

The effect of exchange rate fluctuations and the introduction of nanotechnology on Iran's agricultural exports and solutions, using the self-return model with distributed interruption (ARDL)

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ABSTRACT: In this study, considering the importance of non-oil exports (especially agricultural goods) which is the basis of trust of each country and due to its importance in the current economic conditions of Iran as a supplier of raw materials for food processing industries, the effect of exchange rate Which is one of the key variables affecting the export process of non-oil and agricultural goods to be studied on these products. Of course, to facilitate the production and export of this sector due to many challenges such as increasing population growth and demand for food supply, climate change, environmental problems such as the accumulation of toxins, chemical fertilizers and pesticides, limited agricultural land and resources Water The use of modern techniques in the world, including nanotechnology and nuclear technology, etc., has become more important in the agricultural sector. In this research, the library method has been used to analyze the subject and in preparing the required statistics, an attempt has been made to use the latest official statistics of the country, which have been taken from the Central Reserve Bank, National Customs, Ministry of Jihad Agriculture and other organizations and institutions. In the present study, the time period studied is from 1992 to 2011. For this purpose, after static tests, the Distributed Interval Distribution (ARDL) model has been used to estimate the relationship between agricultural exports and the exchange rate, as well as other variables studied. The results show that in the short run there is a direct effect between rising exchange rates and increasing exports. The results also show that there is an inverse relationship between the relationship between trade and export of the agricultural sector and between the relationship between trade in the previous period and the export of the agricultural sector in the current period and a positive relationship between value added of the agricultural sector, agricultural production and agricultural capital. Thus, it is recommended that some non-price policies such as structural changes in preferred or higher comparative goods due to increased international competitiveness as much as exchange rate changes improve the export situation and consequently improve the trade balance on the agenda to be placed.

Keywords: *Agricultural Exports; Distributed Interval Distribution Pattern (ARDL); Exchange Rates.*

INTRODUCTION

The economic growth literature, special attention has been paid to foreign trade as a growth factor. Hence,

the strategy of encouraging exports as a successful strategy has been considered by many economists. In this regard, some economic studies as well as the expe-

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rience of developing countries, especially Southeast Asian countries, show that exports can be an engine and driver of economic growth and development (Khaliqi Sikaroudi and Shaukat Fadai, 2012). Iran's foreign trade is characterized by the export of single products and strong dependence on foreign exchange earnings from oil exports. Since the emergence of oil in Iran until today, the share of exports of this product in total exports has been increasing. However, due to fluctuations and uncertainty in the realization of oil revenues, today the expansion of non-oil exports is an undeniable necessity. On the other hand, it is believed that the agricultural sector in Iran has a high potential in the global market due to the vastness of the land and the diversity of climate (Barghandan *et al.*, 2012).

According to the foreign trade statistics of the Customs of the Islamic Republic of Iran, in 2009 the value of agricultural exports was equal to 3660/9 thousand dollars, which is equal to 23.9% of the total value of non-oil exports. During 2007 and 2008, the share of the agricultural sector in total non-oil exports is equal to 23.7% and 22.8%, respectively. By examining the situation of agricultural products in world rankings, the results show that Iran has the first to seventh positions in some of the products, for example, in the production of pistachios, dates in the second place, pomegranates in the first place and in the production of cherries. Grapes, apples, almonds, citrus fruits and figs are ranked first to seventh in the world. Therefore, it can be said that Iran is one of the major fruit producing countries in the world and in terms of diversity of about 100 types of horticultural products in the world, 50 products are produced in Iran and in terms of diversity of production in the world is a very high ranking. It is important. (Barghandan *et al.*, 2012).

In exporting the agricultural products, the government has made direct and indirect price interventions in the export of agricultural products. Restrictions on the export of agricultural products were widespread until a decade ago, which led to lower domestic prices for exportable products. The government's indirect interventions were related to the policy of keeping the exchange rate low, which has caused the most damage to agricultural exports. In recent years, programs have been launched to balance the economy and establish a stable economic environment, for example, in some

cases the government has set up several exchange rates to establish the real exchange rate and then to Make a single exchange rate. As a result, exchange rate fluctuations, which have always been severe, have been substantially reduced. However, the lack of an efficient marketing system has greatly reduced the benefits of this policy. Since the agricultural sector is not only affected by the policies of this sector and due to the structural relationship between all macroeconomic variables, the exchange rate is affected and exchange rate fluctuations can be achieved through different levels of prices, production and exports. And affect imports. Therefore, in order to determine and explain the correct and appropriate exchange rate policy in the near future, the export of products in this sector can be improved to an acceptable level. For this purpose, in this chapter, the assumptions, objectives and other aspects of the research have been studied (Hassani Dizaji, 2011).

Iran's capabilities in the field of production and supply of agricultural products have caused a major volume of the country's non-oil exports to be allocated to these products. Therefore, the export of agricultural products is an important source of foreign exchange injection into the country, and since the agricultural sector is a strategic sector, so strengthen it, both internally to ensure political and economic independence and externally to implement policy. Expansion of non-oil exports is necessary to obtain foreign exchange resources. Considering the share of this sector in the total non-oil exports and its potentials in the country, ie the unique climate diversity of the country, significant facilities in suitable agricultural soil, diversity and production of agricultural products and considering that this sector, The context of economic activity is close to half of the country's population and also less dependence of this sector on complex technology seems to be necessary to investigate the factors that affect the export of this sector. Therefore, due to the existence of vast potentials in the agricultural sector of Iran, in this study, an attempt is made to identify the factors affecting the export of the agricultural sector, a step to promote trade in this sector and its global position. Agriculture is one of the main sectors of the economy that due to its share in GDP, employment, foreign sector and food security in the field of trade policy should

