

## Financial Sanctions and Economic Growth: An Intervention Time-series Approach

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### Abstract

In the present study, the authors examined the impact of financial sanctions on economic growth using Iran's data and intervention time-series analysis over the period 2005-2017. Financial sanctions targeted the country's financial resources and increased interest rates and medium- and long-term financing costs. In general, financial sanctions adversely affected the financial sector. In this regard, blocking of assets and restricted access to financial and foreign exchange resources, depreciated domestic currency, reduced investment, exports, and production along with increased inflation and unemployment ultimately reduced economic growth.

The results indicated the effectiveness of financial sanctions on economic growth in the short-run. However, during the third period (2010-2014), when severe and multilateral financial sanctions are imposed, the coefficient is negative (0.54), which is higher, compared to the other periods. As the economic sanctions of Iran have intensified, the economic growth has slowed down. Nevertheless, in the long run, financial sanctions have had a weaker negative effect of 0.19 on the economic growth.

**Keywords:** Financial Sanctions, Economic Growth, Intervention Model, Iran's Economy.

**JEL Classification:** F51 · O 47 · O 53

## 1- Introduction

Financial and trade sanctions are the most common type of restrictions in the global economy. Sanctions are also economic and political tools to impose the demands of a country and secure its interests by another country (Bazooabandi, 2015; Bert, 1997; Cheraghali, 2013; Denant-Boemont, Masclet & Noussair, 2007; Lam, 1990; Neuenkirch & Neumeier, 2015; Tian & Whalley, 2010; Trofimova, 2015; Van Furstenberg, 1991). Although a range of sanctions has been imposed, the increase in financial sanctions over the past few years has been unprecedented. Financial sanctions, along with the oil-dependent economic structure have led to targeting economic artery by the sender country and put the Iranian economy under pressure. Since 2006, sanctions on Iran's economy have been tightened, and the UN Security Council has issued four resolutions against Iran over its nuclear program. UN sanctions against Iran include blocking the assets of companies and people who were allegedly involved in or supporting Iran's nuclear program or the production of ballistic missiles. These resolutions expanded sanctions on Iran, especially increased financial sanctions, forced companies, and institutions to follow sanctions against Iran (Vesali & Torabi, 2010).

Over the past few years, financial sanctions have adversely affected Iran's financial sector, rising interest rates and financing costs. Financial sanctions have also restricted foreign trade, especially the import of capital and intermediate goods which adversely affect economic growth. With the tightening of financial sanctions since 2011, the import of intermediate and capital goods became difficult, and problems appeared for procuring raw materials, technology transfer, and providing spare parts and new equipment for some industries (Kazeruni, 2018). In addition, financial sanctions have raised political risk and increased systemic risk, which affected the capital market (O'Hara, 2017). Moreover, the

sanctions affected the foreign exchange market where the devaluation of the currency happened (Steil & Litan, 2006).

US financial sanctions encompassed restrictions that deprived Iran of the financing of US EXIM bank, export credit, loan guarantee, and export insurance. Also, US representatives at the international financial institutions are deterred from voting for granting a loan to Iran. These sanctions reduced the financial ability of Iran and enforced the country to find costly alternatives for financing projects. The primary effect of financial sanctions was the reduction in financing for the development of oil and gas projects.

Because the bulk of the country's export revenue and part of the government's expenditures provided by oil revenues, it created a bottleneck in the investment in the oil and gas sector which has adverse consequences, as the government has to develop oil fields and increase their capacity to extract oil. Therefore, the primary effect of US financial sanctions was to reduce funding for Iran's oil projects, which have delayed investment (Mehrabani, 2015).

Given the financial sanctions imposed on Iran's economy over the past few decades, which have been accompanied by financial and investment constraints, the authors of the present study examined the dynamics of the impact of financial sanctions on Iran's economic growth. In this study, the intervention model as well as the monthly data have been used for the period 2005-2017.

Financial sanctions are considered as an exogenous and dummy variable, and the economic growth rate variable is considered as an endogenous variable in the model. The organization of the present study is as follows: in the second section, the literature review is discussed and the third section addressed the methodology. Then, in the fourth section, the model and its findings are presented. Finally, in the fifth section, the results and policy recommendations are presented for reducing

the impact of financial sanctions.

