Iranian Journal of Economic Studies, 5(1) 2016, 31-47

Shiraz University

Iranian Journal of Economic Studies

Journal homepage: ijes.shirazu.ac.ir

The Switching Pattern of Government Expenditures in Response to Sanctions in Iran

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Article History

Received date: 22 August 2017
Revised date: 2 October 2017
Accepted date: 14 October 2017
Available online: 28 October 2017

JEL Classification:
H12
H72

Keywords:
Sanctions
Government expenditure
Switching model
Iranian economy

Abstract

The aim of international economic sanctions is imposing economic restrictions on target countries. In order to decrease the sanctions negative brunt on public and make it ineffective, government may respond to sanctions through policies such as increasing the supply of public goods. This paper studied the regime changes of government expenditures in Iranian economy in response to economic sanctions using Markov-Switching model during period of 1978 to 2014. The results from estimated specified model indicated that firstly, total constructive and current expenditures in response to sanctions follow Markov-Switching pattern. Secondly, total constructive and current expenditures in response to sanctions raise and this finding confirms using public goods as defensive tools sanctions in Iran.

1. Introduction

An international economic sanction is used as a political tool to special changes in the target countries. Economic sanctions are usually associated with the creation of prohibitions or restrictions on the economic activities of key firms and also the commodity transactions of target country. In negative economic sanctions, in order to change the power and political institutions, the types of restrictions, embargos, quotas and license denial are imposed to target country which has negative effect on the economic performance of country under sanction (Baldwin 1971, 1985). Economic restrictions imposed through sanctions lead to the decline of the economic situation and welfare of people, which can cause internal discontents and motivate people to create changes; it is something that sanctioning countries peruse. Governments in target country try to respond to sanctions by policies through which mitigate sanctions' negative effects.

The previous documents related to how countries respond to boycotts show that some governments in the countries under sanctions try to create a public belief about the inhumanity of sanctions by applying policies that indicate the negative effects of sanctions on people. In this way, government seeks to reduce

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DOI: 10.22099/ijes.2017.25256.1330
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sanctions' negative brunt and mitigates citizenry protest about the economic undesirable situations. In this regard, political leaders may use sanctions as propaganda purposes; so that limit economic potential activities for showing the inhumanity of sanctions (Oechslin 2014). This action mitigates sanctions negative brunt in society and enfeebles potential protesting movements against the states. Government may also pursue the plan of suppressing the public goods through limiting the public goods consumption, which increases the cost of revolutionary movements and decreases the chance of revolution success in the opinion of potential revolutionaries. Finally, it leads to the continuance of regime activities.

In contrast, governments can raise the supply of public goods and services and encourages investment on public goods which mitigates people defiance to economic and political restrictions from international sanctions and loosens incentives for revolutionary movements (Mesquita and Smith 2010). In this way, society political leaders use public goods and services such as basic cares and economic incentives as defensive tools against sanction's negative effects on country's economy which strengthens the loyalty of people to regime and makes that country policy supported by citizens (Mesquita and Smith 2010).

A clear example of countries under international sanctions is Iran. Since the Iranian revolution in 1979, different types of sanctions have been imposed with the aim of changing the hostile position of Iran toward to West. In the following years, sanctions imposed by America were backed by the international community to change Iran's political behaviors (Naghavi and Pinataro 2015).

The types of sanctions that were imposed over the years on Iran were as follows: The economic sanction of Iran between 1979 and 1981 and 1981 and 1988, with the aim of banning sale and export of all military equipment to Iran by the USA's law of extension embargo of military equipment over Iran and Iraq that created a new round of Iran economic sanctions during the 1989-1992; Dual Containment and increasing the sanctions against Iran including restricting development foreign investment in Iran's oil industry between 1993 and 2001; the issue of comprehensive sanction with the formation of Iran's nuclear file in united nations after September 11 and the continuation of Iran economic sanction. Moreover, between 2006 and 2010, new boycotts against Iran's nuclear program was imposed in the way that new bans on importing nuclear-related technology were introduced and key companies and individuals' assets were arrested. American Council expanded sanction to Iran's energy sector which was accompanied in July 2012 by European Union (Farzanegan 2013).

It seems that imposed financial and economic sanctions against Iran in different years not only have not provided the intended goals, but it has led to the stabilization and invigoration of Iran (Naghavi and Pinataro 2015). The various factors affect the success or failure of sanction in target countries; one of them is tools used by governments in response to sanction. This article along with studies carried out by Oechslin (2014), Mesquita and Smith (2010) aimed to investigate the quality of government response by focusing on the fact that

what regime changes in government expenditures has been created in Iranian economy due to sanctions. The findings of this research covered the lack of empirical studies in the field of government expenditures regime changes in the countries under sanctions.

