African Journal of Agricultural Research Vol. 5(18), pp. 2485-2490, 18 September, 2010
Available online at http://www.academicjournals.org/AJAR
ISSN 1991-637X ©2010 Academic Journals

Full Length Research Paper

Effect of exchange rate on dried apricot export in Turkey: A vector autoregression (VAR) analysis

Orhan Gündüz

Department of Agricultural Economics, Faculty of Agriculture, University of Ondokuz Mayis, Samsun-Turkey.
E-mail: orhan.gunduz@omu.edu.tr. Tel: 90362 312 1919. Fax: 90362 4576034.

Accepted 5 August, 2010

Volatilities, which occur in exchange rates, cause variability in revenues also obtained from export. This study aimed to explore the relationship between variability in exchange rate and export values of dried apricot. VAR method was followed using monthly time series data covering the period of 2003:01 - 2008:12 and mutual relations were analyzed by using VAR method. The stationary variables were analyzed using the Augmented Dickey–Fuller (ADF) test. Research results showed that there was unidirectional causality from exchange rate to exports values. Based on the results of an impulse-response test, volatility caused by a shock with one standard error to be applied on variables may become stable after 11 periods. Research results also showed that volatilities in export values depended on exchange rate by 20% in long period. Following stabilization policy for exchange rate and extending markets to alternative ones may increase the export revenues.

Key words: Dried apricot, exchange rate, export, VAR.

INTRODUCTION

It is well known that the competition power of the countries having positive foreign trade rates is high in international markets and any decrease in foreign trade rates means a decrease in competition power and consequently, lower prices will be bidden for the goods, which may be exported to abroad. Whenever such situation has occured, exporters and importers wish that; foreign trade rates turn to their favor by following policies for changing exchange rates because exporters and importers assume a tight relation between these two variables. So, they make their foreign contacts based on a valid exchange rate. However, recent studies have failed to show any clear evidence about presence of relationship between foreign trade rates and exchange rate variable.

Alse and Oskooee (1995) found in their study that there was no long term relation between effective exchange rate and foreign trade rates in which 25 less-developed and developed countries were searched by performing co-integration method. Similarly, Aristotelous (2001) discovered that exchange rate variable have no effect on the export during the years between 1989 and 1999 from England to America. However some studies achieved different results. Arize (1997), investigated effect of volatilities in exchange rate on export of United States of America (USA) and his empirical findings showed that volatilities in exchange rate have a negative effect on export of USA. The results of the research conducted were similar to that of Özbay (1999) who found that uncertainty on exchange rate in Turkey had statistically significant negative effects on export. Öztürk and Acaravci (2003) focused on the effects of volatility in exchange rate on Turkey's export via co-integration model by using monthly data for the period of 1989:01 - 2002:08 and determined that volatility in exchange rate has a negative effect on export demand. However, this relationship is weak. The results of the study conducted by Saatçioğlu and Karaca (2004) confirmed the upper evidence. They found that uncertainty on exchange rate in Turkey affects negatively their study in which they used quarterly data. Barişik and Demircioğlu (2006) also stated weak relationship between exchange rate regime and foreign trade.

Despite the presence of relation between variations in exchange rate and aggregate foreign trade rates, same relationship does not exist between export and import

values for selected product. Focusing on relationship between the relevant variables and variations in exchange rate by using time series may be useful, especially in sub-sectors (that , industrial and agricultural products).

Many previous empirical studies reported statistically significant relationship between export values of agricultural products and exchange rate. Goodwin and Schroeder (1991) revealed the presence of a dynamic relation between wheat prices and currency exchange rate by using VAR. Babula et al. (1995) focused on the effect of currency exchange rate on USA's corn export associated with time period by using co-integration analysis. Their research results showed that there was no co-integrated relationship between exchange rate and corn prices as well as export sales for the period before 1985; however, the reverse was the case for the period after 1985. Similarly, many researchers have dealt with some relationship in Turkey. Bügük et al. (2001) examined the effect of exchange rate uncertainty on export of Turkish agricultural sector. However they did not find out any significant relation between exchange rate uncertainty and export, with the exception of a couple of products. Yanikkaya (2001) suggested that variations in exchange rate had effect on tobacco and cotton export. Çekerol and Gürbüz (2003) discovered that an interaction exists between variations in real effective exchange rate and export/import price indexes for products of agriculture and forest, mining and quarries and industry in Turkey with the help of vector autoregression (VAR) analysis. Yalçin (2006) tested whether or not a relation exists among domestic nut prices (Ordu and Giresun), average nut export prices and the prices of European stock markets by using Granger causality analysis. Based on the results there was a unidirectional causality relation between the prices of stock market and Turkish nut export. The prices of stock market and nut that occurred in Europe affected both Turkey's export and the prices in Giresun and Ordu stock markets. However, the nut prices that occurred in Turkey did not affect the stock prices that occurred in Hamburg market. Fidan (2007) analyzed co-integration relation between agricultural import/export and real effective exchange rate (REER) by using Johansen co-integration analysis and Granger causality analysis in Turkey and suggested that REER had no significant effect on agricultural import/export. Erdal and Uzunöz (2008) investigated causality relation between nut export prices, exchange rate and European stock market prices for the period 1995 – 2007 in Turkey and Europe. They stated that variability in exchange rate affects nut prices in both Turkey and Europe.

