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Investigating the Role of Sanctions on Non-Performing Bank Claims of the Country's Banking System Using the Three-Step Least Squares Technique

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Abstract

With the complexity of monetary economic relations in today's world, the banking sector is increasingly supporting the growth of the real sectors of the economy by playing a mediator, direct or indirect role. The ratio of bank inflows is one of the basic principles of calculating the efficiency of the banking system and consequently, increasing non-immovable receivables leads to increased credit risk in the main cause of bank bankruptcy. On the other hand, the economic dimensions of global sanctions on monetary economy complicate the evaluation of sanctions related indicators in economic studies, which is why it seems that among factors that affect intangible demands, even indirect influence of international sanctions has introduced banks as one of the sources of crises in the economy. Accordingly, in this paper, due to the importance of the role of banks in increasing economic growth, some of the reasons for the impact of global sanctions on increasing inflow demands are considered. Therefore, after identifying the factors affecting sanctions, on non-current demands, using a new index for sanctions, a kind of economic modelling is used. Therefore, using exploratory factor analysis, the index is calculated and the time series of this index is created for the period after the Islamic Revolution until the end of the 1980s. In this regard, 12 variables that were highly affected by sanctions are exploited in the process of indexing sanctions. In the following, using three-stage least squares technique in the context of a small macroeconomic model, while examining the reasons associated with sanctions on important macroeconomic variables such as economic growth, trade, investment and employment, the reason and severity of the impact of these components on non-current demands is discussed. The results of the model estimation show that sanctions on non-current demands of banks are indirect and even affect some directly.

Keywords: Economic sanctions, Non-performing bank claims, Small macrometry model, Exploratory factor, Three-stage minimum squares.
JEL Classification: D1, D29, E23.

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Introduction

The economic and, of course, legal aspects of global sanctions on the country's economy, as well as their scope, make it complicated and difficult to analyze and measure the components related to the sanctions on macroeconomic variables. Apart from this, the quantification of the sanctions issue in itself is not a small problem. On the other hand, today, among the various indicators of financial stability, non-current claims of banks are very important, because claims affect asset quality, credit risk, and the efficiency of resource allocation to productive sectors. Considering that most of the country's banks are state-owned in terms of capital, it is logical that the banking system is equally affected by the policies of statesmen in international relations. After the victory of the Islamic revolution, there have been four stages of sanctions against Iran. The first stage is related to the years 1357-1959, during which the Iranian government's assets were confiscated from American banks, and the export of any food and medicine to Iran was banned. In addition, Americans are prohibited from any financial transactions with Iranians, and the United States has prohibited any type of import from Iran and all travel to or from Iran. All military equipment pre-purchased or purchased by the Iranian government was also confiscated. The second stage coincided with Iraq's military aggression against Iran, and this stage was mostly applied between 1362 and 1974. Stricter controls than the first period of sanctions regarding the export of dual-use military equipment to Iran, the approval of the ban on the export of American goods and products to Iran by the US Congress, the ban on any deal for the development of the oil industry in Iran, the ban on imports, exports and mutual investment between Iran and the US. , the approval of Damato Law 1 were the main sanctions of the second stage. The third stage of sanctions started in 1375. The approval of the "Iran and Libya Sanctions" law and the inclusion of the names of Iranian banks and a number of institutions and companies affiliated with the Islamic Revolutionary Guard Corps in the list of sanctions have been the most important measures of this round of sanctions until 2013. In the fourth stage of the sanctions, which started in December 2009 with the aim of weakening the nuclear power and slowing its growth, the sanctions on Iran's oil exports, the sanctions on the Central Bank of the Islamic Republic of Iran and the stricter sanctions on the import of essential and basic goods are considered the most important sanctions. The impact of sanctions on the economic field only defines the process of the impact of sanctions policies, but does not provide a convincing answer about its quantitative and qualitative conditions. Because in fact, the discourse in the field of sanctions often focuses on victory or

1According to this law, companies that invest more than 40 million dollars in Iran in one year will be banned from doing business with the US government. This law was presented to the US Congress by "Damato", a senator of Italian descent from the US Congress and one of the conservative Republicans. Based on this, the President of the United States was allowed to

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sanction non-American companies that provide oil industry technologies to Iran. Damato's law is revised every 5 years.

2The D'Amato law was approved by the Congress and signed by Clinton in the form of punishment for Iran and Libya after it was combined with the plan of "Benjamin Gilman", the head of the International Relations Commission of the US House, which had the same content as the D'Amato law. In this law, penalties were specified for non-American companies that invest more than 20 million dollars a year in Iran's energy sector.

3Garshasbi, Alireza, Yousefi Dindarlou, Mojtabi (2015). Investigating the effects of international sanctions on Iran's macroeconomic variables. Economic Modeling Research, No. 25, pp. 131-195.

-The failure of sanctions insists on the position of zero percent options to consider sanctions. The lack of good quantitative models in this field has caused most of the studies to focus on explaining the channels of the sanctions' impact on the economy. Due to the importance of sanctions, apart from being effective or ineffective, in achieving the goal, they affect various economic sectors such as trade, investment, employment and economic growth. Therefore, in addition to studying the routes and the impact process, as far as possible, the impact of sanctions on these sectors will be studied based on quantitative models. Therefore, explaining the effectivity of trade, investment, employment and economic growth from sanctions in various forms of sanctions is the most important goal of the present study, the result of which - considering the direct relationship of the aforementioned twelve variables with non-current claims - the impact of the country's non-current bank claims can be equally He considered the sanction as definite and proven.

