

The effect of currency shock and monetary policy of the central bank on the production gap during business cycles: LSTAR threshold model approach

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Abstract

This study aimed to explain the effect of currency shock and the monetary policy of the central bank on the production gap during business cycles. A model with a threshold approach (LSTAR) was used based on the seasonal data of the Iranian economy from April 2001 to July 2019. According to the statistical tests related to the correct specification of the model, the currency shock rate is a threshold variable for changing the coefficients as its function. The results showed that the central bank intervention and the oil shock had more effects on the production gap. The nature of production in Iran's economy is oil, and its booms and busts are synchronized with the booms and busts of oil income. The injection of high oil revenues and the experience of high economic growth increase the GDP growth and reduce the production gap due to the low currency shock rate. The continuation of economic growth in the upper stages increases investment in production, decreasing the production cost and gap. In addition, the effect of currency shock increases with the foreign exchange interventions of the central bank and crossing the threshold and entering the non-linear sector. In other words, policymakers have tried to control the growth of currency shock by more reaction to the growth of the exchange rate. However, the reaction to exchange rate deviations decreases after crossing the threshold. Therefore, controlling the exchange rate becomes more robust with the increase of its growth rate in foreign exchange interventions.

Keywords: Exchange rate, Central bank monetary policy, Business cycles, Threshold approach model
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1 Introduction

There are still numerous disputes about the origin and mechanism of trade cycles about a century after the first scientific studies were conducted. Recognizing and understanding business cycles is the first step in properly designing stabilization policies. Many economists agree that the driving force of business cycles can include monetary and financial policy shock in consumer demand and investment caused by oil price changes and technological shock.

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However, there is no agreement about which of the shocks are more important to describe the fluctuations of business cycles. Despite the importance of the topic, no significant studies have been conducted to understand the mechanism of business cycles in Iran's economy. Oil shocks in Iran's economy through oil revenues lead to an expansionary financial policy. As a result, the central bank's conversion of oil foreign exchange earnings to its Rial equivalent leads to an expansionary monetary policy. The traditional monetary theory considers the creation of a lot of money as an essential and fundamental factor in the instability of the exchange rate and the general level of prices. Therefore, currency shocks and monetary policy of the central bank should be closely related to make the monetary environment more unstable, where nominal shocks decrease the exchange rate and high inflation [2]. The government's financial dominance obliges the Central Bank to provide the equivalent of Rials of foreign exchange earnings from crude oil sales. On the other hand, the central bank is forced to buy foreign currency to manage the exchange rate. Therefore, the foreign assets of the central bank, the monetary base and, as a result, the liquidity increases. The specific rule of monetary policy during the past years in Iran is to spend the oil revenues by the government and transfer it to the foreign sources of the central bank and the monetary base. Therefore, oil shocks are known as one of the main channels of the monetary policy mechanism in the Iranian economy. Oil price shock is an exogenous factor, which is affected by various international factors. Therefore, confirming the empirical evidence of the role of oil shocks makes monetary policy exogenous. As a result, the domestic economy is highly vulnerable to external factors, leading to volatility and instability. According to [3], when the degree of complete exchange rate pass-through occurs, monetary policy shocks can negatively affect the production and business cycles of countries. Devaluation of the domestic currency, caused by a positive monetary policy shock, can result in domestic spending to direct global demand to domestic goods [1]. The increase in oil revenues as a result of the positive oil price shock expands the public sector, resulting in a decline in private sector participation in economic activities. Therefore, the central bank's behavior and its intervention in implementing monetary policies to control inflation and correctly identify currency shock in an inflationary situation require research. Previous studies have shown that the central bank's behavior on the business cycles of the country indicates a research gap. Therefore, this study aimed to explain the effect of currency shock and monetary policy of the central bank in the country's business cycles using the soft transition threshold approach.

2 Research literature

This study first discusses the theoretical foundations and their adaptation to the country's economic structure and then examines some foreign and domestic studies.