be given special attention. In addition, this sector is very important in economic independence and self-sufficiency of the country's economy, and economic independence in turn is one of the important principles of the constitution. The agricultural sector is the platform of economic activity for nearly half of the country's population and less dependence on complex technologies as well as extensive production facilities are among the characteristics of this sector (Hassani Dizaji, 2011). However, it should be noted that despite the less dependence of the agricultural sector on technology, the introduction of some new knowledge, including nanotechnology, can be an effective step in the production and export of this sector. For example, nanotechnology can be used in the correct use of pesticide quality, sensors in identifying harmful factors in farms, packaging containers in pesticides, filtration in agricultural products and production of livestock, poultry and aquatic inputs, agricultural biotechnology, animal health care. This technology will be useful to reduce the cost and production process of many agricultural and food products. These technologies in industry and agriculture will increase productivity in production and increase the risk of investors in the production and export of products. According to the above, one of the important sectors in non-oil exports is the export of the agricultural sector, which is mentioned in this article.

REASERCH METHODS

Method

This present study has dealt with the effect of exchange rate on the export of Iranian agricultural products. The present study has been studied spatially around the axis of the Islamic Republic of Iran and its trade borders. From the time perspective, the research has been studied during 1992-2011. In this research, in order to express theoretical issues and collect information, the library method including documents and documents contained in books, articles, dissertations, etc. has been used. Also, the data required for this research have been obtained from statistics and information available in the Central Reserve Bank, FAO, Customs of the Islamic Republic of Iran, Trade Development

Organization of Iran and the Ministry of Jihad Agriculture. Gathering required information and statistics in the first step, then we used econometric models to select the general shape of the appropriate model in relation for the research topic. In the next step, with the help of econometric methods such as time series tests (static and convergence), the relationship between the relevant variables and the export of the agricultural sector is calculated. Also, the self-distribution model with wide ARDL intervals has been used to estimate the equations.

Static and non-static time series:

Any of the time series data can be generated by a random process. In time series models, it is very important to know whether there are random conditions for the model or not. In other words, we are to detect if it can be assumed that the series remains unchanged over time? If the characteristics of our random process change over time, the above series is said to be unstable. In this case, a serious problem arises to impose and predict the series. That is, if the randomness does not change over time (it is a static series), we can estimate the constant coefficients using the previous data. As a brief discuss we shall say, a random process becomes static when its mean and variance remain constant over time. In this case, we are able to estimate fixed coefficients using previous data. so, if a time series be static, it is necessary for the mean and its variance to remain constant over time, and for the amount of covariance between two time periods to depend only on the number of intervals or the interval between two time periods. It means:

$$E(Y_t) = \mu \quad (1)$$

$$\gamma_k = E[(Y_t - \mu)(Y_{t+k} - \mu)] \quad (2)$$

$$\text{VAR } Y_t = E(Y_t - \mu)^2 = \sigma^2 \quad (3)$$

Here γ_k is the covariance at the k interval is equal to the covariance between the value Y_t and Y_{t+k} . In fact, between two values of Y where K interrupts are spaced, $K=0$, in this case we have γ_0 equal to the variance Y (σ^2). If $k=1$, the covariance γ_1 is two consecutive Y. Now if we assume that our origin moves from Y_t

to Y_{m+t} and if Y_t be static, the mean of variance and covariance of Y_{m+t} should be the same. This means if the time series is static, the mean, variance, and covariance (for different intervals) remain constant, no matter what time we calculate them.

Unit Root Test checking

In order to achieve reliable results from estimating the desired model, the variables used in the model must first be tested statically. In this study, Generalized Dickey Fuller (Augmented Dicky-Fulle Test) was used to investigate the statics of the variables in the pattern.

Augmented Dicky-Fulle (ADF) Test

For the instability test, first we hypothesized that the time series in question had a first-order self-explanation process, and then tested the hypothesis H_0 accordingly. If this assumption is not correct and the under studying time series has its own ρ order, the estimated relation for the ρ test will not have a correct dynamic statement and this will cause the regression error sentences to be correlated. Once the error statements are self-correlated, the Dickey and Fuller test can no longer be used for reliability because in this case the limit distribution and critical quantities obtained by Dickey and Fuller are no longer correct. For this reason, Dickey and Fuller in 1981 generalized their model by assuming self-correlation of disturbance components. He used dependent variable latency values to eliminate autocorrelation; Because the correlation created between the perturbation components is due to the existence of delay values of the dependent variable, which removes the correlation. Therefore, the generalized model is as follows:

$$\Delta Y_t = \delta Y_{t-1} + \sum_{i=2}^p \beta_i \Delta Y_{t-i+1} + \varepsilon_t \quad (4)$$

ΔY_{t-i+1} Delay values, are dependent variables. They also tried to expand their pattern for different time series by adding a fixed component and a linear time trend. Dynamic self-return pattern with distributed interrupt: To estimate the relationships in the model for examining the short-term and long-term relationships

between the dependent variable and the explanatory variables of the model, co-integration methods such as Angel Granger can be used. However according to limitations in Using this method and also to avoid the shortcomings of this model, such as the presence of oblique in small samples and the inability to test statistical hypotheses, more appropriate methods for analyzing long-term and short-term relationships between model variables It has been suggested that one of the most important of these is the ARDL approach (Pesaran, 1997). Using this approach does not require the same degree of co-accumulation of variables that is necessary in the Granger parasite pattern. This method also estimates the long-term and short-term patterns in the model simultaneously and solves the problems related to the removal of variables and autocorrelation, so the ARDL method estimates to avoid problems such as autocorrelation and endogenousness. They are inexperienced and efficient. For this reason, in the present study, the ARDL model and also the Microfit software package has been used to estimate the models and perform related tests.