On the other hand, a comparative study of the state of non-current claims of banks in 2011 among 105 countries of the world shows that despite the use of non-usurious banking in Iran, the country's ranking is not in a good position. For example, the average ratio of non-current claims among 105 countries in 2011 was about 7%, which is far from Iran's ratio of 15.1%. According to the ratio of non-current claims, Iranian banks are ranked 94th in the world and ranked 27th among the 30 countries surveyed. They are also in the 6th place among the 7 oil exporting countries. Considering the above, it can be seen that the country's banking system is not in a good condition in terms of resources compared to other countries in the world, and it needs an immediate solution to the problem of non-current claims. , is its value. It is logical that the violation of debt repayment or its non-payment - whether voluntary or outside the control and will of the borrowers - occurs anyway, and the occurrence of outstanding claims is inevitable. Therefore, what is important in the country's banking system today, The increasing increase in non-current claims and, as a result, the decrease in liquidity, the disruption in the allocation of resources and ultimately the decrease in the profits of banks. This study deals with

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the effect of global sanctions on the increase of non-current claims of banks during the years after the Islamic revolution and the four-stage sanctions against Iran. Therefore, the 12 variables of "economic growth rate, private consumption, private investment, import, non-oil export, tax revenue, exchange rate, liquidity, consumer price, employment, price index of imported goods and price index of export goods" which have a great effect of sanctions in The indexation process of sanctions are exploited. According to the findings of this research, the direct effects of sanctions are significant only in terms of economic growth and the exchange relationship, and they are evaluated as definite but indirect effects on other variables as well. This article is arranged in five sections. After the introduction and in the first part, theoretical foundations related to sanctions and indexation of sanctions are presented. In the second part, research records are introduced. The third part explains the research model and its estimation method. In the fourth part, data, findings and experimental results are analyzed, and finally, in the fifth part, the summary and suggestions are presented.

1 Aziznejad, Samad, Seyed Noorani, Mohammadreza (2012). Investigating the effects of economic sanctions on Iran's foreign trade. Majlis and Strategy, No. 61, pages 165-210.

2. Theoretical foundations

The challenge of the criteria and criteria for the evaluation and verification of sanctions has intensified during the last few decades and with the increase in the amount of sanctions against the Islamic Republic of Iran, and has become one of the most important concerns of the banking system and the structure of the country's monetary economy. Following that, one of the fundamental problems of banks is the problem of their outstanding claims. In addition to reducing the bank's financial capacity in providing new facilities and reducing the bank's profit, non-current claims cause negative effects on various economic sectors and on a wider scale for the people of each country through monetary and financial crises. It is precisely for this reason that the study and analysis of the effects of sanctions - defined as external factors - on the amount of non-current claims of banks is necessary. It should be emphasized that unfortunately there are few studies in the field of sanctions and most of them have used accounting approaches to measure the direct costs of sanctions. This method is not able to include all the desired indicators in the influence channels of sanctions and therefore it is considered a serious problem. In other studies, virtual variables have been used to explain the effects, which cannot have enough capacity to show the effects of sanctions. In recent years, non-current claims and how to collect them have always been one of the important and challenging issues in the country's banking system, but when cross-border components are involved in the occurrence of these claims, their collection becomes a complicated and difficult process.

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2-1. Sanction and its effects

Providing a comprehensive definition of the concept of sanctions is the first step in the process of examining its effects. Economic sanctions refer to a set of decisions that are applied by country(s) against a country that has violated international laws and moral standards accepted by the public. The goal of the sanctioning body is to force the offending country to give up its goals or at least agree to negotiate to end the behavior. (Yazdan Panah, 2013: 33). Another important issue is the indicators that determine the effectiveness of sanctions. "What determines the economic effectiveness of sanctions is the objectives of the sanctions, the trade partners of the sanctioned country, the implementation costs of the sanctions, the commercial relationship between the sanctioned and the sanctioning body before the sanctions, the involvement of other countries by the sanctioning body and finally the list of goods subject to sanctions. In relation to the success of the economic sanctions in achieving its goals, the following conditions have been proposed" (Gershasbi and Yousefi Dindarlou, 2015: 133). A sanction on a country's monetary system can be effective if visible and tangible indicators are realized. These indicators include: the cost of sanctions for the sanctioned economy is more than two percent of the gross national product; The ratio of the gross output of the sanctioning country is at least ten times that of the sanctioned country; It is possible to dominate more than a quarter of the country's entire commercial system; Sanctions should be applied in the shortest possible time and with the cooperation of the sanctioning trade partner countries; And finally, the cost of imposing sanctions should not be high for the imposing country. With this point of view, sanctions can reduce international trade, reduce investment in the sanctioned country, inflexibility of the structure and priorities of consumption and production, and ultimately reduce the flexibility of the labor market in the sanctioned country. It is noteworthy that, the advantages of a country in different steps of international trade are explained according to the production possibilities curve and according to the revealed preferences in the production and consumption sector. Sajjad Faraji Dizji (2017) has given about the diagram of production, consumption and specialization in different stages of international trade: according to diagram 1, in a hypothetical economy, two goods x and y using production facilities and taking advantage of specific technology in the form of curve I is produced If the hypothetical economy cannot produce on its possibilities curve, the optimal allocation of production factors has not been made and part of the inputs are used in excess. This curve is concave with respect to the origin of the coordinates and has a decreasing efficiency with respect to the scale. (Farji Dizji, 2017: 46). Consumer preferences are depicted using four convex consumption curves C1, C2, C3 and C4, each of which shows a certain level of utility in different combinations of goods x and y in diagram 1.

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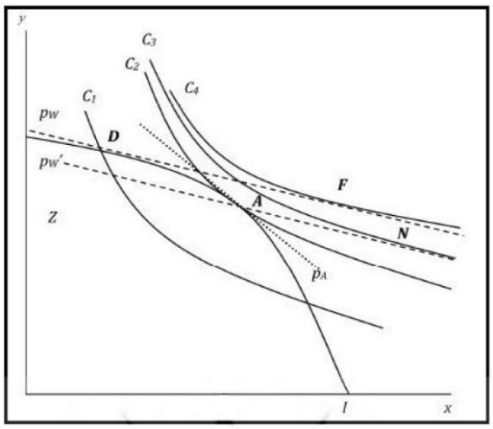

Diagram 1. Production, consumption and specialization in different stages of global trade (source: Garshasbi and Yousefi Dindarlou, 2015: 135).

