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The Effect of Economic Variables on Export of Traditional and Agricultural Goods in Iran

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ABSTRACT

Export can play an effective role in the process of trade liberalization. Therefore, the investigation of the effect of macroeconomic variables on the export of goods is greatly important. The present study intended to investigate the effect of five macroeconomic variables including exchange rates, GDP, relative agricultural prices, agricultural net capital, and money supply on the export of traditional and agricultural goods. Vector Auto-regression (VAR) model and Johansen's co-integration test were used in this study. The results of the present research showed that there was a significant positive relationship between the export of traditional-agricultural goods and exchange rates, agricultural net capital, relative prices and money supply. Moreover, there was a one-way causal relationship between export and exchange rates as well as export and money supply. Furthermore, using the adjustment factor of Error Correction Mechanism (ECM) for variables, it can be concluded that in case of export imbalance in each year, about %0.061 of the obtained imbalance can be adjusted in the subsequent period. Johansen test and co-integration vectors were calculated in order to determine the relationship between the variables in the long run; and the effect of variables were investigated by applying the constraints on co-integration relationships. Consequently, the present study indicated that exchange rates, agricultural net capital, GDP, and relative prices had a significant positive effect on the export of traditional and agricultural goods.

Keywords: *Iran; Export of Traditional and Agricultural Goods; VAR model; Macroeconomic Variables; Johansen Test.*

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INTRODUCTION

The agricultural sector is one of the main sector of Iran's economy that accounts for %14 of the country's value-added (Central Bank, 2005). The agricultural sector is of utmost importance in the country's economy due to its considerable capabilities and capacities and is noteworthy for the crucial role it plays in providing food for people and raw materials for the industries (Moghaddasi & Farhadi, 2003). Meanwhile, the main resolution of the agricultural sector, as the food producer sector, is supplying the food needs of society. However, with production development, this sector can supply not only sufficient food but also other economic needs; thus, policies should be made in this sector according to the country's macro policies (Razzaghi, 1997). Research has shown that since the mid-1970s, several studies have investigated the effect of macroeconomic variables, as exogenous variables, on the agricultural sector (Xu, 1974; Chambers and Just, 1980; Batten and Belongia, 1986) while others studied the effect of macro-agricultural variables as endogenous variables. The agricultural sector is influenced by the many factors and variables (Baek et al., 1998) amongst which economic factors are the most effective ones. Therefore, it is necessary to investigate the effect of economic factors on this important sector by making appropriate economic plans and policies with more information and knowledge in order to attain a higher effectiveness factor. With regard to the significance and immensity of the agricultural sector, making any policy on this sector will affect the entire economy in the country. The importance of export and the need for making appropriate plans in export sector, including the export of traditional and agricultural goods, for creating self-sufficiency is to the extent that has always drew the attention of Iranian economists and experts; that is to declare that non-oil export has become one of the main economic goals after Islamic Revolution. Consequently, in addition to understanding and accepting the problems and deficiencies in the process of export and the negative consequences caused by single-product economy in the country, the present study has gone further to investigate export from the perspective of macroeconomics and has examined export as a macroeconomic variable influenced by other variables (Shakeri, 2004). Export development organizes production for greater markets where more appropriate and less costly production methods can be used due to the intense competition in those markets. In fact, foreign commercial trade is one of the most important components of economic systems. The development of export increases domestic production, reduces unemployment problems, and help the balance of payments through fundraising and attracting foreign aids. Non-oil export has long been accentuated in Iran. According to some experts, the intense reliance of domestic production and export on oil revenues as well as the fluctuations of oil prices in recent years have turned the country's economy towards non-oil export inevitable. The enormous capabilities of the country in production and supply of agricultural products accounts for the majority of country's non-oil export. On the other hand, considering that Iran's membership in WTO is inevitable and will be fulfilled in the futures, it is necessary to provide appropriate conditions for the improvement and continuity of export after its membership in WTO. Iran's membership in WTO reinforces the competition for export rise between countries. In such circumstances, the countries that accept the terms and conditions of WTO will be able to attend the competition. Since one of the main objectives of the third development plan is the development of non-oil export and regarding that agricultural products are considered as the major non-oil goods, the importance and effect of these goods on economic growth of the agricultural sector and, subsequently, on economic growth of the whole country will be determined. The purpose of the current study was investigating the effect of macroeconomic variables on the export of traditional and agricultural goods in Iran during 1991-2014.

