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The Study of Exchange Rate Fluctuations on the Export Prices of Iranian Food Products (Dynamic Panel Data Approach)

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Abstract

In this paper, the evaluation of the real exchange rate transfer and the asymmetric transmission of real exchange rate fluctuations to the export prices of food products for the country during the period (2001-2015) was studied using two approaches of PMG and GMM systems. The TGARCH method was used to calculate the real exchange rate fluctuation index and the Markov Switching method was used to calculate the positive and negative shocks of the real exchange rate fluctuation. The results of the study showed that the real exchange rate transfer was full on the export price of food products in the period under review. The real exchange rate fluctuation has increased production costs, thus increasing the export prices of food products. Export prices also react to positive, negative shocks are not the same exchange rate fluctuations, and the effect of negative shocks, exchange rate volatility has been more than positive shocks.

Keywords: Exchange Rate Transfer, PMG, GMM.
JEL Classification: F14, F31, C51, C33.

1. Introduction

The evolution of foreign exchange regimes over the last few decades has made the exchange rate issue, especially in developing countries,

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more than ever seen as a key factor in economic policy and decision making (Manafi Anvar et al, 2015). The exchange rate as a key variable in international trade is one of the most important determinants of the price index of export commodities in developing countries. The price index of exported goods as an important indicator of competitiveness is an important variable in foreign trade studies. In this regard, the study of the effect of the exchange rate on the price index of export commodities, especially in countries that follow the strategy of export development, is of particular importance; because exchange rate changes in these countries should be adjusted so that their competitiveness in markets Guarantee the export (Aziz, 2009). The percentage change in the price index of exported goods in terms of foreign currency as a result of one percent of the exchange rate change is referred to as the transfer value of the exchange rate (Carbaugh, 2009 . The exchange rate is based on the price of exported goods in foreign currency in a variety of ways. If the percentage change in the price of the exported goods in terms of foreign currency is in proportion to the percentage of exchange rate change, the unit price law is established and the exchange rate conversion is complete (Haghighat and Hosseinpour, 2010). If the price of exported goods does not change as a result of exchange rate changes, exporters will absorb all exchange rate changes and the exchange rate conversion is zero. If the change in the price of exported goods in terms of foreign currency is less than the exchange rate, the exporters will absorb a part of the exchange rate and the exchange rate transactional is incomplete (Hoque & Razzaque, 2004). The estimation of the transitional exchange rate in the economy of the country is essential and necessary because the efficiency of foreign exchange policies for adjusting the trade balance depends to a large extent on the rate of exchange rate transfer to the price of commercial goods, which can be measured by two dimensions of export and import Is. Determining the transfer of exchange rate effects on export prices can play a role in export development planning. For example, in the foreign trade section of countries, knowing how much the exchange rate fluctuates can affect the price of commercial (export and import) and non-commercial goods, especially for developing countries seeking to improve their trade balance, can be very be useful. Thus, the study of the effect of

exchange rate fluctuations on the price of exported goods can be an important issue in the literature on the international economy. According the position and importance of the agricultural sector and its related industries in gaining economic independence, achieving self-sufficiency and creating export revenues in the country, also the inevitable effects of exchange rate and fluctuations in this sector and its related industries, and the necessity Export development, identifying the factors affecting export competitiveness is considered as the research priorities of the country. Thus, in this paper, we investigate the effects of exchange rate and exchange rate fluctuation on export prices of Iranian food industry. The food industry is one of the most important industrial groups in the field of agriculture and industry in the developing countries. This traditional industry is a key component of the national economy (Vokoun et al., 2015). Considering the relative abundance of factors and inputs such as natural resources, labor, etc. in the country, this industry can be a source of potential for permanent and seasonal employment, national production growth and rising foreign exchange earnings (Salmani & Abdi, 2014). Several studies have been carried out at the transitional exchange rate and the factors affecting it in different countries. By reviewing these studies, it can be seen that the rate of conversion of the exchange rate varies according to the type of goods and the structure of the target markets. The history of research in domestic studies on the transfer of exchange rate is negligible, while in global research, especially in the last two decades, it has been significant. Mallick and Marques (2010), using panel data and a coherent method, examined the short-term and long-term effects of exchange rate transfers on Indian export prices. In this paper, Indian exports are based on a two-way code of 1996-1996 and the monthly 1996-1996 Is considered. Their results showed that the transitional exchange rate in the short run is incomplete for India. Roy and Pyne (2011), using the simultaneous equation model of supply and demand, examined the degree of exchange rate transfer to the index of commodity prices in India during the period 1960-2000. They found that the rate of exchange rate transfer to the price index of exported goods is incomplete. They also found that the degree of exchange rate transitions to the price index of goods exported by different

