

# Cointegration analysis of wine export prices for France, Greece and Turkey

**M. Nisa Mencet**<sup>1</sup>

**M.Ziya Firat**<sup>2</sup>

**Cengiz**

**Sayin**<sup>1</sup>

Akdeniz University, Agricultural Faculty, Department of Agricultural Economics, Antalya, Turkey  
(Tel: +90 2423106514; Fax: +90 2422274564)  
[nmencet@akdeniz.edu.tr](mailto:nmencet@akdeniz.edu.tr); [csayin@akdeniz.edu.tr](mailto:csayin@akdeniz.edu.tr)

<sup>2</sup> Akdeniz University, Agricultural Faculty, Department of Animal Science, Antalya, Turkey.  
[mzfirat@akdeniz.edu.tr](mailto:mzfirat@akdeniz.edu.tr)



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# Cointegration analysis of wine export prices for France, Greece and Turkey

M. Nisa Mencet<sup>1</sup>

M.Ziya Firat<sup>2</sup>

Cengiz Sayin<sup>1</sup>

Akdeniz University, Agricultural Faculty, Department of Agricultural Economics, Antalya, Turkey  
(Tel: +90 2423106514; Fax: +90 2422274564)  
[nmencet@akdeniz.edu.tr](mailto:nmencet@akdeniz.edu.tr); [csayin@akdeniz.edu.tr](mailto:csayin@akdeniz.edu.tr)

<sup>2</sup> Akdeniz University, Agricultural Faculty, Department of Animal Science, Antalya, Turkey.  
[mzfiat@akdeniz.edu.tr](mailto:mzfiat@akdeniz.edu.tr)

**Abstract.** Mediterranean countries have noticeable affect on the world wine exportation. Among these countries France, Greece and Turkey are selected for this study because of different wine market, trade systems and wine policies they have. In this study, cointegration analysis was conducted for real wine export prices and real exchange rates for France, Greece and Turkey. The long term relationships between real exchange rates and real wine export values were explored by using cointegration analysis. Annual data from 1970 to 2003 was used for this analysis and the data sets were found to be integrated of the same order. It was also found that they move together in the long run by Johansen Cointegration Test. Then, Error Correction Model (ECM) was applied to search any short term relations and impacts of exchange rate variations on wine exports. French and Greek monetary policies affect their wine export volume by the years. Therefore, any depreciation of local currency in dollar terms will lead to increase of exports vice versa. On the other hand, Turkish wine real export value and real exchange rate were found not cointegrated. Since, there was not any cointegrated vector, any exchange rate volatility do not influence Turkish real export wine value. Subsequently, the reasons of wine market failures in these countries and pursued policies were discussed.

**Keywords:** Cointegration Analysis, Error Correction Model (ECM), Wine Export Prices, Real Exchange Rates, Wine Market.

## 1. Introduction

It has been known that grape cultivation and wine drinking had started by about 6000 BC. The first developments about wine were taken place around the Caspian Sea and in Mesopotamia. The early Mesopotamians were the first known people to cultivate grapes. Wine came to Europe with the spread of the Greek civilization around 1600 BC<sup>[1]</sup>. The modern day wine industry goes to as early as 1900 to become the thriving global industry of today. Wine is one of the world's oldest drinks. Wine producing countries for their self consumption have been few since ancient times. Nowadays the trade of the wine volume has increased, trade system improved and new regulations and rules launched in recent decades. The world's wine markets have been influenced also from globalization and over the past decade the capacity of the markets enlarged around the world dramatically. At the same time, globalization, technological revolution and massive increases in wealth have changed the wine world beyond recognition, transforming wine from a regional to a truly international product. Despite the fact that per capita consumption has been declining in a number of significant wine consuming nations, consumption is still increasing in many other countries <sup>[2]</sup>.

