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Exchange Rate Overshooting in Iran During 1959-2005

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Abstract: The value of the Iranian Rial has been depreciated per dollar in the recent decade and the exchange rate overshooting is said to be an important short-run phenomenon. This contribution studies the overshooting and undershooting of exchange rate in Iran by applying Dornbusch monetary model. In this study we have shown that whether or not the exchange rate in short-run deviates from long-run equilibrium magnitude and if it does so, by what velocity it runs towards long-run equilibrium magnitude. By using time series data for the period of 1959 to 2005, this important subject has been analyzed by employing error-correction and co-integration models. The econometric test results show that this theory works in Iran.

JEL: F31 · C22
Key words: Exchange rate · Overshooting · Undershooting · Error correction and co-integration model

INTRODUCTION

Exchange rate establishes connection among different countries' national money and this enables us to compare international costs. We can define the exchange rate as a number of units of national money in a country that is used to purchase one unit of national money from another country [1]. In short term, this rate might be equal with the equilibrium rate of a long run or it might deviate from the equilibrium rate of a long-run. According to Dornbusch [2], practicing an expansionary monetary policy can influence macro-economical variables such as exchange rate. He believes that money expansionary policy causes reduction in interest rate and accelerates the capital flight. So the value of national money in country decreases and this reduction in short run is more than that of the long-run.

In an open-economy with floating exchange rate, effects of monetary policy on economy will be transmitted through changes in interest rate and exchange rate in a short-run on the price in long-run [3]. For the first time, the e ffects of monetary policy in open-economy have been studied by Mundell [4] and Fleming [5]. The Mundell - Fleming Model is a short run model, because it assumes the prices fixed. This model is also called the Keynes open economy model. With the developments in 1970s (and dispensing with fixed exchange rate policy), fixed price model has been of little use. Dornbusch supposed that the level of price in long-run is flexible and in short- run is sticky [6].

According to these assumptions as well as some others, Dornbusch believes that the level of price will be in balance in long-run. Levels of prices in short-run will be fixed and in long-run it changes according to money supply and exchange rate.

Experimental

Exchange Rate Stability and Factors Determining the Equilibrium Real Exchange Rate: Since exchange rate fluctuations make many problems on economic decision-makings and decrease economic efficiency by increasing the expenses so analyzing the conditions that leads to decrease in exchange rate fluctuations are very important.

We can have the market stability just once the demand and supply aspects lead to conditions that any deviation from equilibrium state leads to the potentials to force the market to return towards equilibrium [7].

When exchange rates are stable, the more it becomes possible to have good programs and plans for manufacturers, exporters and importers and it enforces the governments to put the exchange rate in a limited scope that is more fruitful for the development of the country

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and give exporters, importers and manufacturers the opportunity to be sure of the stability of the exchange rates [8].

It is generally believed that nominal exchange rate stability leads to constancy of price levels because expenses of importing with country's current currency decrease or remain fixed. But we should consider that exchange rate stability would not be spontaneously effective on the control of inflation. Therefore in policies of demand side being expansionary we will face with inflation. Furthermore, in Iran because of having some limitation on foreign reserves for consistency of exchange rate, putting some limitation on commercials is itself of the factors that limits importing the final and interface goods which ultimately decrease the aggregate supply and by causing economic depression it leads to cost push inflation that is the result of high expanses and it neutralizes the effects of nominal exchange rate stability. As a result the real exchange rate decreases and resources split from the product section of tradable commodities and is absorbed to the section of non-tradable commodities such as housing and services.

Although the equilibrium real exchange rate is only a function of real variables, in practice, we can say that real exchange rate will react to both real and monetary variables. A real exchange rate does not mean that the present real rate should always be equal with equilibrium rate. Most often, in short-run, the real exchange rate is different from the equilibrium rate [9].

Short-run deviations and even middle-run that are not typically great and which exist because of some temporary changes in real variables and short-run deficiencies and compatible expanses, occur. So other changes can cause large and permanent deviations between real exchange rate and equilibrium real exchange rate or it may lead to unsuitable adjustment of real exchange rate.

Government decisions about allocating the expenses between tradable and non-tradable as well as the type of enacted taxes will influence long-run equilibrium exchange rate. If the government expenditures are provided by taxes that cause a decrease in factor productivity, it will have long-run effects on real exchange rates.