2.1 Currency shock, monetary policy, and business cycles

Currency shock is vital due to its adverse effects economic and economic stability performance. Exchange shocks cause uncertainty in the trend of relative prices, increase production costs and risk, decrease profits, increase disruption in decision-making processes, deprive of the power of planning and reduce investment motivation, especially in the main activities of the economy. Reducing incentive to invest in the main activities of the economy, due to data communication, puts the production in all the main activities of the economy, in the same direction and with different degrees, under the negative effects of the currency shock and forms business cycles in the economy. Business cycles are fluctuations at the level of macroeconomic activities with a simultaneous boom in many economic activities, followed by a similar recession in general economic activities. Currency shock is monetary-based, which is considered a demand side shock. Therefore, the effect of currency shock on the occurrence of business cycles is in the form of the theory of the demand side of business cycles. According to the theoretical foundations and subject literature, the business cycle mechanism in the Iranian economy begins with the government's budget deficit and its historical dependence on oil export revenues. The increase in government revenues has enlarged the size of the government in the economy and raised the government's costs. Hence, the government has converted oil revenues into Rials to cover this cost and grow the central bank's foreign assets, monetary bases, and money supply. Another situation is when the revenues from oil exports are reduced, and the government is forced to borrow from the central bank to cover its budget deficit. In this case, the net growth of government debts to the central bank, monetary bases, and the growth of money supply increase. The result in both cases has been the high growth of liquidity in the economy. In the short term, this liquidity will not be absorbed by the real sector of the economy, and at the same time, increasing the speed of money circulation will cause high inflation rates.

2.2 Independence of the central bank and currency shock

Many studies have emphasized the role of domestic institutions regarding monetary policies, most of which are related to the independence and transparency of the central bank¹. Generally, the favorable quality of an institution is related to the low level of prices. The central bank independence decreases the volatility of currency shock². However, the role of political instability and the low level of democracy and institutional conditions in explaining the instability of currency shocks. No relationship was found between central bank independence and low currency shocks. Improving institutional quality is not related to reducing currency shock in countries with high levels of currency shock. The effectiveness of economic reform policy is not possible without understanding political economy and disruptive policies. According to this study, disruptive policies are often proposed when the policy maker faces many restrictions. Reforms quickly fail in countries with many restrictions, including weak institutions, leading to its inefficiency. Such a reduction of currency shock is reduced only in countries with moderate restrictions. Central bank independence does not affect currency shock in economies with strong, or weak restrictions or its effect is low. Countries with a good political environment due to solid institutions also have low currency shock.

2.3 Central Bank's policy response to currency shock in inflationary conditions

Monetary policymakers intervene directly in the foreign exchange market (buying and selling currency) when their goal is to stabilize the exchange rate. In this case, the policy response to currency shocks can be expressed in the form of relation (1) (4):

$$\Delta r_t = -\rho e_t \quad (1)$$

Intervention in the market in the fixed exchange rate system is unlimited to keep the exchange rate stable. Hence, ρ tends to infinity. In the floating exchange rate system, policymakers do not intervene in the currency market ($\rho = 0$), but the floating exchange rate is managed. In this model, the EMP index and the central bank intervention are:

$$EMP_t = \Delta e_t + \eta \Delta r_t \quad (2)$$

And η is equal to [Tabatabaei and Afshari:2012:112]:

$$\eta = -\frac{(1 - \pi)(\alpha + \beta_1 + \beta_2)}{(\beta_1 + \beta_2 \kappa_2)(\phi_1 + \alpha_{\gamma_1} + \alpha_{\phi_1}) + \gamma_2 \kappa_2 (\alpha + \beta_1 + \beta_2)} \quad (3)$$

The intervention index is also defined as a part of the currency market pressure, which is removed by the central bank intervention in the market. Therefore, the intervention index based on the direct intervention of monetary policymakers in the currency market is:

$$I_t = \frac{\eta \Delta r_t}{EMP_t} = \frac{\eta \Delta r_t}{\Delta e_t + \eta \Delta r_t} \quad (4)$$

This study first calculates the intervention index of the central bank in the foreign exchange market to demonstrate the effects of this intervention in different seasons on the foreign currency shock and business cycles of the country.