## 2- Literature Review

The empirical literature on this issue could be divided into two groups. The first group explores the overall effect of economic sanctions on economic growth in Iran, which is as follows:

Rahimi and Azerbaijani (2013) examined the impact of economic sanctions on production and economic growth in Iran. They used the Generalized Method of Moments to estimate a macro model over the period 1360-1389 (1981-2010). The results indicated that the variable of economic sanctions had a negative and significant effect on growth and production.

Ezzati and Salmani (2014) investigated the effect of economic sanctions on Iran's economic growth, emphasizing the foreign sector of the economy. They estimated the effect of using the ARDL model. The findings indicated that before the imposition of extensive oil and banking sanctions during 2013-2014, the moderate sanctions have no direct and significant effect on non-oil GDP per capita growth in Iran.

Derakhshan and Fadaei (2015) explored the short and long-term effects of economic sanctions on Iran's economic growth. To this end, they estimated the effect using the ARDL model to explain the impact of economic sanctions on the economic growth during 1978-2013. The results of short-term estimates indicated that the weak sanctions did not have a significant effect on economic growth, but moderate and heavy sanctions in the short term had a negative impact on the economic growth. The results of the long-term relationship showed that the weak sanctions, in the long run, did not have a significant effect on economic growth, but moderate and heavy sanctions, in the long run, had a negative impact on economic growth.

Garshasbi and Yousefi (2016) examined the effects of international sanctions on macroeconomic variables of Iran's economy.

To this end, a sanction index has been developed using twelve variables that had a high impact on sanctions and a factor analysis method over the period 2008-2010. They assessed the impact of sanctions on economic growth, trade, investment, and employment using the three-stage least squares (3SLS) method in a small macroeconomic model. The results indicated that the direct effect of sanctions on the economic growth and terms of trade was significant. There was also a direct relationship between the intensity of sanctions and their effects on economic variables.

In the second group of empirical studies, the effect of financial sanctions on economic growth was examined.

Mohamed (2006) investigated the effect of financial sanctions on South Africa using an intervention model during 1986-1991. The results indicated that the 1986-1991 financial embargo on South Africa had a negative effect on the time trend of South Africa's economic growth. There was also an inverse relationship between the intensity of financial sanctions and the apartheid system.

Dizaji and Bergeijk (2013) explored the early phase success and ultimate failure of long-term economic sanctions on Iran's economy using a VAR model. They used economic variables (government consumption, imports, investment, and income) and political indicators (the polity variable denoting changes in the dimensions of independence and democracy). The results indicated that sanctions were effective in the short run, but their effectiveness was limited in the long run.

Farzanegan (2013) investigated the impact of international financial and energy sanctions on Iran's informal economy. A structural equation model, multiple indicators, multiple factors (MIMIC), and trade imbalances have been used to measure the volume of informal economy in Iran during 1970-2002. The results suggested that financial and energy sanctions affected Iran's financial policy and had a negative impact on Iran's economic

growth.

Neuenkirch and Neumeier (2015) examined the impact of the United Nations and US economic sanctions on Iran's GDP growth. Their examples included 160 countries that experienced 67 economic sanctions during 1967-2012. The results suggested that UN sanctions had a significant negative impact on the economic growth of the target country. On average, the imposition of UN sanctions has reduced GDP per capita growth by more than 2%. The adverse effects of US sanctions on the real GDP growth were smaller than UN sanctions and reduced GDP growth by 0.75 to 1 percent.

Besedes, et al. (2016) investigated the impact of financial sanctions on German border capital flow using the OLS method. The analysis is based on monthly data from the German balance of payments over the period 2005-2015. The variables of the model included sanctions, per capita GDP growth, capital flow, public debt, and capital market. The results indicated that financial sanctions had a significant negative impact on border capital flows.

Pestova and Mamonov (2019) examined the economic impact of financial sanctions on the Russian economy using the BVAR model. They divided macroeconomic variables into internal and external financial and non-financial variables. The results suggested that the effects of financial sanctions on most variables were moderate but significant. Moreover, the results indicated an average GDP growth reduction in 2014 and 2015 by 0.43 and 0.74 percent, respectively. Financial sanctions had a limited impact on consumption and investment, wages, and inflation in Russia. The negative impact of the sanctions on interest rates, imports, and the Ruble exchange rate in 2015 was even more severe.