As can be seen in diagram 1, two price ratios Pa and Pw are predicted to exist. The first ratio shows the lack of global free trade and the second price ratio shows global prices. Point A in the diagram represents production and consumption over a long period of time in a hypothetical situation where there is no other country that this hypothetical economy can trade with in a state of full embargo, or we can say it is like a situation where a full embargo applies. A country has been applied. Point F, which is equivalent to the point of free trade, is the amount of consumption before the imposition of sanctions at its highest level (C4). The difference between the consumption balance of goods x and y at this point with the production of these goods at point D represents the export and import of each commodity in this economic behavior. Therefore, it is explained that the free trade of C4 is more desirable than the complete embargo (without free trade) of C2. On the other hand, the non-sanctioned economy based on full specialization has production at point D because it is actually the same point of production after imposing sanctions in the hypothetical model. Because the production indicators are used in specific proportions and time is spent to be able to be allocated again. Given the minimum consumption levels, the reduction in production to point D is the composition produced early in the embargo period. Therefore, it is evident that if the trade level is possible, it seems logical that the consumption mix is not optimal and the consumption level reaches its lowest value.

This situation creates the minimum utility relative to the situation where there is no trade. The reason for this can be related to the fact that the conversion rate at point D (price ratio Pw) is not equal to the final substitution rate. Therefore, consumers tend to exchange goods y with x, and therefore the price of goods x (Px) increases. In this process, the production model produces more product x while making adjustments. This will change the pattern of using inputs, especially manpower. With regard to the final states, in the cases of applying sanctions and closing the space of an economy, it can be stated as follows: in the real world and after the

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application of sanctions, the economies are at a point between D and A. (Gershasbi and Yousefi Dindarlou, 2015: 135). Therefore, taking into account the mentioned cases, the imposition of sanctions, like many other quantitative restrictions, reduces the level of trade significantly and significantly. Chart 2 shows the impact of sanctions on the supply limitation and ultimately the increase in the price of imports and in general the impact on the value and price of trade. Curve D in a hypothetical small country with an open economy and represents the import demand curve of that country. Therefore, the trade of such a country is never able to influence global prices, but it is a price acceptor in global markets. So, the supply curve becomes a straight line and if the cost of transportation is not a limitation at all, the equilibrium of perfect competition is achieved at point E.

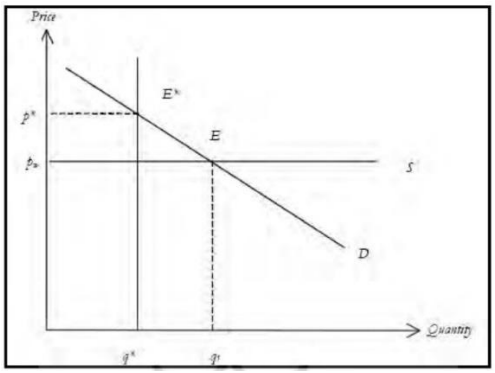

Chart 2. Trade impact of sanctions (source: ibid. 135).

The second diagram shows that consumers buy the quantity q1 at the world price level pw. Now, if the exporter embargoes the exports to the target country, it is obvious that the amount of purchase will be limited to the level of q*. The vertical line represents a quantitative constraint because the embargo effectively restricts supply and thus increases import prices in importing countries to the level p*. The gap between (p*-pw) represents a quantitative limitation. The amount of welfare that can help the public and private sector is also equal to q* (p*-pw). (ibid: 136).

In the following, the influence channels of sanctions on various areas will be discussed. First, it can be evaluated in Figure 3 that the time process of utility depends on consumption probabilities and it shows a sudden decrease from point F to point D in time T - which is the period of sanctions in Figure 1.

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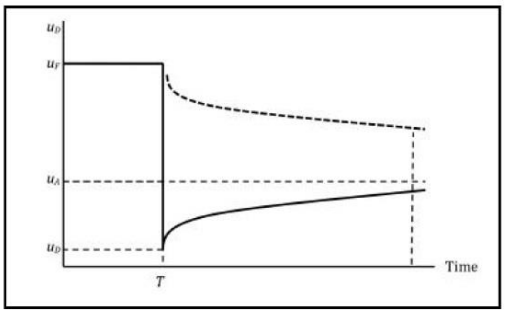

Chart 3. Changes in the utility of the economy along the path of free trade to a trade-free economy due to the embargo (source: ibid.: 136).

According to the third diagram, after the imposition of sanctions, the economic balance of the sanctioned country decreases significantly and decreases from uF to uA point. Therefore, it can be acknowledged that economic sanctions are different from each other due to political and military levers on each country, and the sanctioners follow different paths to achieve their goals. One of the main sanctions channels is targeting trade and production changes and other related variables such as investment and employment. Therefore, according to the explanations and diagrams provided, the most basic effects of sanctions can be classified in three categories: import, export, and capital inflow and outflow. Below is a brief description of each one. A) Import category. It is evident that the production is highly dependent on the import of goods such as raw materials, intermediates and capital, which directly or indirectly threaten their embargo. Even if imports are not completely cut off, the added costs of imports in such a situation will increase the cost of domestic production, which is not only domestic damage, but also reduces the competitiveness of domestic goods in global markets. Apart from this, the decrease in imports, because it leads to a decrease in the government's revenues from tariffs, increases the government's expenses, and this indicator causes more severe effects than in the previous cases. Especially when, for any reason, political, economic, the ruling system in the sanctioned country does not intend to reduce the amount of imports. In other words, if the official-government structures limit or completely cut off imports and international exchanges, perhaps a much better situation can be imagined, because the country's consumption is practically adjusted to the level of domestic production, but by insisting on the continuation of imports in ways that were mentioned, more difficult conditions are expected. In other words, before the embargo, in a free trade condition, the country is able to trade with the world with the amount of global production and demand and at the level of global market prices, and on the other hand, producers and consumers are faced with certain identical amounts. (The amount of consumption, exchange with the amount of production in the embargoed country) Therefore, only the amount of import will undergo changes based on components - mostly small - which is completely reasonable. Now, if the country is faced with the embargo and the blocking of the import borders and, as a result, the impossibility of smuggling goods, it is obvious that the

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prices in the domestic market will increase because the process of replacement - and production - of the consumed goods will actually slow down. Of course, it is assumed that the production in the embargoed country does not depend on the import sector and is considered completely separate from that sector. For this reason, it is necessary to explain that if production is dependent on imports, this issue should be investigated. b) Export category. It is no secret that export is one of the most important sources of currency supply. It is precisely for this reason that if the export of goods and services is one of the sanctioned cases, its requirements, like foreign exchange resources, will face serious disruption. If the embargoed country has a low variety of exports, it will face more risks and damages in the same proportion. c) Capital channel category. Studies show that the expansion and restriction of production in any country requires the provision of capital and investment, which, if one of the main provisions of sanctions, can slow down or even negatively affect the economic growth of the target country.