2.4 Research background

The relationship between economic fluctuations and business cycles was evaluated using the Structural Var model (SVAR). The results showed that uncertainty and volatility in macroeconomic indicators in an economic recession is often an internal response to output shocks, while uncertainty about financial markets is probably the source of output volatility. Uncertainty and fluctuations in macroeconomic indicators play an essential role in economic recession. The primary cause of economic recession is fluctuations in currency indices, financial crises, oil fluctuations, and monetary shocks.

The monetary policy and business cycle fluctuations of the Lebanese economy were assessed from 1980 to 2015. The results showed that the Lebanese economy is mostly under its total capacity, and the capacity utilization is related to inflation in the short term but not in the long term. In other words, monetary factors cause economic disturbances in the Lebanese economy cycle in the short term but not in the long term.

¹ See: Alesina and Summers (1993): 151-162; Eijffinger and Geraats (2006): 1-21; Dincer and Eichengreen (2014): 189-259

² See: Aisen and Veiga (2008): 207-223

The currency shocks, central bank policies, and business cycles were examined using the generalized least squares model. The results indicated that the central bank independence reduces the negative effect of currency uncertainty shocks along with a modern transparency effect. However, the results have low certainty given the limited access to transparent information.

The relationship and effectiveness of monetary policies was investigated on the exchange rate in Iran using time series from 1959 to 2007 and the self-explanatory method with the Auto Regressive Distributed Lag Method (ARDL). The results revealed that the monetary policy variable significantly and positively affects the exchange rate in the long term, while the effect of the national income was negative and significant. The monetary policy had a positive and significant effect on the exchange rate in the short term with a break and part of unstable exchange rate fluctuations. National income and consumer price index had negatively and significantly affect the exchange rate.

The effect of fiscal policy shock on cyclical and structural budget balance was studied in OPEC member countries from 1980 to 2015. The effect of fiscal policy was investigated by separating the budget balance into two cyclical and structural variables and using the structural self-regression approach of the panel proposed in Pedrouni (2013), as well as separating the structural shock into two country-specific and common shock among OPEC member countries. According to the results and the theory, the effect of the financial policy of expenditure on the real and structural budget balance was positive, and tax was negative. The automatic stabilizer and monetary policy should be considered to deal with economic problems instead of a discretionary financial policy.

The effect of monetary shocks on different economic sectors was examined using the FAVAR approach from April 1970 to July 2016 and showed that the added value of different production sectors showed different behaviors in the face of monetary shock. The service group was more sensitive to the monetary shock than the industries and mines and the agricultural sector, and the oil sector did not react significantly to the monetary shock. Considering the different effects of different economic sectors, the central bank and monetary authorities should consider the reaction of all sectors to have more accurate plans for the national economy during the monetary policy.

3 Model structure and data

This study aimed to explain the effect of currency shock and monetary policy of the central bank on the production gap during business cycles. Considering that the dependent variable is the business cycles of the country and the explanatory variables, currency shock, the degree of central bank intervention, the price of heavy crude oil in Iran, and the real interest rate, the general form of the LSTR model is as follows:

$$GDPgap_t = \phi'(INT_t, EX_t) + (\theta'INT_t, EX_t)G(\theta'INT_t, \gamma, c) + u_t, t = 1, \dots, T \quad (5)$$

In which, the transition function F is equal to:

$$F(\gamma, s_t, c) = (1 + EX\{-\gamma(s_t - c)\})^{-1}, \gamma > 0 \quad (6)$$

The final model of estimation is:

$$GDPgap_t = \alpha_0 + a_1INT_{i,t} + a_2OILSH_{i,t} + a_3EX_{i,t} + a_4M_{i,t} + a_5DMEXP_{i,t} + a_6DEP_{i,t} + U_t \quad (7)$$

