The effect of some macroeconomic variables on the performance indicators of companies listed on The Tehran Stock Exchange (selected industries) during sanction periods (before and after the JCPOA)

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Abstract

Purpose: This study is aimed at investigating the effect of some macroeconomic variables on the performance indicators of companies listed on The Tehran Stock Exchange (selected industries) during sanction periods (before and after the JCPOA).
Methodology: This research is an applied and correlated study using deductive-inductive reasoning. Collected data is analyzed (financial reports). Therefore, this study is an ex-post facto. The sample of this study is collected over an 11-year period spanning from 2010 to 2020, including 181 firms listed on The Tehran Stock Exchange. The multivariate linear regression is conducted to test the hypotheses.
Findings: The findings indicate that sanctions (both pre- and post-JCPOA) acted as moderators in the relationship between exchange rate fluctuations and firms' added-value. Except for the automotive industry, sanctions (pre- and post-JCPOA) moderated the relationship between foreign investment and corporate investment activities in all industries. Sanctions (pre- and post-JCPOA) moderated the relationship between the production price index and corporate profitability in all industries except the automotive industry. Sanctions (pre- and post-JCPOA) moderated the relationship between the import of raw materials for intermediate and capital goods and corporate operational activities.
Conclusion: America's withdrawal from Iran nuclear deal, JCPOA, in 2018 caused great damage to Iran's economy. These sanctions are expected to have a more destructive impact on business enterprises in the post-JCPOA era. Testing the hypotheses, the results show that sanctions (pre- and post-JCPOA) moderated the relationship between the exchange rate fluctuations and corporate performance indicators.

Innovation: This research provides valuable insight into the sanction conditions and companies' reactions to them. It not only leads companies towards self-sufficiency and cooperation with knowledge-based firms for development and growth, but also reduces dependence on foreign resources and goods.

Keywords: Exchange Rate Fluctuations, Foreign Investment, Sanctions, Corporate Performance Indicators

Introduction

Sanctions are tools used by countries to persuade a government to change their policy. Sanction imposers force the targeted government to react in their favor. Economic sanctions are the most practical international bans, limiting the government in its international trading relationships. The objective of the sanctioning country is to impose significant costs on the target country to coerce a change in policy or attain a specific action from the target government which results in causing harm to their resource allocation. Economic sanctions can vary from trade and trader barriers, limiting foreign investments, restrictions on financial transactions, stopping financial aids and avoiding technology updates.

Iran has always been targeted by America for sanctions, which greatly lowered Iran's economic ability. Imposed bans from 2012 to 2015, when Iran was under worldwide pressure, decreased oil exports enormously and prevented the government from repatriating approximately 120 billion dollars from foreign assets. According to the Joint Comprehensive Plan of Action (JCPOA), it was agreed to lift nuclear-related sanctions; however, primary US sanctions on Iran remained in place. These sanctions prohibit most commercial activities between the US and Iran. They ban Iran's advanced missile activities and Sepah Pasdaran as well. Iran's exports have increased by 7% from 2016 to 2017. However, on May 8th 2018 America withdrew from Iran's nuclear deal.

Sanctions were reinstated in November 2018 (a 90-day plan) and expanded (a 180-day plan). The US Department of Treasury admitted Iran's sanction to be one of the most restricted sanctions America has ever imposed on a country which leads in a significant effect on the energy, shipping and financial sectors.

Iran has always been targeted for sanctions, especially after the 1979 revolution. The first sanctions were imposed by the United States when Dr. Mosadegh was the prime minister. When Oil Nationalization was implemented by him, America and England, with the aim of controlling the plan, restricted Iran's only national income, which was exporting oil (Toghiani, 2014). Since the 1979 revolution, the United States has led international efforts to use sanctions to influence Iran's policy. Therefore, stronger economic sanctions were enforced by the United Nations Security Council in 2006 and the European Union in 2007.

However, America believed the imposed sanctions need to be toughened; therefore,

First, they prohibited European countries from dealing with Iran by suggesting that it would either be America or Iran they could have trading deals with.

Second, in 2002, attracting international and the United Nation's attention, they accused Iran of having a ballistic missile program (Nefu, 2018).

Since America, England, France and Germany tried to stop Iran's nuclear program, the Atomic Energy Agency asked The United Nations Security Council to demand Iran to suspend enrichment activities by issuing Resolution 1696, giving a 30-day deadline (Azari & et al., 2008). Iran continued its program regardless of the mentioned resolution, which forced even European countries, who believed in encouraging politics rather than harsh sanctions (Ghasemi, 2014), to extend sanctions against Iran following the US. They imposed more economic embargoes against Iran in 2010, issuing the Resolution 1929. And in 2012, they expanded the sanctions on the energy section and bank transactions.

Although Iran has always been boycotted after the 1979 revolution, it has never been under international pressure like it has been by the US and EU since 2010 (khalaatbari, 2018).

America used to impose embargoes on Iran on oil export, shipping lines, cargo, insurance and financial sections. However, having EU and the United Nations support, he prevented bans' circumvention by imposing even tougher sanctions on small and medium enterprises, which greatly affected Iran's economy (Khalaatbari, 2018).

The restrictive measures cause a decline in foreign exchange resources and a sharp increase in exchange rates, inflation and financial sanctions, which yield obvious results (Lopez,2015). It decelerates economic development and commercial and financial relations between the sanctioning country and the targeted government (Hufbauer et al., 2009). Considering the above, this paper aims to investigate the impacts of macroeconomic variables, i.e., real exchange rates (EXit), producer price index (PPIit), import of raw materials (IMit) and foreign direct investement (FDIit) on performance index, i.e., cash flow from operational activities (CFOit), cash flow from investment activities (CIFit), profitability (Iit)and firm added value (AVit) in listed companies on The The Tehran Stock Exchange in Pre- JCPOA (2010 to 2014), Joint Comprehensive Plan of Action- JCPOA (2015 to 2017) and Post-JCPOA (2018 to 2020) in selected industries (chemical, automobile manufacturing, pharmaceutical and steel). Taking four independent variables and hypotheses into account, four regression models are selected, tested and analyzed.