The organization of this paper is as follows: Section two addresses the background of the research. In Section 3, the methodology of research is explained and also research data are introduced. In this regard, the time trends of the data are examined and then in order to determine the type of switching Markov model, diagnostic tests are carried out. The results of the estimation of the Markov switching model and the diagnostic tests of the classical assumptions are presented in Section 4. Finally, Section 5 analyzes the findings and conclusions.

2. Background

Regarding the effect of economic sanctions on the behavior and response of government and also the issue of regime changes in the government expenditures in response to the threats of the sanctions not so many empirical studies have been carried out. One of the related studies carried out in this field related to Arad and Hilliman (1979) study who argued that threat as trade bans decrease the next costs of sanctioned production and causes that society to focus on the defensive goods production. According to Kaempfer and Lowenberg (1992) political sanctions make political leaders modify their undesirable policies. Mesquita and Smith (2010) claimed that in order to remain in political power, individual leaders use two mechanisms including increase public goods or the confiscation and restriction of public goods which control the revolutionary behavior in the face of sanctions; accordingly, in response to sanctions, public services and goods can be increased or decreased. Escriba-Folch and Wrigh (2010) believed that the impact of economic sanctions depends on institutional capacities or structural relieve in target country; individual regimes that do not require institutions to respond to citizens, show more sensitivity to reduce resources. Rabiei and Ahmadian (2014), Acemogla (2005) and Oechlin (2010) emphasized that in order to reduce sanctions' negative impacts, the supply of public goods as a defensive tool in target countries is used to increase the economic incentives of agents for investment on efficient public goods. Increasing government expenditures on public goods discourages people's motivation under sanction in the protest against the existing situation. Oechlin (2014) stressed that the aim of economic international sanctions is the regime-change and democratization by providing an economic – political model. In this study it is noted that ruling elites in the face of sanctions reduce the efficiency of economic activities by limiting public goods. Naghavi and Pignataro (2015) expressed that sanctions create a behavior change in government through which it prevents people discontent. Farzanegan et al. (2015) studied the effects of sanction on household welfare in Iran using CGE model. The results from this research showed that all income groups of

households in urban and rural areas believed that their welfares will be declined due to oil sanctions. Oil sanctions have influenced total import, total export, private consumption, capital income, and GDP negatively. Afesorgbor and Mahadevan (2016) analyzed how economic sanctions have the negative effect on government consumption and other economic variables such as employment, poverty and GDP. This research also studied the effect of economic sanctions on income inequality among 68 target states during 1960 to 2008. Findings showed that sanctions had an adverse impact on income inequality and it is stronger when the period of sanctions is longer.

3. Method

The factors such as financial, political and economic decisions make some economic variables have multiple structural breaks over time. Markov switching models are able to model the behavior pattern of the data over time. One of the advantages these models is the possibility of a permanent change or several temporary changes which can often occur for the short run. The exact times of changes and structural failures can be determined endogenously by switching models (Fallahi and hashemi dizag 2010). This model imposes less assumption on the distribution of the variables of model and is capable to estimate the changes of dependent and independent variables simultaneously (Abounoori and Erfani 2008; and Mehregan et al. 2013).

In order to introduce the Markov switching process, assume s_t is a random variable that only includes an integer value as$\{1, 2, \dots, \mathrm{N}\}$. Also, suppose the probability that s_t equals to particular value j as the function of previous period quantity ass_{t-1}:

$$p\{s_t = j | s_{t-1} = i, s_{t-2} = k, \dots\} = p\{s_t = j | s_{t-1} = i\} = p_{ij} \tag{1}$$

This process describes an N-state Markov chain with transition probabilities $\{p_{ij}\}_{i,j=1,2,\dots,\mathrm{N}}$, where the transition probability p_{ij} indicates the probability that state i regime transfers to j regime; $\mathrm{p_{i1}} + \mathrm{p_{i2}} + \cdots + \mathrm{p_{iN}} = 1$.

