A SIMPLE METHOD TO FORECAST THE TIMBER FOREST PRODUCTS IN THE MEDITERRANEAN EUROPEAN COUNTRIES USING SOCIOECONOMIC FACTORS

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Abstract

Main objective of this research is the study of the wood market and the wood products for the four Mediterranean member states of the European Union (Greece, Italy, France and Spain) and how the multiple regression could estimate the relationship between production, imports, exports and consumption for each wood product for every country, with explanatory demographical and economical variables and the time periods. The econometric research became using linear regression. The use of these simple models could be a useful tool in the hands of policy makers to take critical decisions about the future of the Mediterranean European timber market and how this market could strengthen the domestic economies generally.

Key words: wood products, European Mediterranean wood market, forest sector, timber production, forecasts.

Introduction

The forecasts contribute in the recognition of problems that examine the timber as natural resource and in the adoption of suitable policy and more specifically the suitable programs of development that will contribute in the concretization of desirable objectives. (Adams et al. 1978) The models of forecast in the forest sector are many and they can be separated in various types with various criteria (Narbuurs and Paivinen 1996). Wide (2005) used a simple model of simulation for the forest sector. He claimed that the main advantages of use of this model are the usage of fundamental economic theory but also that this model is ready to be used simulating various scripts. It is so adaptable that could give simple and possible answers in what will happen in the production, consumption and trade if we have changes in offer and demand. The imported data that author used is 1) the observed quantities of production and consumption in each region. 2) the observed prices of products in each region 3) the observed elasticities of offer and demand in each region. Many others models were used in time for predictions

in forest sector us G.T.M. (Global Trade Model) (Kallio et al. 1987), T.S.M. (Timber Supply Model) (Sedjo and Lyon 1996), C.G.T.M. (Cintrafor Global Trade Model) (Cardellichio et al. 1990), A.T.L.A.S. (Aggregated Timber Supply System) (Mills and Kincaid 1992), H.O.P.S.Y. (Hinssen 1994), N.A.P.A.P. (North American Pulp and Paper model) (Zhang et al. 1993). The aim of this study was to investigate how the multiple regression could estimate the relationship between production, imports, exports and consumption for each wood product for every European Mediterranean country, with explanatory demographical and economical variables such as population, GDP, Consumer's Price Index, Industrial Production Index and also the time periods. As results we get the simple / multiple linear regression analysis, and the respective predictive ability tests. The major product categories, witch have been examined, are roundwood for coniferous and non coniferous trees, sawwood for coniferous and non coniferous trees, wood panels, wood pulp and paper – paper board.

Material and Methods

As region of research in the present paper were received the four European countries of Mediterranean basin, Greece, France, Italy and Spain. The data sets, that were used, are derived from Food and Agriculture Organization's announcements and the analysis was based on annual values from F.A.O. for the period 1972–2002 (FAO 1986, FAO 1993, FAO 1994, FAO 1998). The data for the independent variables (Population, Gross Domestic Product and Industrial Production Index were received from UNECE (Eurostat 2005), (UNECE 2005) and Eurostat databases and the Consumer Price Index from the International Labor Organization database (ILO 2005).

All the above mentioned products are converted to round wood equivalent units with the usage of coefficients that were taken from FAO, in order to compare with each other. In particular, the research focused on the investigation of the supply, the demand and trade for wood and wood products for each member state. The individual categories as mechanical, semi-chemical and chemical woodpulp after they were first converted in cubic meters (cum), are summed and gave the total of equivalent round timber for the woodpulp. The same procedure followed for the all categories that they had subcategories. At analysis were used linear models applying simple and multiple linear regression. The models that were used have the general form $Y = b_0 + b_1 x_1 + b_2 x_2 + + b_3 x_3 + \ldots\ldots + b_n x_n$. (1)

The method of simple and multiple linear regression used with scope to calculated the value of a variable (dependent) from two or more independent (explanatory) variables via the data with linear relation from each other. The main reason for which was used the linear regression method is because it is the simplest and the most practical. The models that have been used occasionally and are reported extensively above (T.A.A.M., C.G.T.M, G.F.S.M., G.F.P.M. and other) are very specialized and they require a big number of data. The advantages of these models are certain that they give detail reports for

the market and also for the exterior factors that influence the market. Although they need a lot of information and data to import. At the same time it is obvious the need of existence of more practical alternative solution (Wide 2005). The multiple regression is a general and flexible method of analysis of data that can be used when the made dependent variable is studied as operation of independent variables but also when is studied the relation from each other (Cohen and Cohen 1983). The method of multiple linear regression contributes biggest in the manufacture of predictable models (Draper and Smith 1981). Existed also cases of products in which the linear regression did not give reliable results. After the calculation of the equation, became the following tests which certify the correctness of process. Thus in the tables following are given the basic statistical tests of regression. Adjusted R^2 (R^2_{adj}), SEE (Standard Error of Estimate), P Value ($P>0.05$) is the probability of being wrong in concluding that there is a true association between the variables and V.I.F. (Variance inflation factor). One simple and important diagnostic of multicollinearity is the Variance inflation factor (Matis 2004). When the value of V.I.F is bigger than 10 there are redundant variables in the regression model and the parameter estimates may not be reliable.