Literature

Many studies have examined the impact of macroeconomic variables on firm performance indexes. Notably, we distinguish each macroeconomic variable, its effects on firm performance and sanctions' impact on the relationship between macroeconomic variables and firm performance (Boyd et al., 2005; Ozmen et al., 2012; Bhattacharjee & Han, 2014, Barakat et al., 2016; Issah & Antwi, 2017; Doruk, 2023).

Oil is one of the most political commodities in Iran's economy due to its injection of revenue. Thus, it is used as a vulnerable lever to put pressure on the Iranian economy. Export sanctions, the Central Bank sanctions and currency fluctuations have profound effects on production (Nademi & Hasanvand, 2018). Sanctions on energy sources not only have severe consequences on exports, but they also affect petrochemical exports. Iran used to enjoy a strategic location, which resulted in outstanding development in petrochemical exports. However, imposed sanctions limited

petrochemical exports (Amini & Zare, 2017).). From 2012 to 2013, the restrictions on financial transactions led to a severe decline in the import of auto parts, approximately halved compared with previous years. The automobile industry's dependency on the import of auto parts shows its vulnerability to the sanctions. The banking system is also influenced by the sanctions, since international banks refuse to cooperate with Iranian banks. Unclear economic status puts firms at higher risks in terms of investment.

In this paper four dependent variables are considered; added-value, investment, profitability and operational activities.

Economic sanctions adversely affect society's welfare by reducing the added-value of beneficiaries (shareholders, clients, governments, lenders and other beneficiaries).

Sanctions have been used to advance a range of foreign policy goals. One of which is to isolate the target country from interacting internationally, mainly in three sections:

1- Technology
2- Trading
3- Banks and financial institutions

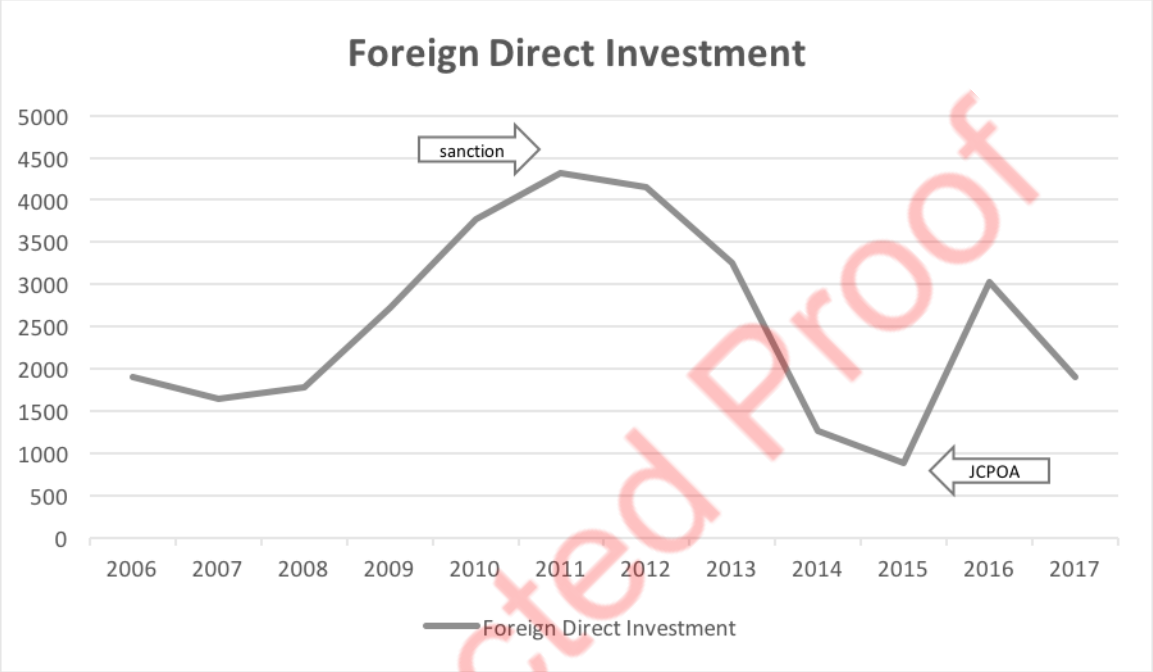
Therefore, sanctions disrupted transactions and reduced cash flows (Fakhari & et al. 2013).

The Central Bank of Iran (CBI) lost its control over exchange rate fluctuations, which enormously inflated the exchange rate. Sanctions postponed the cash flow from exporting oil from 1 month to 5 months in 2005; therefore, the CBI could not maintain the equilibrium of the market. Undeveloped countries are dependent on industrialized countries to import raw materials, technology and machinery. If exchange rates rise due to sanctions, reduction of exchange resources and economic changes, firms are forced to pay bigger amounts for sourcing their needs. Observing companies from 2014 to 2020 indicated that although it results in income enlargement, it increases the expenses accordingly, which ends in an excess of expenses over income and consequently, a decline in added-value. Therefore, the exchange rate is directly related to added value (Izadi & Izadi, 2008).

The average foreign direct investment (FDI) of Iran was 4 billion dollars in 2004, where more than 50% belonged to petroleum, to automobile manufacturing, pharmaceutical and steel sections.