commodities varies. Aguerre et al. (2012) in their study examined the effect of exchange rate volatility and the inflationary environment on the rate of exchange rate transfer in the 37 developing and developed countries during the years 1980-99. Their results showed that with a slow inflation environment, the rate of exchange rate fluctuations and the volatility of the exchange rate in both developed and developing countries have a significant positive effect on the price of imported goods. Elbejaoui (2013) examined the asymmetry of the reaction of imported and export prices to seasonal changes in the four advanced countries during the period from 2011 to 1985 using the asymmetric accumulated ARDL method. Using the positive and negative component analysis of the exchange rate changes, they found evidence of the asymmetry of the transfer in the strengthening and weakening of the exchange rate, meaning that the reaction of the price of imports and exports depends on changes in the exchange rate, and when increasing the value of a country, the amount The transition to the price of imports and exports is greater than the time of weakening. Other results of their study are the symmetrical reaction of German import prices and the French as well as American asymmetric reaction during the exchange rate strengthening. Mehrjerdi and Tohidi (2013) Studied the relationship between exchange rate and export prices of Iranian pistachio experimentally using panel data related to 23 target markets during the period of 1992-2010 and the regression model of constant effects. The results of the model estimation with the common currency rate for all destination markets showed that Iranian exporters are absorbing part of the exchange rate changes and the exchange rate transactions relationship is incomplete. Tamizi (2016) studied the rate of exchange rate on the Iranian export price during the period 1971-2010using a cointegration method (ARDL). The results of the study showed a positive and significant correlation between exchange rate and export price. This means transferring a large part of the exchange rate to the export price of the country of origin. Lashkari et al. (2015) Studied the exchange rate transfer on Iran's index of export prices and its most important business partners in the years 2000-2010 using Generalized Torque (GMM) and Arlane Band estimation methods. The results showed that the rate of exchange rate transfer to the export price is incomplete and close to one, and Thus a large part of the

exchange rate changes are transferred to the export price. Isa Zadeh Roshan (2015) studied the effect of import and export prices on Iranian currency exchange rate for the period of 1990-2012 using the Vector, Vector Error Correction Model (VECM) model for estimating the model using VDC (Variance Analysis) Sources of fluctuations in export and import prices was analyzed and analyzed using shock absorption (IRF) effects of shocks and dangers. Researcher results showed that the effect of the increase of the exchange rate with a delay in the export price is positive and less than one, and the exchange rate transfer to export prices in the studied period in the Iranian economy is incomplete.

The review of the research literature shows that in most studies, the effect of increasing and decreasing exchange rate on symmetric exports has been considered. In this paper, we examine the asymmetric effect of the real exchange rate fluctuation on the export price of the food industry.

2. Theoretical Considerations

According to various studies, including the studies of Aziz (2009), Mejean (2004), Mallick and Marques (2006) and Lashkari et al. (2015), the following empirical model has been used to check the exchange rate on the export price. Suppose there is a distinct country for a commodity n. Consider a firm in a country that exports a different product to in countries. The earnings function of the firm is equal to:

$$\sum_{i=1}^{n} p_i q_i - c\left[\sum_{i=1}^{n} q_i, pd_l, pm_l\right] \qquad (1)$$

$$q_i = Q\left[\frac{p_i}{pc_i}. \text{ other factors in the country i}\right]$$

$$i=1\ldots..n \qquad \frac{\partial q_l}{\partial\left[\frac{p_i}{pc_i}\right]} < 0 \qquad (2)$$

Where $\mathbf{p_i}$ the product price in the market **i**, and **c** the total cost of the firm, the function of the whole product of the firm $\sum_{i=1}^{n} \mathbf{q_i}$, $\mathbf{pd_l}$ The

price of domestic inputs and $\mathbf{pm_l}$ are the prices of the imported inputs of the firm. It should be noted that all values are in the currency of the country. The demand for the **i** product for this firm is as follows:

In which q_i the product in the country i , $p_i$the price of the product in the country i and pc_i the average price of the product in other countries in terms of the currency in the country i. other factors in country i Indicates other factors in the country i that affect the amount of product in that country. To show the above relation in the currency of the country i, p_i is divided by the exchange rate(e_i). e_i Indicates the number of monetary units of the country listed in a single currency of country i.

$$q_i=Q\left[\frac{p_i}{e_i pc_i}, \text{other factors in the country i}\right]$$

$$i=1,\ldots..,n \qquad \frac{\partial q_l}{\partial\left[\frac{p_i}{pc_i}\right]}<0 \tag{3}$$

$$\ln(p_i)=\mu_i+\beta_i \ln(MC)+(1-\beta_i)[\ln(e_i)+\ln(pc_i)]$$
$$\text{s.t } p_i \geq MC \tag{4}$$

By maximizing the firm's earnings function with respect to the demand limitation and with the logarithm of the first order, the equilibrium price that the firm chooses to maximize profits is obtained as follows.