In their article entitled ''the relationship between macroeconomic variables and Iran's agricIturall sector'', Dadras Moghaddam and Zibaei (2009) studied the effect of monetary policy and exchange rates on the price, supply and export of agricultural products in Iran. To this end, they also examined the selected variables of production and exportation of agricultural sector, interest rate, inflation rate, the price of agricultural inputs and products, trade liberalization rate, money supply, exchange rates and GDP during 1961-2005. They found that in order to prevent inflation and price rise of agricultural products and inputs, we should not only rely on monetary policies but also consider all the macroeconomic variables in the long run. More, the changes in macroeconomic variable should be taken into account because these changes affect the agricultural sector while the reverse is not true. Nazemi (2009) studied the effect of macroeconomic variables on non-oil export. He found that there was a positive relationship between non-oil export and exchange rate and GDP while there was a negative relationship between non-oil export and inflation rate within the same period.

Zamani and Mehrabi Boshrabadi (2014) investigated the effect of exchange rate volatility on the trade of agricultural products in Iran. They found that the real exchange rate volatility had a negative effect on the export of agricultural products in the long run though having a lag. The results also showed that the real exchange rate volatility had a positive effect on the import of agricultural products in the long run while having a negative effect in the short run. Therefore, policy makers should implement the policies that help exchange rate stability.

Jiani and Koupahi (2005) estimated the export supply and demand functions of Iran's Saffron. The results indicated the elasticity of the function of export demands towards the export price of saffron; the elasticity coefficient was equal to 02.1. The income elasticity of demand was greater than the unit. Moreover, they found that the function of export demand was not elastic towards the exchange rate and, in general, the rise of this variable had a negative effect on the export of Iran's saffron. The function of export supply was elastic towards the relative price and domestic production of saffron. The rise on the export price, compared with domestic price, increased export supply.

Pakravan et al. (2010) studied factors affecting the export supply and demand of Iran's agricultural products. They found that real exchange rates, relative prices, production quantity, domestic prices, and the dummy variable of war were the most effective variable on the export supply and demand functions.

Aghel et al. (2008) studied factors affecting the value of the export of agricultural products with emphasis on export standards (Pistachio, almonds, dates and apples). They found that respecting export standards for the export of most studied products had a significant positive effect on the amount of export. That is, more markets can be accessed and exchange revenues will expand by encouraging the adherence to international standards for the export of agricultural products and improving the quality of products.

Mohammdi and Hemmati (2010) studied factors affecting the export of agricultural products and the target markets of these products. They found that export prices had a significant negative effect on export demand while GDP had a significant positive effect. According to the results, during this period, Iran had a comparative advantage in the export of dates, apple and pistachio and all three products were oligopolistic.

Khalilian and Farhady (2002) studied factors affecting the export supply of vital agricultural products in Iran. The results showed that GDP (production capacity), relative export prices, and domestic consumption (domestic demand) had a significant effect on the export supply of agricultural products. Moreover, effective exchange rate did not have any significant effect on export supply of agricultural products indicating the inappropriateness of government's exchange rate policies on the export of agricultural products during the period of their study.

Mirzaei Akhijahani (1992) studied factors affecting export supply of traditional and agricultural products. They found that price and income elasticity of export supply of traditional and agricultural products was smaller than unit. In other words, the export supply of traditional and agricultural goods was less elastic than the relative export prices and the income of supplier of export goods.

Nikeghbali (2008) found that the relative price index of agricultural export supply, shocks caused by the supply of agricultural products, the deviation of real exchange rates from its equilibrium state, exchange rate volatility index, and time index had a significant effect on the export supply of agricultural products.