Wine growing plays a key role in agricultural and economic activity. It represents an important contribution to the value of final agricultural output in most of the producer countries. Moreover, at the regional and local levels, the wine growing sector appears to have a conclusive role in agricultural activity and the economy. Therefore, wine exports have been a major source of exportation to contribute to national and foreign exchange earnings for developing countries. Especially Mediterranean countries have noticeable affect on the world wine exportation. Wine growing country characteristics may be very

different from one Member State to another and even from one region to another, not only as regards the degree of specialization of wine-growing holdings, but also as regards the size of the vineyard and the type of wine produced. However, wine production depends heavily on climatic and geographical conditions <sup>[3]</sup>. The new developments about consumption, which is a number of emerging trends in consumers' wine preferences, have been observed. Instead of a daily component of diet, wine demand is associated with purchasing and consumption behavior attached with pleasure, conviviality, psychological satisfaction, refinement and cultural interest <sup>[4]</sup>.

Macroeconomic variables are also effective on wine trade. Exchange rate is one of the main macroeconomic indicators. Exchange rates changes affect exports and imports through changes in their relative prices. Dornbush et al. (1976), indicate that the exchange rate is identified with the relative prices of goods and thus is a determinant of the allocation of world expenditure between domestic and foreign goods <sup>[5]</sup>. Appreciations of exchange rate cause any trade balance deficit and it affects particularly agricultural products. Therefore the importance of the study is to search the real exchange rate volatility and monetary policy on wine exportation.

The aim of study is to examine the impact of the real exchange rate variations on real wine exports value in France, Greece and Turkey for 1970- 2003. In the first section of the study, the EU market (particularly France, Greece and Turkey) will be explored as aspects of having market shares in international trade, consumption, production and regarding with each nation's regulatory wine policies. Afterwards, in the empirical part of the study, the long run and short run relationships between variations in the real exchange rate and wine exports will be examined. To attach importance for wine exportation, cointegration analysis will be done for France, Greece and Turkey. A long run analysis is investigated by applying the Johansen Cointegration Test. Empirical evidence of unit roots justifies the cointegration tests and the subsequent use of an Error Correction Models (ECM) in estimating test equations are used to analyze the short-run dynamics departures from the long-run equilibrium relation under investigation. The procedures used for stationary testing, cointegration testing, and the ECM model estimation are described in detail in the following section.

## **2. Material and methods**

There are 2 variables named Real Wine Export Value (RWEV) and Real Exchange Rate (RER). These series are lasted 33 years. Figures are begun from 1970 until 2003. They are annual series gathered from FAO, EUROSTAT, U.S. Department of Agriculture (USDA), International Organization of Vine and Wine (OIV) and then they are manipulated to make the numbers real. Each countries export quantities were given in Metric ton (Mt) unit. The real exchange rate data are real weighted exchange rate data. The real weighted exchange rate is equal to the average nominal exchange rate (defined as the price of the dollar in terms of foreign currencies). Such changes in the real exchange rate can then be cumulated into an index which shows the level of the real exchange rate compared to a particular base year USDA. Annual data from 1970 to 2003 was used for this analysis and the data sets were found to be integrated of the same order. It was also found that they move together in the long run by Johansen Cointegration Test. Then, ECM was applied to search any short term relations and impacts of exchange rate variations on wine exports <sup>[6]</sup>.

The common objective of cointegration tests is to determine if there exists a long-run relationship among all test variables. All of these tests are designed to find the stationary linear combinations of vector time series, and in all of these tests a number of cointegrating factors must be determined. If the hypothesis is accepted, the error term ( $u_t$ ) is not stationary and this means that  $y_t$  and  $x_t$  series are not integrated. The latter one is rejected,  $y_t$  and  $x_t$  are integrated. Note that since the unit root tests test the null-hypothesis of a unit root, most cointegration tests test the null hypothesis of no

cointegration.  $x_t$  and  $y_t$  are said to be cointegrated if there exists a parameter  $\alpha$  such that

$u_t = y_t - \alpha x_t$  is a stationary process [7;8].

