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EXPLANATION OF THE TURKISH INFLATION RATE WITH FISHERIES EXPORT AND IMPORT

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ABSTRACT

Turkey has a very high potential in terms of fisheries and its fisheries production has steadily increasing. As a result, the export value has been multiplied by a factor of 9 compared to the beginning of 2000's by reaching up to $413 million and the import value increased by a factor of 5 during the same period by reaching up to $176 million. The purpose of this study was to explain the factors that affect the inflation rate with a multiple regression model. Therefore, we used the time series. Time Series (Time Series data): Most macroeconomic variables which are observed in equal time periods belong to this group (e.g. Gross Domestic Production, the inflation and interest rates, exchange rates, the Istanbul Stock Exchange Index, etc.). In this study, we analysed Turkey's inflation rates of the last 27 years with respect to fisheries import ($) and export ($), using the multiple regression analysis method. With the help of the regression analysis model, we were able to explain 66% of Turkey's inflation rate with fisheries export ($) values.

Key words: Inflation, import ($), export ($), multiple regression analysis

TÜRKİYE ENFLASYON ORANININ SU ÜRÜNLERİ DIŞ ALIM VE DIŞ SATIMI İLE AÇIKLANMASI

ÖZET

Türkiye su ürünleri bakımından oldukça zengin bir ülkedir. Her geçen gün büyüyen yetiştiricilik sektörü ile daha ileri noktalara gelmiştir. Bunun sonucunda dışsatım değeri 2000'li yılların başına göre yaklaşık 9 katına çıkarak 413 milyon $ civarına,dışalım değeri ise yaklaşık olarak 5 katına çıkarak 176 milyon $ civarına yükselmiştir. Çalışmanın amacı, enflasyonu etkileyen faktörleri çoklu regresyon modeli ile ifade etmektir. Bu nedenle, zaman serilerinden faydalanılmıştır. Zaman Serileri (Zaman Serileri veri): Değişkenlere ait birbirine eşit zaman aralıklarında gözlemlenen değerleri içeren, çoğu makroekonomik değişken bu gruba girer (örneğin Gayri Safi Milli Hasıla, enflasyon ve faiz oranları, döviz kurları, İstanbul Menkul Kıymetler Borsası Endeksi vs.) Bu çalışmada Türkiye'nin 27 yıllık enflasyon değerleri su ürünlerinde yapılan dışalım ($) ve dışsatım ($) cinsinden değerlendirmeye alınarak çoklu regresyon analiz yöntemiyle çözümlenmiştir.Regresyon analizi sonucunda bulunan model yardımıyla enflasyon oranının yaklaşık olarak %66 oranında su ürünleri dışsatım ($) değerleri ile açıklanabildiği görülmüştür.

Anahtar kelimeler: Enflasyon, dışalım ($), dışsatım ($), çoklu regresyon analizi

INTRODUCTION

Multiple variable regression analysis is one of the widely used econometric tools in econometric data analysis. Regression analysis is a method used to examine relations between multiple variables (Anderson 2003). The standard approach in regression analysis is to summarize and define the relations in a data set, estimate the coefficients, control and observe a system and search regression equations in order to select variables. In regression models, we need certain estimate realizations. In order to determine whether the estimator results are satisfactory or not,

we use tests such as t and F tests. We obtain the coefficient determination, R^2 (Draper and Smith 1981, Yalta 2011). A time series is a set of sorted measurements of related values in time intervals (Maddala and Kim 2002, Güloğlu and Nazlıoğlu, 2013). The purpose of time series analysis is to understand the facts represented by the observation set and accurately forecast the future variable values. Turkey is the 30th in total fishery production with a rank the 27th in capture fisheries and the 21st in aquaculture production in the world (FAO 2012). This data shows us that Turkey fisheries has an important place in the world. Turkey's fisheries export tends to increase continuously (Saygı and Bayhan 2011). The production facilities comply with the EU standards. Since fish products are the only animal product that Turkey can export to the EU, fisheries has an important share within the export. The main reasons of the export increase are Turkey's precedence over other competing countries in terms of production capacity, quality, logistics, food safety and processing technologies, promotion and marketing strategies (Saygı et al 2011). Greece, Italy, the Netherlands, Japan and Spain are the top 5 countries to which Turkey exports fisheries and they make up 74% of total fisheries export. Fisheries export is in the 17th place in the world's total exports. The main export products are European bass, gilthead sea bream, rainbow trout and tunny. A large portion of Turkey's fisheries export consists of fresh-chilled fish. Other fish species, molluscs and processed products are also exported. While the most important markets for sea bass, sea bream and rainbow trout are four above mentioned European countries, the sole market for tunny is Japan. Turkey is the top trout producer and the third in fisheries production among EU countries. Moreover, with the increase in demand for Turkish fish, fisheries export value increased by a record 340% between 1986 and 2012. The export value reached to $465 million in 2011, and this sector is now referred as 'the shining sector' (TÜİK 2013). European sea bass has the highest exportation value in Turkey's fisheries with $91 million, followed by sea bream, rainbow trout and tunny. While the main market of sea bass and bream is the Netherlands, it is Germany for rainbow trout. Turkey's total export of frozen and smoked trout is approximately $85 million (TÜİK 2013). In recent years, remarkable investments have been made on fisheries production, processing and export as can be deduced from Table 1. It can be seen from Table 1 that the inflation rate increased between 1986 and 1994 and decreased between 1994 and 2012. The aim of the present study was to make an attempt to explain the Turkish inflation rate with fisheries export and import values.