MATERIALS AND METHODS

The present study evaluated VAR model using theoretical and practical tools and new econometric techniques. To this end, Eviews software package was used for the analysis of regression models. Eviews is one of the few programs which has a special place in solving simulation models and predicting statistical and mathematical models due to its special features. Ease of run time, easy access to the main lists, availability of input and output information in this programs, and spreadsheets, the ease of use of advanced theoretical methods in the new experiments provided in this program and many other advantages have made it a practical program to be used for estimation of values in this study.

When the multivariate behavior of time series is assessed, the interaction between these variables should be simultaneously noted as a model of equations system. Before estimating such model, it is necessary to ensure that the equations of this system are recognizable. VAR modeling approach has been developed using Bayesian methodology. Bayesian methodology was first proposed by Litterman (1980) for estimation of VAR models which was then known as Bayesian VAR (BVAR). VAR model is, in fact, a linear relationship between the dependent variable and the lags of all variables in the equation system; the number of lags is experimentally determined by the modeler (simulator).

The general form of a VAR equation system with n-dependent variables (n equation) is as follows:

$Y_t = A(L)Y_t = C + \varepsilon_t$

Where, L is lag operator, C represents intercept matrix of equations and ε_t signifies stochastic elements that is assumed to have a normal distribution whose mean and variance are 0 and δ^2 respectively. Moreover, the elements of A matrix are defined as (A_{ij}).

$A_{ij}(L) = \sum L^k a_{ijk}$

Where, i is the number of the equation, j is the number of the variable used in the equation and k is the number of intended lags for the system.

According to Sims (1980), the key issues here is determination of length of lags and appropriate variables to be used in the system. To this end, Maximum Likelihood Ratio Test, Schwarz Information Criterion (SIC) and Akaike Information Criterion (AIC) were used as follows:

$AIC = T \text{ Log } |\sum| + 2N$
$SIC = T \text{ Log } |\sum| + N \text{ Log } T$
Where, $|\sum|$ is determinant of covariance-variance matrix for system wastes, N is the total number of estimated parameters of the system, and T is the number of observations.
In recent years, Johansen test has rapidly become an essential tool for estimating time-series economic model in order to determine the long-term equilibrium relationship between several time-series economic variables. In this method, the determination and estimation of co-integration vectors (i.e. factors related to long-term equilibrium relationship) between variables are carried out using coefficients of VAR model between those variables. The relationship between VAR and co-integration models provides the possibility of obtaining co-integration vectors from the coefficients of VAR model. The starting point of Johansen method for testing and determining co-integration relationships between time-series variables is estimating vector error correction model (VECM) of the variables as follows:
$\Delta y_t = \beta_1 \Delta y_{t-1} + \beta_2 \Delta_{t-2} + \ldots\ldots\ldots + \beta_{p-1} \Delta y_{t-p-1} + \Pi\, y_{t-p} + U_t$
Assuming that all the variables of y_t vector are integrated of the first order I (1), all the terms that have been written as Δy_{t-p} will be stable. The co-integration between a set of economic variables provides the statistical foundation of ECM usage. These models are very well-known in experimental studies. The main reason for the reputation of VECM is that it can relate the short-term volatility of variables to their long-term equilibrium values. When two variables of x_t and y_t are co-integrated, it implies that there is a long-term equilibrium relationship between them. However, there may be an imbalance between them in the short run; in this case, the error term of the following equations is considered as ''balance error.''
$Y_t = \beta x_t + U_t$
$U_t = y_t - \beta x_t$
Now, this error can be used to link the short-term behavior of y_t to its long-term equilibrium values; to this end, the equation can be written as follows:
$\Delta y_t = \alpha_0 + \alpha_1 \Delta x_t + \alpha_2 \hat{U}_{t-1} + \varepsilon_t$
Where, $\hat{U}_{t-1}$ is an error term for estimating regression with a time lag. Such a model is known as error correction model (ECM) where the changes of y_t have been related to the balance error of the previous period.
As shown below, the functional model proposed by Duta and Ahmed (1998) was used to estimate the intended model of the present study i.e. the export function of traditional and agricultural goods.
$X_t = f\,(ER_t, PW_t, y_t, IN_t, M_t)$
Where, X_t is the export of traditional and agricultural goods, ER_t is exchange rate, PW_t is relative prices, y_t is GDP, IN_t is agricultural net capital, and M_t is money supply. In the analysis of the model, as in Duta and Ahmed's model (1998), Johansen's co-integration test and ECM were used, and the logarithmic form of model above can be written as:
$\text{Ln } X_t = f\,(\text{Ln } ER_t, \text{Ln } PW_t, \text{Ln } y_t, \text{Ln } IN_t, \text{Ln } M_t)$
This equation can be modified as follows to estimate the model:
$\text{Ln } X_t = \alpha_0 + \alpha_1 \text{ Ln } ER_t + \alpha_2 \text{ Ln } PW_t + \alpha_3 \text{ Ln } y_t + \alpha_4 \text{ Ln } IN_t + \alpha_5 \text{ Ln } M_t$
Data used in the present study are annual time-series data which were collected from Central Bank of Iran.