In particular, this study will consider the possible long run relation for the real exchange rate and the other variables by using cointegration analysis, as suggested by Saunders et al. (2001) [9], Batten and Belognia (1986)[10], Xu (1996)[11], Johansen et.al (2000)[12]. In this study, we have chosen to use Johansen (1988)[13] methodology.

For the further step, ECM analysis was feasible to implement indicating the impact level and any impact which the exchange rate variations can have on the wine export value in the short run.

$$DRWEV_t = p_1 z_t + DRWEV_{t-1} + DRWEV_{t-2} + DRER_{t-1} + DRER_{t-2} + \varepsilon_{1t} \quad (1)$$

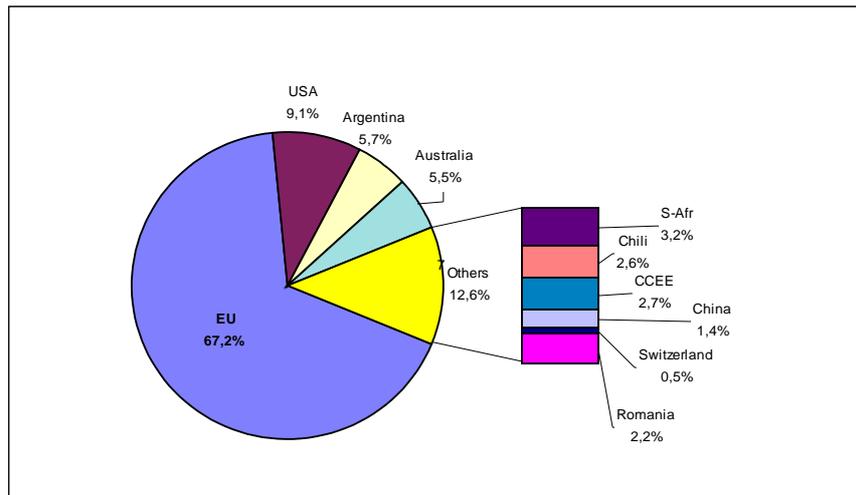
It is assumed that at least one of the coefficients ( $p_1$ ) is nonzero. The error terms are white noise. The  $z_t$  terms are the residuals from the previously estimated cointegration tests. The focus of the analysis is on  $z_t$  terms, as they provide an explanation of short-run deviations from the long-run equilibrium. These variables indicate the extent to which the system under consideration deviates from the long-run equilibrium. In general, the  $z_t$  coefficients indicate the short-run disequilibrium responses of the model. By using lagged values of  $z_t$ , it is implied that the last period's equilibrium error will affect the current period. If  $z_t$  equals zero, then the system is in equilibrium [9].

First of all, both RWEV and RER data sets are found in this study to be integrated of the same order  $I(1)$ , and then it became possible to investigate the existence of a long-run relationship between exchange rates and agricultural exports. This investigation can be undertaken within a cointegration testing framework. If empirical evidence of cointegration is found to exist, this will have important implications for the relationship between the exchange rate and agricultural exports. Cointegration implies the existence of a stable long-run relationship between movements in exchange rates and changes in agricultural exports over longer periods of time [6; 9].

### 3. Wine trade in the EU and Turkey

In the past, the market for wine was primarily one of local production and consumption. This has changed to a bigger extent in the last decades [14]. Several wine producing countries around the world have begun to make an impact on the export market in an attempt to expand their limited local markets. The result of this shift in market focuses for some of the older wine producing countries plus the rise of new wine producing countries around the world has caused an increase in the competitive nature of the global wine market [15].

The world wine business is valued at a consumer value of €150 billion and a wholesale value of €60 billion while the total global production of wine averages at around 275 hl per annum [16]. Europe accounted (in value terms) for all but 5 % of wine exports and three quarters of wine imports globally (Figure 1). After 1997, Europe's share of global exports declined from 88 percent to 70 percent and nowadays, wine is becoming an internationally traded product [17].



