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Effect of Exchange Rate Fluctuations on Export of Medicinal Plants Using the ARDL Approach

Mohamad Reza Kohansal[1], Seyed Mohammad Reza Akbari[2]

1-Associate Professor of Agricultural Economics Department, Ferdowsi University of Mashhad, Mashhad, Iran.
2-Ph.D Student of Agricultural Economics, International Campus of Ferdowsi University of Mashhad, Mashhad, Iran.

Corresponding Author: Mohammad Reza Kohansal

Abstract

Considering the high potential production plants in Iran and global demand for buying this product and its high export value, export share of these plants can be increase among the non- oil exports. In this regard exchange rate can be effective in exports as a determining factor. The main goal of this study is surveying short-term and long-term exchange rate changes on export of medicinal plants in Iran. For Estimation relationships between export plants variable and other selected variables, Auto regressive distributed lag method (ARDL) was used. Required data sets were from Food and Agriculture Organization (FAO) and different publication of central bank of Iran in time horizon 1974-2007. The results indicated that exchange rate fluctuation, along with domestic production in the short term and long-term had most effect on medicinal export plants. In addition, effect of relative price (price than the domestic price), also were studied. Performed Calculations represent a significant and positive relationship between objective plants and relative price index in short term.

Keyword: medicinal plants, exchange rate, medicinal plants export, ARDL method

Introduction

Agricultural sector is one of the main pillars in Iran economy that due to its share of GDP, external sector and food security, should be specially considered in commercial policies areas. In this context, foreign trade can be subject to one of the most important challenges in the economic development of country. Looking to the unstable oil market in the world and severe price fluctuations and also considering the escape strategy from one product economy in Iran, the non-oil exports' with special emphasis on agricultural exports ' can be made effective in adoption of appropriate trade policies. (Torkamani and Trazkar, 2005).

Review massive foreign trade and agriculture section of Iran

Table number 1 shows the Structure of massive foreign trade and agriculture sector of iran in period (1974-2001). Average value of total exports, exports of non-oil and agriculture are, 01/20, 75 / 0 and 3 / 0 of billion respectively, while total and average value of agricultural imports are 22/11, 61 / 1 billion dollars respectively. The total foreign trade balance surplus economy is 79 / 8 billion dollars and lack Trade Balance of the agricultural sector has been 04/10- billion dollar. During this period Iran total value of exports, non-oil and agricultural sector had grew equivalent 56, 5 and 10 percent respectively. Beside, the average of imports value growth in total and agricultural was 18 and 15 percent and they had standard deviation of 44 and 58 respectively. Average of agricultural exports share from total exports 1/5 percent and the average of agricultural imports share from total imports has been 13 percent.

Around the export of medicinal plants

Export of medicinal plants in Iran between 1947 to 2007 has been shown at Figure numbers (1). These changes had been further appearance at decade 90, so that highest export amount of medicinal plant proper to year 1995. Existence of these fluctuations can be significant of a regular program lack on the

manufacturing plants system. In recent years many studies are accepted about the effects of exchange rate fluctuations on international trade of agricultural products:

Chiang and colleagues studied the effect of reducing the dollar rate in Taiwan against the dollar in America on the Taiwan export price. In this study, the effect of exchange rate on Taiwan export value to America and the imports of this country to America were evaluated. The results showed that the effect of exchange rate changes on export prices in the short term and long term was significant (Cheung & et al. 1997).

Torkamani and Trazkar (2005) in a study subject as 'effects of exchange rate fluctuation on export prices pistachio using auto regressive distributed lag method (ARDL)', review the short-and long-term exchange rate effects on pistachio export prices. Data required for this study were collected for the years from 1971 to 2000. Results from this researchers study showed that exchange rate changes on short and long term will be the most important factor affecting the pistachio export price. Other study results indicate the existence of a negative and significant relationship between domestic production and pistachio export price.

In this study, considering the high demand for importing plants and its derivatives, particularly from the European countries and the importance of using plants in medicine, effect of exchange rate fluctuations as a determining factor on medicinal plants export volume has been studied.

Materials and Methods

In this study for survey the effect of exchange rate fluctuations on export value of medicinal plants adherence from Tamby study (1999) were used the export supply linear function that has a bilateral logarithmic form of due to this function ability to reflect the behavior of domestic suppliers for medicinal plants export:

$$\ln EX_{it} = \sim_0 + \ _1 \ln(P_{it}^{\ c}) + \ \ _2 \ln(PR_{it}) + \ \ _6 \ln(ER_{it}) + «$$

In this function EXt , is value of product export in year t (tons scale), PR is value of domestic production (tons scale), ER exchange rate and Pc represents the relative price index that has been resulted from export prices values divide on domestic prices. in the above equation μ is the random error with normal distribution and random Default that has zero mean and variance is constant. in the above equation t and i are indicate the goods. The above relationship shows that the export of medicinal plants as an inside variable is function from variables such as exchange rates, relative prices and domestic production of medicinal plants.

