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Evaluation of Monetary Instability Effects on Output and Inflation during Business Cycles in Iran's Economy

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Abstract

Monetary instability and investigating its effects on other macroeconomic indicators is very significant for making economical policies in all countries. An effort has been made in the present study to evaluate the effect of monetary instability in Iran's economy during recession and expansion periods on GDP and inflation fluctuations in the framework of a dynamic equation system in Friedman's theory. The period determined for this survey is based on seasonal data from the first quarter in 1370 (1991) to the fourth quarter in 1396 (2017). The results showed that monetary expansion in both recession and expansion period was more effective in creating inflationary condition than in influencing the output. Considering the identification of technology structure relevance as an important parameter in the production process, which plays an important role in the business cycle, a considerable finding of the study was that technological shock led to increased price levels and inflation in Iran's economy. Finally, based on the findings, Friedman's hypothesis cannot be confirmed during expansion period in the Iranian economy.

Key Words: Friedman's monetary instability, Monetary policy, Inflation, Gross domestic product, Business cycle

JEL Classification: C53, E12, E32, E41, E51, E52.

1. Introduction

Monetary policies have always had an important position for affecting macroeconomic variables. How to set monetary policies and using monetary instruments are so effective for influencing the output and inflation, which are known as the main criteria for assessing the economy of each country. The hypothesis of classical duality did not accept any interaction between real and nominal variables in the short and long run before the Great Crisis in 1929. But few economists can be found who believe that changes in prices and monetary volume or other nominal shocks will not lead to changes in real variables behavior such as output, consumption and employment in the short run. Simpson (1981) pointed out that monetary policy can affect output and employment level through influencing factors of production (including labor force, capital and technology). He further noted that, assuming money as an asset, inflationary

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condition which originated from monetary policy will lead to adjustment of household asset basket. Therefore, substituting real capital for money transfers resources to the manufacturing sector so this procedure increases output level. In fact, most of the economic researchers dedicate a considerable portion of business fluctuations to monetary shocks. They believe that monetary expansion will stimulate real economic activities unlike a contracting monetary policy which causes recession. Theoretically, some of the schools of economy such as the Real Business Cycle School believe that monetary volume cannot affect real variables even in the short run. Therefore, monetary policy transmission mechanism does not have any value for studying while other doctrines such as Keynesian, Neo-classical, etc., believe in the existence of short-term effects of monetary shocks considering it could be originated from different sources (Bernanke & Gertler, 1995). Therefore, developing a monetary strategy which is fitted to economic conditions is very essential in countries like Iran, which has been encountering different shocks. The use of monetary policies for stabilizing macroeconomic variables in developing countries like Iran involves several challenges, which has not been analyzed in industrial countries. One of these challenges in the Iranian economy originates from banking rules without usury, due to which common monetary instruments like interest rate and Open-Market-Operation are not widely used. However, as the Central Bank of Iran has the same traditional tasks which are based on interest rate, it should use other monetary instruments that are matched with its structural economic condition. Guiding monetary policy in Iran and also in most developing countries instead of using interest rate is usually based on supplying and demanding money and monetary base (Abdolmaleki, Asgharpour & Haghighat, 2017). So evaluating monetary shocks and their effects on real economic activities not only can confirm the importance and sensitivity of monetary authorities but also help to present efficient approaches and optimally use monetary instruments. This study tries to analyze the effect of monetary components and technological shocks on GDP and inflation through a SVAR model. The seasonal data was extracted from the period [1991-2017] in the framework of Friedman's monetary instability hypothesis. Then, confirming or rejecting his hypothesis in business cycle related to Iran's economy was determined. Finally, a strategy for confronting business cycle, recession and expansion periods was suggested. In the second section of this article, the theoretical and empirical background of the study is discussed. In the third section, the research model is introduced. In the fourth section, the model estimation, comparison and analysis are presented. In the fifth and sixth sections, conclusions are made and a solution is presented.

2. Methodology:

The seasonal data used in this article is related to the period 1370-1396 (1991-2017). The data related to monetary base, money multiplier coefficient, money demand (M2), inflation and output was collected from the Central Bank of Iran.

