a negative impact on export performance in developing Asian countries. This implies that the positive effects of RER depreciation on exports could be reduced when such depreciation is not consistent with economic fundamentals. In other word, RER misalignment in terms of real overvaluation could adversely affect export performance since real overvaluation reflects a loss in a country's competitiveness.

3. Methodology

3-1. Model Specification

In order to estimate the relationship between exchange rate gap and economic growth, we have used the model which was presented by Edwards (1986) using gross domestic product (GDP) as an economic growth index. Due to economic structure of Iran with a huge government size, we have used Government investment (GI) as a fiscal policy indicator, private investment (PI) as a variable influenced by fiscal and monetary policy, and Liquidity growth rate as a monetary policy index. In order to investigate the exchange rate gap effect on economic growth, we have replaced real exchange rate with real exchange rate gap (RERGAP). Also export price implicit index dividend by the import price implicit index is used as the term of trade (TOT):

$$LGDP = f(LGI, LPI, M_2G, LTOT, LRERGAP) + u$$

In which the letter L represents the logarithm of variables, RERGAP represent difference between official and parallel market rates, and ε_t represent the disturbance term. Also we have used the variable D97 as a dummy variable for explaining break point of Islamic Revolution in 1979 (D97 = 0 for years after the Revolution) and the variable D01 for indicating the structural change of removing currency deposit trade certification in Tehran stock market in 2001 (D01 = 0 for years after 2001).

The data concerning exchange rate and term of trade is obtained from statistical yearbook published by Statistical Center of Iran (SCI)[1]. The rest of the data is obtained from Central Bank of Iran (CBI)[2].

3-2. Data Description

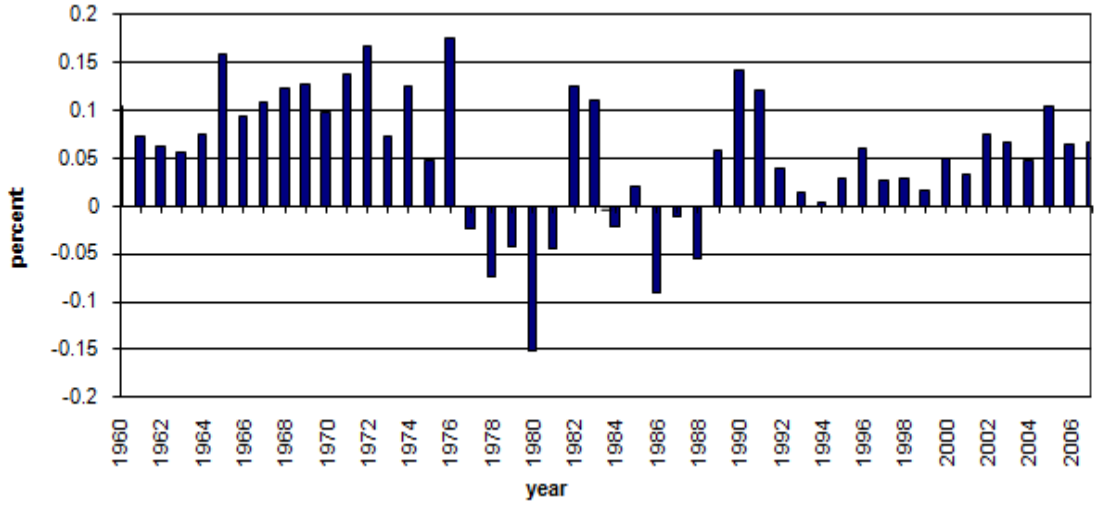
3-2-1. Trend of Economic Growth

Economic growth fluctuation in Iran during the last decades is shown in figure 1. Just after the Islamic revolution, due to Iraq-Iran war, economic sanction, oil revenue reduction, brain drain and capital flights, Iran has experienced negative economic growth. Beginning 1982 thank to increasing oil revenue, a

relative recovery has happened in Iranian economy which continued until 1983. After that due to oil revenue reduction and war deterioration and depreciation of infrastructures, the economy has experienced deep recession during 1984 – 1988. The war had ended 1989. The first five year social-economic plan was implemented just after the war in 1989. The purpose was reconstruction of the economy which was helped with oil price rise. So the nominal growth rate was about 14 percent at the first year of development first plan and has averaged to about 7.3 percent during 1989-1993 which was 0.8 percent less than that it was planed.

As a result of declining oil revenues, due to maturity date of foreign debt, import limitations and drought in country during the last years of first plan and all years of second plan, the average growth rate has declined to about 1.6 during 1995-1997.

Figure 1- Trend of Economic Growth during 1961- 2007



Source: Plotted using Data from Central Bank of Iran

Average economic growth rate during the third socio-economic plan has increased to about 5.5 mainly due to increase in oil revenue, stable economic condition, reform of economic structure, appropriate raining and continued industrial development policies.