Where μ_i and β_i specific coefficients for market i, and MC the final cost of producing an exporter in the market one. If the demand curve for a given firm in the market i is in the conventional form, one can expect the value of β to be between 0 and 1. If β is zero, then only μ will determine the profit margin. Both β and μ both determine the margin of profit, with the value of β between 0 and 1. Given the fact that β has an inverse relationship with the demand-pull on the firm's market in me, the more demand it is, the more β is closer and the exporters are more likely to determine their price than maintaining competitive power to the final cost of attending Will do. If the relationship between the equilibrium price will have to take the logarithm of exchange rate derivatives:

$$\frac{\partial \ln(p_i)}{\partial \ln(e_i)}=1-\beta_i \quad (5)$$

Regarding the given relation, if β=0, the elasticity of the export price versus the exchange rate is one, in this case, the rate of exchange rate transfer on the export price is complete. If β=1, the price of export will not change for one percent of the exchange rate change. And finally, if 0>β<1 for a one percent change in the exchange rate, the export price will change by less than 1 percent.

3. Data and Methodology

In this paper panel data for the period 2001 to 2015 was used for 25 selected products from dairy groups, dairy products, wheat and beverage products with the highest exports. Information is collected from the Islamic Republic of Iran and the Central Bank on a monthly basis. All data is used as a natural logarithm.

In the theoretical papers, various factors influencing exchange rate transitions such as international price discrimination in Krugman's study (1986), the openness of the economy and degree of competitiveness in the Dornbusch study (1987), The effect of transportation and distribution costs in the studies of Barestin et al. (2005, 2003), the effect of the currency pricing decision in the Corsetti and Dedola study (2005), The effect of the currency pricing decision in Bacchetta and van Wincoop's study (2005) is also considered in conjunction with the degree of price stickiness and the stability of military policy in Devereux and Engel (2001) and Book Devereux et al. (2004).

The understanding of the persistence of exchange rate fluctuations in the studies of Froot and Klemperer (1988) and Taylor (2000), and the effect of exchange rate fluctuations in the study of Corsetti and Pesenti (2004) is discussed. In studies such as Clarida and Gali (1994) and Kim (2007), the export price is considered to be a function of real exchange rate, liquidity and gross national product (GDP) without oil. Aziz (2009), in addition to the variables mentioned above, other variables including the CPI index, the degree of trade openness and inflation are also effective on the export price. Depending on the

economic conditions of the countries studied, the important variables can be added to the base model. According to the presentations, the following is used for the present research:

$$lnpx_{it}=\beta_0+\beta_1 lnrer_{it}+\beta_2 lnwpi_{it}+\beta_3 vrer_{it}+\beta_4 lngdp_{it} \quad (6)$$

Where $lnpx_{it}$ is the logarithm of the export price, $lnrer_{it}$ is the logarithm of the real exchange rate, $lnwpi_{it}$ is the logarithm of the Producer price, $vrer_{it}$ is the volatility of the real exchange rate, $lngdp_{it}$ is the logarithm of the gross national product. The real exchange rate is the most commonly used index for competitiveness. This indicator shows the competitive position of the country and with increasing its competitiveness the export of the country increases. Thus, raising the real exchange rate will have a positive effect on the trade balance of the country, and its reduction will have a negative effect (Zainali Ghasemi and Najafi, 2011). Various indicators for measuring real exchange rate are presented, the most important of which are the real exchange rate based on the relative price of commercial goods to non-commercial goods, real exchange rate based on prices The consumer, the real exchange rate based on the value of the unit of export, the real exchange rate based on the normalized costs of the unit of labor in the industry, and the real rate of exchange based on the profitability of the production of commercial goods (Erfani et al., 2015). The index used in this paper is as follows;

$$RER=ER\times\frac{P_f}{P_d} \quad (7)$$

Where RER real exchange rate, ER free market exchange rate, P_f US consumer price index, and P_d consumer price index of Iran (Zamani,2009). In this paper, for the quantification of exchange rate fluctuations, the regression method has been used to differentiate the variance and to calculate the positive and negative shocks of the exchange rate fluctuation; the Markov Switching method has been used.

3.1 Method ARCH and GARCH (p, q)

The method of calculating the fluctuation variable in this research is

of particular importance. Given the importance of estimating volatility, different indices for estimating volatility and volatility modeling have been used. Selection of a particular method may have a significant effect on empirical studies. In this research, for the quantification of the exchange rate fluctuation, the self-regression method is used to differentiate the variance. In traditional econometric models, the fact that the variance of sentences is always disturbed is one of the main and classic assumptions of Econometrics. Robert Engle founded the new method known as ARCH to get rid of this limiting assumption. These models are a kind of nonlinear models that are of great use. In 1986, Bourslieu provided a generalized version of the ARCH model to solve some of the problems of the original model. The GARCH model is a generalized version of the ARCH model, as shown below.