Table 1. Net profit values of the farms investigated

Year	Inflation Rate	Export Values ($)	Import Values ($)
1986	34.6	33 795 209	3 703 223
1987	38.9	36 964 434	7 942 620
1988	68.8	42 517 775	4 693 674
1989	63.3	54 315 781	3 200 691
1990	60.3	55 605 314	11 606 892
1991	66.0	47 396 128	1 039 6511
1992	70.1	46 211 572	19 243 607
1993	66.1	40 477 748	23 203 726
1994	106.3	48 921 961	24 752 992
1995	89.1	49 330 708	35 049 622
1996	80.4	55 195 612	34 072 888
1997	85.7	68 206 913	50 836 365
1998	84.6	39 986 457	40 558 109
1999	64.9	61 547 289	29 408 235
2000	54.9	46 401 627	37 022 930
2001	54.4	54 513 738	11 517 237
2002	45.0	103 057 173	18 754 783
2003	25.3	124 842 223	32 636 120
2004	10.6	180 513 989	54 240 304
2005	8.1	206 039 936	68 558 341
2006	9.6	233 385 315	83 415 006
2007	8.8	273 077 508	96 632 063
2008	10.4	383 055 912	119 768 842
2009	6.3	318 055 912	105 914 621
2010	8.6	312 927 792	133 829 563
2011	6.5	395 311 639	173 886 517
2012	8.9	413 746 656	176 496 516

MATERIALS AND METHODS

Researchers collect, classify and interpret the data to make reliable and realistic decisions in terms of situation assessment and planning. The purpose of the present study was to make an attempt to explain the Turkish inflation rate with fisheries export and import values. For this, we resorted to the data between 1986 and 2012 taken from Turkish Statistical Institute. In order to examine the inflation rate, we tried various mathematical models (linear, quadratic, exponential)

and considering the determination coefficient (R^2), the sizes of error terms and of parameters and we decided to use the linear model. In the econometric analysis, we used inflation rate as the dependent variable, and export and import as the independent variable. We were able to find important variables that affect the inflation rate using the econometric analysis. Multiple linear regression analysis was used to create a time series analysis method. SPSS 15.0 was used for assessment. A time series consists of time trend, seasonal fluctuations, cyclical movement and error term. There are many methods used to analyze the components of time series in order to forecast the behavior of time series (Kutlar 2007). These methods assume that the past can guide the future. The most well-known method is the Box-Jenkins analysis. Forecasting is mostly accepted and understood as predictions made with respect to time series (Sevüktekin and Nargeleçekenler 2010)

Time Series

Observed values (y1, y2,…,yt) are ordered based on time to form time series. It is very important that the variance is normal in time series. If it's not, we use certain methods to convert it. The purpose of using time series is to predict the future values of variables (Rawlings et al. 1998).

Time Series Components

Time series consist of 4 components, seasonal fluctuations (M), secular trend (T), cyclical fluctuations (K) and irregular (random) fluctuations (D) (Elbek et al. 2013).

Time Series

Time series can be stated as

$$Y = (T) * (K) * (M) * (D) \text{ or}$$
$$Y = (T) + (K) + (M) + (D)$$

Seasonal fluctuations do not affect annual time series. We must convert the statement to Y=T,K,D. Seasonal fluctuations, secular trend and cyclical fluctuations are referred to as systematic components. Trend is the main value, while the others are values whose averages are 100.