The transition probabilities in an (N × N) matrix is defined as:

$$\mathbf{P} = \begin{bmatrix} P_{11} & P_{21} & \cdots & P_{N1} \\ P_{12} & P_{22} & \dots & P_{N2} \\ \vdots & \vdots & \ddots & \vdots \\ P_{1N} & P_{2N} & \cdots & P_{NN} \end{bmatrix} \tag{2}$$

The Markov chain allows that a given variable follows different time series process over different subsamples. For a two-state Markov chain, the transition matrix is

$$\mathbf{P} = \begin{bmatrix} P_{11} & 1 - P_{22} \\ 1 - P_{11} & P_{22} \end{bmatrix} \tag{3}$$

Where, p_{ij} shows the turn probability from the state i at time (t-1) to state j at time t. This probability is equal to:

$$p\{s_t = j | s_{t-1} = i\} = p_{ij} \tag{4}$$

Generally, the process of permanent changes in a regime can be described by the Markov chain. This chain is generalizable to processes in which probability $s_t = j$ in addition to s_{t-1} depend on the vector of other observed variables (Filardo 1992; Diebold et al. 1994; and Hamilton 1994).

In Markov switching models, the behavior of y_t is the function of s_t in addition to ε_t and independent variables. Due to changing regime over time and the difference of parameters in any regime, the conditional mean of variable y, the disturbance term of any regime and the variance of each regime can be different. Accordingly, assuming ε follows a normal distribution with zero mean and $\sigma^2(s_t)$ variance, the probability of y_t in different regimes is:

$$f(y_t|s_t, \Omega_{t-1}) = \frac{1}{\sigma(s_t)\sqrt{2\pi}} \exp\left(-\frac{(y_t - \Phi(s_t))^2}{2\sigma^2(s_t)}\right) \quad (5)$$

Where $\Phi(s_t)$ and $\sigma^2(s_t)$ are the conditional mean and variance y_t respectively that follow the status of variable s_t. Therefore, the probability of the random variable y_t depends on the random variable s_t in any time. Since the distribution of probabilities s_t are not independent each other, there is a common probability between y_t and s_t, $f(y_t|s_t, \Omega_{t-1})$; This feature and also the possibility of maximizing the joint probability of random quantities in the likelihood functions make these functions applicable in the estimation of all random quantities in models that are not recognizable. So we can write,

$$L = f(y_t|s_t = j, \Omega_{t-1}) = \sum_{i=1}^{k} \sum_{j=1}^{k} (y_t|s_t, \Omega_{t-1}) p(s_t = j|s_{t-1} = i, \Omega_{t-1}) \quad (6)$$

The maximizing of log-likelihood function $\log(L)$ respect to the parameters is one usual method for estimating of unknown parameters in the likelihood function (Mehregan et al. 2013).

The following general model is applied in the research stage of empirical analysis. In this model, $\boldsymbol{y}_t$ is a vector $(n \times 1)$ of observed endogenous variables and $\boldsymbol{x}_t$ is a vector $(K \times 1)$ of observed exogenous variables.

$$\boldsymbol{y}_t = \alpha_0(s_t) + \alpha_1(s_t)(\boldsymbol{x}_t) + \sigma_r(s_t)\varepsilon_t^r \quad (7)$$

Where s_t is a random variable which follows the Markov chain with transition matrix $p\{s_t = j|s_{t-1} = i\} = p_{ij}$. Also, ε_t^r is a random variable with zero mean and normal distribution, $\varepsilon_t^r \sim N(0, \sigma_r^2)$.

Now, in order to study the effect of oil sanctions on regime changes in government expenditure, the following pattern is introduced (rule 1):

$$\mathrm{Tot}_t = \alpha_0(s_t) + \alpha_1(s_t)(eoil_t) + \sigma_r(s_t)\varepsilon_t^r \quad (8)$$

where Tot_t, is total expenditures as the sum of government current expenditures and constructive expenditures and $eoil_t$ is oil revenues shock as an indicator of economic sanctions.

Also, in order to study the effect of oil revenues shock on current expenditures (rule two) and constructive expenditures (rule three), the following patterns are

introduced:

$$\mathrm{Cur_t} = \beta_0(s_t) + \beta_1(s_t)(eoil_t) + \sigma_r(s_t)\varepsilon_t^r \quad (9)$$

$$\mathrm{Cos_t} = \gamma_0(s_t) + \gamma_1(s_t)(eoil_t) + \sigma_r(s_t)\varepsilon_t^r \quad (10)$$

Where $\mathrm{Cur_t}$ and $\mathrm{Cos_t}$ are government current expenditures and constructive expenditures, respectively.