$$y_t = \mu + \sigma_t \varepsilon_t$$
$$\sigma_t^2 = \omega + \sum_{i=1}^{q} a_i \, (y_{t-i} - \mu)^2 + \sum_{j=1}^{p} b_j \sigma_{t-1}^2 \qquad (8)$$

A model of the GARCH model that is capable of modeling leverage effects is the TGARCH model. This model is described in the honor of its inventors, GJRGARCH, for its high precision in risk research, as follows:

$$\sigma_t^2 = a_0 + \sum_{i=1}^{m} a_i a_{t-i}^2 + \sum_{i=1}^{m} \gamma_i s_{t-i} \, a_{t-i}^2 + \sum_{j=1}^{n} \beta_j \, \sigma_{t-j}^2$$
$$s_{t-i} = \begin{cases} 1 \; if \; a_{t-i} < 0 \\ 0 \; if \; a_{t-i} \geq 0 \end{cases} \qquad (9)$$

According to the model mentioned for $a_{t-i} \geq 0$ the total effect by means of $a_i a_{t-i}^2$ is determined, if any$a_{t-i} < 0$, measure the total effect of a given shock by$(a_i + \gamma_i) a_{t-i}^2$. One can expect bad news for the estimated value for $\gamma_i$positive (Keshavars Haddad, 2015: 549).

3.2 Markov Switching Method

The Markov Switching Hamilton Model (1989; 1994) is one of the nonlinear time series models known. This model incorporates multiple structures that can examine time series behaviors in different regimes.

Using this model, one can distinguish between the positive and negative shocks of the exchange rate. The logic of this type of modeling is the combination of different distributions with different characteristics, which derive from this model the current value of the variables according to the most probable situation determined by observation. The AR series model in the Markov switching model is as follows:

$$y_t=a^t+\beta_1^t y_t+\beta_2^t y_{t-1}+\ldots.. \quad s_t=1.2\ldots.i \tag{10}$$

Where y_t The target time series and s_t The status variable that is unobservable. It is assumed that, in the first-order chain of Markov, the following probability is transferred from state i to j state:

$$pr(\ s_t=j \mid\ s_{t-1}=i\ )=p_{ij} \tag{11}$$

The probability that a state will be transferred from state i at time t-1 to state j at time t. In other words, we have:

$pr(\ s_t=1 \mid s_{t-1}=0\ )=p_{01}$	The possibility of transition from zero to one mode
$pr(\ s_t=1 \mid s_{t-1}=1\ )=p_{10}$	The possibility of transfer from one to zero mode
$pr(\ s_t=0 \mid s_{t-1}=0\ )=p_{00}$	The probability of being in zero mode
$pr(\ s_t=1 \mid s_{t-1}=1\ )=p_{11}$	Probability of staying in one mode

The Markov-Switching model can be explained for the coefficients of its terms, for mode and p interrupt as follows. Among the presented models, each one has the highest amount of right-of-view (Kaseroni et al., 2010).

$$\text{MSM(m)-AR(p)}: \Delta y_t-\mu(s_t)=\sum_{i=1}^{p} a_i(\Delta y_{t-i}-\mu(s_{t-i}))+\varepsilon_t \tag{12}$$

$$\text{MSI(m)-AR(p)}:\Delta y_t=c(s_t)+\sum_{i=1}^{p} a_i(\Delta y_{t-i})+\varepsilon_t$$

$$\text{MSH(m)-AR(p)}:\Delta y_t=c+\sum_{i=1}^{p} a_i(\Delta y_{t-i})+\varepsilon_t$$

$$\text{MSA(m)-AR(P)}: \Delta y_t = c + \sum_{i=1}^{p} a_i(s_t)(\Delta y_{t-i}) + \varepsilon_t$$

In this research, the positive and negative shocks of the real exchange rate are calculated as follows:

$$\text{shoke}^{+} = \max(\varepsilon_t, 0) \qquad (13)$$
$$\text{shoke}^{-} = \min(\varepsilon_t, 0)$$

ε_t The same disturbing sentences Markov-Switching model is estimated for the real exchange rate.

3.3 Generalized Method of Moments (GMM)

Many of the economic relationships are naturally dynamic. One of the benefits of panel data in cross-sectional regressions is to better understand the modalities of moderation.