Seasonal Fluctuations

Seasonal fluctuations represent the seasonal changes in time series. Their values may increase in some parts of the year. These fluctuations are usually caused by natural and socio-economic reasons. For example, as a result of the increasing demand for food and clothing items during the holidays, their prices go up.

Trend (General) Fluctuations

Trend fluctuations are changes seen in time series in a long period of time. Depending on the severities of the factors they are related to, these values may increase or decrease (e.g. indicators such as sales values, GNP).

Cyclical Component

Cyclical components are cyclical fluctuations other than seasonal fluctuations. There are 4 types of cyclical fluctuations; recession, development, prosperity and decline. These fluctuations are not periodic but cyclical (e.g. summer investments, revenues and sales).

Irregular (Random) Fluctuations

Irregular (random) fluctuations are changes that cannot be foreseen.When they will occur or how severe they will be cannot be predicted. These are changes caused by factors such as earthquakes, floods or wars.

Trend Estimation

The purpose of trend estimation is to find the true values of a time series by diminishing the effects of seasonal, cyclical and random movements. It can be described as stabilization of the variance. Trend is the most commonly used method in time series. There are 3 ways to estimate the trend (Elbek et al. 2013).
1. Simple Method: We divide the time series into two equal parts, calculate the arithmetic mean of these parts, mark their spots on the plot and link the dots to find the trend.
2. Moving Averages Method: We acquire a new series by replacing each value with the average of previous and subsequent values and accept it as the trend.
3. Regression analysis: We acquire a linear or nonlinear equation compatible with the data using the least squares method. The Regression Model's most important criteria of viability are deviations in the model and these should be examined accordingly. These are multiple correlation test, heteroscedasticity, autocorrelation and residual plot.

RESULTS AND CONCLUSION

We analyzed Turkey's inflation rates of the last 27 years with respect to fisheries import and export using a multiple regression analysis method. In econometric analysis, we used inflation rate as the dependent variable, and export and import as the independent variable. For this purpose, we made a regression analysis on time series related to the data of 1986-2012. Plots of time series can be found in Figure 1.