Source: Central Bank of Iran

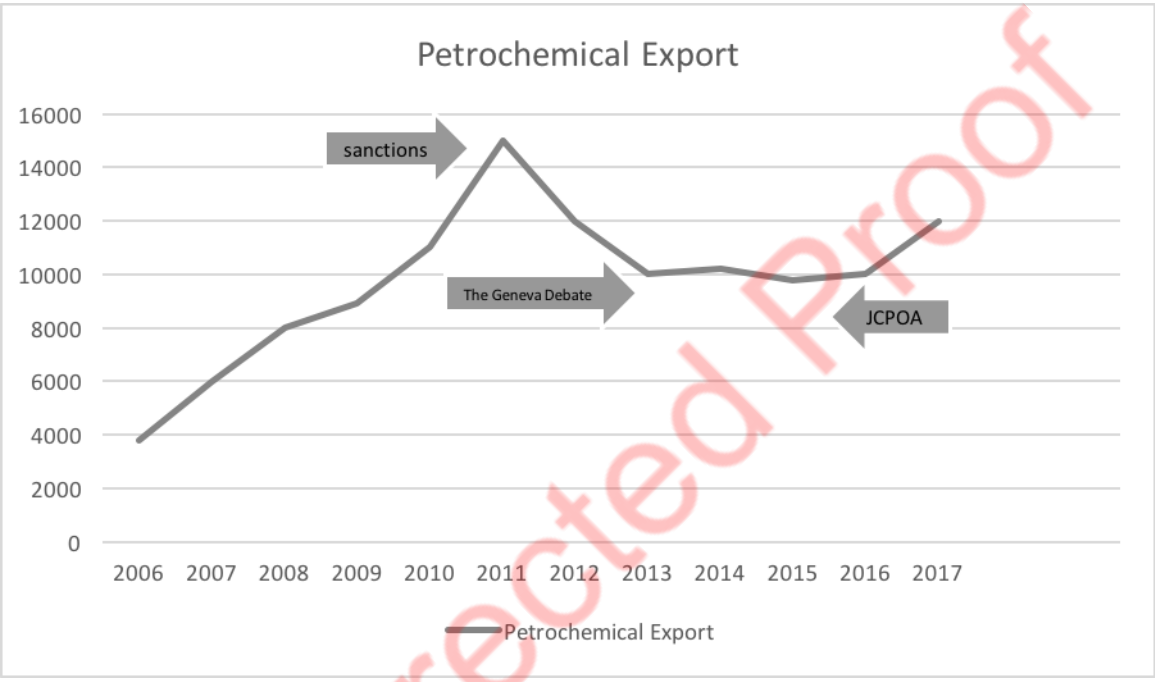
Figure 1- Foreign Direct Investment



Foreign investors are more focused on petroleum, automobile manufacturing, copper extraction, the food and pharmaceutical industries. Iran could attract 34.6 billion dollars in foreign direct investment from 1992 to 2009 doing over 485 projects.

Sanctions not only deduct the raw materials, intermediate goods and capital goods' imports, but also add import expenses and the cost of goods sold. The ascending trend of exchange rate directly modifies production expense and negatively relates with profitability. Consequently, their production capacity lowers and their competition in international markets is questioned. The petrochemical and automobile manufacturing industries, for instance, seriously suffered from sanctions. The production of petrochemical products is significantly inclined due to the ban of selling raw materials, the purchase of final product and updating

maintenance technology during 2006 to 2017 (the Parliament Research Center, 2017).



Source: Central Bank of Iran

Figure 2- Petrochemical Export during 2006 to 2017

Automobile spare part imports rose to 3.2 billion dollars in 2014, but sanctions played an important role in quality by importing from countries like China (Parliament Research Center, 2017).

The import of raw materials, intermediate goods and capital goods also decreased from 26.6% to 7.4% from 2012 to 2015.

Sanctions have obvious effects on the currency market, cause an obstacle in the access of the target country's financial sources, reduce international trading and direct investment, deduct export revenue and increase import volume. Obviously, limiting foreign

trading and industrial activities leads to unemployment. Forcedly, goods are bought at higher rates, thus inflation rises.

Arratibel et al. (2011) claimed that a decline in currency fluctuation results in economic development. Ozmen et al. (2012) believed that exchange rate negatively relates to firm performance. However, financial growth and gross domestic product have a direct impact on performance. Vatavu (2014) stated that the interaction of inflation and the crisis has a negative effect on company performance in the Romanian economy. Chikeziem & Ikenna (2016) believed that no significant relation is concluded between currency rates and economic development in Nigeria. Barguellil et al. (2018) claimed that currency fluctuations negatively affect economic growth. Persley & Boqiang (2018) stated that reduction in currency rate results in an increase in gross domestic product; however, a rise in currency rate has no significant effect on production. Korotin et al. (2018) imposed sanctions from 2014 to 2015 and Ruble rates are not related. Ahn & Ludema (2020) compared sanctioned and non-embargoed firms. Their results showed that sanctioned firms faced huge losses and reductions in asset values. Huynh et al. (2022) found that imposed sanctions have no impact on the energy section; however, it affects other sectors in Russia. He claimed that sanctions related negatively to capital costs and research and development, but they positively affect political risks. Azhdari et al. (2016) found that a 100% increase in currency rate rises 13% of the added value of the industry sector. Tehranchian et al. (2018) claimed that exchange rate fluctuations have positive and negative effects on production in lower than threshold areas and higher than threshold areas, respectively. Predicted and unforeseen impulses in currency rates are negatively correlated with production. In the service sectors, in lower than threshold areas, exchange rate fluctuations are negatively correlated with production, but, in higher than threshold areas, they are positively related. However, currency fluctuations have a neutral effect on production in the agriculture sector. It is recommended to the governments to make more transparent decisions due to the power of predicted impulses of the exchange rates. Considering the above, the following is the first hypothesis:

First Hypothesis:

Sanctions (pre- and post-JCPOA) play a moderator role in the relationship between exchange rate fluctuations and firm added-value.

Reduction in trading and foreign investment resulting from sanctions impose severe economic constraints and forces countries

to change their economic policies, which results in a fall in exchange rates. Moreover, lack of international trust in the target country's banking system causes a reduction in foreign investments.