The annual growth rate in forth plan should be about 8 percent, but the growth rate was about 6.2 and 6.7 percent during 2006 and 2007 respectively. It seems that unfavorable business environment, budget structure, increasing liquidity and low productivity in industrial sectors have played a major role in this low achievement.

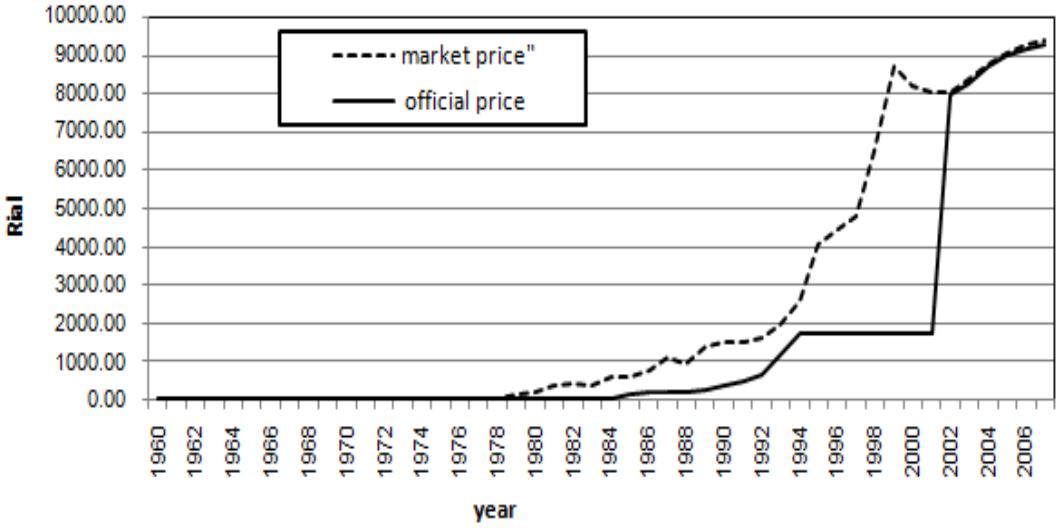
3-2-2. Trend of Exchange Rate Gap

According to Valadlhani (2003) prior to Islamic Revolution, the official exchange rate was approximately 70 Rials per US Dollar. At that time, the gap between the official and black market exchange rate was about 7 Rials which has gradually increased until 2001. The trend and fluctuation of this gap can

be seen in figure 2. It is very interesting to note that a new source of government revenue has originated from foreign currencies sale since 1989. The exchange rate was devalued by approximately 25 percent over the 1989-1992. Despite such devaluation, the black market for foreign currencies has persisted. The gap between the black market and official market has rendered a windfall gain for both the government and foreign currency dealer in the parallel market. For this reason, it is apparent that the substantial segment of "other revenue" in the government annual budget is attributable to the sale of foreign currencies by the central bank in the black market.

In the 1980s government has experienced a substantial budget deficit, so that government indebtedness to the central bank increased remarkably. Under these circumstances soaring inflation has been inevitable. This in turn, amplified the gap between the official and parallel market exchange rate for foreign currencies. Because of this increasing gap, the government devalued Rial in attempt to restore equilibrium in the foreign exchange market. Since the currency earning in Iran has been low, the government has used a multiple exchange rate system, but the system was not successful.

Figure 2- Trend of Exchange Rate in Official and Parallel Market during 1961- 2007



Source: Plotted using Data from Central Bank of Iran

The main reason for Rial value deterioration has been monetization of the enormous budget deficit during and after the war. It should be mentioned that, to some extent, psychological and socio-political factors have also played an undeniable role (Valadkhani 2003). This growing gap directed scare resources to unproductive sectors, increasing capital flights, decreasing economic efficiency, and at the end reducing economic growth.

In 1993 the Iranian government embarked up on the exchange rate unification policy with consultation of IMF. However this policy was not successful in various grounds due to lack of an appropriate government fiscal and monetary policy. Therefore in 1995 the Iranian authorities once again decided to

implement the existing regulation relating to the fixed exchange rate system along with prohibited participation in the black market.

Again in 2001 the government unified the multiple exchange rate regimes into a single equilibrium rate which has been successful since 2003 (as it can be seen in figure 2). Main reason for this achievement may have been the appropriate government fiscal and concretionary monetary policy along with government budget structure reform.

4. Discussion of Findings

As indicated in Table 1 all of the variables used in this research are first order integrated I (1), thus we can use Johansen (1988) cointegration tests to estimate the long run relationship between GDP and the independent variables.