Increase in government expenditures for non-tradable goods which is provided by levy of fixed taxes will increase the price of non-tradable goods and generates a force to strengthen long-run equilibrium real exchange rate. On the other hand, because of levy of fixed taxes and also increasing the price of these goods, demand of private section for non-tradable goods decreases which weakens long-run real exchange rate. Since, increase in government demand for non-tradable goods is more than decrease in demand of private section for those goods (because the marginal propensity for government consumption is more than private Section), so reinforcement of the real exchange rate in long-run particularly for developing Countries in which the government size is huge, is more probable.

All the times, the real exchange rate is dependent on magnitude of fundamental factors (such as global prices, real rates of interest, tariffs and etc) and also the signs pertinent to macro-economy parameters that are because of money surplus and budget deficit or both. Therefore, the interdependence effects of macro-economical policies and real exchange rate behavior in various exchange rate regimes are different.

Adjusting the inappropriate real exchange rate can cause many damages especially on society's efficiency and welfare. This inappropriate adjustment is usually accompanied by a series of controls on trade and exchange rate which is used in order to prevent the exchange resources from going out of the country. This happens when the real exchange rate is expensive or its rate is lower than the equilibrium extent.

Exchange and trade controls cause an increase in expenses that is the result of inefficiency and generates some groups that take part in Competition to achieve supporting policies in order to exploit the resources. In addition, if the exchange rate is high, exports would enormously be damaged and it can destroy the agricultural backgrounds if this situation prolongs. These damages can be remarkable by existence of deficiencies in local capital markets. Inappropriate adjustment of real exchange rate will also heat the stock market and jobbery and occasions capital flow from country. Although from the point of view of private section this capital flow can be optimum, but it may vastly decrease the social welfare.

Equilibrium and Non-equilibrium Real Exchange Rates and Expenses Resulting from Imbalance: Although the concept of inappropriate adjusting of real exchange rate has increasingly dominated policy-making issues, we rarely have an exact and clear-cut definition of it. I this study, inappropriate adjusting of real exchange rate is defined as a long lasting separation of real exchange rate from durable and long-run equilibrium level. This definition says that in order to understand the case of inappropriate adjusting of real exchange rate it is firstly necessary to perceive the function and variations of equilibrium real exchange rate.

The equilibrium real exchange rate shows the proportional price of tradable goods to non-tradable ones. We can say that this proportion according to durable long-run magnitudes of other real variables which is technically called "fundamental factors for real exchange rate", should be compatible to have a simultaneous access to internal and external equilibrium and this reveals that real equilibrium exchange rate is not a constant figure but rather a function of fundamental factors [10]. When one of these fundamental factors changes, for instance terms of trade, the equilibrium real exchange rate will change as well.

Whereas equilibrium real exchange rate is based on real fundamental factors, the actual real exchange rate in short-run and even in middle-run will react to fiscal and monetary fluctuations. For example, expansionary and incompatible policies in macro economy will lead to some movements in real exchange rate that is not relevant to fundamental factors. If the separation of actual real exchange rate from long-run equilibrium continues, it will lead to inappropriate adjusting in real exchange rate. To distinguish variations of equilibrium real exchange rate that is the result of fundamental factors and non-equilibrium changes is one the most difficult tasks for experts and politicians to deal with [11].

Lack of equilibrium in real exchange rate can be conducive to decrease in economic efficiency, inappropriate distribution of resources, destruction of agricultural section and increase in capital flow to abroad. But the most serious disadvantage about unreal costliness of money may be severe controls on exchange and trade. Decrease in efficiency which has roots in these discriminative obstacles in goods trade and financial assets can cause much many problems than inappropriate adjusting of the exchange rate [12].