Results and Discussion

The econometric models that were calculated for the production, consumption and trade for the Mediterranean European countries for the products that are examined are given above and is observed good adaptation of models in the data.

For Greece (Table 1) the R^2_{adj} oscillates from 0.66 to 0.86 statistically important with P Value smaller the 0.05 ($P<0.05$) for all variables, while the

Table 1. Econometric models for coniferous and non coniferous wood and wood products for Greece.

GREECE	R^2adj	SEE	P Constant	P Year	P GDP	VIF
Conifers Roundwood Production = -657,815.7 + (340.9 * year)	0.74	1,911.33	<0.001	<0.001		
Wood Panels Imports = -42,879.2 + (21.6 * year) + (43.2 * GDP)	0.66	135.431	<0.001	<0.001	<0.001	$V.I.F._1 = V.I.F._2 = 1.23$
Wood Panels Consumption = -61,078.7 + (33.371 * GDP) + (31.09 * year)	0.86	112.279	<0.001	<0.001	0.029	$V.I.F._1 = V.I.F._2 = 1.23$
Paper-Paperboard Imports = -102,775.7 + (52.09 * year) + (76.6 * GDP)	0.76	258.335	<0.001	<0.001	<0.001	$V.I.F._1 = V.I.F._2 = 1.23$
Paper-Paperboard Consumption = -147,764.211 + (75.335 * year)	0.82	336.198	<0.001	<0.001		

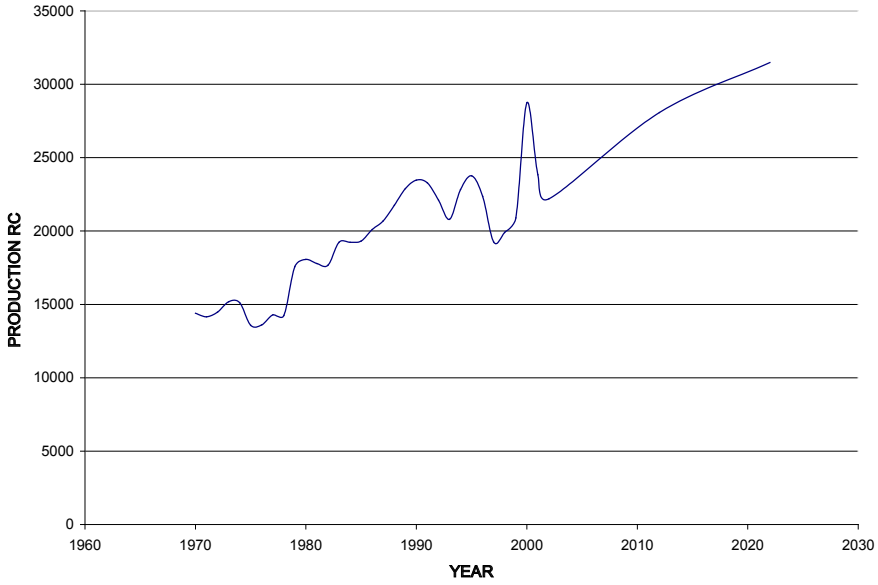

Fig. 1. Conifers roundwood production trend for Greece.

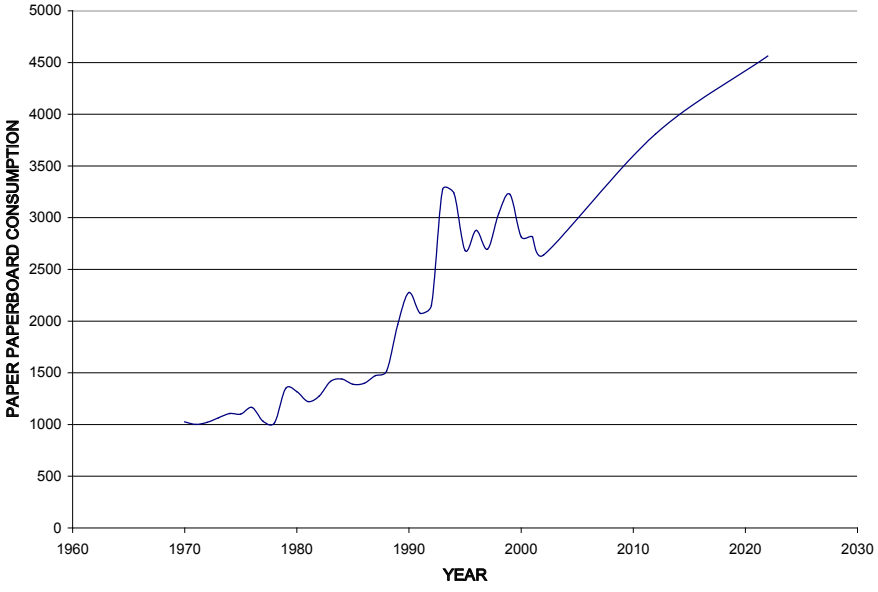

Fig. 2. Paper-paperboard consumption trend for Greece.

standard error of estimate for each equation is considered acceptable. By the five (5) equations that are presented in this paper two (2) of them were calculated with the method of simple linear regression and three (3) with multiple linear regression. The indicator V.I.F. is acceptable. So the prediction for these products remain easy and not complex as if we predict the GDP for the next years we ll be able to predict the conifers roundwood production, the imports of panels and the imports and consumption of the paper. The usage of forecasting model in a productively pure county like Greece, accommodate the work of recipients of decisions to specify the imports policy in the sector of timber, procedure very

Table 2. Econometric models for coniferous and non coniferous wood and wood products for Italy.