The data related to labor force and real capital, which are used for estimating technology coefficient in the mentioned period, was collected from Statistical Center of Iran. For assessing to the effects of monetary components and technological shocks on output and inflation, the following SVAR models were used:

$$\begin{bmatrix} MB\ rate \\ MM\ rate \\ M2\ rate \\ A\ rate \\ \boldsymbol{lY} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ C_{21} & C_{22} & C_{23} & 0 & 0 \\ 0 & 0 & 1 & 0 & C_{35} \\ 0 & 0 & 0 & C_{44} & 0 \\ C_{51} & C_{52} & C_{53} & C_{54} & C_{55} \end{bmatrix} \begin{bmatrix} \varepsilon^{mb} \\ \varepsilon^{mm} \\ \varepsilon^{m2} \\ \varepsilon^{a} \\ \varepsilon^{y} \end{bmatrix} \quad (1)$$

$$\begin{bmatrix} MB\ rate \\ MM\ rate \\ M2\ rate \\ A\ rate \\ \boldsymbol{INF\ rate} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ C_{21} & C_{22} & C_{23} & 0 & 0 \\ 0 & 0 & 1 & 0 & C_{35} \\ 0 & 0 & 0 & C_{44} & 0 \\ C_{51} & C_{52} & C_{53} & C_{54} & C_{55} \end{bmatrix} \begin{bmatrix} \varepsilon^{mb} \\ \varepsilon^{mm} \\ \varepsilon^{m2} \\ \varepsilon^{a} \\ \varepsilon^{inf} \end{bmatrix} \quad (2)$$

$$\begin{bmatrix} MB\ rate \\ MM\ rate \\ M2\ rate \\ A\ rate \\ INF\ rate \\ \boldsymbol{lY} \end{bmatrix} = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 \\ C_{21} & C_{22} & C_{23} & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 & C_{36} \\ 0 & 0 & 0 & 1 & 0 & 0 \\ C_{51} & C_{52} & C_{53} & C_{54} & 1 & C_{56} \\ C_{61} & C_{62} & C_{63} & C_{64} & C_{65} & 1 \end{bmatrix} \begin{bmatrix} \boldsymbol{\varepsilon^{mb}} \\ \boldsymbol{\varepsilon^{mm}} \\ \boldsymbol{\varepsilon^{m2}} \\ \boldsymbol{\varepsilon^{a}} \\ \boldsymbol{\varepsilon^{inf}} \\ \boldsymbol{\varepsilon^{y}} \end{bmatrix} \quad (3)$$

where matrix (1-2) was designed to evaluate the effects of monetary base growth rate (MB rate), money multiplier coefficient growth rate (MM rate), money demand growth rate (M2 rate) and technology growth rate (A rate) on logarithmic GDP data. Matrix (2-2) was designed for evaluating the effects of the mentioned variables on inflation growth rate (INF rate), also matrix (3-2) shows the effects of all variables including inflation growth rate on logarithmic GDP. In this study, the effects of monetary policies and technological shock were analyzed in the same time during business cycle in Iran's economy. In line with this purpose, , first the logarithmic form, and then 1st difference and growth rate of variables were tested and their best form (nearest to Iran's economy) were applied[1].

2-1. Identifying Business Cycles

Hodrick- Prescott filtering can be used to estimate the long-run trend of a time series. This type of filtering is done by minimizing the sum of the squares of the variable deviation (Y) extracted from its trend (Y_t^{tr}):

1. It is worth noting that the monetary policy rule, or Taylor's rule, which makes monetary policy instruments a nominal interest rate, is not applicable to the Iranian economy, because neither the Central Bank's interest rate is fully determined by the Central Bank, nor is the path of the money supply determined independently by the Central Bank; on the other hand, the Central Bank's behavior is arbitrary; Therefore, in this study, the effect of interest rate was neglected.

$$Min \sum_{t=1}^{T} (Y_t - Y_t^{tr})^2 + \lambda \sum_{t=2}^{T-1} [(Y_{t+1}^{tr} - Y_t^{tr}) - (Y_t^{tr} - Y_{t-1}^{tr})]^2 \quad (4)$$

where T stands for number of views and λ is an adjustifier parameter that determines the level of smoothness of the trend. $\lambda = 100$ for annual data and $\lambda = 1600$ for seasonal data (Samadi, 2009). The first part of (4-2) denotes that the less deviation from series trend is better whether in the previous or in the next period. So the chart (2-1) shows the recession and expansion periods:

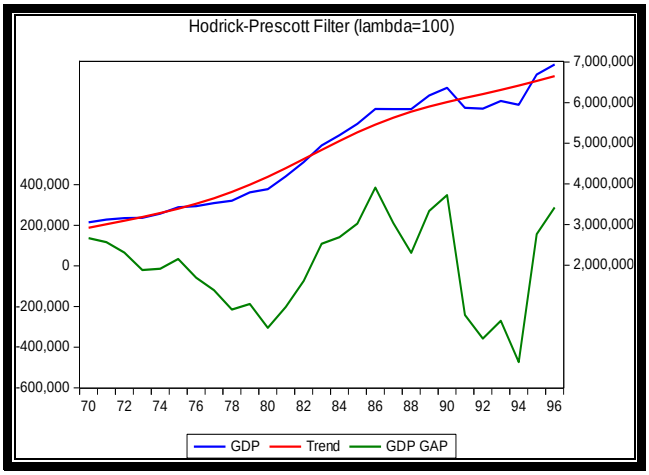

Chart (1): Identifying Recession and Expansion Periods using Hodrick-Prescott filter

Source: Researcher's Calculations

Chart 1 shows the deviation in GDP from the long-run growth trend, which is defined as business cycles. As shown in this chart, [1372-1382] and [1391-1395] include the recession periods and [1370-1372], [1382-1391] and 1395 to1396 include the expansion periods in Iran's economy.

2-2. Production Function &Technology Coefficient Estimation

Production function estimation is one of the fundamental issues in applied econometrics (Intriligator et al., 1996). Choosing the right functional form is one of the most difficult parts of any experimental work (Fan, 2000). The choice of function depends on the nature of the topic of investigation. However, one of the best criteria for determining the production function is to use past experiences. Therefore, it is first necessary to consider the function used in the study of economic theories and the matching of the study conditions to the features of the production function is, in fact, justified. Next, statistical justification and econometric justification are essential. In choosing the production function in different countries, including Iran, usually one of the production functions such as Cobb-Douglas, Transcendental and Translog is used (Torkamani, 1998). One

of the most famous functions used in expressing structural relationships in production from the distant past is the Cobb-Douglas function. This function has the characteristics of necessity, homogeneity, uniformity, concavity, congruence, derivability, non-negativity and non-nullity. The parameters of the Cobb-Douglas function show the elasticity of the inputs. This function clearly demonstrates the necessity of input consumption. One of the limitations of this function, however, is the constant elasticity of input production. This form represents only one production area for each input and is unable to explain all three areas of the production function (Debertine, 1997). Since in the manufacturing sector, ownership is largely owned by the private sector or involves the participation of the private sector, it is not problematic to apply the Cobb-Douglas subdivision form to show only the second production area in using this problem function. One of the advantages of this type of function is the ease of interpreting the results. In fact, this function allows to simply determine the type of return to scale, the efficiency of production factors, the substitution tension between the inputs and their output elasticity. Other reasons for using this function include the simplicity and usefulness for specialized econometric studies (Cobb & Douglas, 1928); (Samuelson, 1979); (Nerlove, 1965); (Heady & Dillon, 1961). The sub-form of the Cobb-Douglas function is as follows:

$$Y = AK^{\alpha}L^{\beta} \tag{5}$$

where Y denotes GDP, A denotes technology coefficient in Cobb-Douglas function. K represents real capital stock, L shows hours of working, α is the degree of output sensitivity to capital stock changes and β denotes the degree of output sensitivity to labor force value. In mathematical terms:

$$\beta = \frac{K}{Y} \times \frac{\partial Y}{\partial K} \quad \alpha = \frac{L}{Y} \times \frac{\partial Y}{\partial L} \tag{6}$$