Overshooting and Undershooting of Exchange Rate: There are two relations in overshooting that should be taken into account. First, equation (1), that is uncovered interest parity and it means that the internal interest rate of bond should be equal with external interest rate plus expected amount of weakening of the value of exchange rate [13].

$$i_{t+1} = i^* + E_t(e_{t+1} - e_t) \quad (1)$$

Where, (i) is domestic interest rate of bond, (i*) is foreign interest rate of bond, (e) is the logarithm of exchange rate (the local price of foreign money) and (E_t) shows market expectancies based on the information in the given time (t). If the bond can completely replace each other and the international capital will have perfect mobility, two types of bond interest rate i.e. local and foreign, can only differ when the enterprises expect variation in exchange rate. We assume that the internal country in global capital market is small and external interest rate is exogenous. We should also mention that Dornbusch model has a perfect foresight on the model and it is not uncertainty.

The second equation (2) of Dornbusch model is the equation of monetary demand [13].

$$m_t - p_t = -\eta i_{t+1} + \varphi y_t \quad (2)$$

Where, m_t:money demand,p_t: level of internal price and y_t is internal product.

All the above magnitudes are logarithmic and η and φ are positive parameters. High interest rate increases the cost of opportunity for keeping the money and decreases money demand. In contrary, increase in income, enhances the demand for money transactions and ultimately money demand is determined according to price level.

The above equation is a simple explanation of money demand function by Goldfield [14]. Of course, there has been some important change in the manner of transactions and money demand function has been examined in recent years but it is not too remarkable to change Dornbusch method completely.

In order to show the overshooting and undershooting of exchange rate, one can combine these two equations as well as some simple hypotheses. Firstly, it is assumed that internal price level p, does not change immediately according to unexpected shock of money and it is modified gradually in course of time (Sticky Price). Secondly, it is supposed that the product of Y is exogenous and has slow movement in compare with unexpected money shock. Thirdly, we take it for granted that money in long-run is neutral. So the permanent increase in (m) can cause an appropriate increase of e, p in long term.

Let's assume that unexpected permanent increase in money supply occurs. If the nominal money supply increases but the price level is temporarily fixed, real money supply i.e. m-p will increase. In order for system to reach to balance, real balance demand should also increase. If we keep y fixed in short-run there should be a downfall in the rate of internal bond [15]. According to equation (1-4), because i^* is consistent and exogenous, there should be an increase in the value of national money. But what we expect as the effect of long-run shock of money supply to occur is appropriate weakening of the exchange rate.

Dornbusch [16] believes that exchange rate should at first place increase in vast amounts and then decrease in long-run, so to speak overshooting of exchange rate. Have this in mind that this result is achieved by the assumption of internal sticky price; otherwise, if all the magnitudes are nominal and price level is flexible and all m, p and e go up proportionately and there would be no overshooting of exchange rate (i.e. money is neutral).

If the income is endogenous, the model doesn't necessarily predict overshooting. In new models, in money demands equations, consumption appears instead of income and this prevents overshooting. So overshooting takes place when money demand is not so dependent on income and aggregate demand in response to real exchange rate variation doesn't move so swiftly. If money demand shows reaction to income variations and aggregate demand is sensitive to real exchange rate then undershooting occurs. Dornbusch thinks of this as unreal; whereas many evidences emphasize that the monetary policy will meaningfully affect the product just by one lag. As mentioned earlier, in the new models at which money demand is a function of consumption, undershooting is not that impossible [17].

Statistical Review and Developments in Exchange Rate Regime in Iran: Exchange rate regime in Iran traces back to 1951s. Exchange rate regime in Iran was kept on the base of fixed exchange rate regime from 1955-1993. That is to say, until 1975 Iranian Rial was locked to dollar and from then on till 1993, it was locked to monetary basket of SDR.

In Iran, the issue of selecting an appropriate exchange rate regime and/or policies pertinent to the determination of exchange rate has been put forward seriously from 1989. These policies, regarding to their profound effects on various economic sections, have always been sensitive and in practice, have been the most influential and determinant element in economic policy-makings.

In 1993, central Bank of Islamic Republic of Iran announced that it uses managed floating exchange rate regime. But practically it kept the exchange rate fixed firstly because of structural problems in exchange rate market and secondly because of productive infrastructures of country's economy. By extensive intervention in foreign exchange market, the central bank didn't allow for daily variation of exchange rate and as a result it seemed that traditional market had tendency to keep the exchange rate fixed. On the other hand, since the major part of Iran's foreign exchange incomes come from oil sale, any increase in demand for imports will subsequently lead to increase in trade balance deficit as well as severe fluctuations in exchange rate.

