To Study Real Exchange Rate Behavior and its Effects on Macroeconomic's Variables.

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ABSTRACT

In this article, real exchange rate behavior and its effects on macroeconomic variables are studied by explaining two models; impulse function and forecasting predicted error decomposition. Studies show that high artificial currency value has caused domestic and foreign accounts equilibrium disturbance and foreign income decrease due to the slackening of commercial and agricultural activities, foreign debt increase, productive capacity, purchasing power and national welfare decrease, and general price level sever increase. Trade balance unexpected reaction is one of the most important points that should be considered while first fostering exchange policy. At the first stage of fostering devaluation policy, contrary to the perspective, trade balance may move into a critical situation.

The results show that in Iran Economy, the effect of Rial real devaluation policy, after three lags (about a year), caused non- oil export growth and improvement. It should be considered that the positive range of this effect was restricted and lasted for no more than one year. This study approves the presence of J- curve phenomenon in Iran from the first quarter of 1977 till the last quarter of 1995. The results show the importance of import share in changing real exchange rate. Short term production changes are affected by output, import, money supply, real effective exchange rate and non-oil – export respectively.

The results also exhibit that two variables – money supply and imports, significantly explain changes in non-oil – export. Production equation is also affected by its own lags. This means that in the above-mentioned period, exchange and monetary policy couldn't play an important role in output changes. Ultimately, in import equation, import is affected weakly by the lags of real exchange rate. It might be explained that during the period of this study, import restrictions as the dominating variable, were the key role of import trend in Iran.

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1. Introduction.

Regulating real exchange rate and reinforcing it correctly are among the greatest problems of domestic and foreign economic relations in developing countries. In the previous studies done by economist, especially International Monetary Fund experts, it is believed that high artificial currency value of different countries has disturbed domestic and foreign accounts equilibrium. Fixing exchange rate at an unreal level has caused sluggishness in agricultural and commercial activities, an increase in foreign debts, a decrease in production capacity and purchasing power, and a sharp rise in general price level. The study of real exchange rate behavior and its effect on macroeconomic's variables inevitably enable us to choose the most suitable policy to confront unbalanced situation in economy. In this article, we are looking for a model to match the economic situation of the country and specify the effect of devaluation on import and export. We are also study the most perfect model that can explain instability share of every variable against incoming shock of every variable of the model. The article is written following the above mentioned aims. After introduction, the theoretical literature is discussed in two parts. In the first part, the effect of non-equilibrium parity rate upon some macroeconomic's variables such as trade balance, capital account, resource allocation, income, wealth and budget will be studied. In the second part, J- curve model will be provided. The most important point in the study of the effect of exchange policy (devaluation) on foreign trade is the unexpected reaction of trade balance while first fostering this policy. The effect of devaluation may contradict possible expectation and worsen trade balance situation.

J-curve explains the existence of the unexpected phenomenon. The third part describes the methodology and econometrics model – impulse function and forecasting error variance decomposition. Impulse function is obtained according to moving average (MA) of a VAR model. In the function mentioned above X_t contains moving average and five variables: non-oil real export, real effective exchange rate, money supply, real output and real import. Using forecasting error variance decomposition, we explain the instability share of every variable against incoming shock upon each variable of the model. The model can measure the effect of each variable on other variables over time. The last part of the article concerns the summary and conclusion.

2. Theoretical Literature

In this part, we begin by considering the effect of non equilibrium parity rate on some macroeconomic's variables followed by J-curve model. Studying the two subjects, we somehow clarify the exchange rate behavior and its effects on macroeconomic's variables.

2-1 The Effect of Non Equilibrium Parity Rate on some Macroeconomic's Variables.

Equilibrium parity rate regularizes the entrance and exit flow of goods, services and capital of one country and others in the world and therefore equalizes entrance and exit flow. With the assumption of stability of other effective factors in balance of payment (such as seasonal factors, changing economic situations, structural factors, expectations and capital flight), if the official parity rate of domestic currency lays above its equilibrium parity rate, we will face real export decrease and real import increase. When real import share drives up and the parity rate lays above equilibrium rate, domestic currency price of foreign goods is lower than similar domestic goods. So, abroad and inside the country, the demand for foreign goods, substitute domestic goods reducing exports and increasing imports. Ultimately, we will face balance of payment deficit.

It also has the same effect on services. It drives up the domestic currency purchasing power against other foreign exchange and motivates to leave the country on vacation, education, medical trips and etc. On the other hand, foreigners intention to enter the country on vacation, education and medical trips reduce and enhance balance of payment deficit. This subject is proven to be right vice versa; if the parity rate stands below the equilibrium rate.

When parity rate is above equilibrium rate, capital sector is also affected. It increases domestic and foreign capital exit making more profit abroad and affecting balance of payment. So we can conclude that one of the ways to diminish balance of payment deficit, especially for those countries that have more productive capability, is to devaluate domestic currency against other foreign exchange .The extend of this changes depends completely on the net supply and demand elasticity for import and export. Import and export supply elasticity also relies on the degree of mobility of factors of production of each country. Demand price elasticity for import and export is related to the kind of export and import goods and the existence of substitution goods.

We have already known that the price in a competitive market shows supply and demand trend and in other words it represents the abundance of factor of production, its costs and production costs. Now, if the exchange rate, which affects a great range of prices, is not based on real equilibrium rate of economy and does not match the production situation of the country, then it is clear why applied assessment measurement can't be used and thus lack of information on real prices results in the failure of economic optimize allocation. Therefore, policy makers and economy in all face confusion and resources loss. If parity rate stands above equilibrium rate, foreign cheap goods import flow will increase and reduce or diminish competitive power of domestic production. On balance, cheap foreign goods rush and domestic competitive power loss will induce profit decrease and investment motivation decline in the production sector. Here, due to cheap price imports and dependence on suspended capital, service sector will increase its share, damage production sector and cause inflation resulting from supply side. On the other hand, creating cheap import, elevates demand for luxurious goods and causes inflation due to demand side. So, non equilibrium parity rate changes economic optimize allocation among sectors bringing loss to production sectors.

When parity rate lays above equilibrium, it causes a kind of income or wealth shift to those who have foreign exchange income or purchase foreign exchange temporarily according to the official rate. These situations reduce the value of income and wealth and increase economic push. But wealth and income of those accorded to control regulation of foreign exchange allocation which can be taken abroad and exchange their fiscal capital and physical wealth according to the official rate and those who take their assets out of the country officially or non officially not even depreciate, but the value of their wealth continuously appreciate abroad due to revaluation of exchange rate versus domestic currency. Besides, devaluation of domestic currency which means more expensive imports and inducing domestic good exports, causing all level of society to pay for additional expenses.