3.1. Data

This paper empirically studied the effect of sanctions on government expenditures regime changes in the framework of Markov-Switching model in Iranian economy. For this purpose, the variables like real total expenditures (the sum of current and constructive expenditures), real current expenditures (including salary, subsidy and etc.), real constructive expenditures and oil incomes shock during 1978 to 2014 have been used. As oil's industry is one of the most important goals of Iran's economic sanction, the variable of real per capita oil income as the index of indicative sanction in Iran is considered (Faraji Dizaji 2012; Faraji Dizaji and Van Bergeijk 2013; Farzanegan et al. 2015; and Garshasbi and Yusefi 2016). To the calculation of this shock, Hodrick- Prescott Filter method is applied. The research data are real and per capita.

In order to estimate the model, statistical tests are carried out firstly. Due to the nature of data, the stationary of data is tested by Augmented Dickey- Fuller (ADF) test that is shown in Table 1.

Table1. Results from ADF Unit root test

variables	Level	Prob	First difference	Prob
Constructive expenditures	-2.26	0.18	-3.97	0.00
Current expenditures	-1.40	0.57	-6.16	0.00
Total expenditures	-1.81	0.36	-6.05	0.00
Oil revenues shock (sanction)	-4.78	0.00	-	-

Source: Research results

The results from Table1 indicate that the variable of oil revenues shock is stationary at significant level of %5 and the hypothesis of existence of unit root for constructive expenditures, current expenditures and total expenditures is not rejected at the significant level %5.

Before testing the model, first we examined the time trends of the total expenditures, current expenditures and constructive government expenditures, as well as the oil revenue shock variable. The results are presented in Figures 1 and 2.

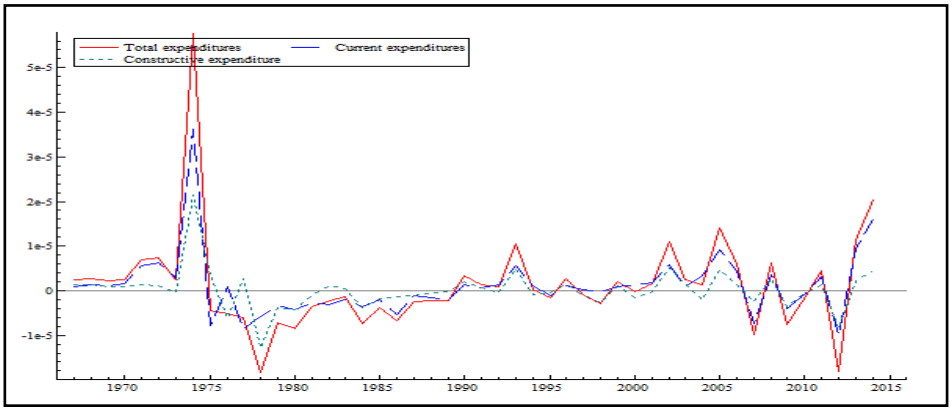

Figure 1. The time trends of the expenditures

Source: Research results

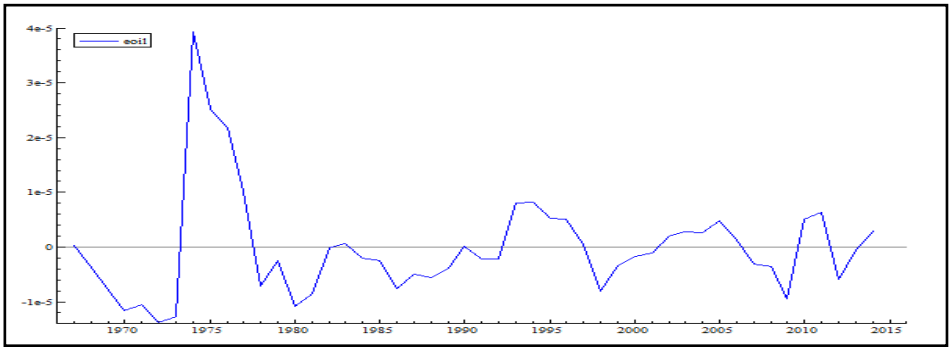

Figure 2. The time trend of oil revenue shock

Source: Research results

The comparison of figures shows that there is a positive relationship between the types of government expenditures and the oil revenue shock, especially during the period of 1973 to 2014. As the purpose of this research was the exploration of the extent and the intensity of government expenditures responses to oil revenue shock Markov switching pattern has been used in the empirical analysis sector. Therefore, this study sought to determine the states of Markov switching models in which the explanatory variables are functions of the regime. In this regard, we must compare MSIA and MSIAH models. In the Markov switching model of MSIA, intercept and the explanatory variable coefficients are functions of regime and in the Markov switching model of MSIAH, in addition to the intercept and explanatory variable, the variance of the disturbance terms is also the function of the regime. For this comparison, the minimum of AIC information criterion and the maximum of logarithm of maximum likelihood have been calculated as shown in Table 2. According to the information of this table, the MSIA Markov switching Model for total and

constructive expenditures and the MSIAH Markov switching Model for the government's current expenditures in response to oil revenue shocks are selected.