ITALY	R^2adj	SEE	P Constant	P Year	P GDP	P IndP	P Pop	P ConPI	VIF
Conifers Sawnwood Exports = -4,935.2 + (2.5 * year)	0.52	22.897	<0.001	<0.001					
Non Conifers Sawnwood Production = 18,688.9 - (0.2* population)	0.53	286.936	<0.001				<0.001		
Non Conifers Sawnwood Imports = -118,794.9 + (60.9 * year)	0.72	364.175	<0.001	<0.001					
Wood Panels Production = -326,372.1 + (167.1* year)	0.72	1002.622	<0.001	<0.001					
Wood Panels Exports = -86,461.570 + (43.9 * year)	0.7	272.353	<0.001	<0.001					
Wood Panels Consumption = -412,367.9+ (210.8* year)	0.79	1,039.515	<0.001	<0.001					
Wood Pulp Production = 86,612.2 - (42.7 * year) + (23.8 * ind production)	0.83	1,89.697	<0.001	<0.001		0.006			V.I.F.1 = V.I.F.2 = = 1.01
Paper-Paperboard Imports = -865.3 + (88.8 * consumer price)	0.92	1212.556	<0.001	0.039				<0.001	
Paper-Paperboard Exports = -32,3504.102 + (164.435 * year)	0.84	735.773	<0.001	<0.001					

Table 3. Econometric models for coniferous and non coniferous wood and wood products for France.

FRANCE	R^2adj	SEE	P Constant	P Year	P lnP	P Pop	P ConPI	P GDP	VIF
Conifers Sawnwood Consumption = -53,672.16 + (11.114 * Population)	0.61	958.107	<0.001			<0.001			
Non Conifers Sawnwood Production = 58,310.2 – (28.9 * year) – (25.1 * GDP)	0.72	127.309	<0.001	<0.001				0.020	V.I.F.1 = V.I.F.2 = = 3.16
Wood Panels Imports = -6,935.569 + (0.140 * Population)	0.81	279.444	<0.001			<0.001			
Wood Panels Consumption = -6,035.026 + (0.131 * Population)	0.70	353.230	<0.001			<0.001			
Paper-Paperboard Imports = -23,990.478 + (0.472 * Population)	0.68	953.630	<0.001			<0.001			
Paper-Paperboard Consumption = -21,999.684 + (0.444 * Population)	0.62	920.790	<0.001			<0.001			

needful for the country. Some possible forecasts display in Figures 1, 2. The results for Italy, France and Spain presented in the tables 2, 3, 4 and could be analyzed with the same procedure.

The number of equations that is given per country varies because all examined depended variables did not give acceptable results. From all examined variables that are not presented they are those in which the models were not adapted as should in the data. (Not acceptable $R_{adjusted}$).

Table 4. Econometric models for coniferous and non coniferous wood and wood products for Spain.

SPAIN	R^2adj	SEE	P Constant	P GDP	P Year	P ConPI	P Inp	VIF
Conifers Sawnwood Consumption = 3,068.19 + (25.57 * consumer price)	0.46	1306.932	<0.001		<0.001			
Wood Panels Production = -31,7517.330 + (161.667 * year) + (59.703 * ind production)	0.80	739.434	<0.001		<0.001		0.049	V.I.F.$_1$ = V.I.F.2 = = 1.06
Wood Panels Exports = -104,727.614 + (53.092 * year)	0.63	393.517	<0.001		<0.001			
Wood pulp Production = -323,036.669 + (165.608 * year)	0.92	515.477	<0.001		<0.001			
Paper Paperboard Production = -495,453.45 + (253.90 * year)	0.91	759.743	<0.001		<0.001			

Conclusions

Forecasts in the forest sector remain significant tools for the sustainable management of domestic forest ecosystems but also for the configuration of national forest policy and economy generally. In the Mediterranean countries the usage of socioeconomics factors and the regression method attributed and the equations that were constructed can be used widely for forecasting process. Also it's important to say that the explanatory variables that were used in the above forecasting method are not unique. It's obvious, that with the usage of more explanatory socioeconomic variables or with the usage of non linear simple or multiple models the predictions could be more. (for more wood product categories). More generally we can conclude that because of that weak economic growth is still hurting European economies and the forest sector demand and forecasts for the current and next years entail many uncertainties, the use of socioeconomic explanatory variables for the construction of simple or multiple linear regression forecasting models with the cautious examination of the trends for each product over the years, remains efficient in the forest sector of Mediterranean countries, strengthening the economic growth with right decisions and choices.

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