Government budget is directly affected by foreign exchange income and expenditure and is indirectly affected by other effects of non-equilibrium parity rate on country economy. In addition to economic calculation in government planning, mistakes might be made following the rate mentioned above. For example, if parity value is above equilibrium rate, for fixed expenditure of foreign exchange, lesser Rial is required. Fixed foreign exchange income brings lesser Rial to the government .In Iran, since the big portion of government income comes from foreign exchange of oil export, its foreign parity rate has special effects on government budget. Since oil income is in foreign exchange, so the devaluation of foreign exchange parity rate either increases or reduces government revenue which is relatively equal to the product of foreign exchange increase in the share of oil income in total government income.

Value added reduce of production sectors and value added increase of services sectors in gross domestic product decreases government tax income of production sectors and increases service sector. This condition may endanger the situation of government budget because tax is easily examined on obtained from production sector comparing to the service sector.

2.2 The J curve.

We can study the J-curve to look at the short-term effects of devaluation on current account of balance of payment. This method is more based on empirical observations than the theoretical. This model shows that when changes of exchange rate take place, to complete goods previously purchased, short run changes of current account will be under control. J-curve corresponds to the movement of current account used over time. Current account may at first be destroyed because export might have been calculated according to domestic currency, producing lesser foreign exchange whereas import had been calculated using foreign currency. It means that devaluation may initially destroy current account because the costs in terms of domestic currency for previous import contracts increases while the value of export in terms of domestic currency remain unchanged.

In this situation, the only time to improve current account is when import volumes in reaction to the increase of import price, decreases, and export volume in reaction to the reduces price in terms of foreign currency, increases. Therefore, the initial effect of devaluation is usually negative because import price calculated in terms of domestic currency brought a sharp increase relative to export price and in this situation, sufficient time is not provided for adjustment of trade volume. But after one lag, trade balance improves by decreasing import growth rate, increasing export growth rate and reducing the gap between import and export price indexes. Devaluation has two effects– quantity and value. Quantity effect of devaluation shows a rise in export and a fall in import and value effect indicates a rise in import expenditure in terms of domestic currency. Practically, the value effects that may destruct trade balance is detected prior to the quantity effects which improves trade balance. For example, imagine that Rial is devaluated. The order made for Iran export goods is the same for time just like before devaluation and if this price of goods was determined by Rial, the revenue obtained from export will not react to devaluation immediately and remain unchanged. But import goods ordered before devaluation and their prices are determined in terms of foreign currency will increase Rial expenditure due to devaluation. After enduring this period of time, when new contracts are signed, export and import will react on devaluation and the improvement of balance of payments depends on the stability of foreign exchange market and Marshall Lerner condition. The above situation is known as J – curve and if the condition mentioned takes place, making the trade balance to follow the rising portion of the "J" curve.

The empirical phenomenon mentioned above was also seen in England at the time of Sterling devaluation in November 1981 and in USA in 1971. Grassman[1] in 1973 and Razin[2] in 1981 also studied the above phenomenon.

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[1] *Grassman, Sven, Exchange Reserves and the Financial Structure of Foreign Trade, 1973, Lexington Books.*

[2] *Razin, Assaf, "Exchange Rate Dynamics", Mimeograph, Tel Aviv University, 1981.*

The unexpected reaction of trade balance obtained at the beginning of fostering exchange policy is its important effect on foreign trade. At the beginning of devaluation, contrary to our expectation, the situation of trade balance worsen (export decrease). J-curve explains the existence of this unexpected phenomenon. According to J- curve, at the beginning of the execution of devaluation policy, an increase in intermediate and capital goods is seen and producers cannot substitute domestic resources with import resources instantaneously. So export declines in the first stage but increases by speeding the process of adjustment between domestic and export resources in later stages. Spitaller in 1980 discerned the short run elasticity and long run elasticity of export and import and believed that a change in exchange rate has a short-run effects on domestic prices. He studied the export and import trends of ten different countries and assimilated their trends of export and import prices, considered the movement of balance of payment and terms of trades, he found out that J- curve phenomenon occurred at the beginning of the execution of devaluation policy.[1]

With the formation of foreign exchange parallel market and its severe fluctuation during Iran-Iraq war, Iran market unofficially faced the introduction of devaluation following the revolution. But Rial devaluation was led officially by the Central Bank after applying foreign exchanges multiple systems in 1976. In this year, the decrease of oil price in the world market reduced Central Bank foreign exchange reserves and revenues. In 1986-1988 when war heightened, needs for

[1] *Spitaller, E., 1980, "Short-run Effects of Exchange Rate Changes on Trade and Trade Balance," IMF Staff Papers*

foreign exchange resources created necessary motivations to foster multiple rate system, re observe non oil export situation and correct trade balance. The result was seen in Rial official devaluation. Since that year on, Iran had several rate of foreign exchange (competition rate, floating rate, official rate) determined by monetary authority. Primary motivation toward non-oil export growth in Iran was prepared by devaluation and encourages non-oil exports policy. After the war, with the beginning of economic adjustment policy in 1993, the Central Bank omitted several rate of foreign exchange system and adopted single rate system. Foreign exchange floating rate was indexed according to market rate and caused more Rial devaluation. Adopting the above mentioned system, at early stage, the government improved non oil export growth but some years later due to monetary and fiscal non coordinating policy and severe increase of inflation, the positive effects of devaluation on non oil export weakened .The sever formation of inflation expectation and foreign exchange fluctuation in the free market, made the Central Bank omit floating exchange rate systems and again fixed the exchange rate (at 3000 Rials) in April 1995. In this article the effects of exchange rate changes on non-oil export and import, from March 1976 till July 1992 is analyzed. The above-mentioned period was chosen due to the repeated changes of exchange systems and their effects on non-oil export and import.

On the balance, an active systematic model has been developed considering the macro economic relationship in an active system framework to explain its effects and influences on important macroeconomic's variable on each other. Hence, we made our study on

VAR model to analyze the relationship of variables and the effects of shocks on each other.

3. Methodology and Econometrics Model.

Impulse function is used in the study to show the effects of devaluation on export and import. Then a model that can determine instability share of every variable against incoming shocks on a variable of model is provided. Forecasting error variance decomposition is also observed for this purpose.

3.1- Impulse Function.

One of the advantages of VAR model is the design of response system against function unit of system variables. Actually impulse function is based on moving averages (MA) of a VAR model:

$$X_t = \eta + \sum_{i=o}^{k} \theta_i \varepsilon_{t-i} \qquad (1)$$

In equation (1) X_t has moving average process (MA) and includes of 5 variables such as: non-oil real export, real effective exchange rate, money supply, real output and import. The coefficient of θ (i=1,2,…) shows an effect of a standard deviation shock of one variable on other variables system. For example, the multiplication of Jth function Σ_{t-i} in kth equation shows the effect of one unit shock from Jth variable upon kth variable (in / an i period). Orthogonalizing model is an approach suggested by Sims in 1980. This approach is practically used for drawing time movement variable system after entering shock and behavioral simulation of each variable.