It was clear based on the upper evidence that exchange rate affects agricultural product export significantly in Turkey. However, there has been less or no study about effects of exchange rate on export values on specific products apart from nut; in spite of the fact that Turkey has a significant role in production and trade of many agricultural products such as nut, olive, dried fruits and vegetables.

One of the most important agricultural export items for Turkey is dried apricot. Turkey keeps the top rank in dried and fresh apricot production in the world. In 2006, Turkish fresh apricot production, which was 460 thousands of tons, comprises 15% of the world apricot production (FAO, 2009). Considering dried apricot production, share of Turkey was 80%. Turkey exported 111 thousands of tons of dried apricot in 2006 and gained 195 million dollars (MARA, 2008). In some years, apricot export revenue reached 300 millions of dollars.

Turkish dried apricot export value varied in association with exchange rate. However, there has been no study to explore direction and degree of this mutual relationship.

So, the purpose of the study was to explore relationship between variabilities in exchange rate ($/TL) and export values ($) for dried apricot by using vector autoregression (VAR) analysis with time series data. The present study therefore may contribute to the literature, and may provide data for dried apricot manufacturers, exporters and policy makers.

DATA AND METHOD

Monthly export values for dried apricot provided by Southeast Anatolian Exporters Unions for the period 2003:01 – 2008:12 ($) (SAEU, 2009) and monthly exchange rate data provided by State Planning Organization (SPO) for the period 2003:01 – 2008:12 (USD -$) (SPO, 2009) were used in the study (Table 1).

"Export values" has hereinafter been referred to as "EXP" and exchange rate has been hereinafter referred to as "EXC" for simplicity. Time series data were analyzed using vector autoregression (VAR) method. E-Views statistical software was used to perform analysis.

Since many econometricians (Sims, 1980; Cooley and Roy, 1985; Rosenweigh and Tallman, 1991; Doan, 1992) emphasized that the aim of VAR analysis was to determine relations between variables, VAR was used to reach the objective of the study.

Pagan (1987) summarized the VAR model in four steps. In first step, data were converted into a suitable form for VAR. Selecting the lag values and variables with the help of causality test was the second step. At the third step, lag values were reduced and coefficients were made plain to simplify VAR. Finally, shocks were obtained with the help of orthogonalization process.

In the study, stationary variables in EXP and EXC series were tested using Augmented Dickey Fuller (ADF) unit root test (Dickey and Fuller, 1979). Dickey-Fuller suggested three types of equation, which were presented below:

No intercept, no trend: $\Delta Yt = \gamma Y(t-1) + ut$

Intercept, no trend: $\Delta Yt = a + \gamma Y(t-1) + ut$

Intercept and trend: $\Delta Yt = a + bt + \gamma Y(t-1) + ut$

Since VARs utilize lags, it is crucial to determine the optimal number of lags for a model. In this study, Schwarz Information Criteria (SIC), introduced by Schwarz (1978), as the tool for selecting lengths was used.

Granger causality test was performed to explore causality relationship between EXP and EXC and the direction of the relationship. Granger causality test checks for prediction of

Table 1. Export values of dried apricot and exchange rate (2003:01 – 2008:12).

