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Original Research Article

The Impact of Financial Sanctions on Capital Inflow and Outflow (case of Iran)

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The paper aims to examine the impact of financial sanctions on capital inflow and outflow in Iran. The research question is about examining the effect of financial sanctions on FDI inflow and capital outflow in Iran. We used the intervention model as an econometric method to estimate the impact during 2005-2019. The paper discussed three periods. From 2005 to 2010, severe financial sanctions negatively affected FDI, and capital outflow was positive. From 2011 to 2015, severe and multilateral financial sanctions were implemented, adversely affecting FDI. There is a positive relationship between financial sanctions and capital outflow. In the third period, i.e., 2016-2019, when financial sanctions and implementation of JCPOA and the withdrawal of the United States happened, the overall effect on FDI inflow is negative. Although Iran absorbed about $2 billion of FDI, with the withdrawal of the United States from JCPOA and the return of secondary U.S. sanctions, the reduction of FDI happened again. On capital outflow, the sanction has a positive effect on capital outflow. Altogether, during 2005-2019, financial sanctions adversely affected FDI inflow and increased capital outflow in Iran.

Keywords: Financial sanction, Capital inflow, Capital outflow, Unilateral and multilateral sanction, Intervention model
JEL Classification*:* D24, F3, F51

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1 Introduction

Foreign direct investment (FDI) is an important source of financing investment projects for developing countries, which complements domestic sources of capital. FDI has a provocative role in creating jobs and disseminating production technology (UNCTAD, 2015).

Given the capital shortage, countries in the international arena are trying to transfer more foreign capital to their countries, and in the meantime, there are successful countries that can provide the ground for successful capital inflow. Among these, one of the most important sources of capital is FDI which due to its contribution to economic growth and development, there has been tough competition among countries to attract it. Because achieving long-term and sustainable growth requires mobilizing capital in which FDI is an important one.

Iran's economy faced financial sanctions in recent years. Various types of sanctions are targeted to restrict the flow of capital to the most sensitive sectors, impose travel bans on government officials, or restrict local banks' access to the global financial market. However, in many cases, FDI can replace imports and financing (Lektzian & Biglaiser, 2013; Earley, 2009; Peksen & Peterson, 2016; Hatipoglu & Peksen, 2018).

Iran's economy faced comprehensive financial sanctions and an oil embargo. The implementation of financial sanctions against Iran and its simultaneity with energy sanctions put additional pressure on its economy. The performance and effectiveness of financial sanctions can be examined through two channels.

First, financial sanctions disrupt financial and credit relations with the external economy and affect variables such as production, imports, investment, and consumption. In particular, with financial sanctions, especially the central bank, the country's access to oil revenues and the international financial system is limited. In such a case, production and investment projects are restrained.

Second, financial sanctions make the transfer of resources (if possible) more expensive, as well as the outflow of capital. In this circumstance, the transfer of capital requires more transaction costs for the enterprises. Also, due to the outflow of capital, the foreign exchange reserves of the country decrease.

A look at the sanction's laws imposed on Iran for investment in the oil and gas industry, and the difference between the implementation of the sanction's

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laws for Iran and Libya (ILSA) and (SISADA), show the impediments of these sanctions for investment in Iran.

The ILSA Act, also known as Damato Act, prohibits any extraterritorial investment or combination of investments in Iran's oil and gas industry in excess of $ 40 million over a year. In addition, the U.S. president implemented at least two sanctions in a list of six sanctions imposed on foreign companies violating the law.

The signing of the law by the U.S. president led to strong protests by European governments against the extraterritorial application of U.S. government laws. Finally, by filing a lawsuit against the U.S. by the European countries in the W.T.O. Dispute Settlement Body, the U.S. administration agreed to exempt European companies (Razavi & Zeynodini, 2018).

The importance of the issue is that capital is an input for production and economic growth. Thus it is expected that financial sanctions adversely affect on capital inflow and production. Moreover, the development of ~~a~~ risky environment, encourages capital outflow. The necessity of this research is that Iran witnessed the decline of capital inflow and the increase of capital outflow after the imposition of financial sanctions.

In the previous studies, they investigated the effect of "sanction" on FDI, but in this study, in the first place, we examined the impact of "financial sanction." Second~~ly~~, we separated capital inflows from capital outflows and discussed both. Third~~ly~~, we explored the effects of unilateral and multilateral sanctions. Fourth~~ly~~, the severity of sanctions and sanction periods are investigated including the period of implementing JCPOA and the U.S. withdrawal.

Therefore, the research question is the impact of financial sanctions on FDI and capital outflow in Iran.

1.1 Capital inflow and outflow

According to UNCTAD, in 2010, Iran ranked sixth in FDI, and based on the UNCTAD Vision 2025 program, Iran needs $ 3.7 trillion in investment, including $ 1.3 trillion foreign investment (Rasouli Ghahroudi & Chong, 2020).