There exist different approaches in covariance matrix decomposition (like analyzing spectrum, Cholski analysis and…). Sims variance–covariance matrix is also analyzed according to Cholski approach.[1] In this situation variance–covariance matrix (ε_t) represents Σ_ε and is analyzed according to two matrix –upper and lower triangles.

$$E(\varepsilon_t \varepsilon_t) = \sum_\varepsilon \quad , \quad \sum_\varepsilon = GG' \qquad (2)$$

In this condition G is used;

$$G^{-1} \sum_\varepsilon G'^{-1} = \sum_v \qquad (3)$$

$$V = G^{-1} u \quad , E(V_t V'_t) = \sum_v \qquad (4)$$

Where V_t vector is an orthogonal vector.

On the other hand we can also use the transformation of normal until, G^{-1} is chosen in such a way that;

$$G^{-1} \sum_\varepsilon G'^{-1} = I \qquad (5)$$

Actually G matrix enables us to obtain the model whose error term possesses unique variance and are not correlated to each other. In this framework, using Cholski analysis, the effect of devaluation (vice versa) and the effect of other shocks on economy system are studied. It should be stated that in most empirical studies, incoming shock of one variable on other variables of the systems is always considered as a deviation. In this study, incoming shock of every variable on other variables as one percent increase is considered to specify the quantity of non–oil export changes due to devaluation.

Figure (1) shows a 1 % Rial devaluation (1 % revaluation in real effective exchange rate) on non–oil export. According to this graph, the execution of foreign exchange policy results in non–oil export decrease

[1] *Sims, G. "Macroeconomics and Reality", Econometrica, 48, 1980.*

in the first quarters. At the primary stage of exchange policy, imported intermediate and capital goods cost increased and producers were unable to substitute domestic goods with imported goods instantly. The result accorded with Spitaller study in 1980 and explained J phenomenon in Iran economy (form March 1986 till August 1995).[1] Focusing on the graph, we see that non–oil export trend increased in the next quarter and by adjusting recourse substitution process, (from the third quarter on), positive non–oil export was seen. After six–quarter, adjustment was completed and non–oil export reached to its highest amount. After that, the effect of policy is vanished over time.

Figure (2) shows the impact of a 1 % revaluation in real effective exchange rate (real devaluation of domestic currency) on non-oil export. It also indicates the fit of logarithmic trend toward non–oil export reaction. In the above model, we can see that 1 % devaluation in real domestic currency rate (Rial) brought about 27% increase in non-oil export. This analysis is also true for 1% revaluation in Rial real value which caused about 27% decrease in non-oil export. On the other hand, if the logarithmic trend toward non-oil export reaction be fitted for ten quarters, the fit of logarithmic trend toward non-oil export reaction shows that for one percent devaluation in Rial real value, non-oil export increases by 0.91 percent.

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[1] *Spitaller, E., "Short-run Effects of Exchange Rate changes on Trade and Trade Balance," IMF Staff Paper, P. 8, 1980.*

Figure (1): impact of a 1% devaluation on non-oil export

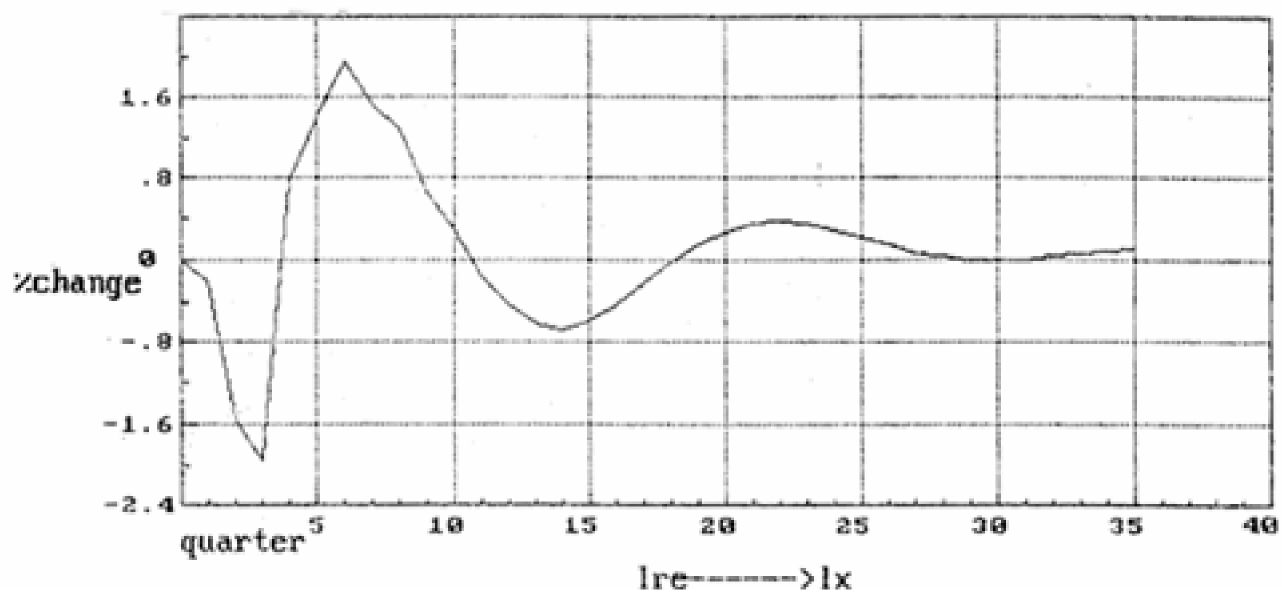


Figure (2): impact of a 1% devaluation on non-oil export over time and its logarithmic trend

