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The Effect of Macroeconomic Variables on the Exchange Rate by the System Dynamics Approach

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Introduction

In modern monetary economy, the trade of various goods and services between different countries is inevitable. Unlike the domestic trade of goods and services in a country, which is done in the national currency, for buy the foreign goods, it is necessary to use the currency of the exporter country. Therefore, it can be said that the exchange rate is a measure of the value of the national currency of one country against the currency of other countries. The study of the developing economies, especially Iran, shows that these countries are facing very large fluctuations in exchange rate.

Unusual fluctuations in the exchange rate cause instability in the economy a relative reduction in purchasing power, and have devastating effects on the real variables of the economy. Awareness of these changes can help monetary authorities to design an efficient monetary policy to stabilize prices and increase employment. Numerous variables, both at the micro and macro levels (including productivity, interest rates, sanctions, high powered money, etc.) affect the exchange rate and are also affected by exchange rate fluctuations.

For example, productivity is directly related to exchange rates. With increasing productivity in the production of tradable goods, labor productivity and consequently wages in this sector increases, and ultimately this increase strengthens the national currency and reduces the real exchange rate in the long run. The interest rate is another variable that affecting the exchange rate and affects the speculative demand for money and affects the money supply as well as its value against foreign currency by changing the demand for national currency.

Objective

A look at the exchange rate trends in Iran over the past years shows that the Iranian economy has been facing major currency jumps during this period.

Because many factors affect the exchange rate and the models used in previous studies do not have the ability to use all the available factors in modeling, in this study, in order to investigate the sensitivity of the exchange rate to important economic variables, first the trend of exchange rate changes has been modeled by considering 42 variables and using the system dynamics method, and then the sensitivity of the exchange rate to changes of five Macroeconomic variables (productivity, government spending, sanctions, high powered money and interest rates) have been examined.

Data/Methodology

in this study, in order to investigate the effect of macroeconomic variables on the exchange rate, first the trend of exchange rate changes is predicted using the system dynamics method for the period 2004 to 2022, and then, the effect of changes in factors such as productivity, high powered money, share of government construction spending, Sanctions and interest rates on exchange rates have been assessed.

The systematic approach of this model is that each factor and variable affects the factor or other factors and is influenced by another factor or factors and it forms Reinforcement or balancing circles as well as cause-and-effect relationships. Finally, taking into account all the factors, circles and relationships, the general pattern of the exchange rate will be created. Then, using the sensitivity analysis method, the effect of changes in each of the macroeconomic variables on the exchange rate will be examined. Data for the model is obtained from the Central Bank and the Ministry of Economic Affairs and Finance.

Results/Findings

The results show that, increasing productivity leads to economic growth and increasing exports, increasing foreign exchange supply and reducing the exchange rate, on the other hand, increasing economic growth, increasing national income and imports and increasing the exchange rate. Two contrasting effects neutralizes each other.

Sanctions increase exchange rates by restricting exports and imports and banking operations.

Increasing government spending, on the one hand, increases national income as well as imports, which increases the exchange rate and on the other hand, it increases the supply of foreign exchange by increasing GDP and increasing exports, which leads to a decrease in the exchange rate.

An increase in the high powered money increases the money supply through increase in liquidity, which in turn leads to an increase in the exchange rate as inflation increases. Also, with an increase in the exchange rate, the net assets of the central bank increase and increase the high powered money, which ultimately leads to an increase in the exchange rate.

Interest rates affect the amount of output and exports through changes in investment, and thus changes in the exchange rate.

Implications

According to the results of the research, we recommend government officials to take the necessary measures to control these variables (interest rates, inflation, monetary base, productivity and government construction spending). In other words, we suggest to government officials that to control the exchange rate, they can control and manage the variables that affect it.

***Key word**: Sensitivity analysis, exchange rate, system dynamics, factors affecting exchange rate*