Table 1- Result of Augmented Dickey-Fuller Unit Root Tests

Variable	95% Critical Value for the Augmented Dickey-Fuller Statistic	Augmented Dickey-Fuller test Statistic	Stationary Report
LGDP	-3.53	-2.48	Non Stationary
DLGDP	-2.94	-3.45	Stationary
LGI	-3.53	-2.26	Non Stationary
DLGI	-2.94	-5.97	Stationary
LPI	-3.53	-2.83	Non Stationary
DLPI	-2.94	-4.90	Stationary
LRERGAP	-3.53	-0.04	Non Stationary
DLRERGAP	-2.94	-5.03	Stationary
LTOT	-3.53	-2.56	Non Stationary
DLTOT	-2.94	-6.04	Stationary
M2G	-3.53	-3.19	Non Stationary
DM2G	-2.94	-8.29	Stationary

Source: Computed based on the data from cbi

Tables 2 and 3 show the cointegration test in 5 % and 10% significance level based on maximal eigenvalue of the stochastic matrix and model selection criteria. The SBC results suggest that there is one cointegration vector between gross domestic product and government investment, private investment, exchange rate gap, trade of transaction and liquidity growth.

Table 2- LR Test Cointegration Result Based on Maximal Eigenvalue of the Stochastic Matrix

Null	Alternative	Statistic	95% Critical Value	90% Critical Value
r = 0	r = 1	57.4147	36.2700	33.4800
r <=1	r = 2	29.5635	29.9500	27.5700
r <= 2	r = 3	24.8755	23.9200	21.5800
r <=3	r = 4	13.0376	17.6800	15.5700
r <= 4	r = 5	1.2287	11.0300	9.2800
r <= 5	r = 6	.18230	4.1600	3.0400

Source: Computed based on the data from cbi

As indicated in table 4 the cointegration vector coefficients show positive relations among GDP, and LGI, LPI and LTOT while negative relation with LRERGAP and M_2G.

Table 3- Result of Cointegration LR Test Based on Model Selection Criteria

Rank	Maximized LL	** AIC	*** SBC	**** HQC
r=0	77.7208	65.7208	55.0157	61.7508
r=1	106.4282	83.4282	62.9100	75.8190
r=2	121.2099	89.2099	60.6629	78.6233
r=3	133.6477	94.6477	59.8560	81.7452
r=4	140.1665	96.1665	56.9143	81.6099
r=5	140.7808	93.7808	51.8524	78.2317
r=6	140.8720	92.8720	50.0514	76.9920

** Akaike Information Criterion
*** Schwarz Bayasian Criterion
**** Hnnan-Quinn Criterion
Source: Computed based on the data from cbi

As can be seen in Table 4, all the estimated coefficients are statistically significant and have the expected theoretical signs. The LGI coefficient suggest that 1 percent increase in public investment lead to 0.37 percent increase in GDP which on theoretical basis, this positive relation is acceptable due to economic structure and large government share in Iran. The LPI coefficient indicates that 1 percent increase in private investment cause to 0.30 percent increase in GDP which is in line with all growth models. It is found that the exchange rate gap elasticity is – 0.16. It means 1 percent increase in exchange rate gap lead to 0.16 percent decrease in GDP. This is reasonable due to that exchange rate gap increases uncertainty and capital flight, direct scare resources to unproductive sectors, deteriorates different economic sectors operation, decreases economic efficiency, and at the end reduces the economic growth.

Table 4- Estimated Cointegration Vector Based on GDP Model

Variable	Cointegration Vector
LGDP	- . 75 (-1.00)
LGI	. 28 (. 37)
LPI	. 22 (. 30)
LRERGAP	- . 12 (- . 16)
M2G	- .003 (- .005)
LTOT	.52 (.70)

Source: Computed based on the data from cbi

The results show the negative relation between liquidity growth (M_2G) and production such that 1 unit increase in liquidity growth results 0.005 unit decrease in GDP. This issue is acceptable due to liquidity growth effect on inflation fluctuation, change in money demand, disturbing price mechanism of goods and production factors and so that, stagnation effect on economic production. Finally the estimated model indicates 1 percent increase in TOT lead to 0.70 percent increase in GDP. There is not a unique theoretical basis (Edward and Liaquat 1986), for this positive relation in Iran has become positive. Since income effect is bigger than the substitution effect, thus increasing trade of transaction could lead to rise in production.