Time period (year-month)	Export value (million $)	Exchange rate (TL/$)	Time period (year-month)	Export value (million $)	Exchange rate (TL/$)
2003-01	6.30	1.65	2006-01	6.30	1.33
2003-02	1.90	1.62	2006-02	7.70	1.32
2003-03	4.60	1.65	2006-03	8.50	1.33
2003-04	2.70	1.62	2006-04	6.40	1.33
2003-05	3.20	1.49	2006-05	6.20	1.41
2003-06	3.80	1.42	2006-06	6.40	1.59
2003-07	2.00	1.40	2006-07	5.30	1.55
2003-08	5.20	1.40	2006-08	10.40	1.46
2003-09	12.20	1.37	2006-09	10.20	1.47
2003-10	6.20	1.42	2006-10	10.70	1.48
2003-11	8.30	1.47	2006-11	13.00	1.45
2003-12	8.10	1.43	2006-12	12.20	1.43
2004-01	8.80	1.35	2007-01	9.70	1.42
2004-02	5.70	1.33	2007-02	9.60	1.39
2004-03	6.90	1.32	2007-03	10.70	1.40
2004-04	5.60	1.35	2007-04	7.30	1.36
2004-05	8.30	1.50	2007-05	5.50	1.33
2004-06	4.30	1.49	2007-06	6.30	1.32
2004-07	7.10	1.45	2007-07	7.20	1.28
2004-08	10.10	1.47	2007-08	14.90	1.31
2004-09	13.40	1.50	2007-09	14.70	1.26
2004-10	10.20	1.48	2007-10	15.80	1.20
2004-11	9.70	1.44	2007-11	20.20	1.18
2004-12	10.10	1.40	2007-12	13.20	1.17
2005-01	7.50	1.35	2008-01	16.20	1.17
2005-02	7.40	1.31	2008-02	15.20	1.19
2005-03	7.40	1.30	2008-03	16.00	1.23
2005-04	7.00	1.35	2008-04	13.40	1.30
2005-05	6.00	1.37	2008-05	8.80	1.25
2005-06	4.60	1.35	2008-06	5.40	1.23
2005-07	2.20	1.33	2008-07	4.60	1.21
2005-08	7.50	1.34	2008-08	17.60	1.17
2005-09	12.20	1.33	2008-09	20.90	1.23
2005-10	10.90	1.35	2008-10	18.10	1.47
2005-11	8.20	1.35	2008-11	14.80	1.59
2005-12	9.80	1.35	2008-12	8.00	1.54

TL: Turkish Lira.

variables based on causal relations that exist among EXP, EXC and lagged variables in the VAR model. The test utilizes the F distributions. Granger causality test was expressed as below (Granger, 1969).

$$Y_t = \alpha_0 + \sum_{i=1}^{n} \alpha_i Y_{t-i} + \sum_{i=1}^{n} \beta_i X_{t-i} + \varepsilon_t$$

$$X_t = \chi_0 + \sum_{i=1}^{m} \chi_i X_{t-i} + \sum_{i=1}^{m} \delta_i Y_{t-i} + u_t$$

In the above equations, α, β, λ and δ represent parameters. n and m were lag lengths. ε_t and u_t were independent, zero-average and constant disturbance terms. Initial hypotheses were tested mutually considering calculated F values, in which.

$Y_t \longrightarrow X_t$, then Y affects X.
$X_t \longrightarrow Y_t$, X affects Y.

Since Sims (1980) recommended using impulse-response analysis and variance decomposition obtained from moving averages' section of the VAR model due to the difficulties in interpretations of calculated coefficients, the results of VAR were interpreted by

Table 2. ADF unit root test results (level).

Variables	Intercept	Intercept and trend
EXP	-3.908 [0]	-5.046 [0]
	(-2.902)	(-3.474)
EXC	-3.075 [2]	-3.750 [1]
	(-2.904)	(-3.475)

MacKinnon (1996) 5% critical values are in parenthesis. Values in brackets show lag lengths specified by considering Schwarz Information Criterion (SIC).

Table 3. Granger causality test results between EXP and EXC.

Null hypothesis	F- test	Result	Conclusion
EXC does not Granger cause EXP	269.48 (0.08)*	Rejected	Exchange rate is Granger cause for dried apricot export.
EXP does not Granger cause EXC	0.34 (0.72)	Accepted	Dried apricot export value does not cause for exchange rate.

The asterisk * indicate rejection of the null hypothesis at the 5% level. The values in parentheses show p-values.