After estimation export supply model, in order to obtain more homogeneous results and avoid non-diagonal analysis of data, must first stationary of all model variables will be investigated. For this most important its often used Dickey Fuller and augmented Dickey Fuller statistics that have broader application.

In this context, we often encounter variables that are not static in level, that this variables are supervisory on long-term relationships and it s need to reviewed relationships between other variables that able to influence the short-term actions. To review long-term and short-term relationships between the dependent variable and other explanatory variables, can be took advantage from convergence methods such as Engle - Granger and error correction model such as (ECM). Error correction Patterns give the relationship, variables short term fluctuations to equilibrium values in long-term (Noferesty, 1999).

Considering the past studies it can be found the limitations of these two models such as existence of skewed in small samples and lack of ability in implement of statistical assumptions test. Therefore, a suitable method for analyzing long-term and short-term relationship between variables has been suggested that called auto regressive distributed lag method (ARDL) (HM Pesaran & B. Pesaran, 1997). All estimate stages and reviewing relevant tests, completed by Eviews5 and Microfit 4.1 software packages. Information and data required for this study, were collected from statistical databases on food and Agriculture Organization (FAO) and various publications of Customs organization and Central Bank of Iran for time horizon between 1974-2007 .

Augmented ARDL model can be written based on the pattern of present study, as follows:

$$\sim(L,p)EX_t = \sim_0 + \sum_{i=1}^{k} \ _i(L,p)X_{it} + u_t, \quad i = 1,2,...,k$$

In which $\sim_0$ is the width of the source, EX_t is export supply and L is the lag factor that is defined as follows:

$$L^j EX_t = EX_{t-j}$$

Also X_t is the vector of independent variables that used in the export supply function. Therefore, we will have:

$$\sim(L,p)=1-\sim L^1-...-\sim_p L^p, \qquad _i(L,q)= \ _{i0}+ \ _{i1}L+ \ _{i2}L^2+...+ \ _{iq}L_i^q$$

X_{it}, is the ith independent variable. Based on this dynamic ARDL model ,export supply function can be calculated as follows:

$$\ln EX_t=\sim_0+\sum_{i=1}^{k} \ _i \ln EX_{t-i}+\sum_{i=1}^{m}£_i \ln P^c_{i(t-i)}+\sum_{i=1}^{n}¥_i \ln PR_{i(t-i)}+\sum_{i=1}^{f}\_i \ln ER_{i(t-i)}+£_0 \ln P^c_{it}+¥_0 \ln PR_{it}+\_0 \ln ER_{it}+u_{1t}$$

In this function k, m, n, f, are optimized interruptions for variables Ex, Pc, PR and ER respectively. To estimate long-term relationship between the variables, there are many theories, that only one theory has been discussed in this study. Chosen Theory in this study uses a two-step method as the syntax following: in the first stage the existence of long-term relationship between variables is tested. In this regard, if total estimated coefficients relate to total delay of dependent variable are smaller than one; dynamic model will tend to long-term balance. Therefore, for the convergence test is required that following hypothesis test is performed (Noferesty, 1999):

$$H_0:\sum_{i=1}^{m} \ _i-1\geq 0 \qquad\qquad H_1:\sum_{i=1}^{m} \ _i-1<0$$

$$t=\frac{\sum_{i=1}^{m}\hat{} \ _i-1}{\sum_{i=1}^{m}S\hat{} \ _i}$$

With comparing computational T- Statistic and critical quantity provided with Bonerjy, Dulado and master in desired confidence level can be found the existence or absence of long-term balance related between the following variables. If long-term relationship between variables in the model is proven, the second phase, estimated coefficients and long-term analysis is done (same source). In the long-term relationships between present variables in the model will be true:

$$EX_t=EX_{t-1}=...=EX_{t-p}, \qquad X_{i,t}=X_{i,t-1}=...=X_{i,t-q}$$

At the right of relationship q term from qth lag is relevant to ith varaible. Long-term relationship between variables can be expressed as follows:

$$EX=\sim+\sum_{i=1}^{k} \ _i X_i+v_i \qquad , \qquad \sim=\frac{\sim_0}{\sim(1,p)}$$

$$_i=\frac{_i(1,q)}{\sim(1,p)}=\frac{\sum_{j=0}^{q} \ _i}{\sim(1,p)} \qquad , \qquad v_i=\frac{u_t}{\sim(1,p)}$$