Since GDP and RERGAP both are I (1) there is an error correction model corresponding to these variables which indicate that dependent variable changes will be a function of explanatory variables. In fact the error correction model considers the equilibrium and long run role of variables in short run fluctuation adjustment. The estimated error correction model is:

$$\hat{ECM} = -0.7455LGDP + 0.2774LGI + 0.2237LPI - 0.1176LRERGAP + 0.5214LTOT - 0.0035M_2G$$

Table 5. Error Correction Model for GDP

Variable	Variable Coefficient	t Statistic (Prob)
ecm(-1)	-0.073	-2.98 (0.005)
D 79	0.058	5.07 (0.000)
D 01	-0.029	-2.32 (0.025)
R^2 = 0.40	DW= 1.47	

Source: Computed based on the data from cbi

The results of error correction model for GDP indicate that exchange rate gap have negative effect on production in short run, such as in the long run. Error correction term coefficient is statistically significant and is equal to -0.073 (Table 5). This coefficient show that each year 7.3 percent of disequilibrium will be adjusted within the system in short run. Thus the adjustment process is very slow. According the error correction model LGI, LPI and LTOT are the most important determinant of GDP in the short run, but we can't extent this result to LRERGAP and M_2G.

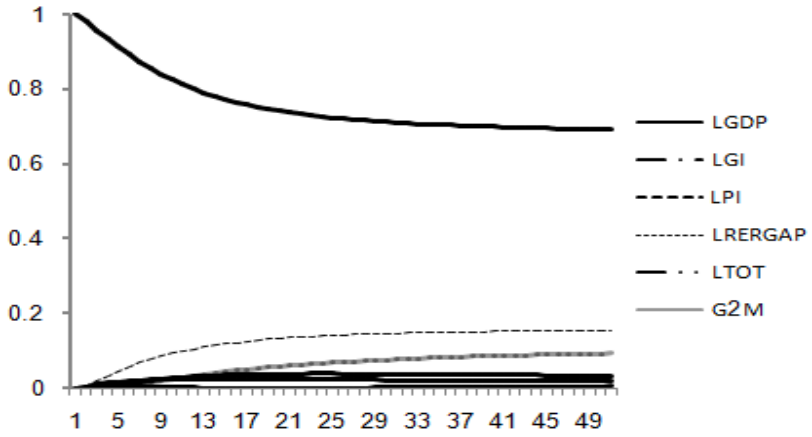
Table 6- Results of Variance Decomposition of GDP Prediction Error

Variable	Trend	LGDP	LGI	LPI	LRERGAP	LTOT	M2G
L (GDP)	1	0.98	0.00	0.00	0.00	0.00	0.003
	2	0.96	0.00	0.00	0.01	0.00	0.004
	3	0.94	0.00	0.01	0.02	0.00	0.004
	4	0.93	0.00	0.01	0.03	0.00	0.004
	5	0.91	0.00	0.01	0.04	0.01	0.003
	10	0.85	0.01	0.02	0.07	0.03	0.002
	15	0.81	0.01	0.02	0.09	0.05	0.001
	20	0.78	0.01	0.01	0.10	0.06	0.001
	25	0.77	0.01	0.01	0.11	0.07	0.002
	50	0.73	0.01	0.01	0.12	0.08	0.008

Sources: Computed based on the data from cbi

In order to evaluate the share of variables instability on a specific variable fluctuation, we have used variance decomposition. The variance decomposition for GDP indicates that the main source of GDP changes in the short run is itself. When the effect of GDP changes decrease, the main part of this reduction will be replaced by RERGAP in median and long run (Table 6). This is well illustrated in Figure 3 in which the exchange rate gap is the most important variable in determining gross domestic product in median and long run.

Figure 3- Variance Decomposition of GDP Prediction Error



Sources: Plotted based on the data from CBI.

5. Conclusion

Due to the importance of exchange rate gap effect on economic growth in Iran, we have examined this effect empirically, using annual time series data during 1961-2007. To do so the Johansen cointegration technique was employed to estimate the long run relationship between exchange rate gap and economic growth.

The results based on Schwarz Bayesian Criterion have suggested that, there is one cointegration vector between gross domestic product and government

investment, private investment, exchange rate gap, trade of transaction and liquidity growth.

The cointegration vector coefficients show a positive relation among GDP, and LGI, LPI and LTOT while negative relation with LRERGAP and M_2G. All the estimated coefficients are statistically significant and have the expected theoretical signs.

The result of error correction model for GDP represents that each year 7.2 percent of disequilibrium will be adjusted within the system in short run. Thus, adopting the appropriate policy against the undesirable changes in exchange rate gap is useful.

Also the variance decomposition for GDP has showed that the main source of GDP changes is itself in the short run while replaced with RERGAP in median and long run.

In General the empirical results of this study confirmed the significant negative relationship between exchange rate gap and economic growth. Therefore, adopting the appropriate exchange rate policy in order to adjust real exchange rate may have important role to increasing output capacity and economic growth.

Footnote

[1] www.sci.org.ir
[2] www.cbi..ir

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