2-2. Sanction indexing

The current research is an experimental research in the field of proof-of-concept research based on real past information. As the study of the texts and legal provisions related to sanctions show, it usually includes some types of transactions, the names of people and companies under sanctions, and by examining them, it is clear that these items cannot be adapted or presented in the form of quantitative or non-quantitative variables. . It is evident that the names of individuals or companies cannot be considered as a suitable indicator for sanctions because it is practically impossible to do a decent scaling. Virtual variables are also often related to the option of sanctions or not, and technically compared to explanatory variables, they have less transparency capacity in experimental models. The researcher believes that due to the fact that listing and collecting sanctions information does not seem to be efficient, it is better to target sanctions and provide researchers with more real and complete data. Therefore, choosing a specific variable among the types of variables affected by sanctions as a "sanction variable" does not meet the demands and goals of this research. On the other hand, the aggregation of several variables affected by the embargo, each of which is affected by the embargo in a way, creates limitations due to the addition of explanatory variables and also the interpretation of the embargo in economic modeling. It seems that the variables that are sanctions variables in nature are closer to the goals of this article, which can be extracted with the factor analysis method. The important point of factor analysis is whether such variables can be described by a number of factors less than the number of variables, and what characteristics each factor represents. The first person who tried factor analysis is Spearman (1904), who is known as the founder of this method. After him, Pearson (1910) introduced the "principal components" method and then Hetling (1933) expanded it. The first calculations and studies using the factor analysis method were carried out between 1900 and 1930, using Spearman's model. Of course,

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except for Spearman, other experts such as Brett, 5 Helisinger, 6 Kelly 7, Pearson and Thomson 8 also tried to complete the factor analysis method in that time period.

In the first years of the 1930s, it became clear that Spearman's general single-factor model cannot always be sufficient in describing the relationships between the variables of a set. Therefore, Thurston seems to be the most prominent analyst of the modern factor method and has an undeniable contribution to the expansion of this method from the 1930s to today. With the emergence of powerful, fast and powerful computers of the new generation in the late 1950s, with the help of the initial findings of the common factor theory of Thurston (1947) and the general formulation of Hetling (1933), in relation to the mathematical calculations of the principal components that were previously due to many calculations Difficult and complex, it had not been used, a new analytical method was invented, which was called exploratory factor analysis.

It is necessary to explain that the number of factor analysis methods with the invention of image analysis (Gutman 3, 1953), fundamental factor analysis (Rao 4, 1955 and Harris 5, 1962), alpha factor analysis (Keyser 6 and Caffrey 7, 1965) and the least residual method (Bargman 8 and Jones 9) , 1966), was fully developed. A little later and further, Lawley10 (1940) showed in an article about the maximum likelihood method that factor analysis can be efficient as a statistical method in most researches. Exploratory factor analysis, in the framework of orthogonal factors11, which is used to calculate the output of the sanctions index, actually describes the structure of covariance (correlation) between a large number of variables using unobservable random values that are called factors. Assuming that the variables are categorized by their correlation, in such a way that all the variables in a given group have a strong correlation with each other but not with the variables of other groups and have a relatively small correlation, each group of variables has its own main structure. In other words, for each group of them, a factor describes its characteristics. (Gershasbi and Yousefi Dindarlou, 2015: 144).

Factor analysis is an extension of principal component analysis, and similar to the estimation of the covariance matrix (∑)). But estimation based on factor analysis is more accurate and reliable. In orthogonal models, vector μ and matrix ∑ are random. The premise of the factor model is that X is a linear combination of a number of unobservable random variables F1, F2, F3, ..., Fm called common factors12 (general) and error sentences εm ... ε3 ε2 ε1 called special factors13. The factor analysis model can be shown in the form of equation 1:

$$X - \mu_1 = 1_{11}F_1 + 1_{12}F_2 + 1_{13}F_3 \ldots + 1_{1M}F_m + \varepsilon_1$$
$$X - \mu_2 = 1_{21}F_1 + 1_{22}F_2 + 1_{23}F_3 \ldots + 1_{2M}F_m + \varepsilon_2$$
$$\ldots$$
$$X - \mu_p = 1_{p1}F_1 + 1_{p2}F_2 + 1_{p3}F_3 \ldots + 1_{pm}F_m + \varepsilon_p$$

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1ij is the i-th variable in the j-th factor. L is the matrix of these weights. Of course, Xi is only a function of the i-th component of the eigenvector εi. In the factorial method, the standard deviation X1 - μ1, X2 - μ2, X3 - μ3, ..., Xm - μm are a function of p + m random variables F1, F2, F3, □, Fm and εm ... ε3 ε2 ε1 which cannot have observed The important difference between the multivariate regression model and the factor model is that explanatory variables are visible in the regression model. Therefore, obtaining a direct output from the factor model according to the observations X1, X2, X3, □, Xm is practically not possible. Of course, despite this problem, by adding hypotheses about random vectors F and ε in model 1, correlation relationships can be checked. Therefore, it can be assumed:

$E(F) = 0_{Mx1}$
$E(\varepsilon) = 0_{px1}$
$Cov(F) = E(FF') = I_{mxm}$

$$Cov(\varepsilon,F) = E(\varepsilon\varepsilon') = \Psi_{pxp} = \begin{bmatrix} \Psi 1 & \dots & 0 & \dots \\ 0 & & \Psi 2 & \dots \\ 0 & & \dots & \dots \end{bmatrix} \begin{bmatrix} \Psi 1 & 0 & \dots & 0 \\ 0 & \Psi 2 & & . \\ 0 & . & & \Psi p \end{bmatrix} \quad (2)$$

On the other hand, it is assumed that F and ε are independent of each other, so:

$$Cov(\varepsilon,F) = E(\varepsilon F') = 0 \quad (3)$$

These hypotheses, in addition to equation 1, form the orthogonal factor model. This model confirms the existence of a structure of covariance matrix for matrix X in the form of ∑, which are shown in model 4. The purpose of factor analysis is to find F1, F2, F3, □, Fm to clarify which one can be used as a sanction index. (ibid: 146).