Consideration to above phrase , the long-term relationship in medicinal plants export supply function can be demonstrated as follows:

$$\ln EX_t=¢_0+¢_1 \ln P^c_i+¢_2 \ln PR_t+¢_3 \ln ER_t+u_{2t}$$

Due to convergence between the set of economic variables, it should be used the error correction model (Noferesty, 1999). ARDL error correction model equation can be written as the following relationship:

$$\Delta EX_t=\Delta\tilde{}_0-\sum_{j=2}^{p}\tilde{} \ _j\Delta EX_{t-j}+\sum_{i=0}^{k}\hat{} \ _{i0}\Delta X_{it}-\sum_{i=1}^{k}\sum_{j=2}^{q}\hat{} \ _{i,t-j}\Delta X_{i,t-j}-\sim(1,p)ECT_{t-1}+u_t$$

In this phrase Δ is the first difference operator and $\widehat{\sim}_{j,t-j}$ and $\widehat{\ }_{ij,t-j}$ are the estimated coefficients of equation (6). $\sim(1, p)$ are the coefficient that measured the speed of adjustment. Error correction sector (ECT_{t-1}) is as follows:

$$ECT = EX_t - \widehat{\sim} - \sum_{i=1}^{k} \widehat{\ }_i X_{it}$$

Total optimized lag of any variables can be determined with each of akaike, Schwartz- Bayesian, and Hanan-Quinn criterions (Torkamani and Trazkar, 2005).

Research Results

After determining export supply model using the relation (1), then this function with using convergence method was called ARDL estimated and with get helping from relations (2) and (3), generalized to relation number (5) that is ARDL dynamic model. The estimation of Dynamic model results for medicinal plants export with assistance from the Schwartz - Bayesian criterion (SBC) - due to relatively low sample size and using maximum 3 effective lag for variables is shown in Table 2. One of the most common cases using in ARDL dynamic model coefficients is examine presence or absence of long-term relationship between variables. For this purpose, considering the relation (6), the needed statistic calculated equal to -26.18.

Comparing this value with critical quantity Presented by Banerjy, Dulado and Master (Noferesty, 1999) at the level of 90 percent (-3.45) zero hypothesis based on the lack of long-term relationship between variables can be rejected and a long-term equilibrium relationship between variables model is established.

According to relationship (8) the results of long-term relationship estimated export supply equation that shown in form of relation (10) is presented in Table (3). The results of this table, all estimated coefficients of dynamic ARDL model, except the relative price, have been significant statistically that is explanatory this fact that exchange rate and domestic production in long-term are effective on medicinal plants export quantity.

Considering the coefficient obtained for the exchange rate (-0.121), we are witnessed a negative relationship between exchange rate and exports are medicinal plants. Therefore, whatever exchange rate increases it will caused to reduced export volume. About the negative relationship between exchange rate and exports volume there are two different perspectives. One is the supplier Vision and other one a vision is related to the producers. Plants supplier Group to foreign markets, must reflect the exchange rate fluctuations to producers than they considering changes in domestic demand, have decision to increase or decrease their export goods. In this table, the coefficient of domestic production value is calculated equal to (+1.261), that represents a positive relationship between exports and domestic production. In this regard by increasing or decreasing of the domestic production, demand for export plants also increased or decreased. There is convergence between the set of economic variables that based on the use of error correction model provides. In this regard for survey short-term Relationship between exports and other studied variables, the error correction model (ECM)' the relation (11)' were used. The Results of error correction model for export plants function presented in table (4).

As can be seen in Table 4, export of medicinal plants in the short term with all variables has a significant relationship, this means that all variables in the short term exports of effective medicinal plants. The sign of all coefficients obtained according Theoretical study are.

Table 4 indicated that the export of medicinal plants in short-term have the significant relationship with all variables. Also error sentence coefficient evaluated equal to -0.70 . This fact represents that 70 percent of the plants export Variable deviations (not balance) from equilibrium values (long term) is defaced after a course; so that we can be very optimistic rather than influence of government policies in short - term.

Suggestions

Exchange rate fluctuations (in the long and short term) have been significant effect, but negative on the amount of exports. In this regard its recommended that we create a common economic market for producers and exporters. The benefits of creating a common market include knowledge of producers from exchange rate fluctuation and adjustment of markets.

Another factor influencing exports (in the short term and long-term) is the domestic production volume that has been always positive and significant impact. In this regard it recommended that we held education and promotion courses.