Pekas (2015) found that foreign direct investment and economic growth are positively related in countries using Euro.

Fadhil & Almasafir (2015) believed that foreign direct investment and human resources greatly help economic growth. However, technology obtained from foreign direct investment is not sufficiently combined with human resources to lead to economic growth.

Mirkina (2018) expressed that the impact of sanctions on foreign investments varies over time depending on the cost of sanctions, the initial imposed sanctions and the decades. Expensive sanctions lead to a significant decrease in direct investment in the short term, although they have no long-term impact. In the 1990s, direct investment had negative effects in short term runs; however, it liquidates through time.

Le & Bach (2022) study showed that sanctions impacts on direct investment vary when different embargoes are imposed. Foreign investment reduces significantly during and after the crisis period.

Nguyen and Ahmed (2023) concluded that sanctions destructively affect foreign investment. Considering the above, the following is the second hypothesis:

Second Hypothesis:

Sanctions (pre- and post-JCPOA) play a moderator role in the relationship between direct foreign investment and firm investment activities.

The rise in the producer price index is directly correlated with an increase in the producer cost resulting in a reduction in firm profitability. Since profitability is considered as a factor of economic growth, it is directly being affected by the impact of sanctions on sales and purchase rates (Ahn & Ludema, 2020). Developing economies are more vulnerable to macroeconomic conditions (doruk, 2023). Sanctioned countries are not only more exposed to export and import costs, but also are less likely to find suppliers (Bary & Kleinberg, 2015). One of the main effects of embargoes is the increase in the cost of investments. Companies are forced to hire more employees in order to increase production. Obviously, the prices of the goods boost, inflation is created and the export profit declines dramatically (Bary & Kleinberg, 2015).

Karshenasan & Soleimani (2014) expressed that sanctions and profitability are negatively related.

Kimasi et al. (2015) believed sanctions imposed on the target country's banking system have negative effects on profitability (ROA and ROE rates). Banks' refusal to provide LC services has indirect effects on ROA and ROE.

Ezzati et al. (2019) found that production reduction resulted from sanctions decrease employement of Iran's industrial sector. Considering the above, the following is the third hypothesis:

Third Hypothesis:

Sanctions (pre- and post-JCPOA) play a moderator role in the relationship between the production cost index and firm profitability.

Increasing acceleration of countries' reciprocal dependency, stable development, productive production and modern goods are believed to be the main means of success (Gloser et al. 2015). Companies have no choice but to update their production lines to adapt to the market needs (Hsu et al., 2014). Therefore, the inquiry for import increases, which greatly affects the dependent companies to import (Ahn & Ludema, 2020).

Sanctions limit the access of companies to potential imported goods, which causes disruption in product processing plans, supply chain management and material and resources management, resulting ultimately in reduction of cash flow (Cimprich et al., 2018).

Sucky & Zitzmam (2018) and Georgise et al (2014) claimed that the import of raw materials benefits firms in terms of efficiency, creativity, flexibility and productivity. Thus, its effect on cash flow from operational activity is undeniable. However, Foroutan (1996) reported that the impact of imports on profit- cost margin is negative and negletable.

Garshasbi and Dindarlou (2015) quoted that there is a positive relationship between international sanctions and Iran's macroeconomic variables such as business, investment, employment and economic growth. A direct relationship between sanction severity and its effects on economic factors was found. Considering the above, the following is the fourth hypothesis:

Fourth Hypothesis:

Sanctions (pre- and post-JCPOA) play a moderator role in the relationship between the import of intermediate and investing in raw materials and firm operational activities.

Research Design and Variables

All firms on The The Tehran Stock Exchange meeting the following criteria are included in our sample. Table 1 shows the sample and our sorting strategy.

Table 1- Sample

The number of listed companies until 2021		**680**
First sort	Lack of access to financial information	9
Second sort	Active transactions after 6 months	34
Third sort	Listed after 2002	121
Fourth sort	Non-chemical, pharmaceutical, automobile and steel listed companies	335
Number of companies		**181**

To test hypothesis 4 dependant variables are employed as performance indicators (added-value, profitability, cash flows and investement).

The following regression model is used to test the first hypotheses:

Equation 1)

$$AV_{it} = \alpha\alpha_0 + \beta_1 EX_{it} + \beta_2 FDI_{it} + \beta_3 PPI_{it} + \beta_4 IM_{it} + \beta_5 JCPOA_{it} + \beta_6 EX_{it} * JCPOA + \beta_7 Size_{it} + \beta_8 CPI_{it} + \beta_9 GDPR_{it} + \beta_{10} SHIM_{it} + \beta_{11} LIQ_{it} + \beta_{12} SQ_{it} + \beta_{13} IQ_{it} + \beta_{14} B\ Hold_{it} + \beta_{15} ROA_{it} + \varepsilon_{it}$$

The following regression model is used to test the second hypothesis:

Equation 2)

$$CFI_{it} = \alpha\alpha_0 + \beta_1 EX_{it} + \beta_2 FDI_{it} + \beta_3 PPI_{it} + \beta_4 IM_{it} + \beta_5 JCPOA_{it} + \beta_6 FDI_{it} * JCPOA + \beta_7 Size_{it} + \beta_8 CPI_{it} + \beta_9 GDPR_{it} + \beta_{10} SHIM_{it} + \beta_{11} LIQ_{it} + \beta_{12} SQ_{it} + \beta_{13} IQ_{it} + \beta_{14} B\ Hold_{it} + \beta_{15} ROA_{it} + \varepsilon_{it}$$

The following regression model is used to test the third hypothesis:

Equation 3)

$$I_{it} = \alpha\alpha_0 + \beta_1 EX_{it} + \beta_2 FDI_{it} + \beta_3 PPI_{it} + \beta_4 IM_{it} + \beta_5 JCPOA_{it} + \beta_6 PPI_{it} * JCPOA + \beta_7 Size_{it} + \beta_8 CPI_{it} + \beta_9 GDPR_{it} + \beta_{10} SHIM_{it} + \beta_{11} LIQ_{it} + \beta_{12} SQ_{it} + \beta_{13} IQ_{it} + \beta_{14} B\ Hold_{it} + \beta_{15} ROA_{it} + \varepsilon_{it}$$