Table (1) shows Iran's FDI inflows and capital outflows over the past 10 years. As it was indicated during 2013 and 2014, FDI inflow was diminishing as a consequence of financial sanctions.

FDI data released by UNCTAD show that in 2014, Iran could only attract $2 billion and 105 million in FDI. Iran's share of total world foreign investment was only 17%, which is insignificant due to the high capacity of

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Iran's economy and Iran's ranking among the world's largest economies (Rasouli Ghahroudi, 2015).

In 2013, Iran attracted 3 billion and 50 million dollars of foreign investment. In 2013, foreign investment in Iran decreased comparing to the previous year. While from 2010 to 2012, the amount of foreign investment was increasing in Iran. It was $2.983 billion foreign investment in 2009 and then increased from $ 3.649 billion in 2010, $ 4.277 billion in 2011, and about $ 4 billion in 2012.

The decline in Iran's foreign capital inflows in 2014 coupled with the outflow of capital from Iran which quadrupled in the same year compared to the previous year (UNCTAD, 2015). In 2012, by the intensification of sanctions, Iran lost billions of dollars of investment in that sector, as international companies withdrew from some of Iran's projects and refused to invest more or sold it to other companies. Therefore, Iran relied on local and Asian companies to develop its oil fields (UNCTAD, 2015).

In this regard, the JCPOA and the lifting of a significant part of the sanctions imposed on Iran led to a gradual improvement in the economic environment, such as reducing economic risk, improving oil exports, reducing fluctuations in the foreign exchange market, and facilitation of money transfers. In addition, increased economic security and the confidence of domestic and foreign investors with reducing investment risk increased the desire to invest in Iran.

According to UNCTAD (2015), Iran attracted about $2 billion and 50 million of foreign direct investment in 2015, which means the capital inflow decreased compared to the previous year.

In 2018, with the withdrawal of the United States from the JCPOA and the return of U.S. secondary sanctions, a new situation emerged mainly in the two areas of the oil and gas industry, namely the field of crude oil, petroleum products, and petrochemicals and also for investment in the oil and gas industry. According to SISADA law, the authorized investment ceiling for Iran's oil and gas industry was 20 million U.S. dollars per year, and if a non-US company invests in Iran's oil and gas industry more than this ceiling, it will be subject to sanctions by the U.S. government. That was another reason for reducing Iran's capital inflows.

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Table 1
Iran's FDI inflow and capital outflow during 2009-2018 (million-dollars)

Year	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
FDI Inflow	2983	3649	4277	4662	3050	2105	2050	3372	5019	3480
Capital Outflow	90	174	227	1441	146	605	120	104	76	75

Source: UNCTAD 2019

1.2 Theoretical Background

Sanctions are rapidly becoming a foreign policy tool and an alternative to military power. In recent years, the United States imposed financial sanctions on corporates and individuals in Russia, Myanmar, Nicaragua, Venezuela, and Iran. One of the effects of sanctions can be the lack of access to foreign capital (Glini and Emsia, 2014).

Kaempfer & Lowenberg (2007) show that short-term and long-term effects of sanctions on foreign investment are different. Sanctions by reducing the capital available in the long run lead to higher production costs and lower profits.

Therefore, an increasing number of developing countries try to attract FDI for implementing their development plans. Iran is among the countries looking for foreign investment to implement its development projects, but the financial sanctions had adverse consequences for absorbing foreign investment. Indeed, sanctions created uncertainty and made domestic and foreign investors wait and see the situation (Mohabati, 2018).

In a financial sanction, the sender country refrains from conducting financial transactions, money transfers, or investments to receiving country; the sender country also uses its influence in the international financial institutions to disrupt any financial relationship or technical assistance to the country under sanction or even freezes the country's assets. By imposing sanctions, the risk of trade and investment increases, and financing costs also increase relative to the global and regional average. It takes time to redirect trade and financial relationships, which is costly too. In addition, increasing smuggling and reducing the quality of imported goods are among other adverse effects of financial sanctions.

Financial sanctions may target the financial assets of receiving country. Various government agencies have accounts in foreign banks to deposit their assets. By freezing their accounts, a significant amount of the asset of the sanctioned country is taken out of transactions and remains unused. Sender

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countries try to persuade international investors in the financial markets not to invest in the target country (Lektzian & Biglaiser, 2013: p. 91).

Finally, financial sanctions are expected to affect the country's economic growth because the sanction adversely affects the investment. The reduction in investment, both domestic and foreign, reduces economic growth, affecting economic development. In general, sanction reduces the willingness to invest in the economy by creating a high-risk environment.