Description of the model used

As stated, the model used in this study is designed according to the investigation of the effect of real exchange rates on exports of Iran's agricultural sector which has been done from 1992 to 2011. In the following, first the general form of the model used is presented and then the variables used in the model will be explained.

Variables and data used:

The general form of the model used, which is the basis for estimating and estimating the pattern of the exchange rate effect on agricultural exports, is as follows:

$$\text{Export Quantity} = f[(\text{LRER}, \text{LTOT}, \text{LAV}, \text{LP}, \text{LPC})] \quad (5)$$

- LRER: Exchange logarithm (real)
- LTOT: Logarithm of agricultural sector exchange relationship
- LAV: Value added logarithm of agricultural sector
- LP: Logarithm of agricultural production
- LPC: Agricultural capital logarithm

Among them, the exchange rate, the exchange relationship between the agricultural sector, the value added of the agricultural sector and agricultural capital have been extracted from the site of the Central Reserve Bank, as well as the production of the agricultural sector from the FAO site. In the following, the pattern variables are explained.

a) Real exchange rate (in terms of purchasing power parity): In this study, to calculate the real exchange rate, the definition of this rate is used based on the theory of purchasing power parity. According to this theory, the real exchange rate is obtained by multiplying the ratio of foreign prices to domestic prices by the nominal exchange rate. In many cases, instead of using price ratios, the emphasis is on price ratios. In this method, the real exchange rate is calculated as follows:

$$E_{PPP} = \sum_{i=1}^m W_i \frac{P_i}{P} E_0 \quad (6)$$

Where E_{PPP} is the amount of real currency, P_i is the consumer price criterion in the countries with the most trade with the country, P is the domestic consumer price criterion, and E_0 is the official domestic exchange rate.

b) Exchange relationship: Trade shocks affect the real exchange rate through their effect on relative prices. The trade exchange relationship of each country is determined by the ratio of the price index of exported goods to the price index of imported goods. External changes in the exchange relationship, such as its improvement, will reduce the real exchange rate, and this decrease will be achieved if the income effect of exchange relationship changes due to its substitution prevails. In general, it can be said that the effect of the exchange relationship on the real exchange rate is ambiguous and depends on whether the income effect is dominated by substitution. In this study, the following equation is used to show the effect of the exchange relationship on the real exchange rate:

$$TOT = \frac{\frac{v_x}{X}}{\frac{v_m}{M}} \quad (7)$$

Where v_x and v_m are the values of export and import in terms of million dollars, X and M are the amount of

export and import in terms of thousands of tons. Thus, the said fraction indicates the value of exports (value of each ton of exported goods) and its denominator indicates the value of the unit of import (value of each ton of imported goods).

Data & Information

This research is done as a library method and the tools are gathering notes and using the tables. The statistical population in this research is the whole agricultural sector and no special sampling method is used in this research due to the nature of the work. In this research, the library method has been used to express theoretical issues and collect information. The data required in this study are from the statistics and information available in the Central Reserve Bank, FAO, Customs of the Islamic Republic of Iran, Trade Development Organization of Iran and Ministry of Jihad Agriculture. Has been extracted. The research data are as follows, in this section the trend of changes in variables will be examined.

Analysis of changes in research variables:

a) Agricultural export: Iran's foreign trade is characterized by the export of single products and strong dependence on foreign exchange earnings based on crude oil exports. Since the exploration of oil in Iran until today, the share of its exports in total exports has been increasing. In addition, oil exports during recent decades, especially after the Islamic Revolution in Iran have always been accompanied by significant fluctuations and the country's economy has faced serious crises. As can be seen in the chart below, the amount of exports of Iran's agricultural sector at the

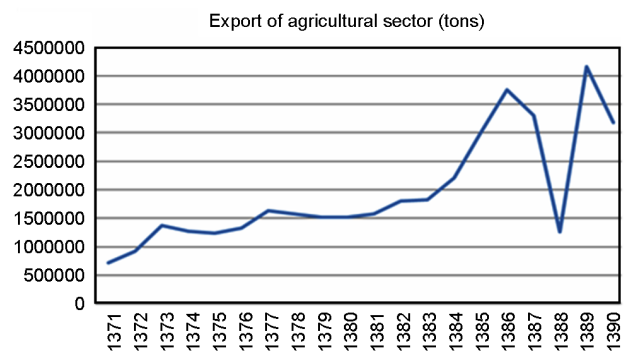


Fig. 1. The trend of changes in the agricultural export during the 1992-2011 era.

end of the study period compared to the beginning of it has increased about 6 times and the highest amount of exports is related to 2010. Also, this amount has been accompanied by fluctuations during the period, the peak of these changes is related to 2009, which reaches its lowest level in recent years.