**Figure 1.** World Wine Production (2002- 2003) <sup>[18]</sup>

Until about 15 years ago, wine exporting was an almost exclusively European activity and the wine from other countries was not common. The major European wine producing nations of France, Italy, Spain, Portugal, and Germany hold 67 percent of the wine export market share shown in Figure 2. Australia holds 8 percent. The remaining countries have 25 percent of the wine export volume market in 2003 <sup>[18]</sup>.

Figure 2 depicts the chronological numerical value of wine export. From 1975- 1985, about 80 per cent of exports came from five European Union members (France, Italy, Spain, Germany, and Portugal), another 10 per cent came from Bulgaria, Hungary and Romania, and a further 8 per cent came from other European countries and the former French colonies of North Africa. Since then, however, California and several southern hemisphere countries (Australia, Argentina, Chile, South Africa, and New Zealand) have begun to challenge that European dominance. Between 1986 and 1999, this new group's combined share of world wine exports grew from 1.6 to 15 per cent in value terms <sup>[19]</sup>.

The EU has a leading position in the world wine market. Data has indicated that European wine culture makes up 45 % of wine- growing areas, 60 % of production (178 million hl), 60 % of consumption (127 million hl, 9 l/capita/ye ar) and 70 % of exports (4.4. billion €). At the global level, the EU is both the largest exporter and the main importer of wine. It exports on average just over 10 million hl per year, mainly to the United States (23%), Japan (15%), Switzerland (13%) and Canada (9%). During 2000- 2003 period, wine exports is averaged €4.5 billion (14 million hl) and this value is accounted for 34 of drinks exports and 0.4 % of total EU revenue from exports. Average value export (value/volume) is 325 €/hl, import (value/volume) is 215 €/hl in 2004. France, Italy and Spain are major exporting countries and their export increase significantly while export volume decreased in Greece (-30%), Hungary (-19%) and Germany (-10%) in the last decade. On the other hand, Australia, the United States, Chile and Eastern Europe are the main importers of wine to EU <sup>[20]</sup>.

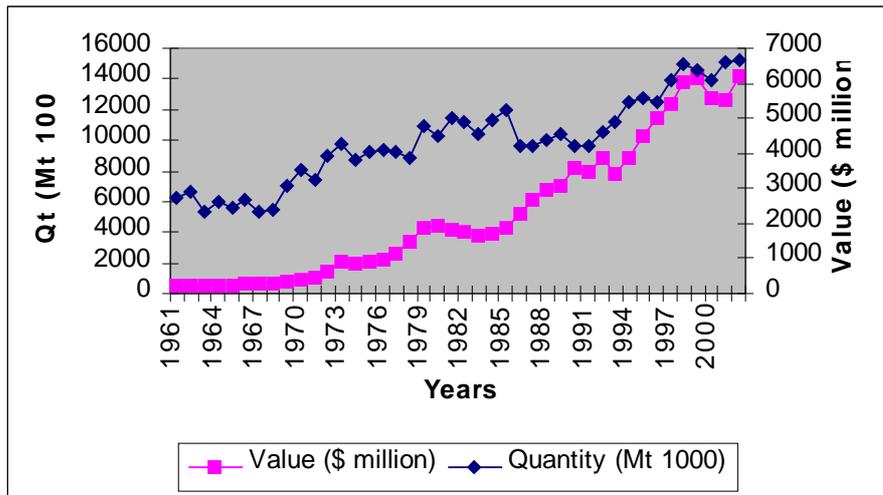


Figure 2. Worldwide Export Quantity, Volume and Prices <sup>[18]</sup>

There are big differences in unit-price between the products and also between the volumes exported. The unit price of Quality Alsace is 3, 13 Euro/Liter for intra EU trade. However, the price is 5, 77 Euro/Liter for extra EC. The difference is 2, 67 Euro/Liter which is relatively high. In the EU, there is price discrimination for export. The price for intra- EU trade is lower than for the extra- EU trade. The most significant difference is burgundy's which is 5, 79 Euro/Liter <sup>[21]</sup>.