RESULTS AND DISCUSSION

Table (1) presents the results of Augmented Dickey-Fuller Unit Root test.

Table (1): Unit root test for estimating variables using Dickey-Fuller test.

Variable	Statistical Value ADF		Critical Value ADF		Test Results ADF
		%10	%5	%1	I(1)
LX	-4/412	-2/642	-3/00	-3/769	I(1)
LER	-4/095	-2/646	-3/012	-3/788	I(1)
LPW	-2/935	-2/801	-2/320	-1/582	I(1)
LY	-3/838	-2/66	-3/04	-3/857	I(1)
LIN	-4/119	-2/660	-3/040	-3/857	I(1)
LM	-2/849	-2/642	-2/00	-2/769	I(1)

Source: Research Findings.

According to Table (1), firstly, all the studied variables were normally unstable; secondly, all the aforesaid variables were made stable by applying a lag and all were integrated of first order I (1). That is because in the logarithmic first-order difference of all variables, the statistical value, which was greater than the critical value in terms of absolute value, was augmented by Dickey-Fuller test and all were made stable using a single lag.
Now, the optimal order of VAR should be specified through lag determination criteria. Determination of optimal lag should be based on the number of variables in the model and sample size; the results of determination of optimal lag are presented in Table (2).

Table (2): Determination of the number of optimal lags for variables, VAR model

Lag Length	Bayesian-Schwarz	Akaike	Hannan-Quinn
0	507/1	1/458	1/471
1	-0/149	-0/248	-0/223
2	-0/530	0/431	0/454
3	1/028	0/928	0/950

Source: Research Findings.

According to Table (2), the statistical value of Bayesian-Schwarz, Akaike and Hannan-Quinn had the smallest value in the first lag. The more lags the model got, the more the values of Bayesian-Schwarz, Hannan-Quinn and Akaike would be. They had the smallest value just in the first lag. Therefore, the optimal lag of the model was equal to 1. In the next step, the number of co-integration vectors between the variables were determined using the statistical values of trace matrix and maximum likelihood-ratio tests. Tables (3) and (4) display the results.

Table (3): Trace Matrix Test (Trace λ)

Null Hypothesis	Alternative Hypothesis	Statistical Value	Critical Value (at %5 CI)	Potential Value (at %95 CI)
r=0	r≥1	85/272	47/856	0/000
r≤1	r≥2	37/035	29/797	0/006
r≤2	r≥3	10/711	15/494	0/229
r≤3	r≥4	0/005	3/841	0/940

Source: Research Findings.

Table (4): Maximum Likelihood-ratio Test (Max. λ)

Null Hypothesis	Alternative Hypothesis	Statistical Value	Critical Value (at %5 CI)	Potential Value (at %95 CI)
r=0	r=1	48/237	27/584	0/000
r≤1	r=2	26/323	21/131	0/008
r≤2	r=3	10/705	14/264	0/169
r≤3	r=4	0/005	3/841	0/940

Source: Research Findings.