b) Real Exchange Rate: Since the basis for calculating anything for comparison or other purposes is its actual rate, currency also has two rates: the nominal, and the real rates. And in economic analysis, the real price is always the basis. Exchange rate is an important factor in the export and import of products and inputs, so it has been used in this research. The real exchange rate is another variable affecting GDP, which is obtained using the following equation:

$$RER_t = E \times \frac{P^*}{P} \tag{8}$$

E: Nominal exchange rate

P*: Foreign price index

P: Domestic price index

In explaining the real exchange rate trend, we ought to mention the exchange rate system and exchange rate arrangements in Iran before and after the Islamic Revolution have undergone many changes. Since the 1970s, a multi-exchange rate system has ruled the Iranian economy, which, along with foreign exchange regulations and import controls, has had important consequences for the economy and the efficiency of economic policies. In the years before the revolution, the real exchange rate was stabilized due to high oil revenues and the absence of a crisis in the balance of payments. After the revolution, with the formation of the parallel currency market and the sharp fluctuations of this market during the war, preparations for the devaluation of the Rial (IRR) began unofficially. In 1986, with the global fall of oil prices in the market, the income of the Central Reserve Bank of Iran in the form of foreign currencies decreased. and with the intensification of the imposed war in the years from 1986 upto 1988, the need for foreign currencies resources provided the necessary incentives for creating multi-exchange rate policy and recalculating in non-oil exports and improvement of the trade balance, which held the devaluation of the Iranian Rial (IRR). At the end of the war and the improvement of

oil revenues, the real exchange rate in the free market during the 1990 upto 1993 era decreased during a downward trend. Then according to the negative consequences of economic adjustment policies, the exchange rate faced sudden and temporary fluctuations and jumped to 14000 rials at the beginning of 1995. Subsequently, the exchange rate first reached about 10500 Rials (IRR) in a decreasing trend in 1998 and then resumed its upward trend and increased to 14000 Rials (IRR) in 2000. Since then, and especially over the last decade, the real exchange rate has fallen. During this decade, oil revenues were on the rise and the government injected most of the oil revenues into the country's economy. In contrast, the Central Reserve Bank during this period tried to prevent the oversupply of foreign exchange supply to the market and, consequently, a more sharp decline in the exchange rate by accumulating its foreign exchange assets. In fact, due to the limitations of the Central Reserve Bank in the accumulation of foreign exchange reserves, the role of the government in implementing foreign exchange policy dominated the role of the Central Reserve Bank, which resulted in a downward trend in the real exchange rate. The implementation of the targeted subsidy plan was another reason, because it caused a jump in domestic prices. The chart below shows the trend of real exchange rate changes from the 1970s to the end of the 2000s. Since then, and especially over the last decade, the real exchange rate has fallen. During this decade, oil revenues were on the rise and the government injected most of the oil revenues into the country's economy. In contrast, during this period of time the Central Reserve Bank tried to prevent the oversupply of foreign exchange supply

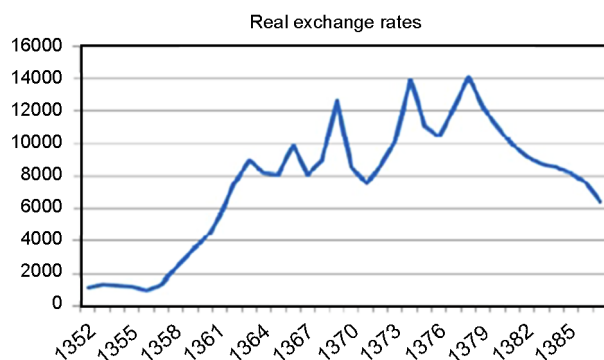


Fig. 2. The trend of real exchange rate changes before and after the Islamic Revolution.

in the market, and consequently a more sharp decline in the exchange rate has been seen by accumulating its foreign exchange assets. In fact, due to the limitations of the Central Reserve Bank in the accumulation of foreign exchange reserves, the role of the government in implementing foreign exchange policy dominated the role of the Central Reserve Bank, which resulted in a downward trend in the real exchange rate. Another reason was The implementation of the targeted Iranian National Subsidy Plan, because it caused a jump in domestic prices. The chart below shows the trend of real exchange rate changes from the 1970s to the end of the 2000s.

c) Agricultural sector exchange relationship: The exchange relationship is one of the criteria for assessing the extent to which the country benefits from commercial interests, so it has a special place in the economy. The exchange relationship is calculated as follows:

$$TOT = \frac{\frac{v_x}{X}}{\frac{v_m}{M}} \quad (9)$$

Where v_x and v_m are the value of export and import in terms of million dollars, X and M are the amount of exports and imports in terms of thousands of tons. Thus, the said deduction form indicates the value of exports (value of each ton of exported goods) and its denominator indicates the unit value of imports (value of each ton of imported goods).

As shown in diagram (3), the exchange relationship between the agricultural sector during the period un-

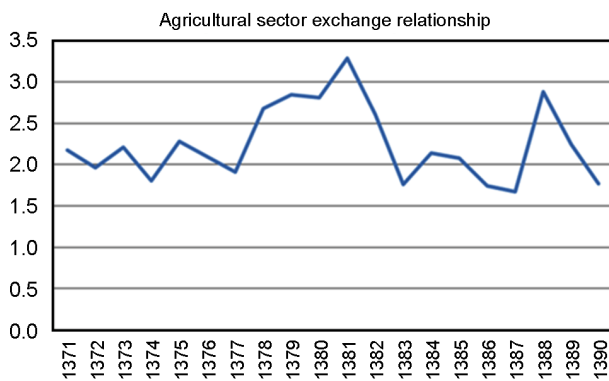


Fig. 3. Trend of changes in the relationship between the agricultural sector during the period 1992-2011 (Source: Research Findings)