Discussion of the literature review: the first category of studies examined the impact of economic sanctions on the economic growth. However, the unilateral and multilateral sanctions, as well as the severity of this

impact, have not been investigated. Therefore, we considered unilateral and multilateral sanctions, and also the severity of sanctions.

The most important contribution of this study is that we examine different periods of financial sanctions and their severity, unilateral and multilateral sanctions, and the effect of JCPOA. Moreover, in the present study, we have applied an interventionist approach, which has not been used so far in Iran to study sanctions.

### 3- The Model

#### 3-1- Intervention Analysis

Economic time-series are often affected by policy changes and restrictions such as sanctions, shocks, strikes, and unusual effects. In the time-series literature, these are known as interventions.

In a non-intervention analysis, no intervention takes place and the trend continues unchanged. It means that the expected trend is realized in the absence of intervention (Shadish & Sullivan, 2011).

Intervention analysis measures the immediate or delayed effect of an event on the time-series data. These "events" or "interventions" may or may not be planned (Tonta, 2018). In fact, the time-series is interrupted by interference at a specific point in time.

It was introduced by Box and Tiao (1975) to model the effect of a dynamic change in the time-series at a given time. Intervention variable is depicted as slope and/or level change and indicated by zero and one. Level change occurs at a specific time but its effect may be unchanged, increased, or decreased over time. The effect of slope intervention increases over time (Rai, et al. 2014).

The intervention changes the level of time-series or the level after a short delay so that the downward series change upward (Abraham, 1980).

Intervention analysis discussed by Box and Tiao (1975), Deutsch and Alt (1977), Helmer and Johansson (1977), Aczel and Fullam

(1986), Bhattacharyya and Layton (1979), Hung and Tsay (1994), Larcker, Gordon, and Pinches (1980).

The analysis is based on the modeling of Auto Regressive Moving Average Vector (ARMA). It can be considered as an ARCH process (Enders, 1995). Most of the mentioned researchers applied this method. For example, to predict the stock price in China, Jarrett and Kyper (2011) used an intervention model. Mosungum and Anieting (2016) also used an intervention model to indicate the effect of an intervention in the foreign exchange market of Nigerian currency. We examined the dynamics of financial sanctions on economic growth in Iran using the Ender, Sandler, and Cavalli intervention model (1990). The general model used in this study is presented in Equation (1):

$$Y_t = \alpha_0 + A(L) Y_{t-1} + c_0 Z_t + B(L) \varepsilon_t \quad (1)$$

In this equation,  $Z_t$  is the intervention variable that takes zero before financial sanctions and one after imposing the sanction.  $\alpha_0$  is intercept, and  $L$  is a lagged operator<sup>2</sup>,  $A(L)$  and  $B(L)$  are polynomials that include lags (such as  $Ly_t = y_{t-1}$ )

Furthermore, we have

$$A(L) [1 + a_1 L + a_2 L^2 + \dots + a_p L^p] \text{ and } B(L) [1 + b_1 L + b_2 L^2 + \dots + b_q L^q]$$

However, the effect of intervention changes if  $Y_t$  has a unit root. Also, a shock or an impulse will have a permanent effect on the level of the unit root process. Assuming that it takes time for  $z_t$  to affect the target series, this behavior is presented in Equation (2):

$$Y_t = \alpha_0 + A(L) Y_{t-1} + c_0 Z_{t-d} + B(L) \varepsilon_t \quad (2)$$

The form of intervention function and delay factor  $d$  are mostly determined by the experience. We estimated alternative models

<sup>2</sup>We can write the lagged operator of  $y_{t-1}$  by  $L y_t$  and  $y_{t-2}$  by  $L^2 y_t$ .

and then used Schwarz-Bayesian and Akaike criteria to choose the best model.

### 3-2- Data and Periods

The data for economic growth rate extracted from the website of World Development Indicators. The data are quarterly for the period 2005: 1 to 2017: 4 and the information for the financial sanctions is extracted from media websites and scientific papers.

Ender, Sandler and Cavalli intervention model (1990) was used to examine the impact of financial sanctions.

The empirical analysis comprises four periods: The first period, which includes 2005-2017, encompasses the entire period of the study. The second period encompasses the data for the period 2006-2011, during which financial sanctions were intensified.