Figure 1. Granger causality relation.

performing impulse-response analysis and variance decomposition. Impulse-response functions reveal response to the changes when a unit of shock is applied to one of the variables. The form of impulse-response function was given below (Uysal et al., 2008; Kadilar, 2000).

$$z_t = \mu + \sum_{i=0}^{\infty} \phi_i \varepsilon_{t-i}$$

The variance decomposition, obtained from VAR's moving averages' section was performed in order to indicate how much variation occured in variables. If most of the variations in a variable are caused by the shocks in itself, this indicates that the variable acts intrinsically. However, if most of the variations are caused by the other variables in the model, this indicates that the variable acts externally (Enders, 2004).

RESULTS

Results of the ADF unit root test applied to the series were presented in Table 2. Based on the results of ADF test, it was clear that, both EXP and EXC variables in logarithmic form did not have unit root. Due to the fact that t-statistic values for the ADF were larger than the MacKinnon (1996) critical value, the analyzed series were non-stationary status.

Causality analysis was conducted using two lags, which was determined based on the results of Schwarz Information Criterion (SIC). Results of F test, which was used for determining whether causality relationship exists between EXP and EXC variables or not, were presented in Table 3. Direction of the relationship between EXP and EXC variables was depicted in Figure 1.

The results of Granger causality test showed that there was a unidirectional causality between EXC and EXP, indicating that exchange rate was the cause for export values of dried apricot while export values of dried apricot was not the cause for exchange rate. It was clear from the upper evidence that long-term volatilities in exchange rate affected the export values of dried apricot. This finding affirmed the results of many previous studies (Arize, 1997; Özbay, 1999; Öztürk and Acaravci, 2003; Barişik and Demircioğlu, 2006).

The results of impulse-response analysis revealed that EXP and EXC variables responded to a one-time shock on other series (Figure 2).

When a shock with one standard error was applied to exchange rate (EXC), its cumulative effect on export values of dried apricot is negative for 4 periods. However, this negative effect declined after the 4th period and disappeared after the 11th period. On the other hand, cumulative effect of shocking with one standard error applied to EXP on EXC was positive for 2 periods. But, this effect became negative after the 2nd period and negative effect decreased after the 6th period. Finally, it reached long term stability after the 11th period. It was fixed based on the results of impulse-response analysis

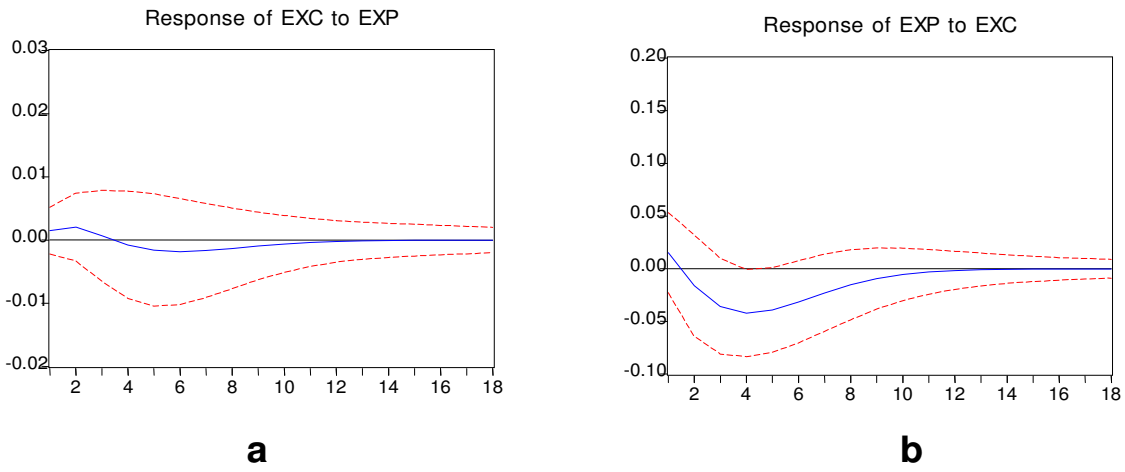

Figure 2. Responses of EXC and EXP variables: (a) Response of export values (b) response of exchange rate.