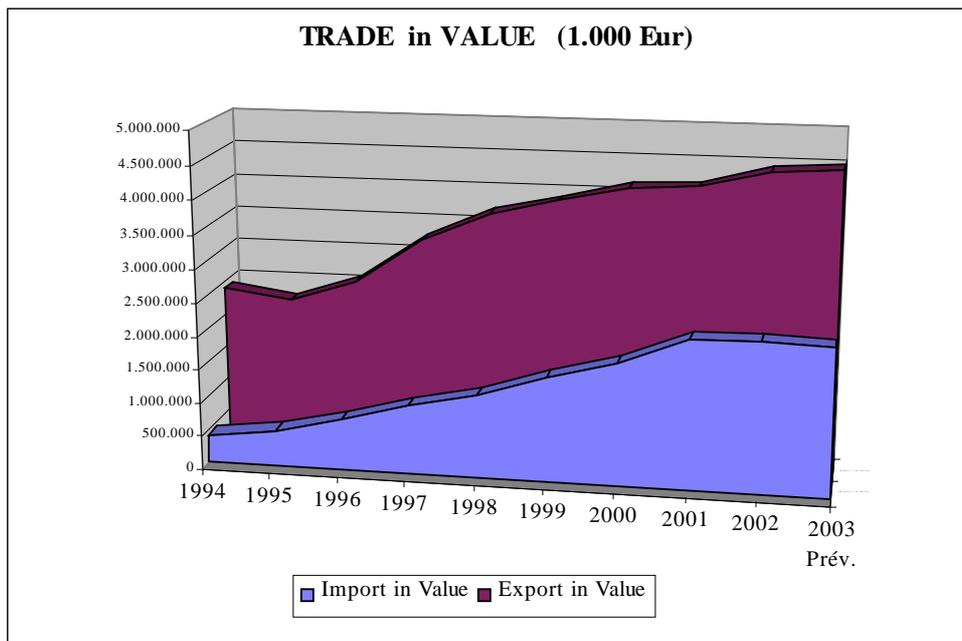


Figure 3. Wine trade in EU value <sup>[21]</sup>

### 3.1. Wine in France and Greece and Turkey

France is the largest wine producer in the world since at least the end of the 19<sup>th</sup> century. The reputation of French wine grew with its export to England, Scotland, Scandinavia and the Middle East. After the French Revolution, vineyards that had belonged to the nobility and religious communities were parceled out to small landowners. France maintained its reputation as the world's largest wine producer since the trade of wine began. The markets for French wines have been traditionally segmented into quality and table wines. The best quality French wines belong to regulated categories such as Appellation d'Origine Contrôlée (AOC-Controlled Denomination of Origin), or Vin Délimité de Qualité Supérieure (VDQS-High Quality Wine from given area). In France, the wine trade is regulated by legal regulations, and the quality attributes of the best wines are regulated under the existing AOC scheme. Due to such regulation the French market is constrained in the international market at the same time. France also leads beside the production the world in per capita consumption of wine. French wine consumption is estimated at 60 liters, down more than 50 percent since 1970. French exports represent more than 30 percent of total French production, or one bottle out of every three bottles. Some emerging markets for French wine include Hong Kong, Taiwan, and Malaysia. French exports to the United Kingdom (\$84 million), Germany (\$84 million), and the United States (\$64 million) increased by 10 percent. Other EU member states remain the largest export markets for French wine [22].