Amidst years 1993-1994, the unofficial exchange markets faced with severe fluctuations. In a way that for some periods the Central Bank was forced to increase the floating rate considerably. But despite taken policies, foreign exchange was not available for all applicants and the Central Bank avoided any intervention and exchange supply in market, conceiving that foreign exchange available in the market would be enough for applicants in new equilibrium rate. But because of different transformations such as taking these policies, foreign exchange market encountered with shortage in exchange supply.

At the beginning of 1995, some exchange limiting policies was conducted because of fluctuations in exchange rate in black market as well as considerable gap which was between nominal exchange rate and floating exchange rate in black market. So by taking the new exchange policies and announcing that exchange transaction out of bank system is smuggled, fluctuation of exchange rate in black market stopped.

In 1996, Central Bank tried to prevent exceeding fluctuations of exchange rate by directing all foreign exchange transactions in to the bank system. During this year, exchange controlling policies and taking commitment from exporters based on foreign exchange sale resulting from non-petroleum exports to bank systems in its due time and to stabilize exporting exchange rate in the level of per dollar being 3000 Rials continued in the line with policies related to previous year.

Exchange system of the country in 1997 and 1998 didn't change remarkably and as former it is based on two nominal rates (black market rate) and exporting exchange rate. According to regulations approved in 1997, by offering sanction to exporters, for selling settlement sheet in Tehran bourse, effective exporting exchange rate increased according to transactional value of settlement sheet in bourse market.

Furthermore, on the base of regulations enacted in 1998, in some cases, the rate of settlement sheet was replaced with exporting exchange rate.

Exchange system of country in 1999 was based on floating exchange rate, exporting rate and rate of settlement sheet and the prerequisites for gradual replacement of rate of settlement sheet instead of exporting rate was provided for 2000. From the beginning

of 1999, determining the exchange rate of settlement sheet was transferred to the function of demand and supply force. In addition, it was supposed for exporters to be able to sell their settlement sheet to the Bank and receive its Rial equivalent or they themselves take actions for importing. In 1999, the whole policies and administrative procedures taken for the foreign section of country's economy, was based on reliance on market factors and supply and demand forces in determining the exchange rate.

In 2000, clarifying of exchange market, reduction of non-tariff barriers in importing and simplifying in exporting of non-petroleum commodities were included in conducted policies in foreign section of economy.

From the beginning of 2000, regarding the success of central Bank in managing exchange market through reliance on demand and supply forces in line with equalization of exchange rate, exporting exchange rate of exchange allocating system in Iran was omitted and exchange deposit certificate was replaced for exchange settlement sheet.

In 2001, applying appropriate monetary and credit policies, consistency of exchange rate along with financial consistency of the government occasioned to the continuation of public trust to government economical policies. In the year the value of Rial enjoyed a relative consistency.

In 2002, by reliance on appropriate exchange reserves and establishing suitable backgrounds in the last years, equalization of the exchange rate for the second phase was done successfully. The exchange system of the country was called "managed floating system" and all of exchange regulations were modified proportionately with mentioned system. In line with establishing grounds for freely transaction of foreign exchange and reduction of demand in parallel exchange market, the sanction for establishing money-changing centers (except free industrial and commercial zones), was issued and regulations related to service exchange transactions at various grounds were notified to bank system.

In 2003, putting surplus of incomes resulting from oil exports to exchange reserve account subsequent to increase in oil price in international markets and using that account in order to cover commitments arising from equalization of exchange rate were conducive for the continuation of equalization policy and stabilize the foreign section of economy. In order to prohibit the negative consequences of exchange rate equalization on repayment of taken commitments in previous years, about 2.5 billion dollars has been added to 2003 budget of the country from exchange reserves account.

Exchange and commercial policies of the country in 2004 has been found on depicted procedures in third program of development based on continuation of exchange rate, encouragement of non-petroleum exports and preventing goods smuggling. In 2004, foreign exchange market did not encounter with great up and down. Investigations show that the value of dollar in official market (inter-banks market in Tehran) and unofficial market in 2004 increases. The average amount of exchange rate in unofficial market increased from 8323 Rials to 8747 Rials by having 5.1% rate of growth. In this period, average exchange rate in official market increased from 8282 to 8719 Rial by having %5.3 rate of growth.