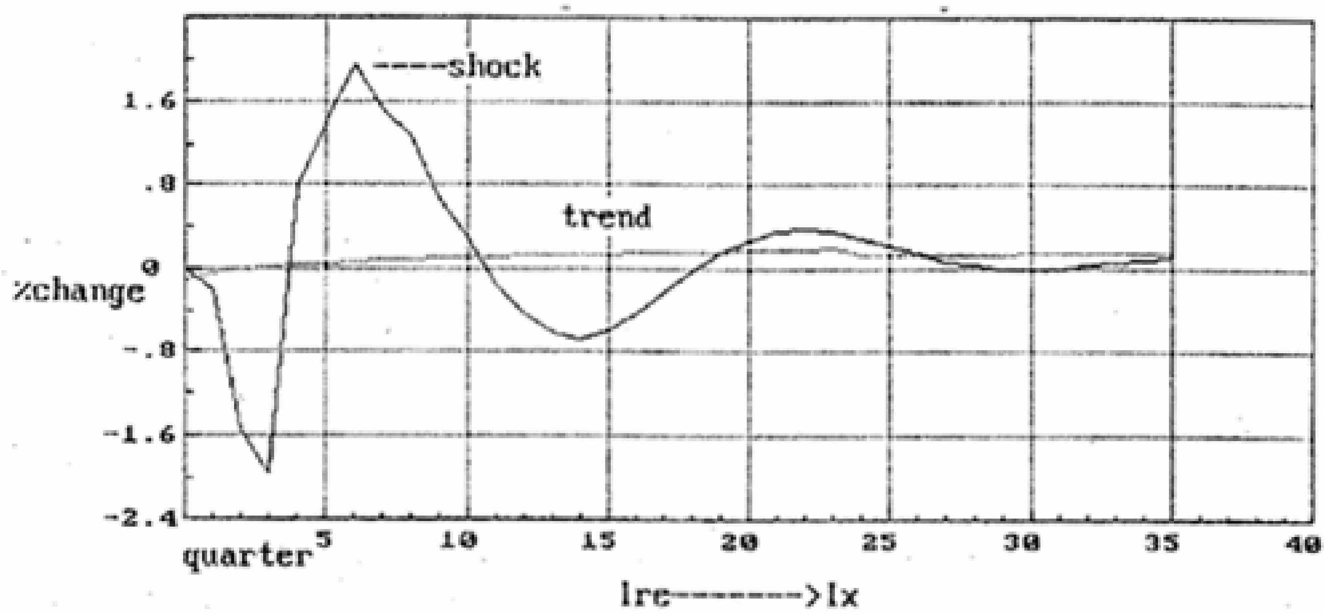


Figure (3): impact of a 1% devaluation on non-oil export over time and its logarithmic trend