Table 2. The results of determining the states of Markov switching models

	MSIA	MSIAH
Total expenditures	AIC: -21.182*	AIC: -21.127
	Log likelihood: 398.873*	Log likelihood: 398.853
Current expenditure	AIC: -21.629	AIC: -22.053*
	Log likelihood: 407.146	Log likelihood: 415.981*
Constructive expenditure	AIC: -22.837*	AIC: -22.669
	Log likelihood: 429.486*	Log likelihood: 427.388

Source: Research results

In the next step, model specification test is carried out. According to this test, the hypothesis of existence of linear pattern against Markov-Switching pattern is tested by Likelihood Ratio (LR); the statistic of this test has $X^2(q)$ distribution where q is the number of regime. If the calculated value is greater than the critical value, the null hypothesis of linearity specified rule was not accepted and thus, the existence of non-linear relation (Switching pattern) was supported. The results obtained from specification are presented in Table 3.

Table 3. The result of LR test

Specified rules	Chi-square statistic	Degrees of freedom	Prob
Rule 1: Total expenditures+ oil revenues shock	15.34	4	0.00
Rule 2: Current expenditures+ oil revenues shock	17.54	5	0.00
Rule 3: Constructive expenditure+ oil revenues shock	17.99	4	0.00

Source: Research results

According to the results the hypothesis of existence of the non-linear relation or Switching is confirmed in response to the functions in which total, current and constructive expenditures in response to oil revenue shock (the indicative of sanction) are adjusted. According to this, the specification of a linear model is incorrect and in order to explore the specified rules for Iranian economy, it is suggested that switching system model is used.

4. The Estimation Results and Discussion

In this section, the switching pattern of total, current and constructive expenditures in response to oil revenues shock is estimated. The results from the estimation of Markov-Switching model related to specified rules in Tables 2 and 3, have been presented in the Tables 4, 5 and 6.

Table 4. The results from the estimation of Markov-Switching model (dependent variable: Total Expenditures)

variable	Coefficient	Standard deviation	T-Statistic	Prob
		Regime 1		
C(1)	$5.44e^{-7}$	$9.63e^{-6}$	0.0565	0.955
$e_{\text{oil}}(1)$	0.6785	0.1477	4.59	0.00
		Regime 2		
C(2)	$9.067e^{-6}$	$1.512e^{-5}$	0.6	0.553
$e_{\text{oil}}(2)$	4.19	0.4413	9.49	0.00
sigma	$4.21e^{-6}$	$1.303e^{-5}$	0.324	0.748

The number of parameters: 7
The number of observations: 37
Logarithm of maximum likelihood: 398.873
AIC: -21.182

Type of test	Test statistic	The value of Test statistic	Prob
Jarque–Bera Test	$\chi^2(2)$	1.1141	0.5729
ARCH Test	F(1,28)	0.0227	0.8812
Portmanteau Test	$\chi^2(6)$	6.3008	0.3903

Classification system based on years covered

Regime	classification system based on years covered	Expected durable	The average probability of regime in each of the years
Regime 1	1979-2011	33	0.976

Total: 33 years with average duration of 33 years.

Regime 2	1978-1978	1	0.987
	2012-2014	3	0.998

Total: 4 years with average duration of 2 years.
probability of transmission from one regime to another regime

	Regime 1 (t-1)	Regime 2 (t-1)
Regime 1 (t)	0.9605	0.2579
Regime 2 (t)	0.0395	0.7420

Source: Research results

According to the results from Jarque–Bera normality test in Table 4, the distribution of disturbance terms in specified Markov-Switching model is normal. Also, results from variance heteroscedasticity and Portmanteau autocorrelation showed that null hypothesis including lake of variance heteroscedasticity and autocorrelation was not rejected. Therefore, disturbance terms had not any variance heteroscedasticity and autocorrelation and there are classic assumptions.

The results of Table 4 present the effect of oil revenue shock as economic sanction index on government total expenditures in Iranian economy. The

estimated coefficients of oil revenue shock were positive and significant statistically over time. This means that in response to the economic sanctions, government expenditures have been increased. However, results indicated that during the periods of under regime 2 (i.e., 1978 and 2012- 2014 with average stability 2 year), oil revenue shock led to an increase in government total expenditures more intensively than the periods of under regime 1 (i.e., 1979-2011 with average stability 33 year).