Estimating the Model and Analyzing the Results: Theoretical model applied in this study is as following [18]:

$$\ln E = \alpha \ln\left(\frac{M_{2(ir)}}{M_{2(us)}}\right) + \beta \ln\left(\frac{y_{(ir)}}{y_{(us)}}\right) + \gamma\left(\frac{P_{(ir)}}{P_{(us)}}\right) + C + u_t$$

In which:

$M_{2(ir)}$: Volume of liquidity in Iran (billion Rials)
$M_{2(us)}$: Volume of liquidity in US (billion Dollars)
$Y_{(ir)}$: Real national gross production in Iran (billion Rials)
$Y_{(us)}$: Real national gross production in US (billion Dollars)
$P_{(ir)}$: Inflation rate in Iran (Percent)
$P_{(us)}$: Inflation rate in US (Percent)
E : Nominal exchange rate in parallel market (Rial based on dollar)

Statistics related to official exchange rate, national production, liquidity and inflation in Iran can be found in the site of Central Bank of Islamic Republic of Iran and statistics about US can be found from Federal Reserve site and Saint Louis site.

We can show this model simply:

$$e_t = \alpha M_t + \beta y_t + \gamma p_t + c + u_t$$

In which:

$$M_t = \ln \frac{M_{2(ir)}}{M_{2(us)}}$$

$$y_t = \ln \frac{y_{(ir)}}{y_{(us)}}$$

$$p_t = \frac{p_{ir}}{p_{us}}$$

Inflation rate has been used as a representative for opportunity cost of keeping money [19].

Stationary Test: The results of Augmented Dickey-Fuller stationary test (ADF), on model variables and their first difference are as Table 1.

Selection of the optimal lag in stationary test has been based on Schwartz Bayesian criterion. Critical value of test statistic for observation level (36 cases), is about -2.9472 and for first difference in observation (35 cases), are about -2.9499. You see that all the varieties at their level are non-stationary and just by one differential they become stationary. It means that all of them are co-integrated from first order I (1).

Estimating Auto Regressive Distributed Lag Model (ARDL): Estimating this model (Table 2) is according to different lag tests and choosing the optimal lag based on Schwartz Bayesian (SBC), criterion done by Microfit software. The maximum lag is 2 which is the most appropriate figure for annual data. You see that except variable Y, all the variables at the level %5 are significant.

According to long-run coefficients achieved from ARDL model, increase in the volume of liquidity in Iran in compare with the United States and also increase in the inflation rate in Iran in compare with the United States both cause increase in nominal exchange rate and reduction in the value of Rials in compare with dollars.

Increasing of real national gross production in Iran in compare with the United States cause decrease in exchange rate (Rial based on dollar), that is in perfect compatibility with monetary model of determining the exchange rate (Table 3).

It is seen that because of a disturbance or a shock and deviation of the nominal exchange rate from its equilibrium path in long-run that is shown in (Table 4), table, in each period %19 of imbalance error in short-run is modified towards long-run equilibrium.

Table 1: Stationary test

	Level		First Difference	
Variables	Lag	ADF	Lag	ADF
e	1	-0.45105^{ns}	0	-3.0954*
M	1	0.61274^{ns}	0	-3.8567*
P	1	-2.7156^{ns}	0	-8/7392*
Y	1	-2.4475^{ns}	0	-4.3345*

Source: research findings

Non-significant: ns, Significant in level %5: *

Table 2: ARDL Model

Variables	Coefficient	Sts. Error	T-Ratio	Sig
(Constant)	1.6125	0.7799	2.0675	0.046
e(-1)	1.1969	0.1255	9.5331	0
e(-2)	-0.3878	0.1147	-3.3794	0.002
M	0.1758	0.0729	2.4108	0.021
Y	-0.1501	0.1368	-1.0972	0.28
Y(-1)	-0.3907	0.1879	-2.0789	0.045
Y(-2)	0.3585	0.1335	2.6836	0.011
P	0.1116	0.0036	3.0555	0.004