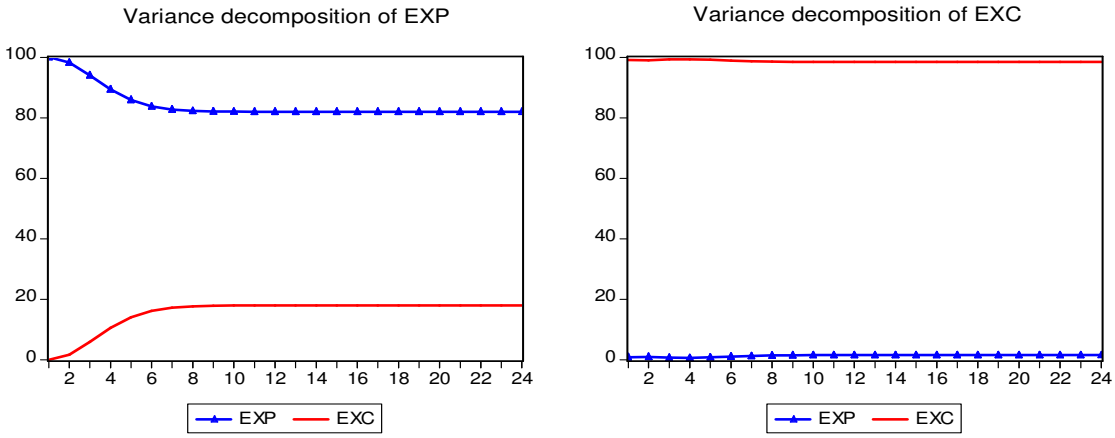

Figure 3. Variance decomposition results.

that the responses sourced by sudden shocks for both variables became stable.

Variance decomposition results were summarized in Figure 3. Based on results of decomposition, most of the total variation in EXP is explained in second period. The variable of EXC caused variation in EXP variable by 20% after the second period. Whereas, 98% of the total variation in EXC was explained by itself. However, effect of EXP on EXC was solely 2%.

The obtained results are same with the result of Granger causality test. Thus, the fact that exchange rate variable has an effect on foreign trade was determined once again; however, it was evidenced that foreign trade does not affect exchange rate significantly.

Conclusion

This study aimed to determine the effect of exchange rate on export of dried apricot in Turkey. Not only, the interaction between exchange rate and export values of dried apricot and but also the degree and direction of this interaction were explored by using VAR model. Monthly time series data covering the period 2003:01 - 2008:12 were used in the study.

Research results showed that exchange rate had significant effect on dried apricot export. It was fixed that an application of shocking with one standard error to EXP and EXC, respectively, led to instability in the EXP and EXC until the 11th period. However, the instability occurring in variables disappeared in long period. Research results showed that 20% of the total variation in dried apricot export was explained by the variation in exchange rate.

Finally, volatility in exchange rate affects trade business. Exchange rate regulations, which are practiced to obtain positive effects on foreign trade, sometimes will cause crisis. This affects dried apricot exporters, who

make business with countries abroad using US dollars, and consequently, dried apricot farmers also. To minimize exchange rate uncertainty, a stabilization policy for exchange rate should be followed. Competition power should be enhanced to avoid strong dependence with exchange rate in foreign trade. Foreign contacts that affect volatility in exchange rate should be reduced to minimum level. Opportunities for exporting to alternative markets should be developed; products like dried apricot should be made and organizational arrangements should be done for ensuring that manufacturers act in cooperation to keep export values in the required level. Thus, exporters, producers and consequently, the nation will win.

REFERENCES

Alse J, Oskooee BM (1995). “Do Devaluations Improve or Worsen the Terms of Trade?”, J. Econ. Stud., 22(6): 16-25.

Aristotelous K (2001). “Exchange-Rate Volatility, Exchange-Rate Regime, and Trade Volume: Evidence from the UK-US export function (1989-1999)”, Econ. Lett., 72: 87-89.

Arize AC (1997). “Conditional Exchange Rate Volatility and the Volume of Foreign Trade: Evidence from Seven Industrialized Countries”, Southern Econ. J., 64: 235-254.

Babula RA, Ruppel FJ, Bessler DA (1995). “U.S. Corn Exports: The Role Of The Exchange Rate” Agric. Econ., 13(2): 75-88.

Barişik S, Demircioğlu E (2006). “Relationship Of Export-Import, Convertibility, Exchange Rate Regime In Turkey (1980-2001)” Zonguldak Karaelmas Univ. J. Soc. Sci., 2(3): 71-84 (In Turkish).

Bügük C, Isik M, Dellal İ, ve A Allen (2001). “The Impact of Exchange Rate Variability on Agriculture Exports of Developing Countries: The Case of Turkey”, J. Int. Food Agribus. Mark., 13: 83-105.