These relations are characterized by the presence of interrupted dependent variables among explanatory variables.

$$y_{it} = a y_{it-1} + \beta x_{it} + \eta_i + \varepsilon_{it} \qquad i=1,2,3,\ldots,N \quad t=1,2,3,\ldots,T \qquad (14)$$

In which y_{it} Dependent variable, x_{it} is a set of explanatory variables also used as instrumental variables, η_i a special individual effect independent of time, ε_{it} The error statement and i and t represent the unit of observation and time. If the panel data model, the dependent variable appears on the right side, other OLS estimators are not compatible (Arrelano and Bond, 1991). Because standard panel models are not able to capture the dynamic relationship between variables, they use dynamic methods to examine relationships between variables. One of these methods is widely used to examine the dynamic relationship between variables, especially for cases where the data has a large N and t is small, the GMM dynamic model. There are two methods for estimating the model in the GMM dynamic data panel. The initial basis for dynamic GMM models was proposed by Arrelano and Bond (1991), which is called the first-order differential GMM. In 1995, Arrelano and Bover and in 1998, Blundell and Bond presented the orthogonal GMM method by introducing changes to the

first-order differential GMM method. The difference between these two methods is based on the way that individual effects are included in the model. In order to make sure that this method is appropriate, it is important to estimate the model of the two tests. The first test of the Sargan test is used to prove the validity of the excess diagnosis, the validity and validity of the instrument variables. The statistics of the Sargan (J-Statistic) are distributed χ^2With degrees of freedom equal to the number of constraints. Correlation test is first order (1) AR and second order AR (2) second test. This test is used to check the validity and validity of tool variables. According to Arrelano and Bond (1991), in the GMM estimation, the disturbance sentences must have first-order serial correlations (1) AR, and have no second-order AR serial correlation.

3.4 Combined Group Average Method (PMG)

In dynamic models, inhomogeneity is solely due to the width of the individual origin μ_i, which varies according to different sections. In order to consider heterogeneity and to estimate the coefficients for different groups, intergroup and intergroup estimates can be used in the panel data model, and with the average of the parameters of the self-explanatory model, the distributional breaks for each section I, the MG estimator calculated the long-term relationship.

Pesaran and Smith (1995) show that mixed dynamic heterogeneous models have inappropriate estimates and that the joint provision of dynamic declarations is unacceptable for all countries. However, the long-term performance of the model can be considered among common countries. The proposed method was an averaging of estimated parameters. Pesaran et al. (1999) called this method the PMG. In fact, this method uses integrated computation efficiency, without any inconsistency. Estimation of PMG is the intermediate between two methods of MG and the method of constant effects. In the estimation of PMG, the long-term coefficients between the sections are the same, while short-term coefficients can change. In accordance with the PMG method, the non-binding clause for a system of ARDL equations is as follows:

$$lnp_{it}=\sum_{j=1}^{p}\beta_{1j}\ lnp_{it-j}+\sum_{j=1}^{q}\beta_{2j}X_{it-j}+\theta_t+\mu_i \quad (15)$$

Where X_{it-j} Vector 1×k of variables and μ_i represents the fixed effects. Also, panel data can be unbalanced and p and q may vary between sections. The above model can be expressed as a vector error correction pattern.

4. Empirical Results and Discussion

In this research, we first quantify the real exchange rate fluctuation index and calculate the positive and negative shocks of the real exchange rate fluctuation. For this purpose, the real exchange rate was tested by common tests, but because of the structural failures in the Iranian economy and in the market, the exchange rate was also tested by Bay and Peron based on the results of this test in the actual exchange rate of the break points It can be seen, and the real exchange rate variable is in terms of structural breakdown points at the Mana level. Regarding the structural failure in the real exchange rate process, it should be followed by methods that consider structural failure; Thus, the GARCH and Markov Switching methods have been used. In order to quantify the real exchange rate fluctuation index, the ARMA rank correlation coefficient is determined according to the results of ARMA and the most appropriate ARMA model with the lowest acacia and Schwartz, as well as the white noise of the remaining model. After determining the appropriate model, the existence of the variance in the model should be confirmed. In this paper, the existence of this effect has been investigated using the ARCH-LM test. After verifying the heterogeneity of variance in the model, we followed the selection of the appropriate model from GARCH. Thus, a variety of GARCH models were investigated and their acacia and Schwarz quantities were compared with each other. Finally, the TGARCH model (1.1.1) was chosen as the appropriate model. The confirmation of this model shows leverage effects and according to the results, the gamma asymmetric sentence coefficient in the TGARCH model is negative and significant, indicating that the shock effects have an asymmetric effect, so that negative shocks (bad

news) fluctuate They create more than positive shocks (good news). After determining the appropriate model, there is a need for tests to validate the model that has been used for the ARCH test and ARCH effects. The results of the tests confirm the normality and consistency of the variance.

Table 1: Results of the TGARCH Model

$$\ln\sigma_t^2=\omega+\sum_{j=1}^{q}\beta_j\sigma_{t-j}^2+\sum_{k=1}^{p}a_k\,u_{t-k}^2+\sum_{k=1}^{r}r_k\,u_{t-k}^2 I_{t-k}$$

Variable	ω	β_j	a_k	r_k
Coefficient	5.51	0.618	1.022	-1.076
Probe	0.125	0.000***	0.000***	0.000***

Source: The researcher's calculations (*, **, *** are significant at 10%, 5% and 1% respectively).