$$(X - \mu)(X - \mu)' = (LF + \varepsilon)(LF + \varepsilon)' = LF(LF)' + \varepsilon (LF)' + LF\,\varepsilon' + \varepsilon\varepsilon'$$
$$E(X - \mu)(X - \mu)' = LEF(LF)'\,L' + E\,\varepsilon\,FL' + LE(F\,\varepsilon') + E(\varepsilon\varepsilon') = LL' + \Psi \quad (4)$$

3. Research background

In the economic discourse and the banking sector, many studies have investigated the non-current demands of banks, the factors affecting them and the effect of these demands on the micro and macro economic and performance indicators of banks. These studies usually use econometric methods. Among them, there are studies with both parametric and non-parametric methods. Importantly, researches in the field of sanctions are few and these few are not available to the public due to security considerations. A. E. Torbat 2 (2005) in an article examining the US commercial and financial sanctions on Iran between 1979-2002.

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2 Torbat, A. E. (2005) Impacts of the US Trade and Financial Sanctions on Iran. Blackwell Publishing Ltd., Oxford.

- It has been paid. He tried to analyze the effects of these sanctions on Iran's economy with the available statistics in commercial sectors such as exports and imports, oil revenues and information on financial fields such as oil contracts, and examine its impact on the amount of facilities obtained by Iran in world trade. The data of this study were obtained for the variables except the embargo from 1966 to 2012 and a dummy variable was used for the initial years of each embargo. The designed model is based on endogenous growth models in which the effects have been analyzed with the SLS econometric method. Finally, he has calculated the costs of US sanctions due to the change in the yield of Iran's oil contracts. Of course, he has also made a comparison between these studies and other studies that exist in the scope of Iran sanctions. Of course, Torbat used the accounting approach to calculate the direct costs of sanctions, which cannot include all the factors affecting the sanctions, and this is a serious problem for his research. Torbet's findings show that economic sanctions have not had a direct impact on Iran's economic growth. These effects have led to the reduction of the country's economic growth through limiting the total import, import of capital goods, import of intermediate goods and primary products as well as exports. Youssef Farji Dizji (2012) in a research investigated the shocks caused by sanctions on Iran's sanctions targets and used a dynamic model in combination with reaction functions and used the assumption of a complete embargo on Iran's purchases by the European Union and the United States of America to evaluate it. is The important issue of this research is how the actions and reactions of economic and political variables affected by sanctions were obtained and how they are effective in determining the outcome of sanctions. According to the time frame examined in this research, almost 83% of Iran's exports, 34% of government revenues and 24% of gross production in Iran are related to sanctions targets. Faraji Dizji (2012) has modeled the embargo as a real per capita oil income shock. The results of this research show that sanctions have significant effects on the fundamental variables of Iran's economy. Of course, the effects of the sanctions are limited in time and only during the first two to four years of the sanctions, because the changes and actually the adjustment of the economic structures will reduce the economic and political effects of the sanctions and the initial effects of the sanctions on the variables of government expenses, imports, gross capital supply and GDP per capita has been negative and significant. According to the results of this study, the impact of sanctions on prices and exchange rates is low and can be excluded. The result of imposing sanctions on the variables over time is Mana. Therefore, it shows the positive political effects of sanctions in the short term. In this analysis, the direct evaluation of the effects of the sanctions on the economic variables is avoided because the direct variables of the sanctions are practically not available. Shokri and Naderi (2012) in a research entitled "Investigation of the relationship between macroeconomic factors and credit risk of banks during the period 2012 to 2018", using the sample data of 15

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commercial banks of J.A.A. who had used the panel data method, concluded that the relationship between variables of economic growth rate, inflation rate, stock price index and exchange rate (dollar) with credit risk is positive and significant and the relationship of money volume with credit risk is meaningless. Mirzaei et al. (2013) in a research entitled the uncertain effect of macroeconomic variables (exchange rate and inflation) on the credit risk of legal customers of Bank Tejarat during the years 2013-2015, using econometric models and in the form of several tests, concluded that the effect Uncertainty of exchange rate and inflation on the credit risk of Tejarat Bank is positive and significant. Kariuki Washington1 (2014) in a research entitled the effect of macroeconomic variables on credit risk in Kenya's banking system, has investigated the macroeconomic environment as a vital driver in the formation of NPL2. The main purpose of this study was to investigate the effect of macroeconomic variables on the credit risk of commercial banks in Kenya. The dependent variable in NPL and the independent macroeconomic variables included GDP per capita growth rate, loan interest rate, exchange rate between the US dollar and the Kenyan shilling, inflation rate, and the granting of internal credit to the private sector by commercial banks. The time frame of the above research was from 1990 to 2013 based on annual secondary data. In this study, the OLS method was used using the error correction model, and the results showed that only GDP per capita growth rate had a strong significant relationship with credit risk in short-term returns. But the results of the long-term model have shown that the relationship between the exchange rate between the US dollar and the Kenyan shilling with negative credit risk and also the relationship between the allocation of domestic credits to the private sector by commercial banks with negative credit risk was significant. Also, the result of the model stated that the relationship between inflation and credit risk was negative and significant, and in addition, the relationship between loan interest rate and credit risk. Ray has also been positive. Castro (2012) conducted a study entitled macroeconomic factors determining credit risk in the banking system for 5 European countries, Greece, Ireland, Portugal, Spain and Italy during the period from 1997 to 2011. The results of the research showed that bank credit risk is significantly influenced by the macroeconomic environment. Credit risk increases with a decrease in GDP growth and stock prices, and increases with an increase in the unemployment rate, interest rate, credit growth and exchange rate. Also, in this study, a significant increase in credit risk has been observed during the recent financial crises.