In order to linearize the Cobb-Douglas function, a logarithm has been taken on both sides of equation. Then we have:

$$\log(Y) = \log(A) + \alpha \log(K) + \beta \log(L) \tag{7}$$

Considering residual amounts, technology coefficients are estimated as:

$$A = 10^{Residual} \tag{8}$$

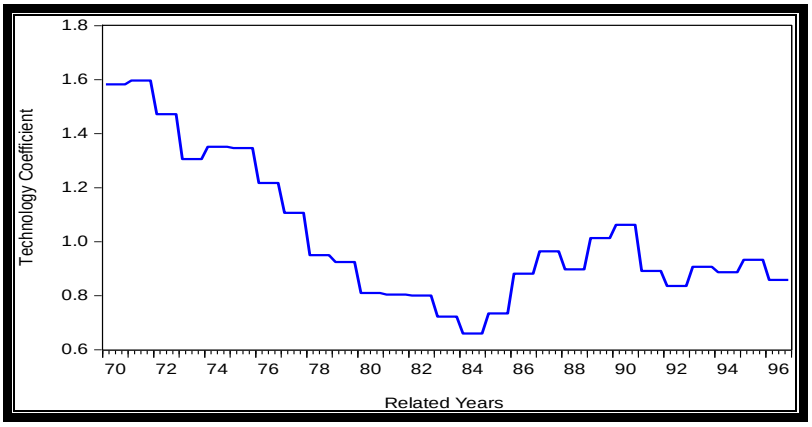

Chart (2): Technology Coefficients Estimation in Cobb-Douglas Function
Source: Researcher Calculations

3. Conclusion:

The share of liquidity shocks including monetary base and money multiplier coefficient, is more effective in creating inflationary condition than stimulating output in the whole period of the selected time [1991-2017]. Among monetary shocks, money demand shock was more effective in output in the whole period and this phenomenon is a reason for rejecting the Friedman's hypothesis about monetary instability which expresses money supply through monetary base is more effective on output fluctuations. During the recession period, when output level decreases, the reaction of inflation to a positive shock of money demand shows less decrease compared to the expansion period when the output level increases. In other words, the elasticity of inflation to an increase in money demand level during expansion period is more than in the recession period. During the expansion period, an increase in money demand is more effective in decreasing inflation than increasing output level. In both recession and expansion periods, money multiplier coefficient shock has the most effective role in increasing inflation in the short run and technology shock has the least effective role in increasing inflation while the money demand shock is more effective in decreasing inflation in the expansion period than recession period. It was also observed that monetary base and money multiplier coefficient shocks in the short run and in the recession period were nearly two times more effective in creating inflationary conditions. In fact, monetary expansion policies in the recession period, which are transmitted through monetary base and money multiplier coefficient channels, considerably intensify inflationary conditions more than the time when the mentioned policies are applied during the expansion period. Technology shock also is more effective in intensifying inflationary conditions than stimulating output level during the recession period. During the expansion period and simultaneously in the short run, the money multiplier coefficient shock increases output level more than creating inflation,

but monetary base shock has a more prominent role in intensifying inflationary conditions. Comparing the effects of monetary expansion policy through money multiplier coefficient and monetary base channels on output and inflation levels, indicates an important role for intensified inflationary condition, which is derived from applying monetary expansion policy during the expansion period. Technology shock is more effective in increasing GDP level than creating inflationary condition during the expansion period. The effect of money demand shock in both periods is more effective in increasing output level than decreasing inflation. But in the case of increasing inflation in response to technology shock in the whole period, it was observed that technological change caused an increase in input share and increased the cost of production process, subsequently, so this situation empowered the inflationary condition; therefore, the role of technology in process of production in the Iranian economic structure is capital intensive. Also, according to Datta and Christoffersen (2004), the technology shock leads to increased GDP, so technology structure cannot be neutral because the output level and other factors of production in neutral structure are independent of technology effects. On the other hand, an increase in inflation level and the general level of prices occurred as a result of technology shock in the country, so the assumption that technology changes due to scale expansion is unacceptable. Therefore, the use of non-neutral and capital intensive technology in the process of production in Iran's economy can also be a logical reason for this phenomenon.