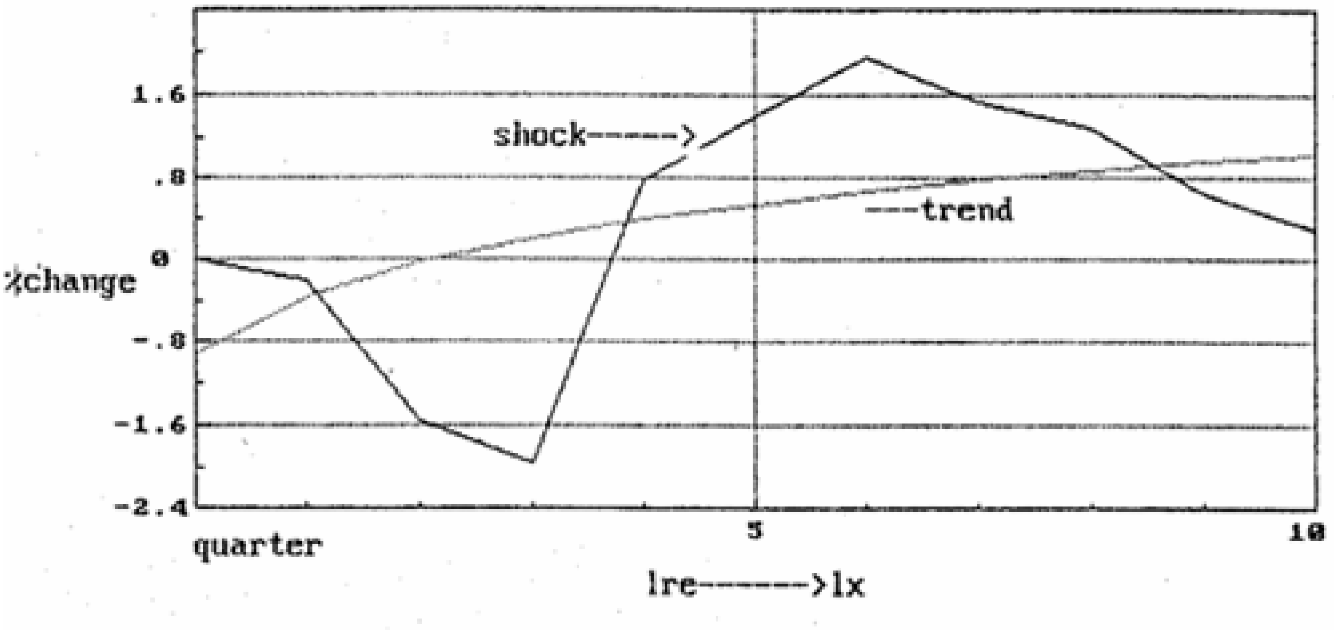


Figure (4): impact of a 1% devaluation on import

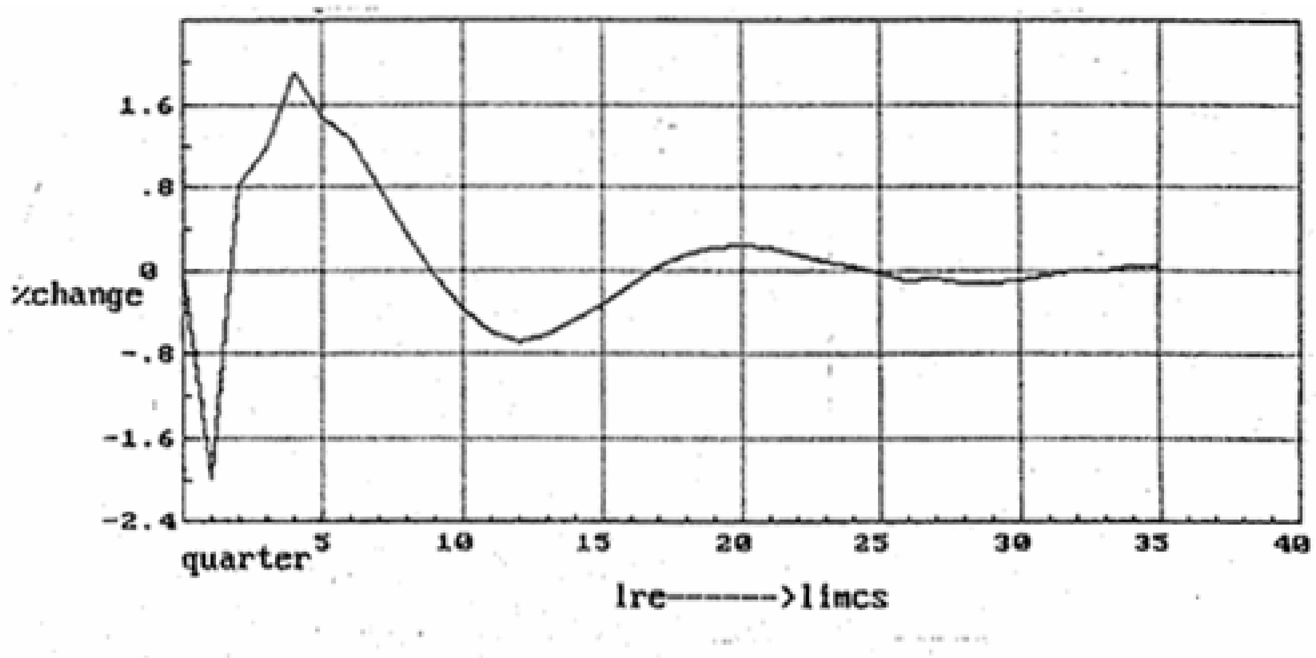


Figure (5): impact of a 1% devaluation on import over time and its Logarithmic trend

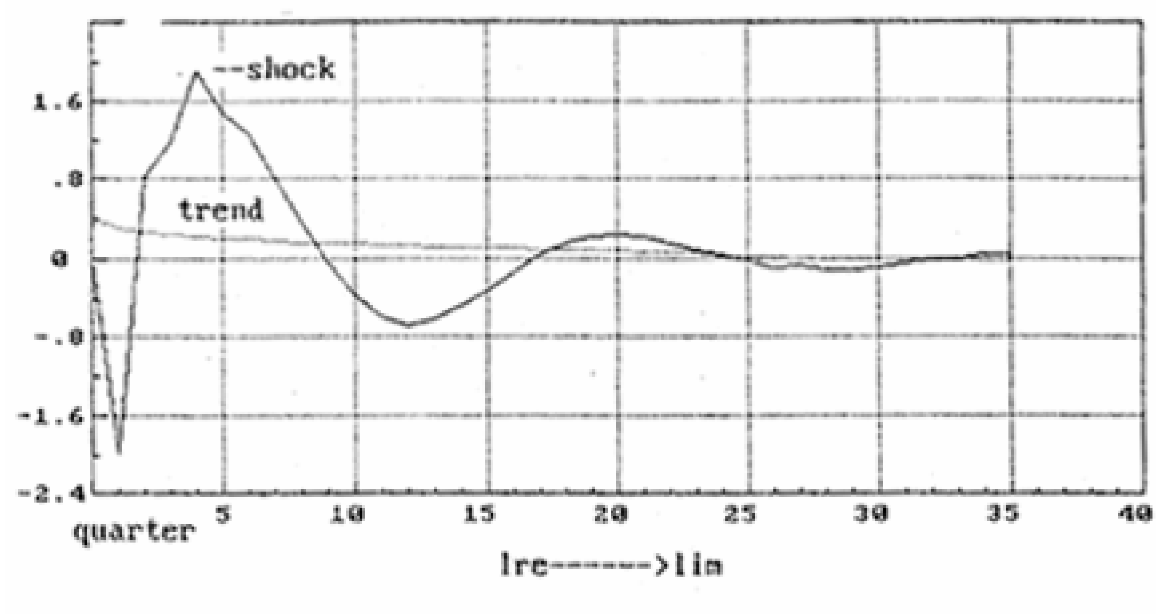


Figure (6): impact of a 1% increase in m2 on real exchange rate

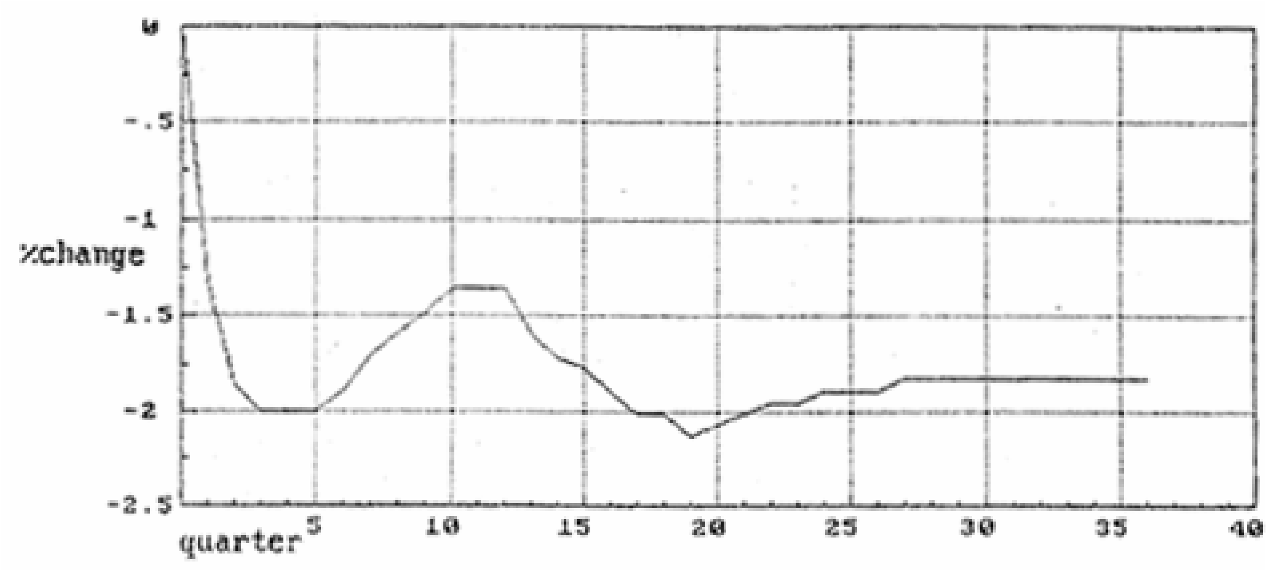
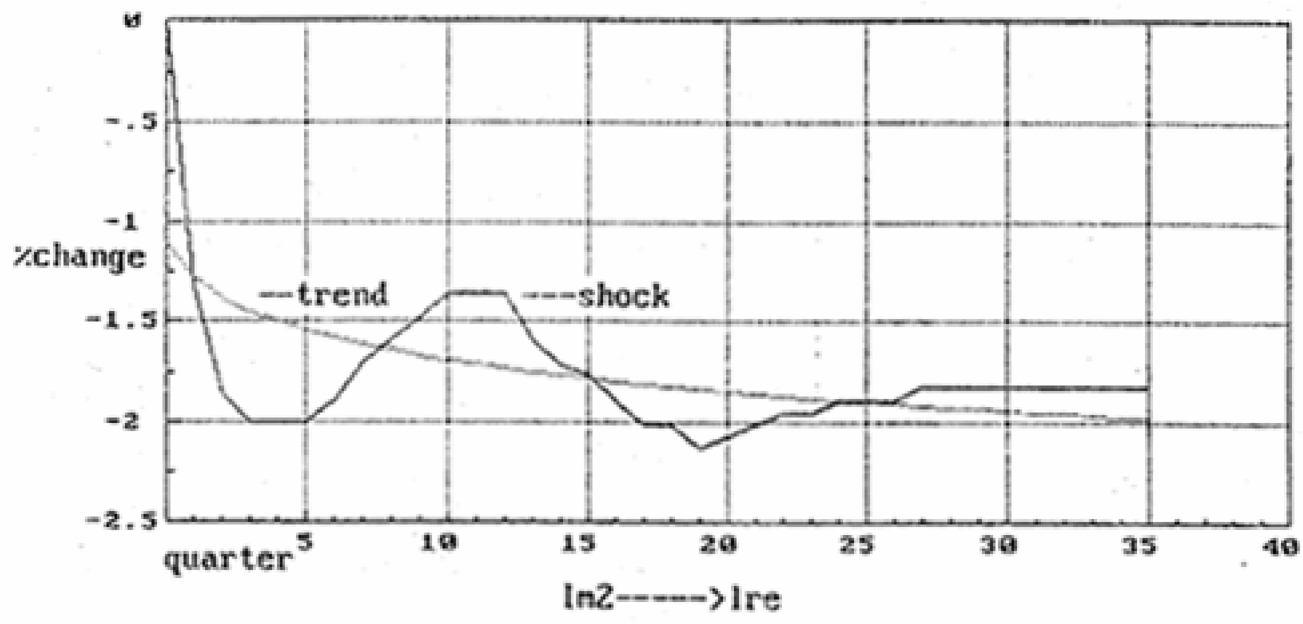