The following regression model is used to test the forth hypothesis:

Equation 4)

$$CFO_{it} = \alpha\alpha_0 + \beta_1 EX_{it} + \beta_2 FDI_{it} + \beta_3 PPI_{it} + \beta_4 IM_{it} + \beta_5 JCPOA_{it} + \beta_6 IM_{it} * JCPOA + \beta_7 Size_{it} + \beta_8 CPI_{it} + \beta_9 GDPR_{it} + \beta_{10} SHIM_{it} + \beta_{11} LIQ_{it} + \beta_{12} SQ_{it} + \beta_{13} IQ_{it} + \beta_{14} B\ Hold_{it} + \beta_{15} ROA_{it} + \varepsilon_{it}$$

The above models are conducted and analyzed in four sectors on The The Tehran Stock Exchange; petrochemical, automobile manufacturing, pharmaceutical and steel.

Table 2- Variables

Variable Type	Details	Measurement
Dependent	Added-value	Net method= profit of stopped performance+ investment return+ cost of goods purchased- operating income
Dependent	Investment	Net cash flows from investment activities
Dependent	Profitability	Net profit/loss
Dependent	Operating activities	Net cash flows from operating activities
Independent	Exchange rate fluctuations	Real exchange rate fluctuations
Independent	Foreign Direct Investment	Foreign direct investment
Independent	Cost of production index	Cost of production index
Independent	Intermediate goods import	Intermediate and capital goods import
Dummy	Sanctions	During pre- JCPOA and post- JCPOA is one; otherwise zero
Control	Inflation rate	Consumers price index
Control	Firm size	Natural Logarithm of sale and asset average sum
Control	Gross production growth	The cost of goods produced
Control	Share growth index	Dividing the market price of shares by their price in a chosen date (origin date)
Control	Liquidity growth index	Summing up the positive and negative cash flows and calculating the monetary ratio
Control	Sale quality	Dividing the cash flow from sale by the total sale
Control	Profit quality	Dividing cash flows from operational activities by total assets
Adjusted	Government ownership and influence	If is the biggest investor is government, it is one; otherwise zero.
Adjusted	Return on Assets	Dividing net profit by

		total assets
Adjusted	Return on Equity	Dividing net profit by equity

Descriptive Statistics

A sample of 181 firms from 2010 to 2020 is chosen to test the hypothesis. The followings are the results.

Table 3- Descriptive Statistics

Variables	**Average**	**Median**	**Maximum**	**Minimum**	**Standard Deviation**	**Sample**
Added-value	-0.159	-0.071	0.990	-0.989	0.419	1991
Investment	0.071	0.049	0.597	-0.0107	0.079	1991
Profitability	0.156	0.131	0.660	-0.362	0.160	1991
Operating activities	0.115	0.090	0.831	-0.399	0.149	1991
Exchange rate fluctuations	0.402	0.214	1.631	0.022	0.472	1991
Foreign Direct Investment	0.554	0.056	6.335	-0.720	1.863	1991
Cost of production index	0.278	0.3240	0.675	0.049	0.182	1991
Intermediate goods import	0.266	0.030	3.150	-0.223	0.919	1991
Sanctions	0.636	0.000	1.000	0.000	0.481	1991
Firm size	14.777	14.611	20.768	10.031	1.905	1991
Inflation rate	0.231	0.220	0.410	0.090	0.114	1991
Gross production growth	1.845	3.000	7.400	-6.800	4.024	1991
Share	0.643	0.468	1.870	-0.208	0.632	1991

growth index						
Liquidity growth index	0.278	0.251	0.406	0.201	0.066	1991
Sale quality	0.135	0.107	0.967	-0.769	0.201	1991
Profit quality	0.203	0.160	1.392	-0.695	0.273	1991
Government ownership and influence	0.157	0.078	0.991	0.000	0.208	1991
Return on Assets	0.134	0.113	0.764	-0.600	0.177	1991

Normal Distribution Test

One of the criteria needs to be examined to test hypothesis, is normal distribution test for dependent variables.

Table 4- Normal Distribution Test

Variable	Jarque-Bera Test	Value
Added-value	5.65203	0.069826
Investment activities	4.420139	0.072263
Profitability	5.420608	0.069983
Operational activities	4.964212	0.71458

According to table 4, the distribution for dependent variables is normal.

First Hypothesis Result

To test the first hypothesis, added-value is used as the dependent variable. Independent variable is exchange rate fluctuations and dummy variable is sanction.

Table 5- First Hypothesis Result (Added-value)