According to the results provided in tables above, the presence of two long-term relationships between the variables of the proposed model was indicated. Therefore, the null hypothesis indicating the absence of co-integration vector or long-term relationship between the variables of the proposed model was rejected at %5 confidence level while the alternative hypothesis indicating the presence of a long-term relationship between the variables was confirmed. Since the statistical value is smaller than the critical value, the long-term relationship was admitted. Once the long-term relationship between the variables was approved, it was estimated and, then, error correction model (ECM) was evaluated. In order to estimate ECM, the regression error term of the long-term stability model (u_t) was used in VECM as an explanatory variable and was estimated accordingly.

The coefficient of error correction term showed that a few percent of the imbalance of the dependent variable was adjusted towards the long-term relationship in each period.

Table (5): Results of Error Correction Test

Variable	Coefficient	Standard Deviation	T-test
D(LX(-1))	-0/949	0/245	3/873
D(LER(-1))	5/176	1/354	3/822
D(LPW(-1))	-0/195	0/837	-0/179
D(LY(-1))	0/052	0/035	1/485
D(LIN(-1))	0/0549	0/0681	0/794
D(LM(-1))	0/007	0/151	0/046
C	-0/472	0/629	-0/854
ECM(-1)	0/061	0/241	0/514

Source: Research Findings.

Table (6): Long-term relationship between variables of the model

Variable	Coefficient	Standard Deviation	T-test
LX	-1	-	-
LER	0/405	0/158	2/558
LPW	0/136	0/064	2/129
LY	0/926	0/129	7/155
LIN	0/439	0/135	2/236
LM	0/859	0/232	3/687
C	-32/296	8/322	-3/88

Source: Research Findings.

The long-term relationship has been displayed in the tables above. According to the obtained coefficients, as shown in Table (6), the long-term export function of traditional and agricultural goods can be written as follows:

LX (-1) = -32/296 + 0/405 LER (-1) + 0/136 LPW (-1) + 0/926 LY (-1) + 0/439 LIN (-1) +0/859 LM (-1)

The results of the present study showed that there was direct relationship between the export of goods and exchange rate in the long run. The positive coefficient of exchange rate indicated that about %1 rise in exchange rates can increase export by %0.405 in the long run. Moreover, there was a direct relationship between the export of goods and relative prices. The positive coefficient of relative prices indicated that about %1 rise in the relative prices can increase export by %0.136 in the long run. There was a direct relationship between the export of goods and GDP in the long run. The positive coefficient of GDP showed that about %1 rise in the GDP can increase export by %0.926 in the long run. There was a direct relationship between the export of goods and agricultural net capital. Its positive coefficient showed that about %1 rise in agricultural net capital can increase export by %0.439 in the long run. Furthermore, there was a direct relationship between the export of goods and money supply in the long run. That is, about %1 rise in money supply can increase export by %0.859 in the long run. Now, it is the time to examine Granger Causality test. To do so, different lags should be evaluated because there may not be any causal relationship between two variables in the short lags. However, they may have causal relationship in longer lags. Although the concept of causal relationship has different dimensions, Granger has introduced a testable concept in his causality test to examine the causal relationship in the context of a time-series model. The results of causal test are presented in Table (7).

Table (7): Results of Granger Causality Test

Dependent Variable	Effective Variable	F-test	Probability P-value	Conclusion
LX	LER	4/055	0/036	Exchange rate is the cause of export.
LER	LX	0/075	0/927	Export is not the cause of exchange rate.
LX	LPW	3/268	0/123	Relative prices are not the cause of export.
LPW	LX	2/251	0/200	Export is not the cause of relative prices.
LX	LY	1/976	0/178	GDP is not the cause of export.
LY	LX	0/475	0/631	Export is not the cause of GDP.
LX	LIN	1/225	0/325	Agricultural net capital is not the cause of export.
LIN	LX	2/625	0/110	Export is not the cause of agricultural net capital.
LX	LM	3/690	0/046	Money supply is the cause of export.
LM	LX	0/467	0/634	Export is not the cause of money supply.