4. Solution

Since the variables in this study are actually macroeconomic variables of monetary policy, appropriate transfer mechanisms should be used to reflect the impact of each impulse at operational policy levels. In the attempt to identify the variables affecting production and inflation in the business cycle of Iran's economy in the present sutdy, it was found that liquidity shock plays an inflationary role in the business cycle of Iran. Thus, the focus is on controlling inflation in times of expansion and recession. According to the results, during the economic downturn, demand for money[1] has been identified as an effective factor in controlling inflation and also during the expansion period, increasing demand for money has lowered inflation. Given the significant role of money demand in Iran's economy, increasing the demand for money can be the solution to the problems in Iran's economy in business times. In this section, the issuance

1. Increasing demand for money is mainly achieved through lower interest rates, revival and management of open market operations and bonds or participation bonds, protection of capital markets, improvement of oil revenues and increase of national income, optimal management of foreign exchange market, increase of exports and attention to comparative advantages in international trade.

of partnership papers[1] is selected and analyzed as one of the important means of increasing the demand for money in order to study its influence. Publication of partnership papers and involving investors in economic activities and paying real profits is the only solution to overcome the limitations of open-market operations in the country. The issuance of partnership papers by the Central Bank is one of the contractionary policy tools. With the issuance of these bonds, the volume of liquidity will be reduced and the funds of these bonds will be blocked by the Central Bank. In the monetary base, issuance of these bonds will increase the Central Bank's debt component and reduce the monetary base. According to the results of this study, during the economic downturn, when monetary base shocks have a significant effect on inflation, the issuance of bonds will reduce inflation. Furthermore, because in this economic period the money multiplier coefficient has a dominant effect on GDP, in the short term, it can inhibit the effects of other shocks. Therefore, reducing the monetary base will not have a detrimental effect on production stimulation. Overall, considering the inflation created by the expansionary monetary policies in the Iranian economy, it completely suppresses the increase in GDP resulting from these policies Therefore, monetary policies can be used for anti-inflationary purposes rather than stimulating production.

References

Abdolmaleki, H. Asgharpour, H. Haghighat, J. (2017). "Friedman's hypothesis of monetary instability in Iran's economy. VARMA, GARCH-M approaches". *Quarterly journal of economic modeling research*, 7(28), 75-102.

Belongia, M. T., and P. N. Ireland. (2015). "Money and output: Friedman and Schwartz revisited". *Working Paper, Boston College*. 6(48), 1223-1266.

Bernanke, B. S and Gertler, M. (1995). "Inside the black box: the credit channel of monetary policy transmission". *American Economic Review*, 4(82), 901-921.

Chi, Q. (2014). "The Impact of Money Supply on the Price: Evidence from China". *Research in World Economy*, (5), No. 1, 75-88.

Cobb, C. W. and Douglas, P. H. (1928). "A theory of production", *American Economic Review*, 1, 139-165.

Debertine, D. L. (1997). *Agricultural Production Economy, Translated by Mousanezhad & Najjarzade*, Economic Research Institute of Tarbiayt Modarres University.

1. For the first time, under Article 91 of the Third Development Plan Law, the Central Bank was allowed to use the Central Bank's participation bonds with the approval of the Monetary and Credit Council. It is worth mentioning that according to the Fourth Development Plan, the issuance of participation bonds of the Central Bank will be allowed with the approval of the Islamic Consultative Assembly.

Datta, A. and Christoffersen, S. (2004). "Production Costs, Scale Economies, and Technical Change in U.S". *Textile and Apparel Industries Philadelphia University*, 33(2), 201-213.

Douglas, P. H. (1948). "Are there laws of production", *American Economic Review*, 38, 1-41.

Emadzade, M. Samadi, S. Hafezi, B. (2005). *Investigating monetary and non-monetary factors on inflation in Iran. Humanities and social sciences research*. Mazandaran university publication. 5th, No 19.

Fan, S. (2000). "Research investment and the economic returns to Chinese agricultural research", *Journal of Productivity Analysis*, 14: 163-182

Friedman, M. (1984). "Lessons from the 1979Ð 82 monetary policy experiment", *American Economic Review*, (74), 397- 400.

Friedman, M., and A. J. Schwartz. (1963a). "Money and business cycles". *Review of Economics and Statistics*, 45(1), 32-64.

Friedman, M., and A. J. Schwartz. (1963b). "A monetary history of the United States". *Princeton, NJ: Princeton University Press*. (1), 15-78.

Handa, J. (2009). *Monetary Economics*. Second edition published by Routledge.

Hante, M., Asgari, M., Khataee, M. (1397). "Investigating the Neutrality of Money in the Iran's Economy". *Quarterly journal of financial economy*, 12(42), 47-74.