Figure (7): impact of a 1% increase in money (m2) on real exchange rate and its log trend



3-2.Forecasting Error Variance Decomposition.

Forecasting error variance decomposition allows us to determine instability share of each variable against incoming shock of every variable of the model. It also allows and measures the effect of each variable on other variables over time. To explain the above matter, consider a VAR model such as:

$x_{t+1} = A_0 + A_1X_b + e_{t-1}$ (6)

With mathematical expectation we will have

$EX_{t+1} = A_0 + A_1X_1$ (7)

By subtracting (7) from (6) we have:

X_{t+1}- E (X_{t+1}) = e_{t+1} (8)

With n times

$E_t X_{t+n}=[I+A_1+A_1^2+\ldots A_1^{n-1}]A_0+A_1^n X_t$

Forecasting error may be written as below:

$$X_{t+n} - \gamma_t X_{t+n}=\sum_{i=0}^{n-1}\Phi_i \varepsilon_{t+n-1} \qquad (9)$$

Powering and applying mathematical expectation on both sides of forecasting error variance, every series based on its variance and variance of other variables is found.

Table (1) till (5) shows forecasting error variance decomposition approach in 25 quarters. In this study, short term consist the first four quarters, medium term include the six quarters onwards and the twenty five quarters is considered long term.

In table (1), in short term, a high share of non-oil export changes explains by itself. In intermediate time (fifth quarter),23% of changes in non-oil export is explained by itself, 2% by real exchange rate, 16% by money supply, 51% by import and 6% by output. In long term, the share of each variable in bringing about non-oil export changes are respectively, 20% by it self, 9% by exchange rate, 14% by money supply, 50% by import and 7% by output. Considering the share of each variable in the non-oil export changes, we see the importance of import in non-oil export changes.

Table 2 approves the importance of import share in real exchange rate changes so, in short term about 42%, in medium term about 52% and in long term about 51% of real exchange rate changes explain by import.

The effect of Quota policy on import might be one of the reasons for the above results. Quota import was practiced by the government continuously during the period of this study and caused repeated import price changes (increase) followed by demand changes (decrease) for this goods and considering substitution effect, demand for non traded goods increases . The above mentioned increase was intensified to a drive up in non traded goods price and a reduce in real exchange rate (the above reason is also true vice versa for the decline in import restriction). In table 2, in short term, non-oil export, money supply and real exchange rate explained 8%, 2% and 46% of real exchange rate changes respectively. In medium term it was 5.8%, 1.9% and 38% respectively and in long term it reached 5.7%, 16% and 26% .Output, in short, medium and long term offers a 1% share in the changes of real exchange rate. Table (3) shows that money supply is exogenous relative to other variables of the system so, in short term, medium term and long term about 85% changes of money supply is explained by it self.

In table (4), import changes, (in short, medium and long term) respectively explaining by itself, real exchange rate, money supply, non-oil export and output .The average share of each is 71% , 10% , 8% , 5% and 3% respectively.

In table (5), output changes in short term are effected by variables such as output, import, money supply, real exchange rate and non-oil export. The share of each variables to explain the output changes was 68% , 12%, 11.5% , 5.9% and 2.6% respectively .In medium term it was 60% , 17%, 11%, 9% and 2.3% and in long term, it was 36%, 34%, 13%, 12% and 3% respectively.

Table1:Decomposition of Variance of nonoil export

time	standard deviation	nonoil export	real exchange rate	money supply	import	gross domestic product
1	0.204188	100	0	0	0	0
2	0.257437	64.14774	0.005545	26.26938	8.950951	0.62639
3	0.429052	25.466	2.848219	16.99437	52.55014	2.141279
4	0.464268	23.85863	4.725894	17.13541	50.52037	3.759696
5	0.479603	23.42624	4.555244	16.26009	51.21181	4.546618
6	0.484839	23.41199	5.079581	15.96207	50.20281	5.343553
7	0.492331	23.35456	6.382908	15.48003	48.81107	5.971434
8	0.500836	22.94625	7.046451	14.9698	48.56068	6.476317
9	0.508576	22.39456	7.528994	14.55216	48.77921	6.745069
10	0.514636	21.87384	7.606081	14.22128	49.44034	6.858467
11	0.517525	21.65079	7.549695	14.06897	49.80895	6.921587
12	0.518743	21.62226	7.560603	14.08962	49.76849	6.959022
13	0.520403	21.57745	7.76891	14.23455	49.71015	6.948933
14	0.523898	21.36348	8.123026	14.42388	49.21365	6.875962
15	0.529052	20.98007	8.460949	14.59362	49.20691	6.758457
16	0.534623	20.54742	8.658197	14.71036	49.44658	6.63745
17	0.539199	20.20701	8.697658	14.77484	49.76757	6.556923
18	0.542075	20.02994	8.648258	14.80101	49.99798	6.522811
19	0.543456	19.99709	8.604721	14.80261	50.05564	6.539934
20	0.544116	20.03063	8.627267	14.78475	49.97703	6.580324
21	0.544793	20.05053	8.716392	14.74819	49.86644	6.618439
22	0.545811	20.01866	8.828135	14.69587	49.81782	6.639518
23	0.547003	19.94729	8.91327	14.63684	49.85935	6.643252
24	0.548027	19.87439	8.949944	14.58443	49.9531	6.638133
25	0.548657	19.83008	8.94963	14.55099	50.03665	6.632648