In which, $GDPgap$ is the potential production minus the actual production, which is used to obtain the production gap from the Hadrick-Prescott filter and as an indicator to show the business cycles of the country. $OILSH$ represents the price shock of Iran's heavy crude oil, EX presents the shock of the real exchange rate, M denotes the volume of liquidity, DEP shows the real interest rate, which is the difference between interest rate and inflation rate, INT indicates the degree of intervention by the central bank, and $DMEXP$ demonstrates the virtual variable of the years of the embargo in the country's oil exports, which was implemented by the European Union and the US Senate against Iran in 2012. Therefore, for the years 2011 and beyond, the number is one and the rest of the years are zero. It is assumed that the dependent variable $GDPgap$ is only a function of its discontinuous values to investigate the features of the STR model with the logistic transfer function based on the Van Dijk model. The following relationship is obtained by assuming a two-part transfer function:

$$GDPgap_t = (\theta_0 + \theta_1 y_{t-1} + \dots + \theta_p GDPgap_{t-p}) + (\phi_0 + \phi_1 y_{t-1} + \dots + \phi_p GDPgap_t - pG(EX_t, \gamma, c) + u_t \quad (8)$$

$$G(EX_t, \gamma, c) = \frac{1}{1 + exp\{-\gamma(EX_t - c)\}} \quad (9)$$

The studied period was from 2001 to 2019, and the data were extracted from the Central Bank website.

4 Model estimation results

4.1 Estimation of the central bank intervention degree

The central bank intervention degree in the foreign exchange market is calculated using Equation 13 and is shown in Table 1 from the first season of 2011 to the fourth season of 2019.

Table 1: The central bank intervention degree

The central bank intervention degree	Season	The central bank intervention degree	Season
0.890318335	03	1.001009207	1380.01
1.757823201	04	1.107334414	02
0.537540057	1390.01	1.08881914	02
0.721488142	02	0.733485977	04
0.564454888	02	0.990775873	1381.01
0.496072943	04	1.019971194	02
0.473258479	1391.01	1.040245078	02
0.583227856	02	1.015511209	04
0.49144796	02	1.000706735	1382.01
0.323603035	04	0.982683955	02
1.445002298	1392.01	1.052539421	02
0.045858068	02	0.963829343	04
0.03261768	02	0.567124414	1383.01
0.328609156	04	1.111445192	02
0.539750151	1393.01	0.92383402	02
1.154832781	02	0.890049623	04
0.339959283	02	0.750409087	1384.01
1.053288304	04	0.649362024	02
0.279623069	1394.01	0.934754428	02
1.090382098	02	0.94603587	04
0.225677485	02	0.939252739	1385.01
0.213221605	04	0.742432714	02
0.994524028	1395.01	0.953399287	02
0.81603555	02	0.928071385	04
0.098354875	02	0.946050458	1386.01
0.760382276	04	0.96247031	02
0.533899028	1396.01	0.925577054	02
0.127081766	02	0.908623182	04
0.544517319	02	0.946313598	1387.01
1.99490151	04	0.916872344	02
0.188746671	1397.01	0.956205172	02
0.672046963	02	1.021494269	04
0.417931442	02	1.208834735	1388.01
0.471536616	04	0.824933528	02
0.631338449	1398.01	0.042365318	02
0.024178648	02	0.867162948	04
0.009324771	02	1.816636561	1389.01
0.997267817	04	0.766540335	02

Resource: research findings

The degree of central bank intervention is reported in the second and fourth columns of Table 1, with a mean as much as 0.40. The Central Bank's intervention activities have removed an average of 53% of the pressure on the currency market from the second season of 2001 to the fourth season of 2019. The estimated degree of central bank intervention shows that $It_t^i > 0$ in 66 seasons. Therefore, the central bank has implemented the asymmetrical intervention

policy in most seasons (66 out of 76 seasons). In seasons where the degree of intervention is greater than one and EMP has a positive value (17 seasons), the central bank has followed the increase in the value of the Rial, and the changes in foreign reserves have been less than the increase in demand for domestic money. In seasons with the degree of intervention greater than one and a negative EMP (2 seasons), the policymakers have set the agenda for the devaluation of the Rial, and changes in foreign reserves have been greater than the increase in demand for domestic money. The value of It is negative in 10 seasons out of all the studied seasons. In other words, the central bank has supported the exchange rate changes created by market forces in these ten seasons. In 15 seasons, the It value is negative, while the EMP value is positive. Therefore, the Central Bank’s policy in these seasons was to reduce the value of money when there is an excess of the money supply through aligned intervention.