In the third period, which includes 2010-2014, multilateral and the most severe financial sanctions were imposed (Alavi & Amiri, 2016; Dizaji, Jariani, & Najarzadeh, 2018; Kazeruni, et al., 2016; Mottaghi, 2018).

In the fourth period (i.e. the period 2015 to 2017) along with financial sanctions, the Joint Comprehensive Plan of Action (JCPOA) has happened. In each period, the stationarity of the time-series and variance heteroscedasticity was examined. Also, the ARMA model was used for estimation.

### 3-3- Empirical Model

In Equation (1), two dummy variables, REACTION and TARGET, are introduced as instrumental variables. The adjusted model is presented in Equation (3). The two-stage least squares method (2SLS) is used to estimate the regression:

$$Y_t = \alpha_0 + A(L) Y_{t-1} + c_0 Z_t + d_i I_i + B(L) \varepsilon_t \quad (3)$$

where  $I$  denotes instrumental variables.

REACTION: denotes a dummy variable if comprehensive international sanctions are imposed, the value for the dummy variable is one, otherwise, it is zero.

TARGET denotes a dummy variable as it

separates financial sanctions from non-financial sanctions. Thus, if there is a non-financial sanction, the value is one, otherwise, it is zero.

$Z_t$  denotes an intervention variable that includes financial sanctions over the period 2005-2017.

The difference between the intervention and the dummy variable is that the intervention variable indicates the occurrence of an event. It changes the direction of time-series, which can be binary (0 and 1) or it may be a quantitative variable that includes real values (Mohamed, 2006).

Before the estimation of parameters, the time-series properties of the data were examined to avoid spurious regression. Economic growth time-series were examined for the unit root by using the Phillips Peron test. It has also been investigated for the effect of Autoregressive conditional heteroscedasticity (ARCH) using LM (or Breusch-Godfrey) and White tests.

By using SBC and AIC criteria, a model with a minimum SBC and AIC value was selected and estimated by the least squares (LS) method. The following criteria were used to identify the appropriate model:

Prior to the estimation of the parameters of Equation (4), the Phillips Peron unit root test was applied to explore the stationarity of the time-series of economic growth. The results indicated that the unit root was not observed in the time-series. The model of economic growth also investigated for

the lowest AIC and SBC criteria (Lloyd, 1993), .

the highest  $R^2$  (Lloyd, 1993), the satisfaction of Co-integration relations. The estimation of residual value is white noise.

#### 4- Estimation Results

A linear intervention model was used to investigate the impact of financial sanctions on Iran's economic growth. The model is presented in Equation (4):

$$Y_t = \alpha_0 + A(L)Y_{t-1} + c_0 Z_t + B(L)\varepsilon_t \quad (4)$$

In Equation (4),  $Z_t$  denotes the intervention variable which represents financial sanctions. It takes zero before the imposition of financial sanctions, and one after that.  $\varepsilon_t$  denotes a white noise disturbance.  $Y_t$  denotes economic growth and  $Y_{t-1}$  denotes the lag of economic growth.  $L$  is also a lag operator. Furthermore, we define:

$$A(L) = [1 + a_1 L + a_2 L^2 + \dots + a_p L^p] \text{ and} \\ B(L) = [1 + b_1 L + b_2 L^2 + \dots + b_q L^q]$$

$A(L)$  and  $B(L)$  are polynomials with lag.  $L$  or lagged operators are used to model the growth effect of the previous period on the current one. The intervention variable also encompasses four periods of financial sanctions. The term  $\varepsilon_t$  is white noise disturbance.

This study has four hypotheses: 1) Financial sanctions over the whole period of study have a negative and significant impact on economic growth. 2) The second round of financial sanctions (severe financial sanctions) has a negative and significant impact on economic growth. 3) The financial sanctions of the third period (multilateral sanctions and the most severe financial sanctions) have a negative and significant impact on economic growth. 4) The financial sanctions of the fourth period (from JCPOA onward) have a negative and significant impact on economic growth.

The effect of Autoregressive conditional heteroscedasticity (ARCH) using LM and White tests. The results indicated the lack of conditional heteroscedasticity in the economic growth data. In addition, we find that there is no auto-correlation in the growth data.

Equation (4) has the best results for the fitting of the intervention model with the lowest AC and SBC.