In addition, the results from the transition probability of one regime to another regime showed that when the economy is in the state of regime 1 in the period (t-1), it remains in the state of regime 1 to the probability of %96 in the period t and rotates to the state of regime 2 to the probability %4 and when the economy is in the state of regime 2 in the period (t-1), it remains in the regime 2 to the probability of %74 and rotates to the regime 1 to the probability of % 26.

Regarding the periods under study, regime 1 with 33 years and the average permanency of 33 has more stability and durability compared to regime 2 with 4 years and the average permanency of 2, generally.

The Table 5 provides the results from the response of government current expenditures to oil revenue shock.

From Table 5, the distribution of disturbance terms is normal and rejects variance heteroscedasticity and autocorrelation in disturbance terms. As results show, oil revenue shock has been increased government current expenditures significantly over the period. However, during the covered period of regime 2 including 2002-2008 and 2012-2014, oil revenue shock increased current expenditures more intensively.

According to results from transition probabilities, whereas economy is in the status of regime 1 in the period (t-1), it remains in the same regime in the period t to the probability of %91 and rotates to regime 2 only to the probability of %9. On the other hand, economy remains in the period (t-1) in the status of regime 2 to the probability of %81, when it was in the status of regime 2 in the period (t-1). In this period, the probability of rotation to regime 1 is %19. Totally, during the period under study in Iranian economy, regime 1 with 27 years and the average permanency of 13.5 years has more stability and durability compared to regime 2.

Table 5. The results from the estimation of Markov-Switching model (dependent variable: Current Expenditures)

variable	Coefficient	Standard deviation	T-statistic	Prob
		Regime 1		
C(1)	$-3.04e^{-7}$	$2.33e^{-5}$	-0.013	0.99
$e_{\text{oil}}(1)$	0.340	0.074	4.58	0.00
		Regime 2		
C(2)	$3.54e^{-6}$	$1.95e^{-5}$	0.181	0.85
$e_{\text{oil}}(2)$	1.501	0.621	2.41	0.02
Sigma (1)	$2.00e^{-6}$	$2.34e^{-5}$	0.085	0.932
Sigma(2)	$4.94e^{-6}$	$3.2e^{-5}$	0.155	0.878

The number of parameters: 8
The number of observations: 37
Logarithm of maximum likelihood: 415.98
AIC: -22.053

Type of test	Test statistic	The value of Test statistic	Prob
Jarque–Bera Test	$\chi^2(2)$	3.52	0.17
ARCH Test	F(1,27)	0.079	0.77
Portmanteau Test	$\chi^2(6)$	4.25	0.64

Classification system based on years covered

Regime	classification system based on years covered	Expected durable	The average probability of regime in each of the years
Regime 1	1978-2001	24	0.935
	2009-2011	3	0.932

Total: 27 years with average duration of 13.5 years.

Regime 2	2002-2008	7	0.830
	2012-2014	3	0.999

Total: 10 years with average duration of 5 years.

probability of transmission from one regime to another regime

	Regime 1 (t-1)	Regime 2 (t-1)
Regime 1 (t)	0.907	0.186
Regime 2 (t)	0.092	0.813

Source: Research results

The Table 6 provides the results from the response of government constructive expenditures to oil revenue shock.

The Table 6 shows the results from the estimation of government constructive expenditures where oil revenue shock leads to an increase in constructive expenditures significantly, although the intensity of expenditures response to oil shocks is different during two system years. In the regime 1 (i.e., during the years of 1980-2001 and 2003-2011), government constructive expenditures had weaker response to economic sanction. In this regime, there

was more stability and durability than regime 2 (i.e., the years of 1978- 1979, 2002 and 2012-2014).

Table 6. The results of the estimation of Markov-Switching model (dependent variable: Constructive Expenditures)

variable	Coefficient	Standard deviation	T-statistic	Prob
	Regime 1			
C(1)	$1.50e^{-7}$	$7.588e^{-6}$	0.0198	0.98
$e_{\text{oil}}(1)$	0.2559	0.0633	4.04	0.00
	Regime 2			
C(2)	$9.91e^{-7}$	$8.91e^{-6}$	0.111	0.91
$e_{\text{oil}}(2)$	1.739	0.1843	9.44	0.00
Sigma	$1.78e^{-6}$	$1.16e^{-5}$	0.154	0.879
The number of parameters: 7				
The number of observations : 37				
Logarithm of maximum likelihood: 429.48				
AIC: -22.83				