4.2 Calculation of Iran’s business cycles

This study used the Hodrick Prescott filter approach to calculate the potential production to show business cycles. The results of this test are shown in the following figure as the GDPgap variable.

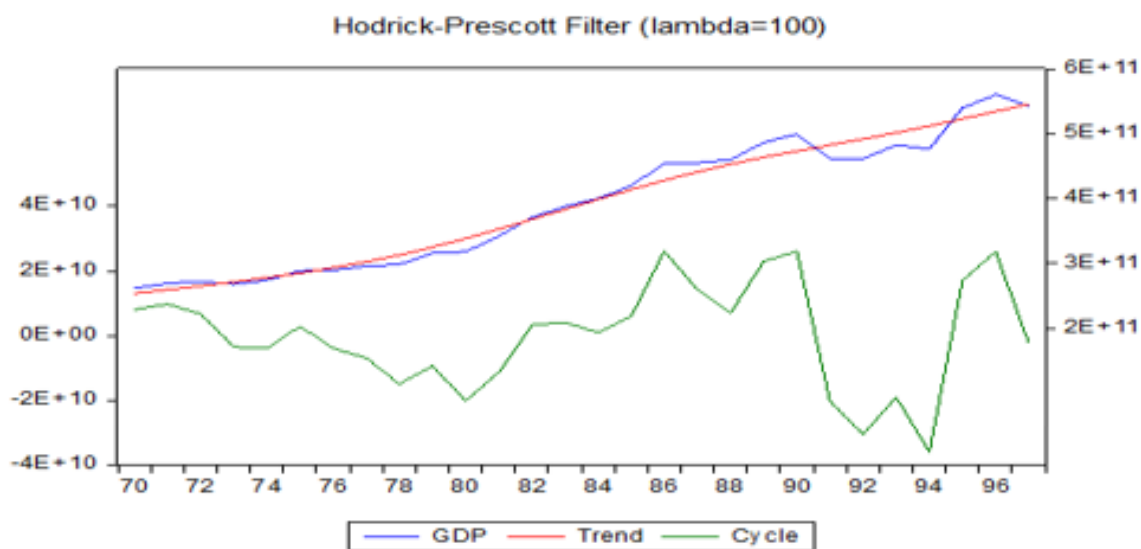


Figure 1: Business cycles of the country

Resource: research findings

According to figure 1, the obtained cyclical component is used to determine recession and boom periods. The Apsis points should be determined to set the period of stagnation and prosperity using the cyclical component. The Iranian economy has experienced five cycles: 2000-2007 boom, 2008-2009 recession, 2010-2011 boom, 2012-2015 recession, 2016-2017 boom, and 2018-2019 recession.

4.3 Linearity test, choice of transition variable, and model type

According to Table 2, the transmission variable in the estimated model is the exchange rate, the null hypothesis based on linearity is rejected, and the first-order model (LSTR) is confirmed.

Table 2: Linearity test, transition variable selection, and model type

Proposed model	F2 statistic	F3 statistic	F4 statistic	F statistic	Variable
LSTR	0.5241	0.3254	0.9854	0.5632	EX (t)