Variables	Sample		Automobile Manufacturing		Petrochemical		Pharmaceutical		Steel
	Coefficient	Value	Coefficient	Value	Coefficient	Value	Coefficient	Value	Coef
Exchange rate fluctuation	0.019	0.028	۰,۰۷۵۷	۰,۰۰۱	۰,۰۰۱	۰,۰۱٤	۰,۰۰۱	۰,۰۰۱	-0.00
Foreign Direct Investment	-0.021	0.000	۰,۰۱۵	۰,۰۰۱	-0.001	۰,۰۰۱	-0.001	۰,٤۳٦	-0.00
Cost of production index	-0.260	0.000	-0.292	۰,۰۰۱	-0.013	۰,۰۰۱	-0.001	0.004	-0.00
Intermediate goods import	0.034	0.000	۰/۰۳۲	۰,۰۰۱	۰,۰۰۱	0.007	-0.001	0.393	۰,۰۰
Exchange rate fluctuation*sanction	-0.442	0.000	-0.452	۰,۰۰۱	-0.014	۰,۰۰۱	-0.001	0.038	-0.00
Firm size	0.053	0.000	۰,۰۰۱	0.058	0.003	0.003	-0.001	0.937	۰,۰۰
Inflation rate	-0.788	0.000	1.573	۰,۰۰۱	-0.019	0.038	۰,۰۰۱	0.242	-0.00
Gross production growth	-0.010	0.001	0.015	۰,۰۰۱	-0.001	0.016	۰,۰۰۱	0.019	-0.00
Share growth index	0.047	0.001	-0.168	۰,۰۰۱	۰,۰۰۱	0.877	-0.001	0.679	۰,۰۰
Liquidity growth index	0.551	0.000	۰,٤۲۷	۰,۰۰۱	۰,۰۲۵	۰,۰۰۱	۰,۰۰۱	0.019	0.00
Sale quality	0.117	0.001	-0.001	0.721	0.004	0.040	۰,۰۰۱	0.007	۰/۰۰
Profit quality	0.037	0.006	۰,۰۰۱	0.253	-0.001	0.474	۰,۰۰۱	0.366	-0.00
Government ownership and influence	-0.033	0.040	-0.001	0.004	-0.001	0.738	-0.001	0.329	۰,۰۰
Return on Assets	0.387	0.000	۰,۰۰۱	0.056	0.010	۰,۰۰۱	۰,۰۰۱	۰,۰۰۱	0.00
Width Origin	-0.931	0.000	-0.492	0.000	0.234	0.003	0.319	0.005	0.29
AR (1)	-	-	0.293	0.000	0.234	0.003	0.319	0.005	0.29
Adjusted coefficient	0.915		0.988		0.983		0.841		0.76
Durbin-Watson	1.526		1.825		1.677		2.039		1.93
F Value	0.000		0.000		0.000		0.000		0.00
	Probability	Result	Probability	Result	Probability	Result	Probability	Result	Prob
Variance heterogeneity	0.000	dissimilar	0.000	dissimilar	0.000	dissimilar	0.000	dissimilar	0.00
Autocorrelation	0.000	confirmed	0.000	confirmed	0.000	confirmed	0.000	confirmed	0.00
Limer	0.000	panel	0.000	panel	0.000	panel	0.000	panel	0.00
Hausman	0.000	constant	0.048	constant	0.000	constant	0.012	constant	0.01

The probability value of the overall coefficient statistic (F statistic) is smaller than 5% in all cases, which indicates that the regression has the necessary statistical validity.

Second Hypothesis Result

To test the second hypothesis, investment activities are used as the dependent variable. Independent variable is foreign direct investment and dummy variable is sanction.

Table 6- Second Hypothesis Result (Investment activities)

Variables	Sample		Automobile Manufacturing		Petrochemical		Pharmaceutical		Steel
	Coefficient	Value	Coefficient	Value	Coefficient	Value	Coefficient	Value	Coefficie
Exchange rate fluctuation	-0.12	0.001	0.001	0.001	-0.001	0.076	-0.001	0.009	-0.001
Foreign Direct Investment	-0.007	0.000	-0.001	0.800	-0.001	0.065	-0.001	0.000	-0.001
Cost of production index	0.029	0.019	-0.001	0.002	0.003	0.144	0.001	0.009	0.003
Intermediate goods import	-0.002	0.000	0.001	0.002	-0.001	0.003	-0.001	0.912	-0.001
Exchange rate fluctuation*sanction	-0.009	0.000	-0.001	0.513	-0.001	0.016	-0.001	0.000	-0.001
Firm size	-0.008	0.001	-0.001	0.094	-0.001	0.293	0.001	0.499	-0.001
Inflation rate	0.038	0.002	0.001	0.001	0.004	0.269	-0.001	0.533	-0.003
Gross production growth	0.001	0.003	0.001	0.002	0.001	0.228	-0.001	0.798	-0.001
Share growth index	-0.006	0.001	-0.001	0.000	-0.001	0.046	-0.001	0.139	0.001
Liquidity growth index	-0.050	0.004	0.002	0.000	-0.008	0.040	-0.001	0.013	-0.005
Sale quality	-0.014	0.016	0.001	0.975	-0.003	0.001	0.001	0.878	0.001
Profit quality	0.061	0.000	0.001	0.001	0.007	0.000	0.001	0.001	0.000
Government ownership and influence	-0.009	0.016	-0.001	0.013	-0.001	0.201	-0.001	0.103	0.001
Return on Assets	0.001	0.916	-0.001	0.091	0.001	0.065	0.001	0.502	0.001
Width Origin	0.196	0.000	0.009	0.000	0.034	0.000	0.017	0.000	0.018
AR (1)	0.222	0.001	0.482	0.001	-	-	-	-	0.206
Adjusted coefficient	0.744		0.792		0.742		0.899		0.793

Durbin-Watson	2.077		2.142		1.524		1.694		2.087
F Value	0.000		0.000		0.000		0.000		0.000
	Probability	Result	Probability	Result	Probability	Result	Probability	Result	Probabili
Variance heterogeneity	0.000	dissimilar	0.000	dissimilar	0.000	dissimilar	0.000	dissimilar	0.000
Autocorrelation	0.000	confirmed	0.000	confirmed	0.000	confirmed	0.000	confirmed	0.000
Limer	0.000	panel	0.000	panel	0.000	panel	0.000	panel	0.000
Hausman	1.000	random	0.000	constant	0.000	constant	0.001	constant	0.123

The probability value of the overall coefficient statistic (F statistic) is smaller than 5% in all cases, which indicates that the regression has the necessary statistical validity.

Third Hypothesis Result

To test the third hypothesis, profitability is used as the dependent variable. Independent variable is cost of production index and dummy variable is sanction.