Type of test	Test statistic	The value of Test statistic	Prob
Jarque–Bera Test	$\chi^2(2)$	0.1875	0.91
ARCH Test	F(1,28)	0.1513	0.7
Portmanteau Test	$\chi^2(6)$	9.159	0.16

Classification system based on years covered

Regime	classification system	Expected durable	The average probability of regime in each of the years
Regime 1	1980-2001	22	0.934
	2003-2011	9	0.983
Total: 31 years with average duration of 15.5 years.			
Regime 2	1978-1979	2	0.885
	2002-2002	1	0.662
	2012-2014	3	0.829
Total: 6 years with average duration of 2 years.			

probability of transmission from one regime to another regime

	Regime 1 (t-1)	Regime 2 (t-1)
Regime 1 (t)	0.9166	0.400
Regime 2 (t)	0.0833	0.599

Source: Research results

In Total, based on the results of Tables 4-6, the positive and significant relation between oil revenues shock and total, current and constructive expenditures are confirmed. Thus, it is claimed that oil revenues shock has created a positive regime changes in government expenditures in Iranian economy. These findings are in line with the discussion of Mesquita and Smith (2010) who believed that in order to decrease the negative effects from sanction, government may support more investment on public goods and services through

increasing the supply of public goods. This action can mitigate the people protest to restrictions from international sanctions.

Figures 3, 4 and 5 illustrate smoothed probabilities related to response rules where total, current and constructive expenditures to oil revenues shock are adjusted. These findings are in line with the results from tables 4-6. In these figures, full color areas show the classification of years between the two regimes.