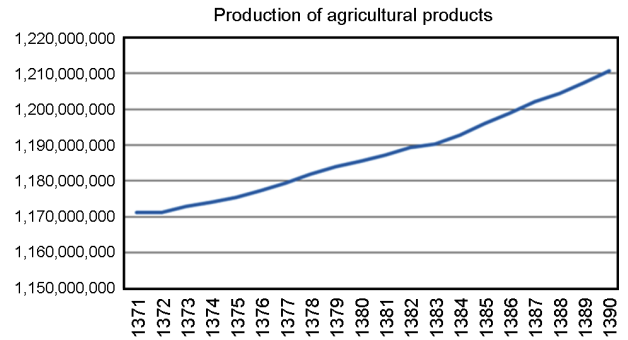


Fig. 4. The trend of changes in agricultural production during the period 1992-2011 (Source: FAO site).

der review is accompanied by successive fluctuations. So that throughout the period this trend is maintained. The highest amount belongs to the year 2002 and the lowest amount belongs to the year 2011.

d) Agricultural production: According to the chart below, the agricultural production has had an increasing trend over a period of 20 years. As can be seen, the amount of production had the highest amount was in 2011 and the lowest in 1992.

e) Added value of the agricultural sector: Today, the quantity of economic variables and elements is an economic criterion that forms the basis of economic theories. In general, national income is the basis of the quantity of economic variables and elements, and usually the amount and economic volume of each society is assessed by the value of the national income of that society, because it depends the result of economic activities of each society is measured by the national income of that society. Accurate calculation and measurement of national income is one of the important economic issues that economists have done a lot of research on. One of the common methods of calculating national income is value added calculation. The added value of the agricultural sector is: the difference between the selling price of products produced in the agricultural sector and the price of the factors used in the production of these products. Iranian agriculturing is one of the most important factor of production and economical issues in this country due to the presence of prominent characteristics in the country such as fertile lands and potential for cultivation of agricultural products, four different climatic seasons, especially high sunlight and abundant labor. So in this part there is asignificant effect on economic growth and devel-

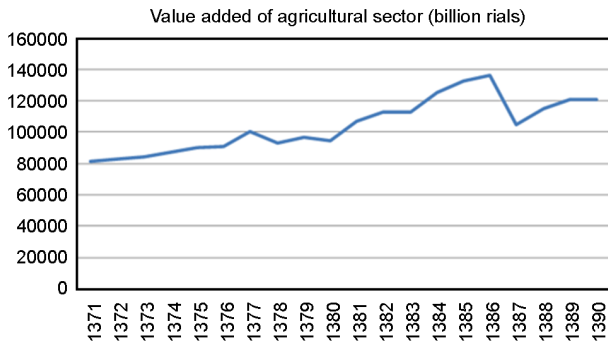


Fig. 5. The trend of value added changes in the agricultural sector during the period 1992-2011 (Source: Central Reserve Bank).

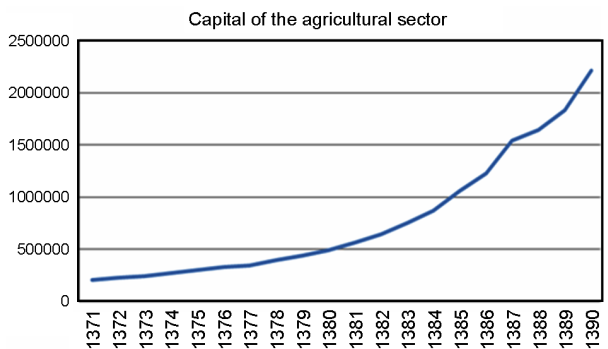


Fig. 6. The trend of changes in the capital of the agricultural sector during the period 1992-2011 (Source: Central Reserve Bank)

opment raise. Iran has undergone many political and economic developments in the period of time under review. However, according to the mentioned issues, this sector has been less affected by these developments and has continued its natural growth trend in terms of added value. Foreign and domestic economic fluctuations have been significantly disabled to affect the agricultural sector. therefore, the trend chart of value added changes confirms this fact. As can be seen

in the chart below, the value added of the agricultural sector has had an upward trend in the twenty-year period of 1992-2011, which reached its highest value in 2007. However, there have been some fluctuations in some years.

f) Agricultural capital: According to the following chart about the capital of the agricultural sector, there is an increasing trend of this variable in the 1992-2011 era. As can be seen in the chart below, the capital of the agricultural sector in 2011 has the highest amount and in 1992 has the lowest amount.

RESULTS

Static test results

The first step in estimating a time series pattern is to study the stationary variables of that pattern. In general, any time series is called weak static when its average variance is constant over time and the amount of covariance between the two time periods depends only on the interval or interval between the two periods and has nothing to do with the actual time of covariance calculation. In order to study the time series statics of this research, the Augmented Dickey-Fuller test was used, the results of which are presented in Table 1.

According to the table above, the results show that the exchange rate logarithm, exchange relationship logarithm and agricultural export logarithm at the static level and the variables of value added logarithm, production logarithm and agricultural capital logarithm become static after one time difference. Therefore, considering that there is a combination of I(0) and I(1) variables in the model, the existence of a cohesive relationship between the variables should be

Table 1. Generalized Dickey Fuller Unit (ADF) Root Test

Variable	ADF statistic	Probability	Degree of accumulation
Exchange logarithm (Lx_1)	-3.505**	0.0195	$I_{(0)}$
The logarithm of the exchange relation (Lx_2)	-2.824*	0.073	$I_{(0)}$
Added value logarithm (Lx_3)	-5.180***	0.000	$I_{(1)}$
Production logarithm (Lx_4)	-3.047**	0.0493	$I_{(1)}$
Agricultural capital logarithm (Lx_5)	-3.164**	0.0395	$I_{(1)}$
Export logarithm of agricultural sector (Ly)	-4.756***	0.000	$I_{(0)}$

* Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level, (Source: Research Findings)

investigated using the appropriate method. Therefore, to analyze the short-term and long-term relationships between variables, the self-explanatory approach with a wide interval was used. Detailed results from estimating the model coefficients are shown in Table 2.