Resource: research findings

4.4 Model estimation results

The function of analyzing the effect of the exchange rate impulse and the central bank's monetary policy in the business cycles of the country is modeled using an LSTR model in which the currency shock transmission variable is used. The estimation results of the model indicate the positive relationship between the real currency shock, central bank intervention, liquidity volume, nominal interest rate, oil price shock, and the virtual variable of embargo years in the country's oil exports with the production gap. The growth of the central bank's foreign exchange reserves increases with raising the government's foreign exchange revenues. In other words, the government provides a larger amount of foreign currency to the Central Bank for exchange with Rials, and the Central Bank has to add these amounts to its foreign exchange reserves. The critical issue of Iran's economic policymakers regarding exchange rate management is directing the exchange rate in the future. The answer to this question requires the study of the exchange rate management mechanism in Iran's economy and determining the optimal course of the exchange rate in the country. Determining the optimal course of the exchange rate also requires examining the consequences of exchange rate management and determining the objectives of the exchange rate policy. A suitable foreign exchange policy can be designed based on the objectives of the foreign exchange policy and available tools to guide the exchange rate to the optimal path after determining the optimal course of the exchange rate and examining the exchange rate management mechanism. According to the structure of the foreign exchange market in Iran's economy, managing the exchange rate and applying the foreign exchange policy requires the separation of the equilibrium exchange rate from the optimal exchange rate. In addition, money volume and real interest rate positively affect the production gap index. Simultaneous long-run movements between money growth and production gap were proven in a wide range of countries in different periods, and [4] can be mentioned in this regard. Increasing the money volume through the monetary multiplier leads to money creation and an increase in the production gap. According to the results, the production gap increases with raising the real interest rate. The inflation rate increased by reducing the nominal interest rate of bank facilities from the beginning of the fourth development plan and based on the rationalization of interest law. Following the decrease in the interest rate of bank facilities in 2005 by 2%, the inflation rate increased (1.5%) compared to the inflation rate of 2004. The inflation increased by 1.6% compared to the end of 2005 and reached 15.2% at the end of the first six months of this year. The change in the composition of deposits, which increased the speed of money circulation and demand, intensified the production gap. The reason was reducing the interest rate of bank facilities in the years after implementing the plan to rationalize the interest rate due to increased demand for facilities. In addition, the lack of timely return of bank resources by the recipients of the facilities was effective due to the difference between the interest rate of bank facilities and the interest rate in the informal market, which neutralized the policy Credit contractions. Due to the dominance of the government's financial policies over the central bank's monetary policy, controlling the growth of the money volume by reducing the central bank's interventions to issue money and the policy of increasing the value of the rial needs to be accompanied by the financial policy in controlling the government's expenditures. Although changes in the growth of money and liquidity can have significant effects on actual economic variables in the short term, changes in the growth of money and liquidity mainly affect the production gap in the medium and long term.

Resource: research findings

The transfer variable was the exchange rate, and the estimated threshold value for this variable was 5.99, which follows this threshold value of the pattern based on the distance of the exchange rate. When the exchange rate crossed the threshold (5.99), the market reaction to changes in this variable increased sharply by comparing the model coefficients. In other words, policymakers have tried to control the growth of currency shock by more reaction to the growth of the exchange rate. However, the reaction to exchange rate deviations is decreasing. Therefore, when the exchange rate experiences higher growth, the policy makers seek to control it more and pay less attention to its deviations.

4.5 Diagnostic tests

According to the results of diagnostic tests in Tables 4 and 5, no remaining non-linearity test showed that all the non-linear behaviors in the model could be specified. The parameters constancy test revealed that the null hypothesis of the test based on the constancy of coefficients and parameters of the model is rejected. In addition, the model had no correlation error and heterogeneity of variance. Therefore, the LSTR model is suitable for explaining the effect of the currency shock and the central bank's monetary policy in the business cycles of the country based on the estimated results of the model and the performed diagnostic tests.

Table 3: Model estimation by LSTR model

Variable		Coefficient	Standard deviation	t statistic	Probability
Intercept	CONSTANT	0.387672	0.183589	2.111628	0.0351
Interruption of the production gap	GDPgapt-1	0.328643	0.116252	2.826990	0.0104
Real currency shock	EX	0.526566	0.238343	2.209281	0.0295
The degree of central bank intervention	INT	0.119064	0.007606	15.65365	0.0000
Oil price shock	OILSH	0.486460	0.030706	15.84253	0.0000
Liquidity	M	0.006095	0.003061	1.991131	0.0470
Actual interest rate	DEP	0.159135	0.046299	3.437115	0.0006
The virtual variable of the years of embargo in the country's oil exports	DMEXP	0.035208	0.018416	1.911790	0.0564
(C) threshold limit		5.990521	0.1533015	39.08	0.000
(γ) Slope parameter		0.822679	0.047883	17.18086	0.0000
Adjusted coefficient = 0.87 (R^2)					