The paper is organized as follows: After the introduction, the second section presents the trend of FDI in Iran. The third section deals with the theoretical background, and in the fourth section, the literature review is presented—the fifth section is devoted to model specification and provides estimation results. The final section is conclusions.

2 Literature Review

On the impact of economic sanctions on FDI, we can mention the following studies.

Nakhli et al. (2021) explored the impacts of the oil embargo and its transmission channels in the Iranian economy using a DSGE model. The results indicated that oil sanctions adversely affected its export, extraction, and external financing and significantly negatively affected the macroeconomic variables. The sanctions reduced central bank foreign exchange reserves, which depreciated the nominal exchange rate. It also reduced government oil revenues and made budget deficit. It also led to the reduction of capital expenditures.

Rasouli Ghahroudi and Chong(2020) examined the effect of macro determinants including sanctions on FDI inflows in Iran. The empirical results revealed that infrastructure, exchange rate, inflation rate, investment return, and governance have a long-run impact on FDI inflows in Iran. Sanction also has a positive impact the inflation rate and exchange rate in Iran.

The distinctions between Rasouli Ghahroudi and Chong (2020) and our study is that we examined the impact of “financial” sanction and seperated capital “inflow” from its “outflow” and “unilateral” from “multilateral” sanctions as well. The “severity of sanction” and the implementing of JCPOA and the U.S. withdrawal were also discussed. Another distinction is the intervention model that we employed instead of OLS method that they used.

Barseghyan (2019) investigated the effects of sanctions on ~~the~~ Russian economy using panel data for the S.C.M. method over 2000-2017. After imposing the sanctions, the results show that real per capita GDP and net FDI inflow decreased in Russia. However, the ban on the imports of agricultural

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and food products promoted Russia's agricultural sector and led to higher productivity of agriculture and agriculture workers' income.

Mirkina (2018) investigated the short and long-term effects of sanctions on foreign direct investment using data for 184 countries over the period 1970-2010. The results indicated that the effect of sanctions on foreign direct investment varies depending on the cost of sanctions, the initial sanctions, and its loss during a decade. Sanctions led to a significant reduction in FDI. However, during most sanctions periods, FDI was adversely affected in the short term, but was somewhat decreased in the long term.

Biglaiser and Lektzian (2011) examined the impact of sanctions on U.S. foreign direct investment inflows using panel data and Computable General Equilibrium Model (C.G.E.) for 171 countries over 1965-2000. Data include GDP, foreign direct investment, trade openness, political factors, and capital control. The results show that the U.S. investors pulled out of countries targeted for U.S. sanctions prior to their imposition. This disinvestment is not permanent, and investment tends to return after the sanctions are lifted.

Jarjarzadeh and Barzkar (2019) explored the effect of economic sanctions on FDI in the Organization of the Petroleum Exporting Countries (OPEC) using Generalized Least Squares (GLS) method and panel data from 2004-2013. The results indicated that market size, degree of openness, public health, oil reserves, and the rule of law positively and significantly affect FDI inflow, but sanctions reduced foreign investment.

Saadat Mehr (2017) investigated the determinants of foreign direct investment in Iran, including economic sanctions using the ARDL method over the period 2007-2014. The results indicated that sanctions had a negative and significant effect on reducing FDI inflow in Iran. Severe sanctions that the United States, the European Union, and the United Nations imposed on Iran reduced Iran's foreign investment by $ 716 million annually. Also, severe sanctions, which include intensified U.S. sanctions and moderate E.U. and weak U.N. sanctions, reduced $ 116 million FDI in Iran annually. In addition, medium-sized U.S. sanctions without E.U. and U.N. sanctions also reduced $ 5.2 million in foreign investment in Iran annually.

Yalfani et al. (2015) examined the effect of sanctions on foreign investment in Iran. The results show that sanctions reduced foreign investment and contributed to the recession rather, the policies of resistant economies can mitigate the adverse effect of sanctions.

Gurvich and Prilepsky (2015) explored the sanctions on the economy of Russia. The results show that sanctions adversely affected the performance of

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state-owned banks, oil, gas, and arms companies. They also find that the imposition of financial sanctions reduced FDI inflow into Russia significantly.

Glini and Emsia (2014) explored the effects of sanctions on FDI in Iran using descriptive and analytical methods. The results indicated that foreign investment adversely affected the financing and implementing development projects.

Sabzehparvar et al. (2013) explored the effect of economic sanctions of FDI on Iran's economy using the O.L.S. method from 1978-2009. The results indicated a negative and significant impact of sanctions on FDI, while GDP and exchange rates positively affect foreign direct investment. Dummy variable utilized as a proxy for the embargo years. Severe sanctions, with high international restrictions, increased the transaction costs for the investors and reduced their profitability. It also increased investment risk and reduced FDI inflow.