Short-term pattern results

To estimate the effect of exchange rate on Iranian agricultural products during 1992-2011, we investigate in the form of Nerlav model. Data were collected in time series from the Central Reserve bank, FAO, and etc. After determining the degree of stagnation, the model was first specified and the effect of the exchange rate on the export of Iranian agricultural products was specified using the Nerlaw Partial Adjustment Model. Microphite software was used for this purpose. In this function, the dependent variable of Iran's agricultural exports and independent variables include production, value added, exchange rate, exchange rate and capital of the agricultural sector.

In this study, in order to achieve the objectives of the research, the required statistics and information were collected from different resources. The method of data and information collection is through library and data collection tool is note sheet taking and using gathered and analyzed charts and tables.

Using ARDL dynamic model coefficients after estimating the model by the above method and after specifying the model, the coefficient of export of agricultural products with one interval, exchange rate, exchange relationship with one interval, added value of agricultural sector with one interval, production with

one interval and The capital of the agricultural sector was identified in the model without interruption. As shown in the Table above, exports of agricultural products, with one interval, exchange rate, exchange relationship and exchange relationship with one interval at a significant level of 10% and added value of the agricultural sector with one interval and agricultural capital at the level of 5% and production At the level of 1% are significant meaning and other variables are meaningless. Also, the export of agricultural products with a interval is marked with a negative sign, which indicates that the export of agricultural products in the previous period (last year) has a negative effect on the export of the agricultural sector in the current period of time. Of course, it is possible that exports increase annually, but the increase in exports is due to increased in production, and in general can have a negative effect on exports from last year to this year according to the political situation and some export restrictions such as restrictions on LC opening, Transportation and visas. Also sanctions can be effective on export and can be one of the reasons for the negative impact of previous period exports on the current period.

The exchange rate variable has a positive sign. So this indicates the increase in the exchange rate will increase exports in the agricultural sector, which is in versus with the hypothesis of the increase in the exchange rate can be an incentive to improve non-oil exports and trade balance. It is not out of mind and in fact it is as expected. The exchange relation variable, and the exchange relation variable with one interval, which are both significant in the table, show

Table 2. Results of estimating the effect of exchange rate on the export of Iranian agricultural

Variable	Coefficient	T ready
Agricultural exports with one interval logarithm	-0.3	-2.22*
Currency exchange logarithm	+0.1	+2.260*
The exchange relation logarithm	-0.46	-1.97*
The exchange relationship with one interrupt logarithm	-0.425	1.98*
The added value logarithm	0.179	n.s0.35
Added-value logarithm with one interval	1.496	2.348**
Production logarithm	0.38	3.9***
Production logarithm with one interrupt	0.318	n.s46.1
Agricultural capital section logarithm	0.207	2.06**
	F = 20.625 ***	R ² = 0.94

products by (0, 1, 1, 1, 0 and 01) ARDL method

* Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level, (Source: Research Findings)

the importance of this variable. Since, according to the definition of the exchange relationship, the ratio of the price of exported goods to the price of imported goods is as shown in the table, the sign of this variable is negative, which means during this study, the price of exported goods decreased with the price of imported goods in agriculture. We have also caused a decrease in the export of the agricultural sector, which is consistent with many domestic and foreign studies, one of the reasons for which is the lack of technological progress, especially in the agricultural sector. Because the advancement of technology causes the price level in developed countries to get increased and in contrast to the price level in underdeveloped countries, while the exchange relationship indicates the ratio of the price of exported goods to the price of imported goods, as we can obviously see it in most of the underdeveloped countries. A negative sign for this variable with one interval also indicates the same situation. As shown in the table, the added value of the agricultural sector is positive with one interval, ie the increase in value added in the agricultural sector in the previous period will increase exports in the current period, which is in full accordance with previous studies. Also the sign for production is positive and is meaning as production rate increases, so does export, which of course can be said to be a two-way effect. In other words, with the development of exports, there will be an increase in production, and on the other hand, the growth of exports may lead to the creation of expertise in the production of export products and increase in production rate. The variable of capital in the agricultural sector is also significant meaning that means with increase in investment on agricultural sector, exports of agricultural products get increased, which is also consistent with other domestic and foreign studies.

The coefficient of determination of the model is 0.94, which means that 94% of the changes of the dependent variable are explained by independent variables and F of the whole model is significant at the level of 1%, which in fact indicates the significance of the whole model. Diagnostic statistics can be used to ensure the establishment of classical assumptions (lack of autocorrelation, correct sequential form, normal distribution of residual sentences and variance homogeneity). The results of these tests are presented in Table 3.

As shown in the table, the probability of all computational statistics is more than 0.5, it is possible to be sure about the classical assumptions in the model. Now, immediately after the dynamic estimation, the test for the presence or absence of a long-term relationship should be performed. To perform this test, the sum of the coefficients with the interval of the dependent variable must be divided by a fraction and its standard deviation. Given that the absolute value of the computational statistic -8.7 is greater than the critical absolute value of the Brass, Dolado and Master table -4.36, the null hypothesis that there is no long-term relationship was rejected. And it can be concluded that between the variables pattern there is a long-term relationship.

Long-term pattern results

After proving the existence of a long-run relationship between the variables, we present the long-term coefficients obtained from the model estimation. These results are reported in the table below.