Table2:Decomposition of Variance of real exchange rate

time	standard deviation	nonoil export	real exchange rate	money supply	import	gross domestic product
1	0.032758	11.85784	88.14216	0	0	0
2	0.04608	14.41011	73.89088	0.224278	9.941895	1.532838
3	0.063971	11.59264	56.33696	1.159347	29.19488	1.716175
4	0.080259	7.900181	45.98147	1.982053	42.75838	1.377909
5	0.093934	5.773094	38.29731	1.92198	52.9559	1.051716
6	0.101197	5.251496	34.52871	1.686007	57.62759	0.906203
7	0.104582	5.577049	32.39883	1.743789	59.40862	0.871711
8	0.106117	6.275038	31.68617	2.52958	58.59309	0.916119
9	0.108099	6.843529	31.47525	4.185814	56.51917	0.976235
10	0.111288	6.937741	30.98682	6.354288	54.72139	0.999757
11	0.115179	6.646947	30.00834	8.48484	53.88758	0.972287
12	0.118704	6.270675	28.78647	10.21152	53.80839	0.922946
13	0.121118	6.044464	27.74843	11.46264	53.85711	0.887359
14	0.122417	6.028211	27.1818	12.28612	53.61794	0.885934
15	0.123166	6.141362	27.14762	12.73909	53.05328	0.918653
16	0.124035	6.244239	27.46922	12.87355	52.44469	0.968296
17	0.12538	6.236396	27.84488	12.77156	52.13517	1.011999
18	0.127104	6.116041	28.03617	12.55923	52.25306	1.035505
19	0.128842	5.955795	27.97957	12.38146	52.64446	1.03872
20	0.13027	5.833634	27.74919	12.36647	53.02057	1.030133
21	0.131292	5.783982	27.45375	12.60332	53.14061	1.018329
22	0.132045	5.790236	27.15935	13.12835	52.91478	1.007281
23	0.132757	5.80759	26.87069	13.91757	52.40765	0.996503
24	0.133585	5.796454	26.55924	14.89408	51.76603	0.98419
25	0.134542	5.745135	26.2077	15.95543	51.12128	0.970445

Table3:Decomposition of Variance of money supply

time	standard deviation	nonoil export	real exchange rate	money supply	import	gross domestic product
1	0.009877	9.558568	2.947677	87.49376	0	0
2	0.012248	6.794358	1.997915	86.74848	0.006588	4.45266
3	0.015399	4.514277	3.707454	74.24701	13.157160	4.374098
4	0.017474	3.671437	5.509058	75.60685	10.919090	4.293567
5	0.019621	2.933836	4.777429	78.24368	9.724760	4.3203
6	0.021443	2.45754	4.305855	80.77826	8.142742	4.3156
7	0.023149	2.113095	3.851171	82.70801	7.084572	4.243156
8	0.024741	1.851014	3.678282	84.13909	6.210460	4.121152
9	0.026275	1.64123	3.580215	85.22471	5.535767	4.018082
10	0.028112	1.477921	3.635183	85.94713	5.001116	3.938652
11	0.029133	1.348742	3.795583	86.34062	4.635847	3.879208
12	0.030483	1.242427	4.073702	86.41714	4.443105	3.82362
13	0.031805	1.149078	4.410861	86.24943	4.426028	3.764608
14	0.033112	1.064492	4.756347	85.93421	4.547486	3.697463
15	0.034406	0.987157	5.062157	85.58075	4.748893	3.62104
16	0.035689	0.917462	5.301559	85.27775	4.967357	3.535875
17	0.036961	0.856072	5.466547	85.085527	5.147373	3.444293
18	0.038224	0.802697	5.563084	85.02625	5.258674	3.349293
19	0.039481	0.755976	5.606859	85.08893	5.294336	3.253906
20	0.040734	0.714085	5.616945	85.24126	5.266928	3.160783
21	0.041987	0.675453	5.612411	85.44262	5.197453	3.072065
22	0.04324	0.639157	5.609444	85.65368	5.108439	2.989276
23	0.044495	0.604886	5.620251	85.84215	5.019496	2.913221
24	0.045753	0.572664	5.652168	85.98511	4.946114	2.843942
25	0.047016	0.542551	5.707405	86.07001	4.899220	2.780811

Table4:Decomposition of Variance of import						
time	standard deviation	nonoil export	real exchange rate	money supply	import	gross domestic product
1	0.301189	3.385458	1.81779	7.861193	86.93556	0
2	0.322916	5.220584	6.645692	9.251781	77.37222	1.509719
3	0.332386	5.789958	7.005953	8.732287	76.5469	1.924901
4	0.337195	5.783906	7.778802	8.48967	75.58131	2.366315
5	0.343033	6.163054	9.606875	8.207537	73.24776	2.774773
6	0.349394	6.263024	10.12249	7.924275	72.50779	3.18241
7	0.355167	6.168525	10.54858	7.713154	72.19001	3.37973
8	0.359881	6.008774	10.45487	7.523153	72.47871	3.444496
9	0.36211	5.981615	10.45197	7.441493	72.65808	3.466837
10	0.363035	6.055686	10.4413	7.520052	72.50705	3.475916
11	0.364269	6.129958	10.61614	7.760338	72.03112	3.462445
12	0.366745	6.133483	10.89763	8.10481	71.44361	3.420463
13	0.37026	6.053788	11.13157	8.47531	70.97906	3.360269
14	0.373947	5.93813	11.22155	8.797132	70.74075	3.302441
15	0.376869	5.852561	11.1828	9.032729	70.66426	3.267653
16	0.37863	5.833531	11.09771	9.176644	70.62723	3.264889
17	0.379456	5.873471	11.05742	9.245432	70.53423	3.289448
18	0.379922	5.934859	11.10562	9.259839	70.3729	3.326783
19	0.380519	5.97822	11.22341	9.238436	70.19875	3.36118
20	0.3814	5.985529	11.3543	9.196551	70.08052	3.383092
21	0.3824	5.96511	11.44663	9.148794	70.04772	3.391742
22	0.38325	5.939013	11.48258	9.110703	70.07516	3.392092
23	0.383796	5.925306	11.47788	9.097626	70.1095	3.389692
24	0.384087	5.928032	11.64175	9.121101	70.1019	3.38722
25	0.3843	5.938675	11.45506	9.184785	70.03727	3.384216