Mohamed and Finnoff (2005) capital flight from South Africa from 1980 to 2000 and estimated its volume from South Africa during the sanction period. They find that in 1980-2000, the increase in capital flight may reflect the discomfort of those involved in capital outflow in the post-apartheid democratic process. They also considered how international capital flows and structural weaknesses in the economy influenced capital flight.

Almansour (2005) investigated capital flight in the Middle East and North Africa during 1970-2002. He used the residual approach to estimate capital flight and empirically examined its determinants from the Middle East and North Africa region (MENA) within a comparative development framework. The results indicated that resource-based economies of the region registered the largest volume of capital flight.

Fardoust (2020) investigated the macroeconomic impacts of U.S. sanctions (2017-2019) on Iran. The results indicated that during 2018 and 2019, Iran's per capita real income fell by about 14 percent (6.8 percent a year)- more than twice the pace of decline during pre JCPOA sanction episode (2012–2015) and higher than the average drop of 3 to 4 percent a year in GDP per capita growth in countries under trade sanctions. Moreover, during 2018-2019 (and continuing in 2020), Iran's inflation rate nearly quadrupled from 9.6 percent to more than 40 percent a year, oil exports fell (cumulatively) by $80 billion, capital outflows continued, and the IRR (Iranian Rial) lost nearly 80 percent of its value against the U.S. dollar.

Heydarian et al. (2021) investigated the impact of financial sanctions on economic growth using Iran's data and intervention time series analysis over the period 2005-2017. The results indicated the effectiveness of financial

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sanctions on economic growth in the short-run. Over the period (2010-2014) when severe and multilateral financial sanctions were imposed, negative coefficient of economic growth was 0.54, which is higher than other periods (2005-2017, 2006-2011 and 2015-2017). Therefore, by intensification of financial sanctions, economic growth has decreased and investment, which is one of the most important components explaining growth, has also slowed down the economic growth. In the long run, financial sanctions have a weaker negative impact by coefficient of 0.19 on economic growth.

As it is obvious from the literature reviewed, the effect of economic sanctions on FDI and capital outflow has been studied. The novelty of our paper is in the separation of periods that unilateral and multilateral effects are implemented, the severity of sanctions, and the effect of JCPOA. Capital outflows are also included. We also employed an intervention approach to examine the impact of sanctions on capital flows.

3 Methodology

The analysis is based on modeling an Auto regressive moving average vector (ARMA) and as an ARCH process (Enders, 1995: 266).

This paper examined the dynamics of financial sanctions on capital flows in Iran using Enders, Sandler, and Cauly's intervention model (1990). The general model used in this paper is presented in Equation (1).

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

Zt denotes intervention variable. It takes zero before financial sanctions and one after imposing the sanction. a_0 denotes intercept, and L denotes a lagged operator, A (L) and B (L) are polynomials that include lags (such as Lyt = yt-1)

Furthermore,

A (L) [1 + a_1 L + a_2 L_2 +… + ap Lp] and B (L) [1 + b_1 L + b_2 L_2 +. + Bq Lq] are lagged operators.

The effect of intervention changes if Yt has a unit root. It takes time for zt to affect which is displayed presented in Equation (2).

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

The experience mostly determines the form of intervention function and delay factor. We estimated models and then used Akaike and Schwarz-Bayesian criteria to choose the model.

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4 Model Specification and Data

Foreign direct investment data extracted from W.D.I. site over the period 2005-2019.

Data for economic sanctions considered since 2007 because, from this year onwards, the so-called sanctions have become smarter and have targeted the monetary and banking sector. Also, with the enactment of U.N. resolutions and the subsequent imposition of severe sanctions against companies and banks associated with Iran, it has actually impacted FDI inflow into Iran and capital outflow from Iran.

The variables in question are the inflow of FDI (BoP current U.S. $) capital outflow (BoP current U.S. $).

We used the intervention model of Ander, Sandler, and Cowley (1990) to examine the impact of financial sanctions on the trend of FDI in Iran. The model is depicted by equation (3):

$$FDI_t = \alpha_0 + A(L)FDI_{t-1} + c_0 Z_t + B(L)\varepsilon_t \quad (3)$$

Zt denotes the intervention variable. a_0 denotes intercept, and L denotes a lagged operator.

Furthermore,

$$A(L)\,[1 + a_1 L + a_2 L^2 + \ldots + ap\, L^p] \text{ and } B(L)\,[1 + b_1 L + b_2 L^2 + . + Bq\, L^q]$$

The empirical analysis comprises three periods:

The first period is, i.e., 2005-2010, in the second period, i.e., 2011-2015, multilateral and the most severe financial sanctions were imposed (Alavi, S., & Amiri, d. (2016); Mottaghi (2018)).

In the third period, i.e., 2016 to 2019, in which (JCPOA) was signed.

For each period, we used ARMA model for estimation. In each period, the stationary of the time series and variance heteroscedasticity were examined using ARMA model for estimation.