Markov's switching model is suitable for estimating that the sample data model is nonlinear. The LR test is used to determine the nonlinearity of the data model.

The statistical value of this test is calculated from the maximum right-sided values of the two competing models, a model with a regimen (linear model) and another with two regimes (non-linear model) and has a chi-square distribution. The results of this test show that it is better to use the Markov-Switching non-linear method for model estimation instead of linear models.

Table 2: LR Test Results

Coefficient	Probe
76.65	0.000***

Source: The researcher's calculations(*, **, *** are significant at 10%, 5% and 1% respectively).

The Henan Quinn, Schwartz, and Akacik information criteria can be used to determine the optimal number of regimes (Garcia, 1988; Hansen, 1992). In this paper, considering the acacia statistics, it seems that using the Markov switching method with three appropriate regimes.

Table 3: Determine the Number of Appropriate Regulations

Number of regimens	log-likelihood	SC	HQ	AIC
2	240.5	-2.52	-2.58	-2.61
3	300.4	-3.10*	-3.19*	-3.24*

Source: The researcher's calculations (*, **, *** are significant at 10%, 5% and 1% respectively).

In this paper, using the acacia criteria, the degrees of autoregressive and moving average are determined. To determine the optimum delay levels, a maximum of two degrees of delay is considered by considering the minimum value of the acacia and the maximum resolution of the appropriate model. Considering the results of the model, we have considered three optimal interruptions.

Table 4: Determines the Number of Interruptions

Number of interruptions	log-likelihood	SC	HQ	AIC
1	443.8	-4.66	-4.77	-4.84
2	440.8	-4.66	-4.67	-4.84
3	447.04*	-4.70*	-4.28*	-4.91*

Source: The researcher's calculations (*, **, *** are significant at 10%, 5% and 1% respectively).

Table 5: Determination of Optimal Markov Swatch Model

Model	Maximum Likelihood statistics
MSM	447.04
MSI	433.92
MSH	601.58*
MSA	484.92
MSIA	511.47
MSIAH	500.1
MSMA	391.99
MSMAH	557.47

Source: The researcher's calculations (* Most Maximum Likelihood)

As noted above, the Markov Swecht model has different modes, which in each of these states is a particular part of the equation of

regimes. To determine the best mode, the maximum rectangular values of these modes are used and the model with a maximum rectangular value is chosen as the optimal model. In this part of the study, the maximum right-hand side of each Markov Switching state is reported in the following table.

Table 6: The Results MSH

Variable	Coefficient	t-statistic	Probe
Constant	0.015	29.7	0.000***
Ar(1)	1.014	118	0.000***
Ar(2)	-0.014	-1.53	0.127
Ar(3)	-0.003	-0.432	0.667
Sigma(1)	0.051	7.97	0.000***
Sigma(2)	0.0005	4.34	0.000***
Sigma(3)	0.006	7.18	0.000***

Source: The researcher's calculations

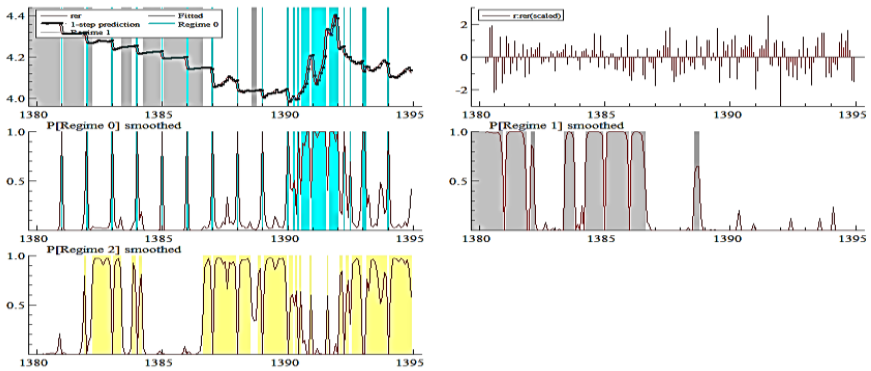

Figure 1: Graph of the Markov Switching Method

After obtaining the real exchange rate fluctuation index and the real exchange rate fluctuation shocks, the main analysis of the research has been done. To do this, first, the Chow test was used to confirm the use of panel data and to identify the type of model from the Hausman test. Regarding the results of the necessity of using panel data and a fixed effect pattern has been confirmed.

Table 7: Results of F Limer and Hausman Tests

F-limer test	Value P-
1220.63	0.000***
Hausman-test	0.000
-4.45	

Source: The researcher's calculations (*, **, *** are significant at 10%, 5% and 1% respectively).

Confirming the use of the static effects pattern in the next stage, serial self-affiliation and the heterogeneity of the variance of the variables used are also investigated. In the following tables, the results of the review of these two tests are reported. In this section, two methods of PMG and GMM have been used to examine the long-run relationship. The purpose of this work is to compare the results of the two methods and to ensure the estimation coefficients.