4. Research model

4-1 Sanction index

Before dealing with the sanctions index, it is necessary to explain that variables such as the price of imported and exported goods, the exchange rate, the country's share of global production and crude oil exports, the country's share of foreign direct investment, the US share

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of Iran's foreign trade, the exchange rate premium , the variance of the exchange rate and the ratio of the non-oil trade balance to the GDP can be evaluated among the variables affected by the embargo, which are the main channels of influence of the embargo on the key variables of the country's economy. It was mentioned earlier that the exploratory factor analysis method is used to perform calculations to extract the sanctions index. Therefore, after the detailed introduction of the indicators and variables affected by the embargo and the calculation of related descriptive statistics and figures, the steps of extracting the common factor or factors have been implemented. Considering that the economic sanctions of Iran started in 1358, the factor analysis is for the period after the victory of the Islamic Revolution until the end of the 1990s.

1 Kariuki Washington

2 Non-Performing Loan

Like many other developing countries, one of the fundamental problems of Iran's economy is the existence of various problems in the production sector, the result of which is the failure to match the economic supply with the demand conditions. Various studies have been conducted based on macro econometric models for research on Iran's economy, but none of them have a model that evaluates the effects of sanctions. Of course, considering the influence channels of sanctions through the import and export channel, macrometric models in which exactly these parts are emphasized, can be a better macrometric model to explain the effects of sanctions. Therefore, in the present article, the small macrometric model 1 is used considering the limitation of the number of equations and endogenous variables of the model, and further considering the limitation and summarization of the article and on the other hand, the clarity of the structure of the equations and the existence of similarities in the mathematical principles of such equations in macrometric models Small with similar studies of other researchers, so the researcher's preference is to present only some of the main parts of the equations and finally, the complete presentation of the findings.

It is necessary to explain that in this experimental study, the best possible fit for behavioral equations and model associations in the set of economic growth rate equations, in the subset of structural equations of the small macroscopic model based on the neoclassical growth model introduced by Barrow and Lee (1991) will be Based on conditional convergence, this model defines the relationship between "the distance of initial income from its stable state" and "economic growth rate" as a direct relationship; The greater distance of income from its stable state indicates the greater distance of physical and human capital as well as technical efficiency from its long-term stable levels. In other words, the more stable the capital and technology levels are, the higher the possibility of investment and technology expansion from advanced economies towards the embargoed country. This structure can actually explain the fact that rich

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countries with a relatively higher capital stock actually have a lower economic growth rate because the higher growth rate actually belongs to countries with low per capita income, the background of which is the dependence of long-term income levels on two political and structural variables. is In other words, the more the policy and structure of the economy are healthy and appropriate, the more the stable levels of income will increase. Therefore, to obtain any initial level of income, faster growth is needed. Nofarsti and Dargahi (1401), for a better understanding of the long-term situation or the stable situation, believe that within the framework of this growth model, the analysis and explanation of the stable situation towards which the economy tends or even converges at time t is completely based on the real policies that are taken at time t It depends. For example, if the economy is dependent on world trade in the time period t, it has a lower level of sustainable income compared to the state of open economy. For time series data, these researchers have proposed a model equivalent to the point specification of Barrow's generalized neoclassical growth model for cross-sectional data in a mathematical form, which for the sake of summarizing the article, they are refrained from presenting them, and it is preferred to explain that in the neoclassical growth model, the diminishing returns on capital mean that For a certain level of production level per capita -

- In its stable state, economic growth and more precisely; The growth rate of production per capita has an inverse relationship with the level of current development per capita. In other words, the rate of economic growth (production per capita) increases with the increase in the level of production per capita - in its steady state. Of course, it can be explained that government decisions and policies, economic system and demographic coordinates are the most important factors of changes in the level of per capita production in its stable state. It can also be concluded that in the mentioned model, continuous improvements in some government policies in the first stage increases the growth rate of per capita production and adds to the level of per capita production over a certain period of time. On the other hand, with the increase in production, the law of diminishing returns is activated and ultimately the growth rate of per capita production is affected by it, and more importantly, it is matched and coordinated with the growth rate of long-term technological progress, which is determined in the core of the structure of the standard neoclassical model outside the model. does Barrow (1999) believes that in a very long-term perspective, government policies can only affect the level of per capita production and have no effect on the economic growth rate.

In order to estimate the sanctions index and the macroscopic model, almost 100 endogenous and exogenous variables have been used, 10 of which are the price index of imported goods (PM) and export goods (PX), the exchange rate (PX PM), the country's share of global production (OILPS) and Crude oil export (OILEXS), the country's share of foreign direct investment (FDIS), the US share of Iran's foreign trade (USIRITR), premium (PEREX) and exchange rate variance (VAREX) and the ratio of non-oil trade balance to GDP (TDNOIL) , is

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related to sanctions and the rest is related to macroscopic model. The explanation is that the first two variables are based on the base year of 1376 and were extracted from the time series information of the Central Bank and the national accounts of the Central Bank. The exchange relationship, obtained from the ratio of the price index of exported goods to imported goods, for the two variables "country's share of global production and crude oil export" from BP1 global energy statistics, "country's share of foreign direct investment", from secret information bank UNCTAD, "America's Share of Iran's Foreign Trade", from the American Statistics Center2, "Exchange Rate Premium" which is obtained from the ratio of the official exchange rate difference from the unofficial exchange rate to the official exchange rate and also "Exchange Rate Variance" which is from the variance The difference between the official and unofficial exchange rates is obtained based on the seasonal information of the exchange rates, both of them are extracted from the time series information of the Central Bank and the indicators of the Central Bank, and finally "the ratio of the non-oil trade balance to the GDP", from the national accounts of the Central Bank. In order to avoid increasing the volume of this study, the endogenous variables are also available in separate and organized tables. Due to the excessive transparency of the system of simultaneous equations used, the three-stage ordinary least squares equation was used to estimate this model, and the estimation period, as mentioned earlier, was in the period of 1357-1390 according to the available statistical data. And the estimation of the model has been done with "EVIEWS" software. Obviously, due to the existence of various fits in relation to the estimation of this model, the best fit has been tried in this article. Table 1 shows the total variance of the existing variables before rotation. "Especial values" block 3 is the total variance of the variables, which is estimated with the help of a special factor.