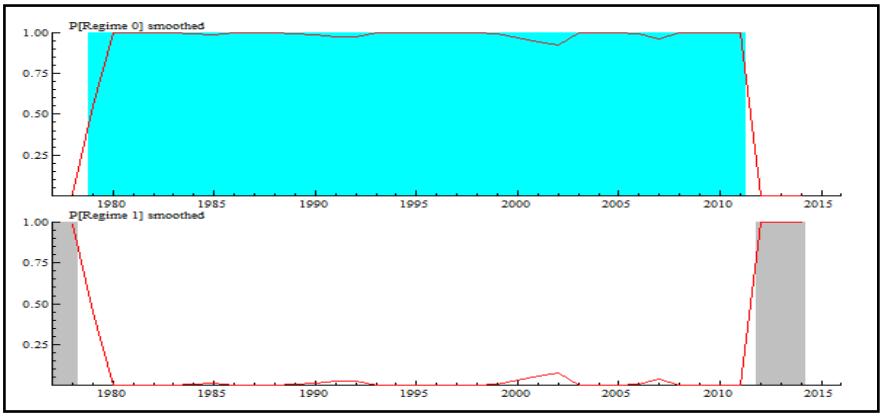

Figure 3. Smoothed probabilities related to total expenditures

Source: Research results

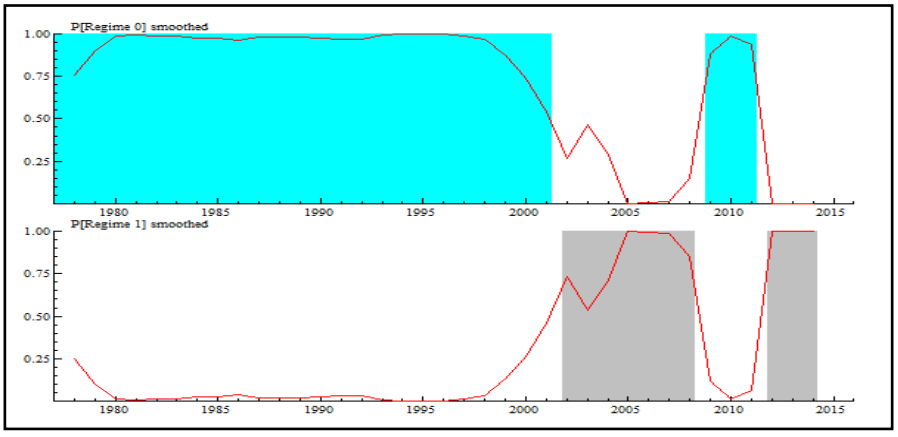

Figure 4. Smoothed probabilities related to current expenditures

Source: Research results

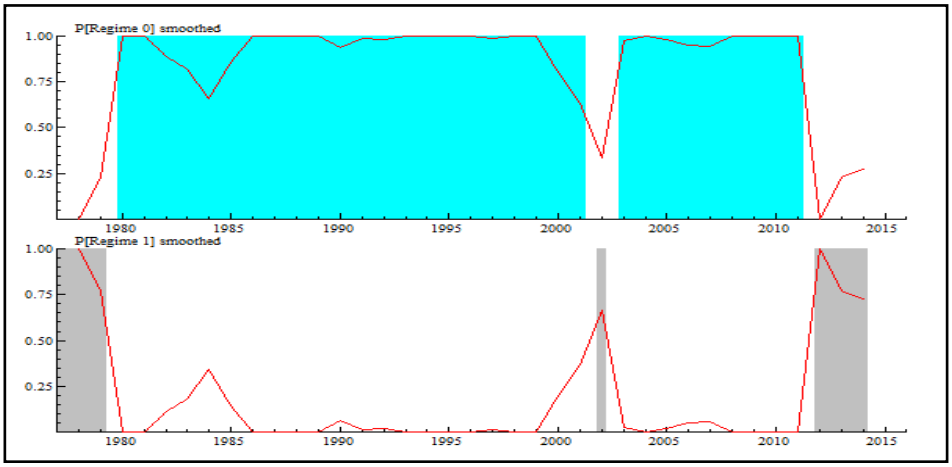

Figure 5. Smoothed probabilities related to constructive expenditures
Source: Research results

The Table 7, summarizes the time periods covered by this study, in which government's total, current, and constructive expenditure have had stronger responses to oil revenue shock.

Table 7. The summary of results

Total expenditures	Current expenditure	Constructive expenditure
1978	2002-2008	1978-1979
2012-2014	2012-2014	2002
		2012-2014

Source: Research results

The presented results in Table 7 are in line with the imposed economic sanctions on Iran between 1979 and 1981 which sale and export of all military equipment to Iran was banned by the USA, in addition to the applied limitations about foreign investment development in Iran's oil industry between 1993 and 2001, as well as the effects from new boycotts against Iran's nuclear program between 2006 and 2010 and also the sanctions that expanded to Iran's energy sector by American Council which was supported by European Union in July 2012.

5. Conclusion

The aim of international sanctions is bringing about changes in the behavior of target countries through the imposition of several types of economic restrictions. This research attempted to study the manner of government response to international sanctions in Iran which has been under different types of international sanctions since 1979.

In this research, the effect of sanctions on government expenditures regime

changes in Iran was studied. In this regard, the results from model specification showed that, real total expenditures, real current and constructive expenditures in response to oil shocks (as sanction index) were adjusted and as the specification of linear model was incorrect, a switching system model was employed.

The results from estimation Markov-Switching model indicated that shock to oil revenue made an increase in total, current and constructive expenditures which was significant statistically. However, oil revenue shock as sanction index, created more increase in government expenditures in some periods. In this regard, during the 1978 and 2012-2014, shock to oil revenue has increased government total expenditures at more intensively.

Also, the results of government current expenditures model showed that although oil revenue shock led to increasing current expenditures over years, but it has happened one rotation in regime situation during the 2001 and 2011; so that during the 2002-2008 and 2012-2014 oil sanction shock has led to more increase in current expenditures.

In addition, in the government constructive expenditures pattern, oil revenue led to increase constructive expenditures significantly, although the intensity of expenditures response to oil shocks were different during two regimes; in 1978-1979, 2002 and during the 2012-2014 government expenditures has been increased with more intensity in response to sanction shock. In regime 1, i.e. during the 1980-2001 and 2003-2011, government constructive expenditures had weaker response to economic sanction. In this regime, there was more stability and durability than regime 2.

In total, the results from estimated Markov-Switching model confirmed the positive regime changes in government expenditures to international sanctions as sanctions lead to increasing total, and current expenditures. Since the increase of government expenditures provide more public services and goods consumption and it can be claimed that in order to fight sanctions and its negative brunt on people, positive regime changes in the types of government expenditures in Iran as defensive tool is created. These findings are in line the opinion of Mesquita and Smith (2010) who stressed that in countries under sanctions, increasing public services and goods by government cut the negative effect of sanctions and can control the behavior of citizens.

Based on the research findings, government expenditures showed more strong response to oil revenue shock in periods that sanctions have been imposed against Iran or supported by other countries such as years between 1979 and 1981 which sale and export of all military equipment to Iran were banned by U.S.A, limitations about foreign investment development in Iran's oil industry between 1993 and 2001 was considered, new boycotts against Iran's nuclear program between 2006 and 2010 were executed and also, European Union in July 2012 supported sanctions which expanded to Iran's energy sector by American Council.

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