The results of this table show that in the long run, the exchange rate variable at the level of 10%, the value added of the agricultural sector and the capital of the agricultural sector at the level of 5% and the ex-

Table 3. Results from diagnostic statistics (Source: Research Findings)

ClasicHypotheis	LM test		F test	
	Probability	Statistic	Probability	Statistic
Waste sentence serial correlation test	2.74	0.19	1.52	0.294
Cryptographic test to specify incorrectly the subordinate form	2.77	0.106	1.54	0.246
Normal distribution of waste sentence test	0.79	0.655	-	-
Heterogeneity variance test	0.792	0.864	0.026	0.783

Table 4. Results of estimating long-term coefficients by (0, 1, 1, 1, 0 and 01) ARDL method

Variable	Coefficient	T statistic
exchange rate	+0.0740	2.58*
Terms of Trade	-0.02	-2.91***
Added value	1.20	2.35**
Production	-0.088	0.31 ^{n.s}
Capital of the agricultural sector	0.15	1.96**

* Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level, (Source: Research Findings)

Table 5. Results of estimating correction and error pattern coefficients (Source: Research Findings)

Variable	Coefficient	T statistic
dx_1	0.1005	0.601*
dx_2	-0.463	-1.97*
dx_3	0.179	0.35 ^{n.s}
dx_4	320.80	3.0***
dx_5	0.207	1.26**
$ecm(-1)$	-1.348	-8.592***

* Significant at 10% level, ** Significant at 5% level, *** Significant at 1% level, (Source: Research Findings)

change relationship at the level of 1% are significant. In the long run, the sign of the variables is in line with expectations. As it is clear, the exchange rate sign is positive and shows the direct relationship between the exchange rate and exports in the agricultural sector, so that a 1% increase in the exchange rate causes a 7% increase in exports, and since the increase in the exchange rate of goods Domestic is cheaper for foreign consumers and therefore increases competitiveness and exports.

As a result, an increase in the exchange rate is accompanied by an increase in exports. The next variable is the exchange relationship, which as it is known, with the increase of the exchange relationship, exports decrease, so that 1% increase in the exchange relationship reduces the agricultural sector's exports by 2%. The added value of the agricultural sector has a positive sign and shows a positive relationship between this variable and the export variable and shows that with the increase of the added value on agricultural sector. The export of the agricultural sector increases and on the other hand the most important factor during the years under review. And at the end of the variable of the capital of the agricultural sector, which with an increase of 1% of the capital of the agricultural sector, the export of this sector increases by 15%. The

coexistence of a set of economic variables provides a statistical basis for the use of line correction patterns. These patterns are increasingly popular in experimental work. The main reason for the popularity of correction and error patterns is that short-term fluctuations of variables are related to their long-run equilibrium values. The results of estimating the correction and error pattern coefficients can be seen in Table 5.

As shown in Table 5, the correction and error coefficient is equal to -1.348 and is significant at the level of 1% and with a probability of 99%, so if the model goes out of balance in less than one year (about less than 6 Month) will be adjusted and will return to equilibrium. The stability of the satisfied coefficients and the model were evaluated by Qsum and Qsum squares tests. Ac-

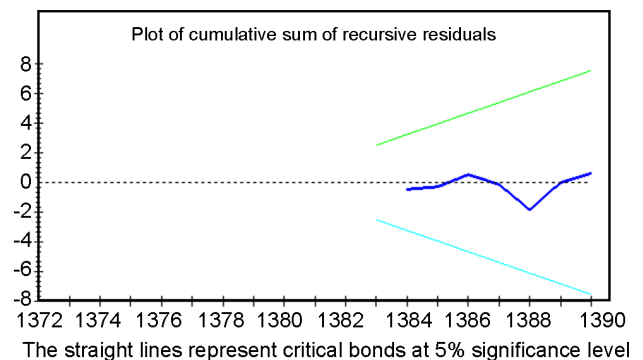
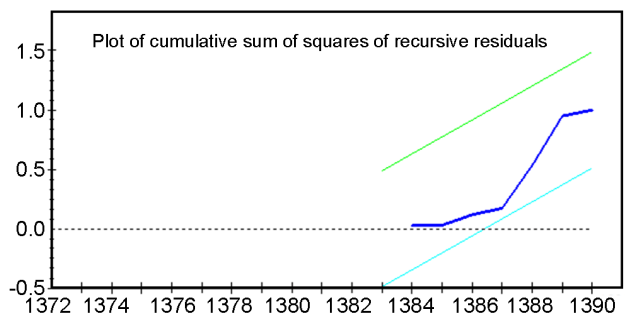


Fig. 7. Qsum test



The straight lines represent critical bonds at 5% significance level
Fig. 8. Generalized Qysam test.

According to diagram 7, since the cumulative waste diagram has not been drawn, the 95% confidence interval has not been broken, the null hypothesis of structural stability is not rejected. According to diagram 8, the existence of structural stability is also confirmed.

RESULTS

Communication

About Iran's economy, considering the importance of reducing the dependence of the country's economy on foreign exchange earnings from crude oil exports and the role of non-oil exports in reducing this dependence and its role in economic development programs, studying the determinants of non-oil exports and provide necessary solutions for development. It is significant that one of the most important non-oil exports is the export of agricultural products, which is also very important and the export trend of these products is increasing. Considering the share of this sector in the total non-oil exports and its potentials, ie the unique climate diversity of the country, significant facilities in suitable agricultural soil, diversity and amount of agricultural production and the introduction of some new and low-cost technologies in the sector Agriculture such as nanotechnology, which are effective in increasing productivity and reducing production costs, and considering that this sector is the platform of economic activity for nearly half of the country's population, it seems that research on factors that affect the export of this sector is necessary. Since the export of Iranian agricultural products in foreign markets has a small share and is affordable, and also the country's exports as a waste of domestic consumption,

so we turn our attention to the supply of agricultural products. Recently, much attention has been paid to the real exchange rate in many issues related to the agricultural economy.