Source: research findings

DW-Statistic	R-Bar-Squared	R-Squared
.12.062.1	.0.9978	.0.9817

Table 3: Estimating the long-run coefficient

Variables	Coefficient	Sts. Error	T-Ratio	Sig
(Constant)	8.4435	1.1112	7.5988	0
M	0.2103	0.0581	15.847	0
Y	-0.9547	0.3444	-2.7721	0.009
P	0.0584	0.2662	2.1967	0.035

Source: research findings

Table 4: Estimating Error Correction Model

Variables	Coefficient	Sts .Error	T-Ratio	Sig
d(Constant)	1.6125	0.7799	2.0675	0.046
de	0.3878	0.1147	3.3794	0.002
dM	0.1758	0.0729	2.4108	0.021
dY	-0.1501	0.1368	-1.097	0.28
dY(-1)	-0.3585	0.1335	-2.6836	0.011
dP	0.0111	0.0036	3.0555	0.004
Ecm(-1)	-0.1909	0.0725	-2.6327	0.012

Source: research findings

Vector Auto Regressive Model: In the model VAR, that is an especial type of simultaneous equation model, the interdependence effect of variables to each other is measured through impulse response function (IRF). In this model, in each stage a shock is given to every variable and its effect on nominal exchange rate logarithm variable which is the subject under question is investigated. Impulse response function measures the returning route of mentioned variable upon giving a shock on disturbance term of every equation (Figure 1).

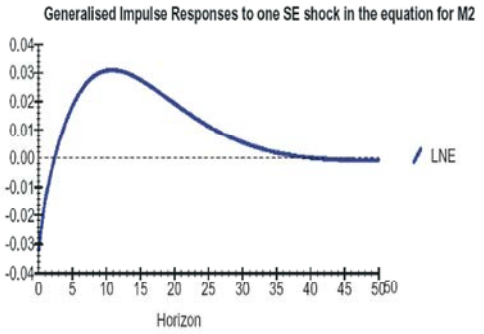

Fig. 1: Impulse Response Function of nominal exchange rate in response to the shock on M variable

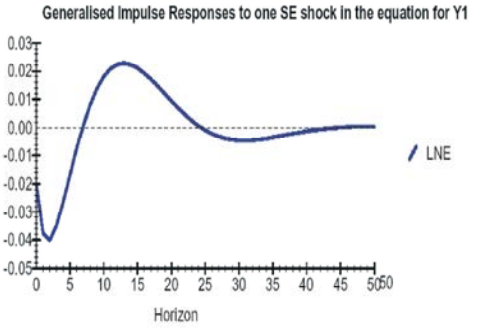

Fig. 2: Impulse Response Function of nominal exchange rate in response to the shock on Y variable

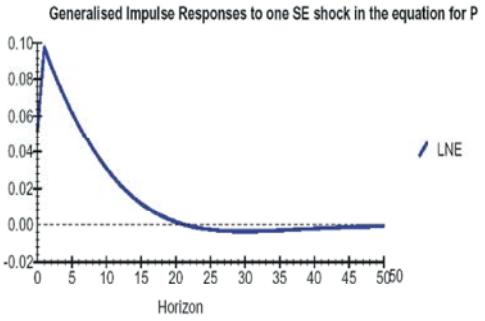

Fig. 3: Impulse Response Function of nominal exchange rate in response to the shock on P variable

It follows that after the shock of increasing volume of liquidity the exchange rate in short-run deviates from its equilibrium direction and then gradually moves to new long-run equilibrium direction that is higher than its first equilibrium magnitude and reaches to equilibrium again. Regarding that the new equilibrium is in higher position than elementary equilibrium (before giving any shocks), so increase in money volume (monetary shock), causes an increase in equilibrium rate in long-run that is compatible with monetary model for determining the exchange rate. But the mutation of the exchange rate in short-run is more than its equilibrium magnitude in long-run that is the indicator of overshooting in exchange rate of Iran economy (Figure 2).

By giving shock for the increase of gross national product in Iran in compare with United States, exchange rate decreases in short-run and then it increases to some extent and subsequently the effect of shock will be reduced. Therefore relative increase in national product and economic growth leads to the reduction in nominal exchange rate and appreciation in exchange rate. This issue indicates the importance of economic growth in the promotion of the value of national money according to exchange determining monetary model (Figure 3).