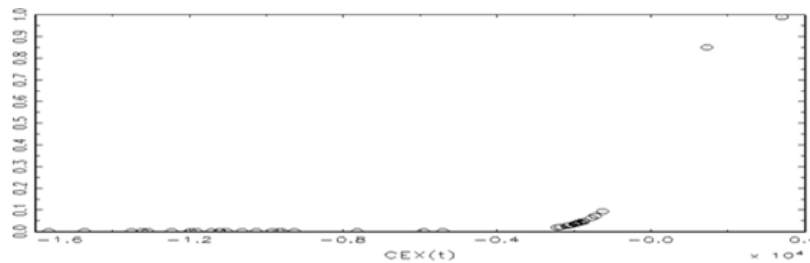


Figure 2: The relationship between the transfer function and the exchange rate transfer variable

Table 4: Serial correlation test of residuals

lag	F-value	df1	df2	p-value
1	0.9865	1	31	0.3265
2	0.3658	2	29	0.7458
3	1.4524	3	27	0.9658
4	1.7485	4	25	0.3265
5	1.5632	5	23	0.4875
6	0.7458	6	21	0.2569
7	0.2563	7	19	0.7485
8	0.7458	8	17	0.2698

Table 5: Results of diagnostic tests

Test	F-value	P-value
ARCH LM-test	0.6325	0.6985
No remaining non-linearity test	1.4258	0.1478
Parameters constancy test	1.8741	0.2369

5 Conclusion

This study aimed to explain the effect of currency shock and monetary policy of the central bank on the production gap during business cycles using the threshold approach model based on seasonal data from 2001 to 2019. The asymmetry of the effects shows that the linear approximation cannot satisfactorily explain the non-linear effects of the variables. In other words, the non-linear time series model can more explain the effect of the currency shock and monetary policy of the central bank in the business cycles of the country than the linear model by considering the changes of variable coefficients over time. This model also depicts the dynamics of the effect of nominal and real variables on the production gap index in Iran's economy in a complete way. Based on the statistical tests related to the

correct specification of the model, the currency shock is based on the statistical tests related to the correct specification of the model. The currency shock, central bank intervention, and oil shock had more effects on production. The nature of economic growth in Iran's economy is oil, and booms and busts in Iran's economy are synchronized with the booms and busts of oil income. The injection of high oil revenues and the experience of high economic growth in oil-bearing countries. The injection of high oil revenues and the experience of high economic growth in oil-bearing countries. In the high stages of economic growth, the continuation of economic growth increases the production investment of raw materials and heavy industries. In this case, the production cost and gap reduce, but the increase in not well-managed oil revenues and the government's foreign exchange earnings are spent on imports and current expenses, increasing the production gap. In addition, the intensity of the effectiveness of currency shock increases with the foreign exchange interventions of the central bank and crossing the threshold and entering the non-linear sector. In other words, policymakers have tried to control the growth of currency shock by more reaction to the growth of the exchange rate. However, the reaction to exchange rate deviations has decreased after crossing the threshold, and as a result, the role of controlling the nominal exchange rate becomes more pronounced with the increase in its growth rate in foreign exchange interventions.

On the other hand, the coefficient of growth of the exchange rate resulting from the sale of oil in the estimated reaction function was more than its deviations from the balance, which indicated more interventions by the central bank in Iran to control the growth of the exchange rate. The Central Bank sought to control the increase in prices with this policy. Governments in Iran have always tried to set the exchange rate at a low level to prevent the increase in prices due to high inflation. This type of interference has resulted in the inflexibility of the nominal exchange rate in response to economic changes and developments, which can be a factor in reducing the real exchange rate in the last few decades in Iran. The relatively average degree of central bank intervention indicates that the central bank's intervention policy did not play a successful role in neutralizing the pressure of the currency market because the government is the leading supplier of currency in Iran's single-product economy. The central bank is also obliged to provide the financial resources of the government budget. Therefore, foreign exchange intervention is mainly done in the market to provide Rial resources for the government budget. Thus, a practical analysis of the activities of the Central Bank in the foreign exchange market can be presented by the Central Bank intervention degree index. In addition, it is possible to estimate the response function of the Central Bank's intervention policy it is possible to estimate the response function of the Central Bank's intervention policy.

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