Table 8: The Results of Serial Self-Correlation Tests and Heterogeneity of Variance

Wooldridge test	Value P-
2.83	0.105
Likelihood-ratio test	0.000
2452.5	

Source: The researcher's calculations

The PMG study examines the homogeneity of long-term coefficients through the Hausman test. This test is based on the assumption that the set of estimation coefficients by the two methods of MG and PMG is not statistically significant. According to the results, we can say that the hypothesis of zero, which is not rejected for integrating long-run coefficients at a significant level, Thus, we can use the PMG efficient estimator to investigate the equation of purpose. The results of the Hausman test are reported in the table below.

Table 9: The Results of the Hausman Test

Hausman-test	Value P-
0.52	0.892

Source: The researcher's calculations

Table 10: The Results of the Consolidated Group Average

Variables	Time period	Coefficient
ppi	Long term	0.93***
	short term	-0.086
Lgdp	Long term	0.047***
	short term	0.007
rer	Long term	1.054***
	short term	0.25***
tgarch	Long term	20.009***
	short term	-2.11***
cons	-0.34***	
etc.	-1.91***	

Source: The researcher's calculations (*, **, *** are significant at 10%, 5% and 1% respectively).

Table 11: GMM Arlane Band Results

Variables	Coefficient	Probe
ppi	0.95	0.000***
lgdp	0.058	0.002***
rer	1.19	0.017**
pexport(-1)	-2.78	0.000***
pexport(-2)	-5.24	0.018**
tgarch	18.16	0.000***
tests		
j-statistic	2.10	0.14
ar(1)	1.16	0.224
ar(2)	0.025	0.979

Source: The researcher's calculations (*, **, *** are significant at 10%, 5% and 1% respectively).

Based on the results of the estimation of PMG and GMM models, the producer price index, which is actually an indicator for the cost of producing export goods and which according to the theory should be a positive sign, has a positive and significant effect on the export price in the long run. Indeed, an increase in the producer price index in Iran would increase the cost of production and, consequently, increase Iran's export prices in terms of rails in all target markets. This reduces

Iran's competitiveness in international markets, which reflects the importance of this variable in determining the value of Iran's export unit over a long period of time.

GDP in the long run has a positive and significant effect on export prices. Given that the output of all products was not available on a monthly basis, GDP has been used as the production of selected products. According to the theory, it was expected that with the increase in production, the price of products would be reduced and this would increase exports, and with increasing exports, the export price of products would increase in the long run.

Based on the results of the volatility index, the real exchange rate has a negative and significant effect on the export price in the short run. In view of these results, it can be said that in the case of temporary fluctuations of the real exchange rate, exporters are less inclined to avoid price adjustment costs. There is a change in prices because of the fluctuation of the real exchange rate, and in this case, exporters will be more willing to adjust the surplus. In the long-term and permanent terms, the real exchange rate fluctuation, with increasing production costs as a result of exchange rate fluctuations, also increases the price of products (Mallick and Marques, 2006). According to the results, in the long run, the real exchange rate fluctuation has increased production costs, thus increasing the export price of selected products.

Real exchange rate has had a significant and significant effect on export prices in the long run. This amount, which indicates the export price tightening to the real exchange rate, actually represents the same rate of exchange rate transfer, and states that for one percentage point increase in the real exchange rate, the export price in domestic currency increases by 1.05 and 1.19 percent respectively, Thus, it can be deduced that all changes in the domestic currency are transmitted to the export price and the transfer of the exchange rate to the full export price. Exchange rate analysis is important in economic research. Understanding how the exchange rate can translate into a country's long-term and short-term policy makers.

Regarding the error correction coefficient, which indicates the speed of moderating the short-run error towards the long-run relationship, it has a value of -1.19 and has a significant coefficient.

Regarding the negative aspect of the error correction sentence, it can be argued that the export price in the previous period exceeds the equilibrium value and, as part of the correction of the error, will bring the value of the Iranian export unit back to its level of equilibrium. Every year, about 1.19% of the difference between the export price of Iran and its long-term equilibrium is corrected.

According to the results of the variable export prices in the two previous periods had a negative effect on the export price. In fact, if the export price increases by 1% during the period t-1, The export price decreases during the period **t** 2.78%, which is not consistent with previous expectations. According to the Sargan test, validation coefficients are validated. The results of the first-order Poetic correlation test and second order correlation show that the instrument variables used are exogenous and as a result, the GMM method has the necessary validity to estimate the regression model. All the steps taken in the previous section for the real exchange rate and the positive and negative shocks of the real exchange rate fluctuation have also gone through the Markov Switching method. The results are presented in summarized form and without detailed reports in the tables below. In this part of the study, the use of combined data, the use of random effects pattern, the lack of serial correlation, heterogeneity of variance, and the use of the PMG method have been confirmed.