Cooley TF, Roy SF (1985). “Atheoretical Macroeconometrics: A Critique”, J. Monetary Econ., 16: 283-308.

Çekerol K, Gürbüz H (2003). “Long-term relations between reel exchange rate variabilities and sectoral foreign trade prices”, ODTÜ Economics congress, 6-9 September, Ankara. http://www.econturk.org/turkiyeekonomisi/odtu_kamil.pdf, (available at 18.05.2009) (In Turkish).

Dickey D, Fuller W (1979). “Distribution of the estimators for autoregressive time series with a unit root”, J. Am. Stat. Assoc., 74: 427-431.

Doan T (1992). “RATS User’s Manual” Evanston, III.: Estima,

Enders W (2004). “Applied Econometric Time Series”, Iowa State University, John Wiley and Sons Inc., NJ.

Erdal G, Uzunöz M (2008). ” The Causality Relationship Among Hazelnut Prices of Turkey and Europe and Exchange Rate” J. Agric. Faculty of Uludag Univ., 22(2): 47-56 (In Turkish).

FAO (2009). Food and Agriculture Organization of the United Nations (FAO), Rome 2006. (http://faostat.fao.org (available at 08.07.2009))

Fidan H (2007), Impact of the Real Effective Exchange Rate (REER) on Turkish Agricultural Trade, Int. J. Soc. Sci., 1: 70-82.

Goodwin BK, Schroeder TC (1991). ¨Price Dynamics in International Wheat Markets” Canadian J. Agric. Econ., 39(2): 237-254.

Granger CWJ (1969). “Investigation causal relations by econometric models and cross-spectral methods”, Econometrica, July, pp. 424-438.

Kadilar C (2000). “Applied Multivariate Time Series Analysis”, Bizim Büro printing office, Ankara (In Turkish).

MacKinnon G, James (1996). Numerical Distribution Functions for Unit Root and Cointegration Tests, J. Appl. Econ., 11: 601-618.

MARA (2008). Statistics of Provincial Directorate of Malatya city, Ministry of Agricultural and Rural Affairs (www.malatya-tarim.gov.tr).

Özbay P (1999). The Effect Of Exchange Rate Uncertainty on Exports A Case Study for Turkey, Central Bank Of The Republic Of Turkey, Working Papers, Ankara (In Turkish).

Öztürk İ, Acaravci A (2003). “The Effects Of Exchange Rate Volatility On The Turkish Export: An Empirical Investigation” Rev. Soc. Econ. Bus. Stud., 2: 197-206 (In Turkish).

Pagan AR (1987). “Three Econom teric Methodologies: A Critical Appraisal,” J. Econ. Surveys, 1(1): 3-24.

Rosenweigh FA, Tallman EW (1991). “Fiscal Policy and Trade Adjustment: Are the Deficits Really Twins?”, Federal Reserve Bank of Atlanta, Working Paper, 91-92: 1.24.

Saatçioğlu C, Karaca O (2004). “The Impact Of Exchange Rate Uncertainty On Exports: The Case Of Turkey” J. Dogus Unive., 5(2): 183-195 (In Turkish).

SAEU (2009). Southeast Anatolian Exporters Unions, Gaziantep-Turkey. (http://www.gaib.org.tr/web/aylikistbulten.asp (available at 13.04.2009)).

Schwarz G (1978). “Estimating the dimension of a model”, Annals of Statistics, 6(2): 461-464.

Sims C (1980). “Macroeconomics and Reality”, Econometrica, 48: 1-48.

SPO (2009). State Planning Organization of Prime Ministry Of Turkey, Ankara. (http://ekutup.dpt.gov.tr/teg/2009/02/tv.25.xls (available at 14.04.2009)).

Uysal D, Mucuk M, Alptekin V (2008). “Analysis Of The Relationship Between Inflation And Growth With Vector Autoregressive Model In Turkish Economy” Zonguldak Karaelmas Unive. J. Soc. Sci., 4(8): 55-71. (In Turkish).

Yalçin İ (2006). “The Analaysis of Hazelnut Prices in Turkey”, Institute of Basic And Applied Sciences of Çukurova University, Unpublished PhD Thesis, Adana (In Turkish).

Yanikkaya H (2001). “The Influence of Real Exchange Rates on Turkish Agricultural Exports”, J. Econ. Admin. Sci. Gazi Univer., 2: 69-80 (In Turkish).