Source: Research Findings.

According the results of Table (7), LX was oriented towards LER; since the observed F was greater than the reference F and P-value was smaller than %5, exchange rate was the cause of export. The orientation of LER to LX showed that since the observed F was smaller than the reference F and P-value was greater than %5, export is not the cause of the changes in exchange rates. There was a one-way relationship between LX and LER.

Moreover, the orientation of LX to LPW showed that since the observed F was smaller than the reference F and p-value was greater than %5, relative prices were not the cause of export of goods. Also, according to the observed F and p-value, export was not the cause of relative prices.

According the orientation of LX to LY and LY to LX, since the observed F was smaller than the reference F and p-value was greater than %5, export was not the cause of GDP; likewise, GDP was not the cause of export respectively.

According to the orientation of LX to LIN, since the observed F was smaller than reference F and p-value was greater than %5, net capital was not the cause of export; neither was export the cause of agricultural net capital regarding LIN to LX orientation. Regarding LX to LM orientation, since the observed F was greater than reference F and p-value was smaller than %5, money supply was the cause of export while export was not the cause of money supply indicating a one-way relationship between LX and LM.

CONCLUSION

The present study investigated the effect of economic variables on the export of traditional and agricultural goods in Iran. The results indicated that there was a significant relationship between the export of traditional and agricultural goods and economic variables such as exchange rates, relative prices, GDP and agricultural net capital. In order to estimate stationary time series, Augmented Dickey-Fuller Unit Root Test was used. To this end, all the variables were made stationary by first order difference through differentiation; thus, all the variables were co-integrated by first order. VAR econometric model was used to estimate export supply function of traditional and agricultural goods. Next, the long-term relationship between the variables was studied using Johansen-Juselius Co-integration test. First, the optimal number of lags was determined using Schwarz Information Criterion, Hannan–Quinn Information Criterion (HQC), Akaike Information Criterion (AIC); the results showed that the optimal lag of a model is 1. Afterwards, maximum likelihood ratio test was carried out which indicated that there was a long-term relationship between the variables. Since the critical value of the test was greater than the statistical value, the long-term relationship was confirmed. Moreover, the potential value, greater than %5 at %95 confidence level, was indicative of the long-term relationship. Then, the pattern of error correction mechanism (ECM) was examined. In the present study, the observed ECM showed that about %0.061 of the imbalance in each period can be adjusted in the subsequent period to achieve the long-term balance; this indicates the relatively high speed of adjustments towards long-term balance. According to Granger Causality test, there was a one-way causal relationship between export and exchange rate; the orientation of the causality was from exchange rate towards export. Furthermore, there was a one-way causal relationship between export and money supply; the causal orientation moved from money supply towards export. The current study concluded that exchange rates, agricultural net capital, GDP and relative prices had a significant positive effect on the export of traditional and agricultural goods.

SUGGESTIONS

Iranian economists and authorities, either in the government or in the central bank, are recommended to not entrust the export affairs to only a special center, namely ''Export Promotion Center of Iran'', but to consider export as a macroeconomic variable which is influenced by other variables.

The problems in the export of traditional and agricultural goods may contribute to their low quantity and unchangeablity in different years. If export becomes the main source of country's budget, the effects of each of the macroeconomic variables on either the decrease or increase of export will be clearly recognized.

Although the problems of export are solvable in the short run, it should be noted that the solution is only a short-term solution and it may lose its efficiency in the long run. Therefore, economic authorities are suggested to make not only short-term but also long-term plans in order to increase national production.

It is recommended to move exchange rates from economical-political state to only economical state.

Prospective researchers are also recommended to investigate the effect of other macroeconomic variables on the export of traditional and agricultural goods from other perspectives and approaches.

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