By increase in inflation in Iran in compare with the United States and reduction in purchasing power of money, the logarithm of nominal exchange rate in short-run mutates intensively and it can obviously show the overshooting phenomenon, of course after passing 3 courses this mutation gradually loses its effect.

So we conclude that increase in money volume and inflation both can cause mutation and overshooting of the nominal exchange rate and depreciation of national money but increase in national product and economic growth in Iran compared with foreign countries leads to the appreciation of national money. We should consider that in this study, nominal exchange rate, the number internal money units are based on one unit of foreign money which is an applicable concept for exchange rate in Iran.

Co-Integration Test and Estimating the Co-Integration Vector by Johansson-Juslius Method: In VAR model, response of model variables (in this study logarithm of nominal exchange rate), to an applied shock on every variable was examined. Now the question is that whether or not there is a long-run equilibrium relationship among these variables which mentioned shock can dismiss these variables from long-run equilibrium. We earlier presented a long-run estimation by ARDL model but in Johansson-Juslius Method that is based on maximum likelihood (ML), the advantage is that if there are more than one co-integration vector, all the vectors will be estimated.

In order to do this, first we use two test criterion maximaum eigenvalue λ_{max} and λ_{trace} or Matrix trace in order to determine the number of co-integration vectors (Table 5).

Table 5: Matrix trace and maximum eigenvalue test

	Model		Model		
type of test	H_1	H_0	Test statistics	Critical value	Critical value
	r=0	r=1	53.348	31.79	29.13
λ_{max}	r<=1	r=2	18.6254	25.42	23.1
	r<=2	r=3	11.4228	19.22	17.18
	r<=3	r=4	2.9325	12.39	10.55
λ_{trace}	r=0	r>=1	86.329	63	59.16
	r<=1	r>=2	22.981	42.34	39.34
	r<=2	r>=3	14.356	25.77	23.08
	r<=3	r=4	2.9335	12.39	10.55

Source: research findings

Table 6: Estimating the Johansen co-integration vector

Variables	Vector Co-integrated vectors	Normalized Co-integrated vectors
E	0.388	-1
M	-0.274	0.70586
Y	0.391	-1.0093
P	-0.035	0.09131
Trend	-0.012	0.03249

Source: research findings

E=0.70586M-1.0093Y+0.09131P+0.03249Trend

In both tests, trace and eigenvalue, the number of co-integration vectors i.e. the number of long-run equilibrium relationship shows that there is only one vector which has been estimated as Table 6.

Here we see that a relative increase in money volume and inflation in Iran in compare with the United States increases nominal exchange rate and weakens national money, but a relative increase in national production and economic growth inside the country in compare with other countries reinforce national money and reduces nominal exchange rate. Furthermore nominal exchange rate in Iran has tendency for increase in course of time.

Variance Decomposition and Logarithm of Nominal Exchange Rate in Var Model: By using the method of Orthogonalised variance decomposition the share of each variable in prediction error variance is evaluated (Table 7). It is seen that in 50 years perspective after the variable itself, logarithm of nominal exchange rate, variable of logarithm of liquidity volume in Iran in compare with the United States is the most influential variable on nominal exchange rate. So we can say that any increase in volume of liquidity inside the country and shock of money increase are among the most effective factors on nominal exchange rate and reduction of the value of national money.

Table 7: Orthogonalised Variance Decomposition for nominal exchange rate
Orthorgonalised forecast error variance decompostion for variable LNE unrestriced vector authoregressive model

Based on 44 observations form 1340 to 1383. Order of VAR = 1

Line M2 y1 p

List of deterministic included in the unrestricted VAR:

C T

Horizon	Line	M2	Y1	P
0	1	0	0	0
1	0.90495	0.011169	0.019336	0.064540
2	0.87153	0.022242	0.025546	0.080683
3	0.84738	0.034998	0.029129	0.088493
4	0.82624	0.049152	0.031491	0.093116
5	0.80659	0.064224	0.033102	0.096086
6	0.78806	0.049716	0.034190	0.098031
7	0.77.66	0.095170	0.34895	0.099271
8	0.75450	0.11019	0.035316	0.099998
9	0.73967	0.12446	0.035526	0.10034
10	0.72672	0.13774	0.035583	0.10041
11	0.71434	0.14986	0.035533	0.10027
12	0.70386	0.16074	0.035411	0.099983
13	0.6948	0.17035	0.33244	0.099605
14	0.68708	0.17869	0.035055	0.099173
15	0.68059	0.18583	0.034859	0.098718
16	0.67522	0.19185	0.034667	0.098264
17	0.67083	0.19685	0.034486	0.098828
18	0.66732	0.20094	0.034322	0.097421
19	0.66454	0.20424	0.034176	0.097021
20	0.66238	0.20685	0.034050	0.096722
21	0.66074	0.20888	0.033943	0.096187
22	0.65952	0.21044	0.033855	0.095987
23	0.65864	0.21160	0.033783	0.095979
24	0.65802	0.21245	0.033726	0.095806
25	0.65760	0.21305	0.033681	0.095665
26	0.65734	0.21347	0.033647	0.095551
27	0.65718	0.21373	0.033622	0.095461
28	0.65711	0.21390	0.033604	0.055391
29	0.65709	0.21398	0.033592	0.095337
30	0.65710	0.21401	0.033584	0.095298
31	0.65714	0.21401	0.033579	0.095268
32	0.65718	0.21399	0.033577	0.095248
33	0.65723	0.21396	0.033576	0.095234
34	0.65728	0.21392	0.033577	0.095224
35	0.65732	0.21389	0.033578	0.095219
36	0.65735	0.21385	0.033579	0.095216
37	0.65738	0.21383	0.033581	0.095214
38	0.65740	0.21380	0.033582	0.095214
39	0.65741	0.21379	0.033584	0.095215
40	0.65742	0.21378	0.033585	0.095216
41	0.65743	0.21377	0.033586	0.095217
42	0.65743	0.21377	0.033587	0.095218
43	0.65743	0.21376	0.033588	0.095218
44	0.65743	0.21377	0.033589	0.095219
45	0.65742	0.21377	0.033589	0.09522
48	0.65741	21.3780	0.033589	0.09522
49	0.6574	0.21379	0.033590	0.09522
50	0.6574	0.21379	0.033589	0.09522

RESULT AND DISCUSSION

In the present study, in order to examine the effective factors on exchange rate, Dornbusch monetary model has been used. In this model, increasing the volume of money inside the country compared with other countries, reduces the value of national money and increases the exchange rate. According to overshooting model, which was introduced by Dornbusch in 1970 [20], because in short-run prices are sticky and are not flexible, so the shock of money increase, causes ore intense increase in exchange rate in short-run compared with long-run. But in long run because prices have much flexibility so some portion of monetary shock is neutralized by prices and money pressure on exchange rate is reduced and exchange rate in short run increases more than that of long run.

In estimating the equilibrium state of variables by ARDL method and Johansson's maximum Likelihood the effect of increase in logarithm variables of liquidity volume in Iran in compare with the United States and inflation rate in Iran in compare with the United States brings about reduction in the value of national money. So inflation as well as money increase is conducive to the weakness of Rial against dollar and this is completely compatible with monetary model.

In contrast, growth in national production reinforces the value of national money. This situation is opposite to the Keynes approach which increase in national production due to increase in importing demands, in turn, increases the exchange rate and weakens the national money.

Therefore, we should use money volume and liquidity control policy. From the results achieved from variance decomposition in VAR model we can conclude that about %21 of nominal exchange rate variations in long-run and middle-run comes directly from money volume. When there is a short-run imbalance for instance a monetary shock in the system and deviation of variables from long-run equilibrium in each period, %19 of imbalance is directed towards long-run equilibrium. By applying a monetary shock, the exchange rate deviates from short-run equilibrium and in a short-run perspective mutates from its direction and then reaches to a new equilibrium position higher than the former situation.

CONCLUSIONS

In this study we have shown that whether or not the exchange rate in short-run deviates from long-run equilibrium magnitude and if it does so, by what velocity it runs towards long-run equilibrium magnitude. By using time series data for the period of 1959 to 2005, this important subject has been analyzed by employing error-correction and co-integration models. The econometric test results show that this theory works in Iran.

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