Table 7- Third Hypothesis Result (Profitability)

Variables	**Sample**		**Automobile Manufacturing**		**Petrochemical**		**Pharmaceutical**	
	Coefficient	**Value**	**Coefficient**	**Value**	**Coefficient**	**Value**	**Coefficient**	**Valu**
Exchange rate fluctuation	0.023	0.060	-0.001	0.003	0.006	0.001	0.001	0.001
Foreign Direct Investment	0.003	0.001	0.001	0.001	0.001	0.001	0.001	0.010
Cost of production index	-0.063	0.154	0.003	0.005	0.024	0.024	-0.001	0.006
Intermediate goods import	0.001	0.877	-0.001	0.345	-0.001	0.751	-0.001	0.131
Exchange rate fluctuation*sanction	-0.216	0.020	0.001	0.541	-0.010	0.031	-0.002	0.000
Firm size	0.003	0.137	-0.001	0.059	0.001	0.395	-0.001	0.070
Inflation rate	0.023	0.707	-0.003	0.049	0.008	0.435	0.002	0.001
Gross production growth	-0.001	0.236	-0.001	0.012	-0.001	0.010	0.001	0.000
Share growth index	0.005	0.624	0.001	0.201	-0.001	0.564	-0.001	0.264
Liquidity growth index	0.225	0.011	-0.004	0.062	0.050	0.006	0.002	0.001
Sale quality	-0.009	0.335	-0.001	0.385	-0.009	0.005	-0.001	0.880
Profit quality	0.069	0.001	0.001	0.053	0.010	0.001	0.001	0.040
Government ownership and influence	0.005	0.600	-0.001	0.526	0.002	0.142	-0.001	0.568

Return on Assets	0.788	0.000	0.007	0.001	0.104	0.000	0.001	0.002
Width Origin	-0.076	0.011	0.016	0.000	0.017	0.625	0.040	0.000
AR (1)	-	-	0.358	0.001	0.408	0.001	0.529	0.001
Adjusted coefficient	0.791		0.679		0.888		0.948	
Durbin-Watson	1.572		1.959*		1.919		1.849	
F Value	0.000		0.000		0.000		0.000	
	Probability	Result	Probability	Result	Probability	Result	Probability	Result
Variance heterogeneity	0.000	dissimilar	0.000	dissimilar	0.000	dissimilar	0.000	dissimilar
Autocorrelation	0.000	confirmed	0.000	confirmed	0.000	confirmed	0.000	confirmed
Limer	0.000	panel	0.000	panel	0.000	panel	0.000	panel
Hausman	0.212	random	0.000	constant	0.000	constant	0.001	constant

The probability value of the overall coefficient statistic (F statistic) is smaller than 5% in all cases, which indicates that the regression has the necessary statistical validity.

Forth Hypothesis Result

To test the fourth hypothesis, operational activities are used as the dependent variable. Independent variable is intermediate and capital goods import, and dummy variable is sanction.

Table 8- Forth Hypothesis Result (Operational activities)

Variables	**Sample**		**Automobile Manufacturing**		**Petrochemical**		**Pharmaceutical**		**Steel**
	Coefficient	**Value**	**Coefficient**	**Value**	**Coefficient**	**Value**	**Coefficient**	**Value**	**Coeff**
Exchange rate fluctuation	0.010	0.004	-0.001	0.076	0.009	0.016	0.021	0.001	-0.00
Foreign Direct Investment	0.004	0.001	-0.001	0.042	0.002	0.056	0.005	0.014	0.001
Cost of production index	-0.019	0.058	0.005	0.180	-0.044	0.001	-0.061	0.009	0.041
Intermediate goods import	0.002	0.001	0.001	0.001	-0.001	0.152	0.005	0.001	0.002
Exchange rate fluctuation*sanction	-0.108	0.003	-0.015	0.106	-0.062	0.038	-0.090	0.071	0.070

Firm size	-0.003	0.010	-0.001	0.825	0.001	0.193	-0.005	0.001	-0.00
Inflation rate	0.056	0.005	-0.013	0.035	0.074	0.004	0.126	0.003	-0.10
Gross production growth	0.001	0.002	-0.001	0.021	0.001	0.017	0.002	0.002	-0.00
Share growth index	-0.002	0.135	0.001	0.014	-0.004	0.011	-0.009	0.021	0.007
Liquidity growth index	0.031	0.107	-0.006	0.332	0.056	0.009	0.034	0.387	0.047
Sale quality	0.041	0.000	0.019	0.001	-0.026	0.001	0.055	0.002	0.002
Profit quality	0.485	0.000	0.001	0.773	0.100	0.000	0.055	0.001	0.125
Government ownership and influence	0.001	0.899	0.001	0.327	0.004	0.031	-0.012	0.001	0.012
Return on Assets	0.026	0.000	-0.001	0.339	0.009	0.202	0.007	0.429	0.031
Width Origin	0.031	0.004	0.016	0.000	-0.011	0.222	0.052	0.003	0.039
Adjusted coefficient	0.987		0.437		0.813		1.177		0.233
Durbin-Watson	2.373		2.054		1.795		1.744		1.585
F Value	0.000		0.000		0.000		0.000		0.000
	Probability	Result	Probability	Result	Probability	Result	Probability	Result	Proba
Variance heterogeneity	0.000	dissimilar	0.000	dissimilar	0.000	dissimilar	0.000	dissimilar	0.000
Autocorrelation	0.000	confirmed	0.000	confirmed	0.000	confirmed	0.000	confirmed	0.000
Limer	0.001	panel	0.000	panel	0.000	panel	0.000	panel	0.000
Hausman	0.000	constant	0.000	constant	0.000	constant	0.01	constant	0.724

The probability value of the overall coefficient statistic (F statistic) is smaller than 5% in all cases, which indicates that the regression has the necessary statistical validity.