Here, capital inflows and outflows in Iran are separated to make the effect of financial sanctions on capital inflow and outflow more tangible.

In Equation (1), the effect of the capital inflow variable, FDI inflow, is included in the model to examine the effect of financial sanctions on each variable. Model specification is presented in Equation (4).

$$FDIIN_t = \alpha_0 + A(L)FDIIN_{t-1} + c_0\, \text{Sanction}\, F_t + \varepsilon_t \quad (4)$$

$FDIIN_t$: inflow of FDI

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Sanction Ft is an intervening variable t for the first period (2005-2010), second period (2011-2015), and the third period (2016-2019).

$FDIIN_{t-1}$: FDI inflow is the previous period.

The next equation is the equation for outflow of capital, which is presented in Equation (5):

$$FDIout_t = \alpha_0 + A(L)FDIout_{t-1} + c_0 Z_t + \varepsilon_t \quad (5)$$

$FDIout_t$: outflow of capital

SanctionFt is an intervening variable that includes financial sanctions of the first period (2005-2010), the second period (2011-2015), and the third period (2016-2019).

$FDIout_{t-1}$: Outflow of capital in the previous period

The following criteria were used to identify the appropriate model:

First, ~~the~~ lowest A.I.C. and S.B.C. criteria (Lioyd, 1993).

Second, the highest R2 (Lioyd, 1993).

Third, it satisfies the following diagnostic study (Enders, 1995);

"All coefficients must be statistically significant, and Auto-regressive coefficients should be such that {y} be a sequence of co-integration.

Fourth, the estimation of residual value is white noise.

5 Results

A linear intervention model was employed to explore the effect of financial sanctions on the inflow and outflow of capital in Iran. The model is presented by Equation (6):

$$FDI_t = \alpha_0 + A(L)\,(FDI)_{t-1} + c_0 SanctionF_t + B(L)\varepsilon_t \quad (6)$$

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

In this Equation, Sanction F is an intervention variable that takes zero before imposing financial sanctions and takes one after the sanctions. Also, this intervening variable includes three periods of financial sanctions, and at each time, one period is considered. εt denotes white noise disturbance.

The delay operators are in the polynomial function L.

Equation (5) has the best results from fitting the intervention model with the lowest A.C. and S.B.C. All options of ARMA models were also considered.

Table (2) presents regression results of FDI inflows for three different periods of financial sanctions.

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Table 2
Results of intervention models for FDI inflows in three different periods

	First Period (2005-2010) Capital inflow	**Second Period** (2011-2015) Capital inflow	**Third period** (2016-2019) Capital inflow
Estimation method	LS	LS	LS
Model parameter	(1,1)	(1,1)	(1,1)
C	30.7614 (0.0114)**	27.9786 (0.0009)**	29.6351 **(0.0003)
$Sanction_t$	-0.0603 (0.0098)**	-0.0567 (0.0510)**	-0.1282 (0.0005)**
$FDIIN_{t-3}$	-	0.3481 (0.0162)**	0.3658 (0.0132)**
$FDIIN_{t-5}$	0.2857 (0.0024)**	-	-
$FDIIN_{t-8}$	-0.7000 (0.0105)**	-0.6333 (0.0186)**	-0.7241 (0.0083)**
Adj R^2	0.9617	0.9637	0.9655
AIC	-2.1573	-2.2135	-2.2626
SC	-1.9301	-1.9862	-2.0353

Note: *Results are significant in P <0.10. **Results in P <0.05 are significant.
AIC: Akaike Information Criterion
SC: Schwartz Bayesian Criterion
Source: Research Findings

In the first period, i.e., 2005-2010 (severe financial sanctions), sanctions hurt FDI inflow. The coefficient of financial sanctions is negative 0.06, which means that with the increase of one unit of financial sanctions in this period, the inflow of FDI decreases by 0.06.

In the second period of financial sanctions, i.e., 2011-2015, when severe and multilateral financial sanctions were implemented, the coefficient of financial sanctions has a negative effect of 0.05 on FDI inflow.

During 2013 and 2014, Iran's FDI inflow has been declining, which could be a consequence of economic sanctions in the field of finance and banking imposed by the United Nations and the United States. The escalation of international sanctions imposed on Iran hurt FDI, especially in the oil industry, as sanctions prevented Iran from gaining access to foreign capital. Therefore, the production capacity of oil and gas fields decreased.

In the third period, i.e., 2016-2019, when severe and multilateral financial sanctions were imposed, as well as the JCPOA period and then U.S. withdrawal from JCPOA. The effect of the coefficient of these sanctions is negative 0.12. In 2015, by signing the agreement of JCPOA and lifting Iran's

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sanctions, Iran absorbed about 2 billion and 50 million dollars of FDI, but in 2018, with the U.S. withdrawal from JCPOA and the return of secondary U.S. sanctions, the inflow of capital to Iran reduced.