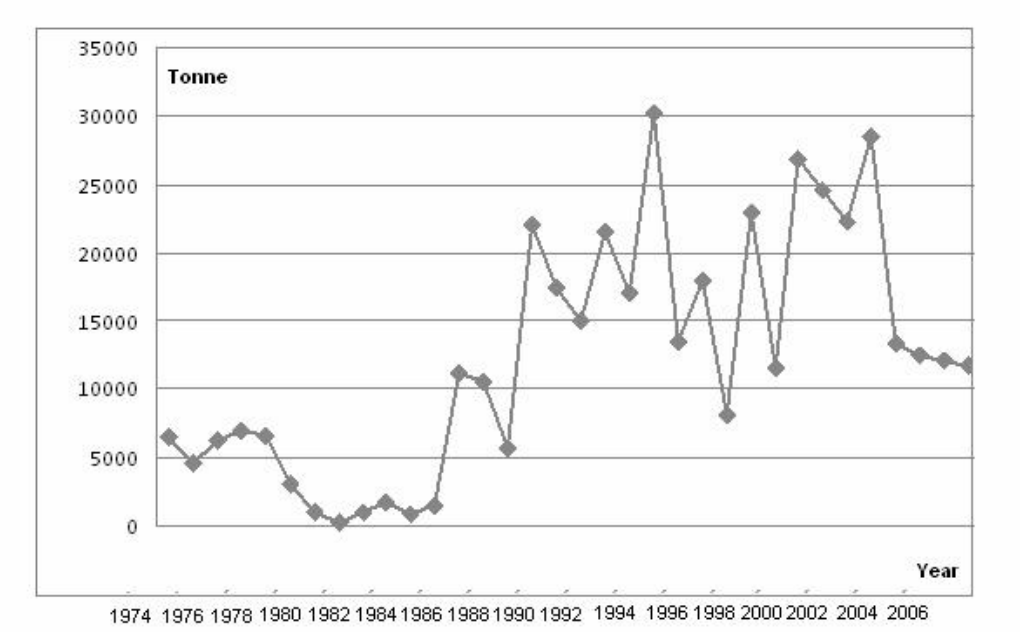

Figure 1. Iran medicinal export value in horizon (1974-2007)

Table 1. Massive foreign trade and agriculture sector of Iran in period (1974-2001)*

Agric import share from total export	Agric export share from total export	Trade balance value		Import value		Export value				
		Agric	Total	Agric	Total	Agric	Non-oil	Total		
17.86	3.48	-1.875	2.683	2.361	13.787	0.553	1.726	17.352	AVE	
5.64	2.13	0.724	6.178	0.825	5.655	0.309	1.425	5.115	Standard deviation	period (1974-2001)

Source: FAO.Production Yearbook, 1974-2001 , * Values are based on billions of dollars

Table 2 . Estimation results of dynamic model ARDL (0, 1, 1, 1)

	variables	prob	t -statistic	Standard deviation	coefficient
Ex (-1)	medical plant export value with one lag	[0.005]	3.085***	0.095	0.293
C	constant	[0.017]	-2.569***	0.438	-1.242
ER	Exchange rate	[0.002]	-3.425***	0.113	-0.387
ER (-1)	Exchange rate with one lag	[0/013]	2.688***	0.112	0.302
Pc	relative price index	[0.000]	4.309***	0.074	0.320
Pc(-1)	relative price index with one lag	[0.001]	-3.842***	0.090	-0.346
PR	domestic production value	[0.000]	9.642***	0.092	0.890
		DW=2.55	$\bar{R}^2 = \%95$		$F = 107.794$

Source: research finding. ***, **, * are indicators of coefficients significant at level of 1, 5, 10 percent respectively.

Table 3. Estimation results of long-term relationship ARDL (0, 1, 1, 1)

	variables	prob	t -statistic	Standard deviation	coefficient
C	constant	[0.036]	-2.226**	0.790	-1.759
ER	Exchange rate	[0.024]	-2.413**	0.050	-0.121
Pc	relative price index	[0.717]	-0.366	0.103	-0.037
PR	domestic production value	[0.000]	11.555***	0.109	1.261

Source: research finding. ***, **, * are indicators of coefficients significant at level of 1, 5, 10 percent respectively.

Table 4 . Estimation results of error correction model (ECM)

	variables	prob	t -statistic	Standard deviation	coefficient
d C	constant difference	[0.017]	-2.569***	0.438	-1.242
d ER	Exchange rate difference	[0.002]	-3.425***	0.113	-0.387
d Pc difference	relative price index	[0.000]	4.309***	0.074	0.320
dPR difference	domestic production value	[0.000]	9.642***	0.092	0.890
		DW=2.55	$\bar{R}^2 = \%89$		$F = 61.263$

Source: research finding. ***, **, * are indicators of coefficients significant at level of 1, 5, 10 percent respectively.

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