The summary of findings is indicated on Table 9:

Table 9- Findings summary

Hypotheses	**Sections**	**Results**
Sanctions (pre-and post-JCPOA) have a moderating role on the relationship between exchange rate fluctuations and added value.	All Sections	Confirmed
	Automobile Manufacturing	Confirmed
	Petrochemical	Confirmed
	Pharmaceutical	Confirmed
	Steel	Confirmed

Sanctions (pre-and post-JCPOA) have a moderating role on the relationship between foreign direct investment and investment activities.	All Sections	Confirmed
	Automobile Manufacturing	Rejected
	Petrochemical	Confirmed
	Pharmaceutical	Confirmed
	Steel	Confirmed
Sanctions (pre-and post-JCPOA) have a moderating role on the relationship between cost of production index and profitability.	All Sections	Confirmed
	Automobile Manufacturing	Rejected
	Petrochemical	Confirmed
	Pharmaceutical	Confirmed
	Steel	Confirmed
Sanctions (pre-and post-JCPOA) have a moderating role on the relationship between intermediate and capital goods import and operational activities.	All Sections	Confirmed
	Automobile Manufacturing	Rejected
	Petrochemical	Confirmed
	Pharmaceutical	Rejected
	Steel	Rejected

Conclusion

This study aimed at examining the impact of macroeconomic factors during sanctions (pre- and post-JCPO) on the firm performance indicators in listed companies on the Tehran Stock Exchange in selected industries. The sample of this study is collected over an 11-year period spanning from 2010 to 2020, including 181 firms listed on the Tehran Stock Exchange.

The results indicated that sanctions increase the exchange rate fluctuations; therefore, companies need to buy their required capital goods at a higher price. This, not only increases the required capital, but also raises the cost of goods produced. Consequently, the national currency drops, the cost of production increases and it causes stagnation and industry bankruptcy. Risks investing internally and internationally in Iran increase significantly due to the fluctuations of exchange rates, and consequently, production insufficiency leads to the decline of firms' added-value. Therefore, there is a negative relationship between sanctions and the relationship between exchange rate fluctuations and firm added-value. The results of our study are in compliance with the results

from Arratibel et al. (2011), Ozmen et al. (2012), Vatavu (2014), Barguellil et al. (2018), Ahn & Ludema (2020), Huynh et al. (2022), Doruk (2023) and Tehranchian et al. (2018). However, the results are in contrast with the findings from Chikeziem and Ikenna (2016), Presley and Boqiang (2018) and Azhdari (2016).

The impact of sanctions on different economic sectors such as trading, investment and employment is undeniable. Sanctions avoid attracting foreign investors. Therefore, admittedly, foreign investments in companies listed on the Tehran Stock Exchange decline due to the sanctions. Sanctions denigrate Iran's market as a high-risk investing option, which prevents foreign investors from injecting money to the market. Thus, sanctions (pre- and post-JCPOA) and the relationship between direct foreign investment and firm investment activities are negatively related in all sectors except automobile manufacturing. Our findings are in line with the results from Pegkas (2015), Fadhil & Almsafir (2015), Mirkina (2018), Le & Bach (2022), Nguyen and Ahmed (2023), Ezzati et al. (2019) and Garshasbi and Dindarlou (2015).

Reducing the import of raw materials, intermediate and capital goods, sanctions cause the increase of the cost of the domestic products by multiplying the import costs. As the rate of exchange gets higher, the cost of product index and cost of production increase. As a result, the production capacity reduces, so the products cannot compete on international market. The above has negative effects on firm profitability. Our findings show that sanctions (pre- and post-JCPOA) and the relationship between the production cost index and firm profitability are indirectly related. The results are in line with Barry & Kleinberg (2015), Ghasseminejad & Jahan-Parvar (2021), Doruk (2023), Ezzati et al. (2019), Kimasi (2015), Garshasbi and Dindarlou (2015) Karshenasan and Soleimani (2014). But they are in contrary to the results from Korotin (2018).

With the increase of exchange rates and import costs, foreign investments and national currency values descend, which not only reduces export prices, but also multiplies the import prices. Sanctions obligate companies to import their capital goods at a higher price, which requires bigger amounts of capital. Weaker national currency and ascending production costs lead to stagnation and industry bankruptcies. Considering the above, internal and

international investors' interests vanish; therefore, production and the cash flow from operational activities decrease. Thus, sanctions (pre- and post-JCPOA) and the relationship between the import of intermediate and investing in raw materials and firm operational activities are negatively related. The findings are consistent with Barguellil et al. (2018), Cimprich et al. (2018), Ezzati et al. (2019) and Garshasbi and Dindarlou (2015).

Practical Suggestion

Investors, especially those who aim the Iranian Stock Exchange, analysts, portfolio managers, market regulators and market observers can benefit from this study. Therefore, the following suggestions are offered:

Sanctions (pre-and post-JCPOA) modify the relationship between exchange rate fluctuations and the added-value of firms. Accordingly, it is suggested to the banks and Central Bank of Iran to balance the exchange market to overcome the stagnation because exchange rate fluctuations deduct firm added-value.

Sanctions (pre-and post-JCPOA) modify the relationship between foreign direct investment and investing activities of firms. It is offered to the government to invest in manufacturing industries which are self-sufficient because they soften the sanctions' effects on listed companies on the Tehran Stock Exchange. This increases the export and investing activities.

Moreover, sanctions (pre-and post-JCPOA) modify the relationship between the cost of production index and profitability. It is suggested to knowledge-based companies to substitute manufacturing the required goods for importing them in order to reduce their dependency on foreign goods.

Sanctions (pre-and post-JCPOA) modify the relationship between the import of the intermediate and capital goods and operational activities in the petrochemical sector. We suggest to the stock exchange organizations, relevant institutions and economic policymakers to improve the macroeconomic index, reduce economic risks, correct managerial and executive processes, secure the country's interests in concluding foreign contracts, formulate industrial development strategies and allocate foreign resources to

productive sectors. When attracting funds, it is a matter of significance to allocate the foreign investments to the real economic sectors rather than the financial and nominal sectors.

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