Therefore, in the present article, the effect of exchange rate on agricultural exports has been discussed. The dependent variable of this research is the export of agricultural sector and its independent variables are exchange rate, exchange relationship, added value of agricultural sector, agricultural production, and agricultural capital. All variables in the research are logarithmic. So first the model was specified and then the static of the model was measured and then by ARDL method, first in the short term and then in the long term and finally the error correction model was calculated. Since model analysis depends on determining the time series intervals of model variables, and due to the greater instability of time series in macroeconomics, the use of conventional econometrics for quantitative analysis of economic relations will have misleading results. Time series instability leads to false regression so that t , F and R^2 tests lose their validity. Therefore, the static variables must be checked first and then the desired function must be estimated. This was done in the field of the desired function and the generalized Dickey-Fuller test was used and the result showed that the exchange rate logarithm, exchange relationship logarithm and agricultural export logarithm at static level and value added logarithm, agricultural production logarithm and capital logarithm The agricultural sector after one differentiation is static or in fact $I_{(1)}$.

After ensuring about the staticity of the variables, the function was explained using the self-modeling method. Interruption and capital of the agricultural sector at the level of 5% and the production logarithm at the level of 1% are significant and the added value logarithm variable is meaningless. The sign of all variables is also in line with expectations, so the results show that the exchange rate has a positive sign and shows there is a direct effect between the increase in the exchange rate and the increase in exports. Therefore, according to the first hypothesis, there must be a direct and significant relationship between the exchange rate and exports of the agricultural sector. It is accepted at the level of 10% and with a probability of

90%. Another variable is the relationship of exchange, the results show that there is an inverse relationship between the relationship between trade and exports and the relationship between trade in the previous period and exports of the agricultural sector in the current period, which is consistent with many domestic and foreign studies. Therefore, the second hypothesis of the research that there is a direct relationship between the relationship between trade and exports of the agricultural sector is rejected.

Another variable is the added value of the agricultural sector, which is significant with a break of 5% and its positive sign, which shows that the value added of the agricultural sector and the export of the agricultural sector act in the same direction, so that with increasing value added, the sector Agriculture, the export of that sector also increases and in the short term, the most important effect on the export of the agricultural sector is this variable. The next variable is production, which has a positive effect on exports in the sense that with the increase in production, the export of the agricultural sector also increases. Exports do not seem to be accepted, and at the end of the variable of agricultural capital, which is a positive and significant sign of this variable indicates that with increasing capital in the agricultural sector, exports of the agricultural sector increases, and finally the third hypothesis that between There is a positive and significant relationship between agricultural capital and agricultural exports. It will be accepted in the short term. The coefficient of determination of the model is 0.94 and indicates the high significance of the model and F of the whole model is also significant at the level of 1% and according to the diagnostic statistics, complete confidence in the classical assumptions was obtained.

Another variable is the added value of the agricultural sector, which is significant with an interval of 5% and its positive sign, which shows that the added value of the agricultural sector and the export of the agricultural sector act in the same direction, so that with increasing added value in the Agriculture sector, the export of that sector also increases and in the short term, the most important effect on the export of the agricultural sector is this variable. The next variable is production, which has a positive effect on exports

in the sense that with the increase in production, the export of the agricultural sector also increases. Exports do not seem to be accepted, and at the end of the variable of agricultural capital, which is a positive and significant sign of this variable, indicates that with increasing capital in the agricultural sector, exports of the agricultural sector get increased, and finally the third hypothesis is there has been a positive and significant relationship between agricultural capital and agricultural exports. It will be accepted in the short term. The coefficient of determination of the model is 0.94 and indicates the high significance of the model and F of the whole model is also significant at the level of one percent and according to the diagnostic statistics, complete confidence in the classical assumptions was obtained.

Immediately after the dynamic estimation, the test of the presence or absence of a long-term relationship was performed and it confirmed the results of the existence of a long-term relationship. Significant percentage as well as the first and second hypotheses of research in the long run were accepted and the relationship between exchange with negative sign and at the level of one percent significant, value added with positive sign and at the level of five percent significant and the third hypothesis Nir in the long run No acceptance The variable of production appeared with a negative but insignificant sign in the model and finally the variable of agricultural capital with a positive sign and the fourth hypothesis of the research was accepted with 95% probability after estimating the model in the long run to estimate the model. Corrections and errors were made and the results showed that if a shock enters the system in less than a year (about six months) the pattern will be adjusted and the pattern will return to equilibrium. The results showed that structural stability is present in the model.

Suggestions and solutions

1. Some non-price policies such as structural changes in lending, insurance development, investment protection policies, improving the business environment, relying on preferred or higher comparative goods due to increased competitiveness In the international arena, changes in exchange rates and, consequently, trade balance are as important as exchange rate fluctuations.

2. Since the exchange rate has a positive and significant effect on the export of the agricultural sector, it is suggested that with proper implementation and continuous follow-up of policies that stabilize the exchange rate or reduce exchange rate fluctuations in the free market, increase the positive impact of the exchange rate on exports of agricultural products.
3. Since the relationship between exchange and negative sign indicates a decrease in the price level of exported goods compared to imported goods, so it is suggested that by adopting policies for the entry and development of technology in the agricultural sector, in this regard, appropriate measures to prevent this situation to To come.

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