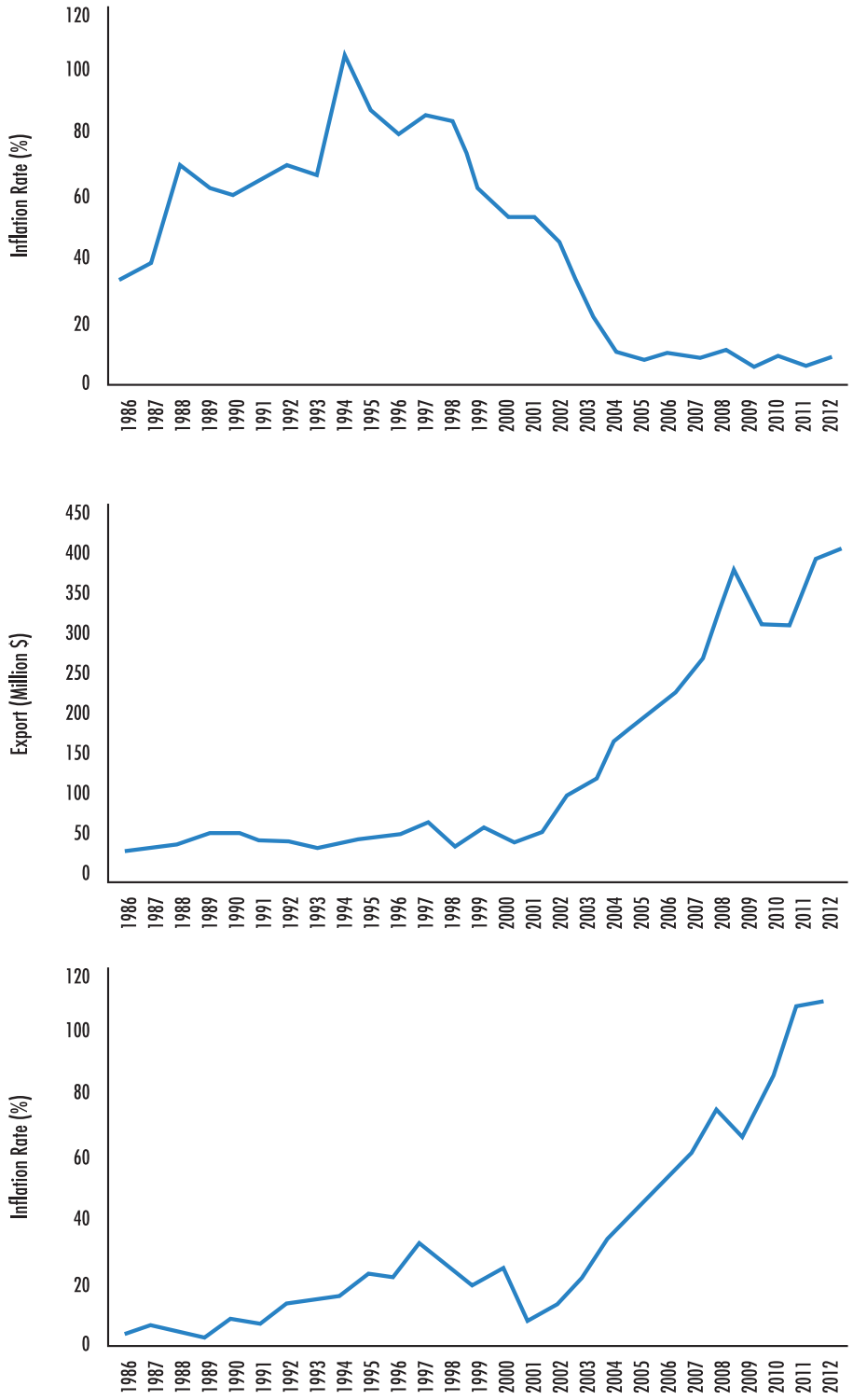

Figure 1. Time series plots of the data (DİE 1986-2004, TUİK 2005-2012)

There was a strong inverse relation between inflation rate and import (r=-0.812). There is also a strong inverse relation between inflation rate and export (r=-0.769). According to the results of multiple regression analysis, the findings given in Table 2 were obtained. According to Table 2, inflation rate and import and export values belong to the same model, that managed to explain the inflation rate by 76% with import and export values. This percentage was thought to be insufficient. For this reason, there was a violation in assumptions or there were more values needed to be added. When we ran an assumption test on the findings given in Table 2, VIF values exceeded 10. In this case, we can say that there is a multiple correlation problem (Rawlings et al. 1998). For this purpose, we remade the regression analysis according to the stepwise method. The explanation rate further dropped to 66% but the multiple correlation problem was solved (Table 3). When we ran a "spearman rank correlation coefficient test", there was no change in variances (Gujarati 1992). In the estimation model given in Table 3, the coefficient was statistically significant and there were no multiple correlations or any changes in variances. We examined the acquired estimation model for autocorrelation using the "Durbin-Watson table", we found a value of d_h= 0.583. Again using the Durbin-Watson table for level of significance α=0.05, n=27 and independent variable number p=2, we found d_L and d_U as1.316 and =1.469 respectively. Since d was 0.583, there was a positive autocorrelation. In order to eliminate the autocorrelation, we made a delayed regression analysis and found the value of dh as 2.075. Using the Durbin-Watson table for level of significance α=0.05, n=26 and independent variable number p=2, we found d_L and d_U as 1.302 and 1.461 respectively. Since d was 2.075, there was no positive autocorrelation. All these test results proved that the regression estimates were successful and the model was acceptable. In the estimation model given in the table, the coefficients were statistically significant and there were no multiple correlations or changes in variances. The resulting regression equation was:

$\hat{Y}$= 73.305 - 1.99x10-7 (export) +ε

The model was linear (F=48.473 p<0,05), thus we can say that the model is acceptable. Although 66.6% of the model can be explained with these independent variables, the remaining 33.4% should be explained by other methods. As a result, we can conclude that the increase or decrease in exports have a great impact on the inflation rate in Turkey.

Table 2. Results of the multiple regression full model

Variable	b	S(b)	Beta	t	p	VIF
Import	$6.56x10^{-7}$	$2.06x10^{-7}$	1.059	8.9232	0.004	11.105
Export	$-4.47x10^{-7}$	$8.17x10^{-8}$	-1.822	5.2051	0.000	11.105
Constant	73.215	4.581		15.983	0.000	
n=27	**R^2**=0.761		**DW**=1.226		**F**=38.144	

Table 3. Results of the stepwise method

Variable	b	S(b)	Beta	t	p	VIF
Export	$-1.99x10^{-7}$	$2.86x10^{-8}$	-0.812	-6.962	0.000	1.000
Constant	73.305	5.352		13.798	0.000	
n=27	**R^2**=0.660		**DW**=0.583		**F**=48.473	

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