During this period, the primary effect of U.S. financial sanctions was to restrict the investment of international companies in Iran's oil industry. The United States has sought to suspend granting loans of private banks as well as government credit to the Iranian government and companies. Therefore, after intensifying sanctions, foreign investment in Iran has been limited. Thus, financial sanctions have delayed and reduced the absorption of foreign capital. Therefore, reducing the inflow of foreign capital could be an important effect of sanctions in this period.

Figure (1) illustrates the monthly inflow of foreign capital to Iran. For the months when there is no intervention, the value is zero, and for the months when there is intervention, the value is one.

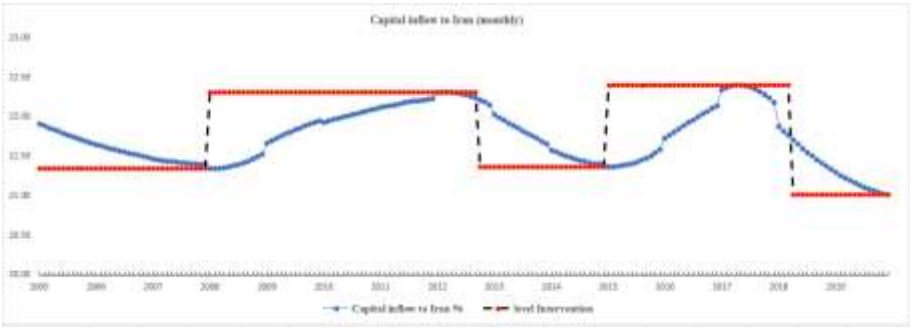

Figure 1. Intervention and monthly capital inflow to Iran (2005-2019)
Source: Research Findings

Before 2011, an average of $4 billion FDI was absorbed into Iran's economy annually as a greenfield investment, of which oil and gas extraction and industrial production were the main industries (Taherpour and Amiri (2016)).

Despite the sharp decline in FDI after the global financial crisis (2007-2009), Iran absorbed about $4 billion of foreign investment in 2010; However, with the escalation of economic sanctions, the absorption of foreign investment decreased sharply, so that we have witnessed a growth of -34.6 percent for 2013 and -31percent for 2014 (Taherpour and Amiri (2016)).

As illustrated in Figure (1), in December 2007, the sanction intervention resulted in a break in the graph, and a change in the slope for capital inflow.

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The volume of capital inflow over the period 2005-2010 is the lowest in the breakpoint. To understand Figure (1) consider equation (7).

$$FDIIN_t = \alpha_0 + A(L)FDIIN_{t-1} + c_0 \text{ Sanction } F_t + \varepsilon_t \quad (7)$$

In Equation (7) for the period 2005-2010, sanction is an intervention variable. It takes zero for the period 2005 and takes one for 2005 onward. In 2005 the intercept shifted to $c_0 + a_0$ in which the initial effect of sanction depends on the magnitude of c_0, and ~~the~~ statistical significance of c_0 could be tested by t statistic.

Also, during 2011-2015 in which multilateral sanctions implemented, the most severe financial sanctions were imposed. In February 2011, sanctions imposed on the Central Bank of Iran and Swift services were cut off. The intensification of U.S. and E.U. sanctions happened during this period.

This fluctuation is illustrated in Figure (1). The impact of the intervention in late 2012 resulted in a change in the slope of the graph for capital inflow. During 2016-2019, capital inflow is the lowest in the whole period of 2005-2019.

After tightening financial sanctions in 2012, international companies withdrew from Iranian projects and refused to invest more or sold their existing investments to other companies. Accordingly, Iranian authorities relied more on domestic companies and a limited number of Asian companies to develop the oil fields. Asian countries also reduced their investment due to the restrictions imposed on the transaction with Iran (Taherpour and Amiri (2016)).

In 2014, the volume of FDI in Iran compared to the previous year decreased by 31%. In 2013, Iran absorbed $3 billion and $50 million foreign investment. In 2013, foreign investment in Iran also decreased compared to 2012, while during 2010 to 2012, the volume of foreign capital absorption in Iran was increasing (Rasouli Ghahroudi, 2015).

Over the third period, along with the imposition of financial sanctions, the JCPOA agreed upon, and implemented in January 2015, but due to the implementation of the JCPOA in the last months of the year, according to the Iranian calendar, its effect was limited.

The extension of these sanctions to correspondent banks has restricted

access of the central bank of Iran to international financial institutions. Accordingly, it, directly and indirectly, affected the macroeconomy, banking operations, and the central bank. But in early 2015, by implementing JCPOA, sanctions were lifted, and Iran's economy faced an increase in capital inflows, which can be seen as an upward trend in Figure (1).