All ARMA models options were also

examined. There is no unit root or conditional heteroscedasticity in the growth data.

Accordingly, the least-squares (LS) method was used for regression (Enders, 2004) to obtain the coefficients for the model variables.

Table 1 shows the results of the economic growth regression for different periods of sanctions.

In the first period, 2005-2017 (the whole period), the coefficient of financial sanctions is 0.07. The sanction has a negative and significant effect (at the level of 5%) on economic growth. The growth rate with one and two lags affected (with coefficients of 1.98, 1.011, respectively) economic growth significantly. This shows that with more lags, the impact of sanctions on economic growth decreases. In the second period of financial sanctions, 2006-2011, in which severe

financial sanctions were imposed, the coefficient of financial sanctions is 0.29. Sanctions have a negative and significant effect (at the level of 5%) on the economic growth and its effectiveness increased compared to the first period.

In addition, the economic growth with two lags has a positive and significant effect (with a coefficient of 0.95) on the economic growth. Moreover, in the third period, 2010-2014, in which severe and multilateral financial sanctions were imposed, the coefficient is 0.54, and it has a negative and significant effect (at the level of 5%) on the economic growth. The economic growth with two and five lags has a significant effect (with coefficients of 1.52, -0.64, respectively) on the economic growth. Although, the effect is much less with the fifth lag.

**Table 1. Estimation of Four Intervention Models for the Economic Growth**

	Economic Growth (2005-2017)	Economic Growth (2006-2011)	Economic Growth (2010-2014)	Economic Growth (2015-2017)
Estimation Method	LS	LS	LS	LS
Model Parameter	(1,1)	(12,12)	(3,3)	(3,3)
C	0.1198 (0.0000)**	0.1971 (0.0114)	0.5465 (0.0000)**	2.8271 (0.0824)*
Sanction	-0.0721 (0.0000)**	-0.2993 (0.0094)**	-0.5482 (0.0000)**	-0.89 (0.0000)**
Growth <sub>t-1</sub>	1.9889 (0.0000)**	-	-	-
Growth <sub>t-2</sub>	-1.011 (0.0000)**	0.9541 (0.0000)**	1.5206 (0.0000)**	-
Growth <sub>t-4</sub>	-	-	-	0.3004 (0.0076)**
Growth <sub>t-5</sub>	-	-	-0.6445 (0.0000)**	-
Adj R <sup>2</sup>	0.9575	0.9169	0.9215	0.8205
AIC	3.0495	3.7872	3.6259	4.509
SC	3.1647	3.2161	3.8167	4.6100

Note: \* The results are significant in P-value <0.10. \*\*Results in P <0.05 are significant.

Source: Authors

The intensifying of sanctions reduced the economic growth, especially oil production, by about one million barrels per day. Production in the automotive and construction industries in Iran has also reduced. In 2014, GDP per capita fell by 17% from \$ 6,376 to \$ 5,293 (Word Bank, 2015).

Thus, the effect of sanctions on energy, banking, and financial activities emerged over the years. Financial sanctions targeted oil exports, the main source of funding for the state budget. As a result, especially since 2012, Iran's oil revenues have fallen sharply. At the same time, inflation in Iran in 2013 increased to 39 percent and more people were trapped in poverty.