Table 1. Sampling sanity test to investigate the exploratory factor (factor analysis)

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	4.831	40.252	40.252	4.831	40.252	40.252
2	3.170	26.419	69.311	3.170	26.419	69.311
3	1.328	11.072	73.981	1.328	11.072	73.981
4	0.891	7.427	79.218			

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5	0.639	5.326	90.006			
6	0.531	4.471	92.653			
7	0.463	3.862	97.114			
8	0.335	2.793	99.093			
9	0.171	1.428	99.674			
10	0.850	0.709	99.903			

The special value for the first factor is equal to 4.831. Due to the fact that the maximum total variance calculated by the factors is from the division of the first factor by 10 (the number of variables affected by the sanctions), the ratio of the variance that can be estimated by the first factor is equal to (40.252=12 ÷ 831.4) percent which is in the column "Variance percentage" 1 is specified. The second factor is 26.4% and the third factor is 11%, describing the total variance of ten variables. The tenth factor also represents 0.7% of the total variance. The percentage of variance determined by the factors is one of the most important rules for determining the quantity of factors. According to the data in Table 1, it can be assessed that the first three factors have eigenvalues greater than one and explain 77.74% of the total variances of the 10 variables. In the falling diagram 2 related to the factors, it is explained that the third and later factors do not provide many explanations.

Table 2. Calculation figures of factors one and two (source: research calculations)

Sanction	**the year**	***Sanction***	**the year**
-0/06	1375	-1/32	1358
-0/31	1376	-1/51	1359
-0/34	1377	-1/62	1360
-0/42	1378	-1/49	1361
-0/41	1379	-1/43	1362
-0/90	1380	-1/30	1363

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-0/74	1381	-1/41	1364
-1/02	1382	-0/92	1365
-0/87	1383	-1/07	1366
-0/99	1384	-0/92	1367
-1/31	1385	-0/51	1368
-1/42	1386	-0/89	1369
-1/58	1387	-0/78	1370
-1/69	1388	-0/42	1371
-1/79	1389	-0/34	1372
-1/83	1390	-0/29	1373
		-0/11	1374

On the other hand, among the extracted factors, it should be noted that the variable coefficient of the country's foreign direct investment share is almost zero in the third factor, and on the other hand, the coefficient of other variables is less than 10%. Therefore, it can be claimed that the third factor (exchange relationship) does not have the nature of a representative variable of sanctions because most of the variables do not share significant variance with it. Considering that all the variables affected by the sanctions must have a significant variance share with the factor carrying the sanctions and the correlation coefficient of the second factor is less than 7%, so the probability that the second factor carries the variance is very low. But the first factor of the correlation coefficients of the variables affected by the embargo and the first factor is suitable, and therefore it can be concluded that this variance variable includes the effects of the embargo.

Further, by calculating the sanctions index, the effects of the sanctions were tried in the form of two components of the increase in commercial costs related to the export and import process (specifically through the equations related to the price of export and import goods through the exchange relationship) and also the direct effects on Some behaviors of the economy (import equations, non-oil exports, private sector investment and GDP growth) should be investigated. The final judgment regarding the direct impact of sanctions on each of the above functions has been taken into consideration through the significance of the coefficient of the sanctions index

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in each of the equations, and the indirect effects have been investigated through the relationship of the equations in the system. Table 3 shows the significant values of the sanctions index coefficients in the 5 equations of economic growth rate, private sector investment, import, non-oil exports and the exchange relationship, which are considered to be the direct influence channels of the sanctions.

Table 3. Significant coefficient related to the sanctions index in the macroeconomic model (source: research calculations)

The significance of the coefficient related to the sanctions index in the equations		
P-Value	**T-Student**	
0/001	4/4-	Economic growth rate
0/73	-0/8	Private investment
0/34	-1/6	Import volume
1/002	0/2	The volume of non-oil exports
0/14	-1/9	Exchange relationship

According to previous calculations and explanations, the most important meaningful interpretation; The inverse relationship of the sanctions variable is with the increase in the economic growth rate and the exchange rate. It can be said that these two variables show a decreasing trend with the tightening of sanctions on Iran. More precisely, the negative effects of sanctions on the two variables of the economic growth rate and the exchange rate are directly interpreted. Due to the complete clarity of the structure of the simultaneous equations estimated in this paper, the 3-step ordinary least squares method with "EVIEWS" software has been used to estimate this model. The results of calculations and evaluation of direct effects in the equations of economic growth rate and exchange relationship are as follows:

The resulting negative coefficient (-32.9) shows that the level of real per capita income has an inverse relationship with the economic growth rate. The positive coefficient of the exchange

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relationship with the economic growth rate (4.5) also explains that with the increase in the average price of each unit of exported goods compared to each unit of imported goods, the economic growth rate increases. The coefficients of the two variables of private and government investment to GDP are also positive, which shows the positive effect of this variable in increasing the growth of GDP. The important point is that the amount of influence of sanctions on economic growth is very high compared to the exchange relationship, and this can be considered a serious warning. The coefficients given in Table 2 are also quite significant. According to the results of the calculations, the increase in the real exchange rate leads to an increase in the average tariff as well as an increase in the exchange rate of the previous period. As the embargo gets more severe, in fact, the relationship of exchange to the loss of the embargoed country decreases. In this study, like some other similar researches, because the effects of sanctions on economic variables were examined with a simultaneous equation system model, the effects of sanctions on endogenous variables of the model can also be observed indirectly. Of course, in order to analyze and accurately analyze the effects of sanctions on the endogenous variables of the model, simulation is needed.

Considering the title of this study and the researcher's focus on indirect effects, it is necessary to explain that identifying the indirect effects of sanctions - on the economy and specifically: non-current claims of banks - can also be calculated and identified by simulation. Therefore, this important was done with two basic methods and "method 1". In the base method, the model is done with the sanction variable and in method 1, the model is done by removing the sanction variable. The difference between the absolute value of each of the endogenous variables in the case of method 1 with the base method represents all the effects of sanctions on each variable. For a more detailed explanation; Three concepts of "variable coefficient of sanction", "total effect of sanction" and "ratio of total effect of sanction to variable" were discussed, which are defined as follows:

All the effects of sanctions: By calculating the average difference of the simulated value for the endogenous variable in method 1, "removing the sanctions variable" from the calculation value based on the base method (in terms of the sanctions variable) can be seen and evaluated in the target period.