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However, with the withdrawal of the U.S.A. from JCPOA on May 7, 2018, FDI in Iran decreased by 30%, and sanctions resumed against Iran on a large scale. The value of FDI in the world in 2018 amounted to 1297 billion dollars, while the value of FDI in Iran was about $3.5 billion, which is about 0.27 percent in the world. Sanctions and the ranking of Iran in doing business (127th in the world) led to a decline in the inflow of foreign investment in Iran.

Figure (1) indicates the effect of the intervention as a change in the slope in early 2018, during which the US withdrew from JCPOA, and the least capital inflow happened.

According to UNCTAD (2019), the global flow of FDI in 2018 reached about $1.3 trillion. However, in 2018, the inflow of FDI in Iran amounted to $3.5 billion, which decreased by about 31 percent comparing to the 2017 FDI inflow. As illustrated in Figure (1), the intervention impact is depicted by a change in the slope, in early 2018 with the U.S.A. withdrawal from JCPOA.

Table (3) indicates the results of the regression of capital outflow for three different periods of financial sanctions.

Table 3

Results of intervention model for capital outflow in three periods

	First period	**Second period**	**Third period**
	(2005-2010) Capital outflow	)2011-2015(Capital outflow	)2016-2019(Capital outflow
Estimation method	LS	LS	LS
Model parameter	(1,1)	(1,3)	(1,1)
C	29.8419 (0.0000)**	10.6151 (0.0182)**	4.7786 (0.0018)**
$Sanction_t$	0.7032 (0.0003)*	0.5732 (0.0731)*	0.2227 (0.0003)*
FDI_{t-1}	-	-	1.1586 (0.0000)**
FDI_{t-3}	-	0.7410 (0.0000)**	-0.4109 (0.0004)**
FDI_{t-4}	-0.3890 (0.0000)**	-0.3536 (0.0221)**	-
FDI_{t-6}	-0.2118 (0.0750)*	-	-
Adj R^2	0.8841	0.8563	0.8841
AIC	1.4592	1.6289	1.4592
SC	1.6822	1.8479	1.6822

Note: * The results are significant in P-value <0.10. **Results in P <0.05 are significant.
AIC: denotes Akaike information criterion and
SC: denotes Schwartz Bayesian criterion

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Source: Research Findings

Model 1 is $Y, = a_t + A(L)Y_t + c0\ emb, + B(L)\ \varepsilon_t$
Model 2 is $Y, = a_t + A(L)Y_t + c0\ emb, + B(L)\ \varepsilon_t$
Model 3 is $Y, = a_t + A(L)Y_t + c0\ emb, + B(L)\ \varepsilon_t,$

In the first period, i.e., over the years 2005-2010 (severe financial sanctions), sanctions contributed to capital outflow. The coefficient is 0.70, which means that with the increase of one unit of financial sanctions in this period, the capital outflow increases by 0.7.

In the second period of financial sanctions, i.e., over the years 2011-2015, the coefficient of financial sanctions is 0.5. It means that there is a positive relationship between financial sanctions and capital outflow.

In the third period (2015-2019), which in addition to financial sanctions, also includes signing JCPOA and withdrawal of U.S.A., The coefficient of financial sanctions is positive, which implies that sanction has a positive effect of 0.2 on capital outflows.

In 2015, by signing the JCPOA and lifting sanctions, the number of projects and the volume of foreign investment increased. This trend continued in 2016 and reached its peak in 2017, but once again, in 2018, investment appeared a downward trend.

It is worth mentioning that the estimates of the outflow of capital from Iran in 2017 show more than $14 billion of capital account deficit and about $12 billion increase in foreign exchange debt for banks during nine months of 2017. Following the increase in capital outflow from Iran, over the period 2016 to 2017, Iran's international foreign exchange reserves decreased by 16.3 billion dollars. More importantly, this trend, which began in 2016 and intensified in 2017, continued in 2018 with the U.S. withdrawal from JCPOA, by resuming of sanctions and the escalation of economic hardship.

Indeed, foreign investment is a function of the country's risk index. With the deterioration of this index, the attraction of foreign investment decreased, and capital outflow happened. In 2005 the net capital account in Iran was negative $ 200 million, but the net capital account in 2010 was negative $ 25 billion. That means that the outflow of capital from Iran increased 125 times (Center for Economic Studies, 2015).

Figure (2) shows the outflow of capital during 2005-2019. For the months when there is no intervention, the value is zero, and when there is intervention, the value is one.