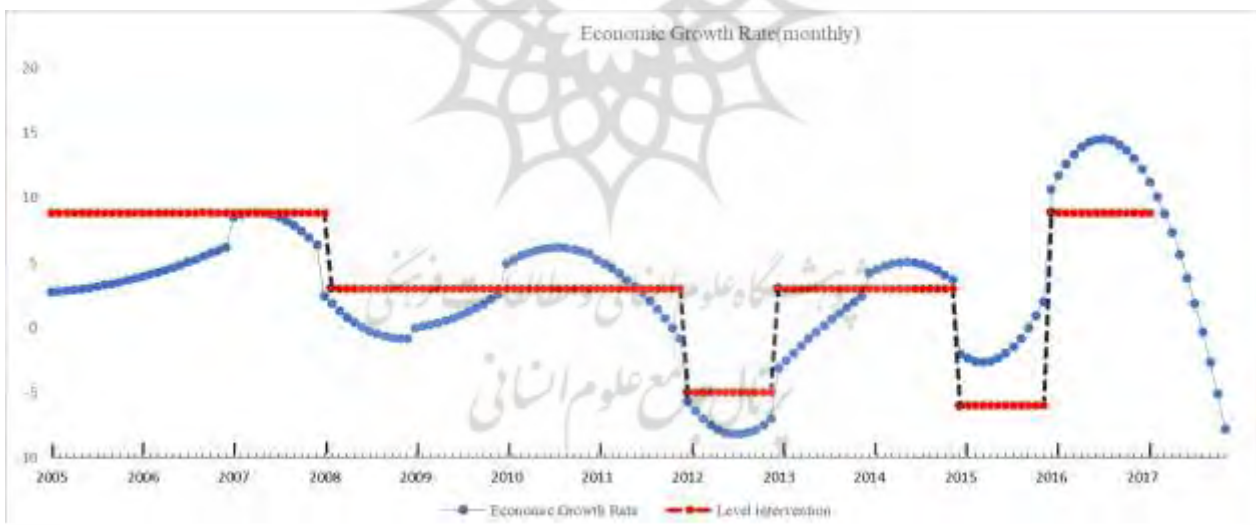
High inflation has fallen somewhat due to a significant increase in imports. Unemployment of young men in 2013 was equal to 26.4 percent, while unemployment of young women in 2013 was equal to 41.7 percent. Thus, sanctions adversely affected economic

growth in Iran and led to high unemployment, high inflation, and a decline in GDP (Farzanegan, 2013).

In the fourth period, 2015-2017, by the implementation of JCPOA, the coefficient of financial sanctions is 0.89. It has a negative and significant effect (at the level of 5%) on the economic growth.

The growth rate increased mostly due to the improvement in oil export. Despite the challenges, oil production and exports improved, reaching pre-sanctions level and boosting overall growth. Oil production then increased to about 4 million barrels per day. The lifting of sanctions attracted foreign investors' attention to the industrial sector (World Bank, 2017).

Figure 1 shows the monthly economic growth rate of Iran. For non-intervention months, it takes zero, and for intervention months, it takes one.



**Figure 1. Intervention and Economic Growth Rate in Iran (2005-2017)**

Source: Authors

As can be seen from Figure 1, the growth rate in Iran's economy during 2009-2015 has experienced ups and downs that could be a consequence of tough financial sanctions imposed on Iran during 2006-2011.

The ban has become more widespread subsequently and included any transaction

through the US banking system that directly or indirectly benefited Iran (financial institutions or people). As shown in Figure 1, in the last month of 2007, the sanction (intervention) caused a break in the trend. This intervention has led to a change in the level that has occurred due to financial sanctions. Also in



2008, in order to further ban Iran from accessing the US financial system, the US banned financial transactions that need U-turn. This led to the prohibition of transactions that directly or indirectly benefited the Iranian government, financial institutions, or the Iranian people. Since 2010, the number of sanctioned banks in Iran has increased, and since the 11<sup>th</sup> of 2011, the intensity of sanctions on the Central Bank and the cessation of Swift services took place. In a 2011 letter to Congress, the US president boycotted Iran's oil revenues and financial transactions related to Iran's oil with the central bank and the payment of countries for Iran's oil exports. The escalation of US and EU sanctions against Iran since late 2011 led to a drop in oil revenues and, consequently, a sudden devaluation of the exchange rate, which led to an increase in the cost of international trade and investment risk in Iran (Kimasi, et al., 2016). These events can be seen in Figure 1. The effect of the intervention has led to a level change.

Also, during 2010-2014, multilateral sanctions and the most severe financial sanctions were imposed (Alavi et al., 2016; Mottaghi, 2018; Kazeroni et al., 2016; Dizaji et al., 2018). In 2012, the US Congress intensified financial sanctions on Iran. In 2011 and 2012, banking sanctions became tough in nature so that new sanctions were imposed on the central bank, and with the cessation of Swift services, Iran's international banking operations were adversely affected. Therefore, in order to reduce the effects of financial sanctions and meet the need for international transfers, the old method of money transfer was replaced (Kimasi et al., 2016). In 2012, the national currency depreciated sharply, and this led to a weakening of the country's currency resources (Nephew, 2017). Therefore, the Iranian economy faced a decrease in the GDP growth from 3.6 percent to negative 7.71 percent in 2011 and 2012, respectively.