Table 12: Test Results

F-limer test	Value P-
1224.06	0.000***
Hausman-test -4.43	0.000
Wooldridge test 2.908	0.101
Likelihood-ratio test 2400.9	0.000
Hausman-test 0.62	0.290

Source: The researcher's calculations (*, **, *** are significant at 10%, 5% and 1% respectively).

Table 13: The Results of the Consolidated Group Average

Variables	Time period	Coefficient
ppi	Long term	0.89***
	short term	-0.112
Lgdp	Long term	0.047***
	short term	0.002
$shoke^-$	Long term	-8.20***
	short term	0.39***
$shoke^+$	Long term	2.42**
	short term	0.14
rer	Long term	1.052***
	short term	0.26***
cons	-0.34***	
etc.	-0.19***	

Source: The researcher's calculations (*, **, *** are significant at 10%, 5% and 1% respectively).

Table 14: GMM Arlane Band Results

Variables	Coefficient	Probe
ppi	0.96	0.000***
lgdp	0.034	0.049**
rer	1.35	0.000***
pexport(-1)	-2.72	0.000***
pexport(-2)	-4.09	0.002***
$shoke^-$	-0.82	0.024**
$shoke^+$	6.13	0.000***
tests		
j-statistic	2.12	0.14
ar(1)	1.66	0.096
ar(2)	-0.417	0.676

Source: The researcher's calculations (*, **, *** are significant at 10%, 5% and 1% respectively).

According to the results obtained from the PMG and GMM method, negative and positive shocks of real exchange rate fluctuations in the long run have had a significant negative and

positive effect on export prices, respectively. In other words, the two variables introduced into the model for considering the asymmetric effects of the real exchange rate fluctuations, taking into account the stability of other conditions in the PMG method, with a one percent increase in the negative shocks of export prices, dropped by 8.2%, with a one-percent increase Positive shocks of the real exchange rate fluctuation Export prices of selected products increased by 2.42%.

In the short run, the situation is different, and the negative currency shocks of the real exchange rate have a positive and significant effect on the export price. It can be argued that the fluctuation of the real exchange rate in different circumstances has a different effect on the export price. If exchange rate fluctuations are temporary, they will reduce export prices while increasing export prices in the long run. As the results show, the reaction of export prices to an asymmetric real exchange rate increase and decline. Indeed, the reaction of export prices to negative shocks of the real exchange rate fluctuations in the long run is more than positive shocks. Thus, it can be said that the reaction of export prices is higher than negative shocks. As explained in the previous section and it was expected that the producer price index is positive here, in the long run, the producer price will increase the export price. However, in the short run, it does not significantly affect the export prices of selected products. In the long run, GDP has a positive and significant effect on the export price of selected products and in the short term, it does not have a significant effect on export prices. The rate of exchange rate transitions in the long run is complete and in short term incomplete. In fact, in the long run, for a one percent increase in the real exchange rate, the export price increases by 1.05% in domestic currency, so it can be deduced that all changes in the domestic currency have been shifted to export prices, and the transfer of the foreign exchange rate to the full export price has been complete. The real exchange rate on prices in the short term transfer was incomplete. With an increase of one percent of the real exchange rate, export prices of selected products increased by 0.26 percent. Despite the difference in the total estimation coefficients, it can be said that the effect of positive and negative shocks on real exchange rate fluctuations is estimated in the same way. The correlation test has been used to ensure that the tools used are valid.

Given the fact that the second test statistic is above 5%, the zero assumption regarding the validity of the tools cannot be ruled out.

5. Conclusions and Suggestions

The main objective of this research is to investigate the real exchange rate fluctuations and its fluctuations in export prices of selected products of Iranian food industry during the period of 2001-2015. In this regard, the real exchange rate fluctuation index of the GARCH method and the positive and negative shocks of real exchange rate fluctuations from the Markov-Switching method and their effect along with other variables in the form of the research model, and using the two methods of PMG and GMM The export prices of Iranian food industry were examined.

The results of the two methods showed that the real exchange rate transfer on the export prices of selected products in the period under review was complete and the real exchange rate fluctuation in the long run led to an increase in export prices. In examining the asymmetric effects of the real exchange rate fluctuation, the results of both shock-induced asymmetric effects were confirmed and showed that the effect of negative shocks is more than positive shocks on export prices of selected products of Iranian food industry.

Since exchange rate fluctuations have a very significant and significant effect on export prices, it is suggested that Iranian economic policy makers and their trading partners curb exchange rate fluctuations by adopting appropriate exchange policies. The instability of the price of their export goods is minimized. Also, by improving the provision of currency services, complying with financial discipline and reducing the growth of liquidity and proper management of currency demand, it will prevent the exchange rate fluctuation.

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