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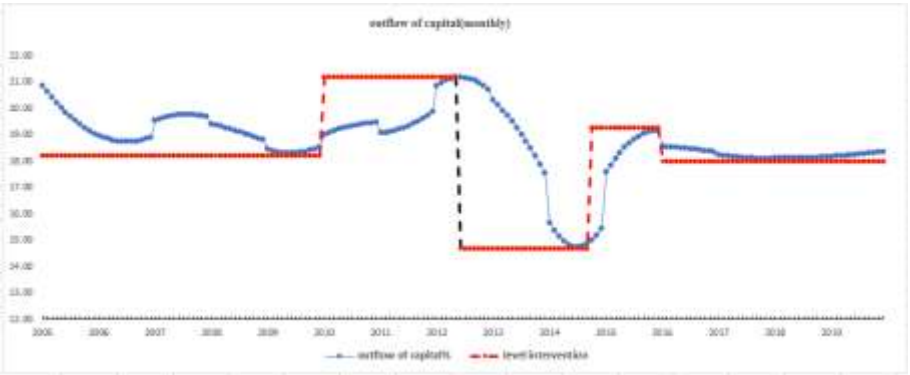

Figure 2. Intervention and outflow of capital from Iran (2005-2019; monthly)
Source: Research Findings

As aforementioned, over the period 2005-2010, severe financial sanctions were imposed on Iran. In 2007, the U.S. Treasury Department imposed extensive financial sanctions on Iran. Any financial transfers that directly or indirectly benefit Iran or Iranian individuals and financial institutions are prohibited for the U.S. banking system. Therefore, financial transfer problems led to the withdrawal of a number of foreign companies from upstream energy projects. The departure of most of these companies happened these years. In the wake of economic sanctions and especially outflow of capital in 2010 slowed the upstream development of oil and gas.

As can be seen from figure (2), in early 2010, the sanction's intervention caused a break in the graph for capital outflow. This was the result of a change in slope of the curve for capital outflow, during which a significant volume of capital flight happened.

As multilateral sanctions imposed on Iran over the period 2011-2015, were severe financial sanctions. Since 2010, the number of Iranian banks under sanction increased. In 2011, sanctions imposed on the Central Bank and Swift services were cut off. International financial sanctions imposed in 2011 and 2012 challenged the development of Iran's energy sector, especially investment in the oil and gas upstream projects. Also, the United States and the European Union enacted laws that intensified the restrictions on Iran's energy sector (Ebrahimi et al. (2013)).

It led to capital outflows in 2012. These fluctuations illustrated in figure (2). The intervention resulted in a change in the slope of the graph for capital outflow in which the significant level of capital outflow happened.

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By U.S. executive order in July 2013, the transfer of money for production and investment was hampered, and investment projects were restrained. It made money transfer more expensive (If possible) and also increased the outflow of capital. Despite the decrease of FDI inflow in Iran, the outflow of capital from Iran in 2014 quadrupled compared to the previous year (UNCTAD, 2015). As illustrated in Figure (2), at the end of 2014, an intervention effect occurred that resulted in a change in the slope of the curve.

As aforementioned, JCPOA agreed upon on July 14, 2015. In January, the plan was implemented, and all sanctions pertaining to the nuclear program were lifted. Due to the implementation of JCPOA in the winter of 2016, the reflection of its effects on the economic performance of the year was limited. In 2015, FDI and foreign portfolio investment were about $ 0.8 billion. After lifting sanctions, it was expected that foreign investment in Iran would increase (World Bank, 2017). During the same year, the outflow of capital from Iran decreased compared to the previous year. However, in 2016, the situation improved in terms of capital inflow and capital outflow mitigated. As can be seen in figure (2), in early 2016, an intervention occurred, ing in a shift in the slope of the graph for capital outflow.

In 2017, there was no significant change in the capital outflow, but in 2018, the U.S. withdrawal from JCPOA led not only to foreign capital outflow but also motivated domestic capital outflow from the Iranian economy.

Therefore, the results are relevant, because capital outflow by intensifying the financial sanctions during 2005-2019, capital inflow declined and capital outflow increased. The results indicated that over the period 2016-2019 by intensifying the sanctions, capital inflow decreased much less than two previous periods. Moreover, capital outflow increased over the period 2005-2010 more than two previous periods. These fluctuations in the trends of capital inflow and outflow illustrated in figure (1) and (2).

6 Conclusions

Despite the changing severity of financial sanctions in the three periods, financial sanctions adversely affected on Iran's capital inflow and outflow throughout the whole period. During the years 2015-2019, financial sanctions, especially after the US withdrew from JCPOA, capital inflow decreased by 12%, which is higher than the periods 2005-2010 and 2011-2015. Also, the outflow of capital in the period 2005-2010 is more than the next two periods, and at the same time with the imposition of financial sanctions in 2006, there was 70% increase in the outflow of capital. Therefore, by the intensification of financial sanctions against Iran, the inflow of capital into the country

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decreased significantly. Capital outflows also adversely affected by sanctions due to increased investment risk and financial transfer problems.

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