The coefficient of the variable sanction: in fact, it is the ratio of the total effect of the sanction to the amount of the variable sanction in the target period in Table 1.

The ratio of the total effect of the sanction to the variable: the ratio of the total effect of the sanction to the amount of the endogenous variable (variables under investigation) in the desired period of each of these variables can be checked in different time periods, and since the maximum effectiveness of the endogenous variables of the model of the sanction is related to the year 2009, And the effects of sanctions on the endogenous variables of the model were

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strengthened by increasing the volume and amount of sanctions during the following years. To summarize the output results, only the year 2018 has been calculated.

Table 4. Simulation of the impact of sanctions on selected variables under study (source: research calculations)

The ratio of the total effect of sanctions to the variable	The whole effect of sanctions	Sanction variable coefficient	period
2-31 (percent)	9.8- (percentage)	6- (percentage)	Economic growth rate
(percentage) - 1.2	4891- (billion Rials)	2691- (billion Rials)	private consumption
(percentage) - 7.9	10729- (billion Rials)	5941- (billion Rials)	Private investment
(percentage) - 9.13	13972- (billion Rials)	7996- (billion Rials)	import
-1.3 (percentage)	2013- (Billion Rials)	917- (billion Rials)	Non-oil exports
9.09 (percent)	2692 (billion Rials)	1547 (billion Rials)	Tax revenue
323/- (percentage)	-0.01 (percentage)	-0.05 (percentage)	Exchange relationship
-5.3 (percentage)	11/169- (thousand billion rials)	79/96- (thousand billion rials)	Liquidity
2.5 (percent)	14.49 (percent)	8/31 (percent)	Consumer price
-0.48 (percentage)	98- (thousand people)	59- (thousand people)	employment
6.13 (percent)	98 (percent)	59 (percent)	Price index of imported goods

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(percentage) -8.8	29- (percentage)	17- (percentage)	Price index of export goods

According to Table 4, by conducting simulation in the period of 1358 to 1390, it was explained that the economic growth rate and then the exchange relationship have the highest effectiveness and that is also a reduction of the sanctions variable. For example, the effect of sanctions more than twice the absolute value of the economic growth rate in 2013 had a decreasing effect on this variable. The effects of the sanctions on the exchange relationship have caused this rate to decrease by more than 23% this year. After that, imports with a decrease of 13.9 percent and the price index of imported goods with an increase of 13.6 percent (relative to the absolute value of these variables) have the greatest impact from the sanctions. The price index of export goods and private sector investment have also been adversely affected by this variable. Liquidity, non-oil exports and private consumption have slightly decreased with the increase of sanctions and the price index of export goods has also increased slightly. Of course, the results of this simulation show the partial impact of taxes and employment on sanctions.

5. Conclusion

Due to the fact that there are no suitable quantitative indicators for sanctions, therefore, most of the researches related to the evaluation of the effectiveness of the sanctions are only focused on clarifying the existing channels in the economic sectors that affect the sanctions. Many studies show that apart from being fruitful for the parties, sanctions affect various economic sectors such as economic growth, investment, trade and employment. Therefore, this research tried to show that for effective and accurate policies; In addition to the influence channels, the exact amount of sanctions effects on these sectors should be evaluated based on quantitative models. Therefore, in this study, the effectivity of trade, investment, employment and economic growth sectors from sanctions and the reasons for the emergency of government support are investigated. In the simplest classification, the general effects of economic sanctions can be classified into three categories: import, export, and capital inflow and outflow. Sanction index was obtained using exploratory factor analysis method and using 12 variables of the first layer of sanctions. Using the small macrometric model, the effects of sanctions on macroeconomic variables were obtained. The results of this study showed that the effects of sanctions on the two variables of economic growth and the exchange relationship are completely direct, and on other variables through the influence of these two variables. Inevitably, apart from calculating the direct effects of the embargo, indirect effects were also investigated using simulation tools. The difference in the value of the variables in the base method (by applying the sanction variable) and method 1 (by removing the sanction variable) determined the impact value. The

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results explained that in 2013, the effects of sanctions on the variables of private consumption, private investment, non-oil export, tax revenue, liquidity, consumer price, employment and the price index of export goods were respectively equal to -2.1, -7.9, -3.1, 0.99, -3.5, -2.5, -0.48, and 8.8 percent of the absolute value of these variables in 2013 were in accordance with the results of experimental studies by other researchers.

The point is that this study was actually done by focusing on the calculation of the effectiveness of twelve indicators of economic sanctions, on the other hand, due to the proven impact of the mentioned indicators on non-current demands which have been examined and proven many times by various researchers and in various studies, therefore the role of Sanctioning on non-current claims of banks is undeniable and should be clearly explained. Therefore, it can be concluded that the consequences of the calculations and results of this article, as well as in accordance with the direct and indirect types of influence of different indicators of sanctions, evaluated the sanctions index as effective on the amount of non-current claims of banks. In other words, relying on the results of this study, it can be concluded that economic sanctions - due to the effectiveness of twelve indicators - have an indirect effect on the non-current claims of banks and even on some directly. More precisely, based on the findings of this research, the direct effects of sanctions are significant only in the economic growth and exchange relationship, and they are evaluated indirectly - and of course completely - on other variables.

5-1. Suggestions

According to the calculations, graphs and tables of this study and the results, these suggestions are presented: the index of the exchange rate after the economic growth index has the most influence of sanctions, so it is suggested that in the conditions of sanctions, the import of luxury goods that leave a lot of currency from the country are absolutely prohibited and government support for the production of some imported goods in the country should be taken into account. Of course, on the other hand, the lack of exports can be compensated to some extent by increasing the variety of export goods. It is obvious that imports decrease more than exports in the conditions of sanctions, and this means the improvement of the level and trade balance in the conditions of sanctions. Therefore, government support policies for the production of export goods in times when sanctions are intensified, is one of the most important suggestions of this study. Controlled helping and frugal management of private expenses, private investments, and reducing economic growth are able to support and strengthen the country's economy in recessionary situations. Therefore, it is recommended that the government, while managing the budget, should also prevent the excessive reduction of construction costs in order to somehow strengthen the effective demand in the monetary economy and thus take it out of stagnation and stagnation.

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