Table 5:Decomposition of Variance of gross domestic product

time	standard deviation	nonoil export	real exchange rate	money supply	import	gross domestic product
1	0.008131	1.311647	0.187626	7.843849	0.189349	90.46753
2	0.012342	2.009237	0.147763	9.934341	0.889046	87.01961
3	0.01597	2.617859	2.304163	11.30498	6.891484	76.88152
4	0.019079	2.650321	5.904462	11.53004	12.14199	67.77319
5	0.021719	2.378217	8.61788	11.14612	17.5907	60.26708
6	0.024021	2.120662	10.46774	10.68013	22.52768	54.20378
7	0.02613	1.998792	11.45405	10.07254	27.33237	49.14225
8	0.027928	2.039356	11.89128	9.403075	31.19291	45.47339
9	0.029316	2.224081	11.91861	8.756488	33.93042	43.17039
10	0.030283	2.502685	11.74271	8.237639	35.53472	41.98224
11	0.030917	3.823086	11.50269	7.912901	36.24205	41.51927
12	0.031329	3.127205	11.28344	7.818982	36.33183	41.43855
13	0.031616	3.366415	11.10759	7.955851	36.08546	41.48468
14	0.031839	3.516929	10.97056	8.28477	35.71753	41.51021
15	0.032029	3.585654	10.8712	8.739484	35.34544	41.45823
16	0.0322	3.597438	10.8264	9.247946	35.0094	41.31882
17	0.032369	3.577619	10.86269	9.751045	34.72216	41.08649
18	0.032554	3.541806	10.99484	10.2125	34.50599	40.74487
19	0.032774	3.495979	11.20929	10.6219	34.39334	40.27949
20	0.033033	3.442421	11.46441	10.99405	34.40137	39.69774
21	0.033326	3.385098	11.70724	11.36443	34.50797	39.03526
22	0.033636	3.330616	11.89436	11.78077	34.65134	38.34292
23	0.033944	3.2853	12.00432	12.29202	34.75293	37.66542
24	0.034242	3.251652	12.03746	12.93741	34.74745	37.02602
25	0.034528	3.227042	12.00765	13.73794	34.60271	36.42466

4. Summary and Conclusion

The effect of real devaluation on non-oil export and import is studied in this article using a VAR model. The effect of shock of real effective exchange rate and money supply on non-oil export and real effective exchange rate, and the share of each variable in changing other variables are clarified by analyzing impulse reaction and forecasting error variance decomposition.

Figure 4 shows the impact of 1% Rial real devaluation (similar to the impact of Rial devaluation on non-oil export) on the country total import. Considering the graph (4), the impact of Rial devaluation, in the first quarter, caused import decrease but in the next periods (from the second quarter onwards) the negative impact of import transformed into a positive one. In the fourth quarter, it reached to its highest (2%) but in the next period the fluctuation range reduced. After the 24 period, Rial real devaluation impact on import diminished. Figure 5 shows the impact of 1% Rial real devaluation and also, the logarithmic trend related to import reaction. In the above mentioned graph, the impact of Rial devaluation on import accorded to expectation which was negative and indicated that the 1% Rial devaluation caused 0.12% decrease in import. The trivial impact of Rial real devaluation on import explained the importance of import control variables (like Quota and …..).As a whole, we can say that Marshall Lerner condition is satisfied only for four quarter in Iran (0.16+0.9=1.06). According to Marshall Lerner condition, when the sum of import elasticity to relative prices and export elasticity to relative prices is greater than one, it indicates the positive effect of Rial real devaluation policy on trade balance. The result obtained in this study approved this condition in four quarters. It should be noted that, non-oil export elasticity (0.9) and import elasticity (0.16) were seen in a 1% impact of Rial real devaluation.

In figure 6, impact of 1% increase on money supply, in the first quarter, caused real effective exchange rate decrease. The decrease reaches to 2% between the 3rd till fifth quarter and between the 10th till 13th quarter the decrease is 1.3% and in the 19th quarter, it was 2.3%. The above impact on real effective exchange rate over time faded after the 20th quarter. Figure 7 demonstrated the impact of 1% increase on money supply on real effective exchange rate and also, the logarithmic trend related to real exchange rate reaction. The logarithmic trend showed that the 1% increase in money supply decreased the real effective exchange rate up to 1.6%. Consequently, the results indicate that coordination of execution of monetary and exchange policy is necessary. The result shows that non-coordinating execution of expansionary monetary policy in Iran, is the main factor neutralizing the effect of exchange policy in the recovery of non-oil export. Fostering 1% Rial real devaluation at 1% increase of money supply neutralized the effect of 1% Rial devaluation and it even increased Rial real value up to 0.6%. Considering these results along with the results of figure 2and 3, the reason for the short term of the positive effect of Rial real devaluation on non-oil export is cleared.

The results of this study can be concluded as follow:

1. In Iran economy, the effect of Rial real devaluation after three lags (about one year) caused non-oil export growth. The positive range of this effect was limited and didn't take longer than one year.
2. Fostering a 1% increase (or decrease) in real effective exchange rate has caused an increase (or decrease) up to 0.27% of non-oil export. But in the first period of fostering exchange policy, for each one percent devaluation in Rial real value, non-oil export rose to 0.9%. This result explained the short term positive effect of exchange policy on non-oil export growth.
3. The presence of J curve phenomenon in Iran from the first quarter of 1977 till the last quarter of 1995 was approved.
4. The effect of Rial real devaluation on import was restricted and for only a 1% Rial real devaluation, import reduced to 0.16%.
5. Marshall Lerner condition was true in the earlier period of fostering Rial devaluation policy.
6. Interference and non-coordination in monetary and exchange policies are the reasons for a short term positive effect of devaluation policy on non-oil export growth. A 1% increase in money supply caused 1.6% drive up in real effective exchange rate.
7. In medium term and long term, about 58% of fluctuation in real effective exchange rate was explained by import. The above condition was brought by Quota policy and tariff on import. Fostering Quota policy on import caused an increase in price and decrease in the demand of import goods. Under this condition, an increase for the demand of nontraded goods made by substitution effect is seen and this itself caused a raised in domestic price and a decline in real effective exchange rate.

8. Import variable explained the high percentage of changes of other variables (except money supply). Share of non-oil export in changing import in short, medium and long term was 3%, 6% and 6% respectively which actually played a trivial share in changing import. The increase of this share in import changes can reduce the execution of import control policies and brought about a clear relation between import and other macroeconomic's variables.

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