Heady, E. O. and Dillon, J. L. (1961). *Agricultural production functions*, Kalyani press, Ludhiana, India.

Hendrickson, J. R. (2017). "An Evaluation of Friedman's Monetary Instability Hypothesis". *Southern Economic Journal*, 83(3), 744-755.

Ibrahim, M. H and Amin, R. (2005). "Exchange Rate, Monetary Policy and Manufacturing Output in Malaysia". *Journal of Economic Cooperation*. 26(3), 103-130.

Intriligator, M. D., R. G. Bodkin and C. Hsiao (1996). *Econometric models, techniques, and applications*. Second edition, Upper Saddle River, NJ: Prentice Hall, USA

JalaliNaeeni, J. and Nazifi, F. (2001). "Asymmetric effects of nominal monetary impulses on output", *Iranian Journal of economic research*. No 9, 13-41.

Jannsen, N., Potjagailo, G., Wolters, M. H. (2015). *Monetary Policy during Financial Crises: Is the transmission mechanism impaired? Kiel Institute for the World Economy*, Kiellinie 66, 24105 Kiel, Germany.

Khodaparast Shirazi, J. (2015). "Measuring the effects of monetary policy shock in Iran". *Quarterly journal of economics*, 11(1), 75-101.

Khalili Araghi, M. Goudarzi Farahani, Y. (2012). "Asymmetric effect of monetary policy and economic fluctuations in Iran's economy". *Quartely journal of economic studies and policy*, 9(2), 31-62.

Kilinc, Mustafa & Tunc, Cengiz. (2019). "The asymmetric effects of monetary policy on economic activity in Turkey". *Structural Chang and Economic Dynamics. Toros University, Turkey*. (6)32, 18-42.

McCallum, B. T. (1988). "Robustness properties of a rule for monetary policy". *In Carnegie-Rochester conference series on public policy*, (29), 173-203.

Monjazeb, M. (2006). "Analyzing the efficacy of monetary volume on output and inflation in Iran's economy". *Quarterly journal of economic research*. 6(3), 1-16.

Nerlove, M. (1965). *Estimation and identification of Cobb-Douglas production functions*, North-Holland Publishing Company, Amsterdam.

Ogbeide, F. (2016). "Monetary Policy and Manufacturing Capacity Utilization: Further Evidence from Nigeria". *South-Eastern Europe Journal of Economics*, 2, 159-174.

Samadi, A. (2009). *False Relationships in Econometrics*. Noor-e-Elm Publishing. Tehran.

Samuelson, P. A. (1979). "Paul Douglas measurement of production functions and marginal productivities", *Journal of Political Economy*, 87: 923-939.

Sharifi Rannani, H., Ghobadi, S., Amrollahi, F., Honarvar, N. (2012). "Investigating Asymmetric effects of monetary policy on GDP and Inflation through the housing price index", *Economic development and planning*. 1(1), 49-88.

Shahbazi, K., Khodaveisi, H., Rezaei, E., Yekta, E. (2018). "Investigating the asymmetric effect of monetary shocks on GDP during business cycle with emphasis on bank credits", *Econometric modeling quarterly*. 7(1), 55-84.

Simpson, T.D. (1981). *Money, Banking and Economic Analysis*, New York, Prentice Hall, 2nd edh.

Snowdon, B., Howard R.Vane. (2005). *Modern macroeconomics Its Origins, Development and current state*, Edward Elgar Publishing Limited House.

Torkamani, j. (1998). "Determination of Risk aversion, Technical efficiency and the effective factors, Case of Fars province", *Agricultural Economy Quarterly magazine*.

Vannieuwerburgh, S., & Veldkamp, L. (2006). "Learning Asymmetries in Real Business Cycles", *Journal of Monetary Economics*, 53(4), 753-772.

Walters, A. A. (1963). "Production and cost functions: an econometric survey", *Econometrica*, 31, 1-66.

Wauk, G. & Adjorlolo, G. (2019). "The Game of Monetary Policy, Inflation and Economic Growth. School of Public Affairs and Administration, University of Electronic Science and Technology of China, Chengdu, China". *Open Journal of Social Sciences*, 2(7), 255-271.

Yousefi, M. (2007). *Investigating the effects of increasing and decreasing monetary volume on real economic activities in Iran. Master's thesis*, Mofid University.