Wine has been made in Greece since ancient times. The tradition of fine wine started making stretches from Homer to the fall of Byzantium. The history of Modern Greek wine therefore really started in the 1960s when modern technology was first applied in the Greek wineries. Greece has just over 150,000 hectares under vine, of which about 77,500 are devoted to wine producing grapes. Total annual production varies, but is in the region of 4.5 million hectoliters of which about 60% is white and 40% is red or rose. There are about 300 native grape varieties grown in Greece, but many are extremely local or used for table grapes or dried fruit. Out of these grape varieties, 27 wines with an appellation of origin scattered throughout Greece. When we compare quality wine for France and Greece, it should acclaim that there is a big difference between them in terms of production volume. Greece has had a stable volume of quality wine production in contrast to France, whose wine production has been incurring a downward trend [23].

The earliest historic evidence of winemaking is found in Turkey from 3000 BC. There are some mythological stories about how wine was found in Anatolia. Turkey comes 4<sup>th</sup> in vineyard acreage in the World but this potential is used not only for wine [24]. Grapes are processed generally for pectin, converted into raisins, dried for eating or processed in a grape based Turkish delicacy and delights. Only 3 % of all grapes go into the production of wine. Most of the country's grapes are grown in the Marmara, Central Anatolia and the Aegean regions. Turkey is one of the graceful countries in terms of grape varieties among the other rich countries. Annually, about 69 million liters is consumed in Turkey while per capita consumption is 0.24 liter. The value of the wine market more than doubled over the review period. There are eighty wineries in Turkey. This number of wineries makes them dominant in market and led to low level of competition. The government monopoly "Tekel" was responsible for the production, importation and export of alcoholic drinks in Turkey over the review period. But there were also private operators in the beer and wine markets. Tekel was privatized by the end of 2003, and state control over the alcoholic drinks market decreased. Given the demand is increasing, production is foreseeing increasing trend. Currently, Turkey has no appellation controller. All serious wine-producing countries have adopted codes and standards regulating wine production, the maintenance of vineyards and the adoption of the controlled appellation. Local wine-makers recognize that Turkey must draft appellation controller standards if it is supposed to be taken seriously in the international market [25]. Nowadays, wine drinking has become fashionable and trendy in Turkey, with

discerning Turks placing a premium on quality. As a result of that, Turkish wines are gaining a positive international reputation.

### **3.2. Wine Policies in the EU**

The EU is considering increased domestic support subsidies for wine and therefore many regulations and legislations have been launched to organize the wine market recently. Wine market regulations in the EU started with the Common Market Organization (CMO) in 1970 and it has been modified until today. A major aspect of the new CMO's strategy is to support and protect "quality wines produced in specified regions" by setting quality standards and taking into account "traditional conditions of production" <sup>[26; 27]</sup>.

Since the 1980's, the wine market has been facing a continuous decline and noticeable qualitative change in demand. These changes have been dealt with by significantly developing the CMO but with some inconsistencies. Initially, CMO practices started out with very strict limitations. It then allowed coupled freedom for plantings virtually guaranteeing sales, thereby generating a serious structural surplus. From 1978, it became very interventionist with the ban on planting and the obligation to distil the surplus. Towards the end of the 1980s, financial incentives for giving up vineyards were reinforced, facilitating a move towards a balance, but without achieving it completely. With the GATT agreements having removed the existing external protection and with demand (which is in constant decline) developing towards a qualitative level which the vineyards could not always guarantee at the time, a reform of the CMO became necessary. This was included in Agenda 2000 and the CAP general reform <sup>[26; 3]</sup>.

The objective behind the Council Regulation (EC) No 1493/1999 was "To reform and simplify the common organization of the wine market, with a view to achieving a better balance between supply and demand in the Community market and improving the competitiveness of this sector in the long term". The new CMO for wine aims to maintain a better balance between supply and demand in the Community market, giving producers the chance to bring production into line with market developments and to allow the sector to become permanently competitive. This goal is pursued by financing the restructuring of a large part of present day vineyards, and should consequently give rise to products sought by domestic and international demand <sup>[20]</sup>. Because of the current market situation between supply and demand in the Community is unbalanced and the rules governing the definitions, processing and marketing of wine need to be refined, updated and made more flexible to take into account changing qualitative consumer demand. Hence the adoption of a wine reform proposal has been put on the Commission working programme for 2006.