Following the US financial sanctions

against Iran, the devaluation of Rial was targeted in the US regulation bylaw in July 2013. To this end, based on the US Congress approval, foreign banks that transact or deposit in Rial received an imposed penalty (Fadaei & Derakhshan, 2015).

From 2015 to 2017, along with the imposition of financial sanctions, the Joint Comprehensive Plan of Action (JCPOA) was also held on July 14, 2015, and implemented in January 2016. Therefore, all sanctions related to the nuclear program were lifted. With the implementation of JCPOA in the last months of 2015, its effects on the economic performance of the year were limited.

Increasing the scope of these sanctions to banking correspondence has led to the limited access of the central bank to international financial relations. The imposed restrictions on financing projects, as well as selling oil, left direct and indirect effects on macro-economy as well as banking activities. The exacerbation of financial sanctions also had direct and indirect costs for banking activity and especially the central bank's treasury department, including currency deposits, currency conversions, securities, gold, and banknotes transactions.

In 2015, following the country's political developments and the implementation of JCPOA, positive expectations in the foreign exchange market were formed due to the lifting of banking sanctions and the reduction in transaction costs. However, the economic growth in 2015 decreased again to -1.59 percent and marked the third recession from 2006 to 2015. This significant decrease seems to be due to the imposition of financial sanctions and their intensification afterward (Garshasbi, 2016).

As can be seen in Figure 1, in 2016, a change in the level occurred, and in line with favorable expectations due to lifting nuclear sanctions, Iran's economy improved significantly. The lifting of sanctions attracted investors' attention to oil and gas, automotive, and telecommunications sub-sectors (World

Bank, 2017). But the renewed financial constraints by the US led to decreasing the economic growth in the following years.

Table 2 shows the results of two-stage least squares (2SLS) and indicate other vector variables in the long run.

**Table 2. Intervention Model for the Economic Growth: 2SLS Estimation Method (2005-2017)**

	Economic growth (2005-2017)
estimation method	LS
Model parameter	(1.1)
C	0.2184 (0.0002)**
Sanction	-0.1977 (0.0797)*
Growth <sub>t-1</sub>	1.4045 (0.0000)**
Growth <sub>t-2</sub>	0.4357 (0.0008)**
Adj R <sup>2</sup>	0.9575
AIC	0.0459
SC	3.1647

Note: \* The results are significant in P-value <0.10.

\*\*Results in P <0.05 are significant. AIC: denotes for Akaike information criterion and SC: denotes for Schwarz Bayesian criterion. In the following equation,

$$Y_t = \alpha_0 + A(L)Y_{t-1} + c_0 Z_t + d_1 I_t + B(L)\varepsilon_t$$

I: denotes an instrumental variable including REACTION and TARGET.

Source: Authors

REACTION and TARGET instrumental variables indicate that the government took control of the reaction after the imposition of international sanctions. The results indicated that financial sanction in the long-run has a coefficient of 0.19. It has a negative and significant effect (at 10% level) on the economic growth. Its effect increased comparing to the short-run. This shows that even with the control of other variables such as TARGET and REACTION, the effect of financial sanctions on economic growth is negative in the long-run, and with the comprehensive international sanctions, the negative effect increased comparing to the short-run. It should be noted that with the withdrawal of the United States from JCPOA, the adverse effect of financial sanctions on the

economic growth has worsened so that the growth rate has reached -4.7 % (World Bank, 2020).

## 5- Conclusion

Intervention Analysis evaluates the impact of a special event on any time-series. An examination of the impact of financial sanctions on Iran's economic growth using an intervention approach indicated that despite the change in the severity of these sanctions in different periods during 2005-2017, the overall effect of sanctions has been negative. The impact of financial sanctions in the short run especially in the third period, 2010-2014, is 0.54 which is more than the previous periods. Thus, the severity of sanctions operates not only as a political but also as an economic signal. In other words, with the increase in the intensity of financial sanctions, the economic growth has decreased. However, in the long run, it has not a significant impact on the economic growth. In fact, with a coefficient of -0.19, sanctions had a negative impact on the economic growth. Therefore, the policy recommendation is the convergence and collaboration of sanctioned countries in order to take legal, political, and economic measures to combat the imposed sanctions and manage conditions by regional cooperation especially trade agreements. Providing new financial routes could be a way out of the imposed financial sanctions.

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