## **4. Empirical Analysis of wine export prices in France, Greece and Turkey**

The impacts of an exchange rate changes on imports and exports depend on the magnitude of the exchange rate changing. The size of the exchange rate impact depends also on crop, year, country, governmental influence in markets, elasticity's, measured price variables, alternative prices considered, and the definition of the exchange rate effect <sup>[28]</sup>. A rise in the price of the foreign exchange rate is a depreciation of the home currency. Foreign currencies have become more expensive hence the relative value of the home currency has fallen. A fall in the price of foreign exchange is an appreciation of the

home currency. As a result of cheaper foreign currencies, the relative value of home currency has risen. Theoretically, as the value of the dollar rises, the dollar price of any given export becomes more expensive to foreign buyers thereby reducing the demand for goods. Similarly, when the local currency depreciates, its depreciation leads to an increase in the sales of exports in foreign markets. The empirical section clarifies the relationship between exports and exchange rates for each country. The exchange rate has a significant effect on country's total exports and consequently its trade balance. In addition, it is very important to managers making international business decisions. Exchange rates are determined by the supply of and demand for a country's currency. When comparing currencies of only two countries, the supply of one currency equals the demand for the other country. In order to demand one currency, one must be supplied by another currency <sup>[29]</sup>. Under a floating exchange rate, currency realignment (appreciation and depreciation) leads to short run adjustments in prices, output, and trade volume. The exchange rate is determined in the foreign exchange market. Exchange rate changes affect exports and imports through changes in their relative prices <sup>[30]</sup>.

The level of demand for exports and its variability are more important than the variability of the exchange rate for a commodity whose storage cost is not negligible. If a commodity can be stored for a long time an exporter might wait until the currency has settled to a more appropriate parity. If the commodity is a perishable one or incurs high storage cost, its exports are likely to be hostage to the vagaries of demand. Volatility of import demand is equally if not more important than one's currency variability on trade. For exporters the problem of exchange rate variability becomes one of hedging the exchange risk when selling goods and services invoiced in foreign currency. If the exporters and importers are risk averse, an increase in exchange rate variability will reduce the volume of trade. The more risk averse the importers are the fewer imports they will buy; similarly, increased risk aversion on the part of exporters will cause them to reduce their supply. Therefore, in the presence of both risk-averse importers and exporters, exchange rate volatility will act as a wedge between demand for imports and supply of exports, unless the wedge (same currency) is simply shifted to either the importers or the exporters, depending on the currency on which the transaction is denominated <sup>[31]</sup>.

#### **4.1. Unit root tests**

The Unit root analysis was firstly used to test stationary of time series. For that reason, the Augmented Dickey Fuller (ADF) test was implemented to determine whether the series has a unit root. Below is a detailed description of the analysis conducted for each country. If the ADF test fails to reject the test in levels but rejects the test in first differences, then the series contains one unit root and is of integrated order one  $I(1)$ . If the test fails to reject the test in levels and first differences but rejects the test in second differences, then the series contains two unit roots and is of integrated order two  $I(2)$ . For the ADF test, one must specify the number of lagged first difference terms to add in the test regression. In this study, time lag was specified according to Akaike Information Criteria (AIC) for each series. According to the criteria of AIC, the lowest AIC value was chosen for this implementation <sup>[32]</sup>.

According to Saunders et al. (2001), the ADF test also determines whether the data series are drifting (i.e. whether they are integrated). The main objective of this test is to discover whether the data series need to be differentiated, and how many times this must be done in order to induce their stationary. If the data series are found to be integrated of the same order, e.g.,  $I(1)$ , then cointegration tests can be performed <sup>[9]</sup>.

Firstly, RWEV and RER was calculated the level of unit root test. According to this, ADF results are larger (in absolute values) than the MacKinnon critical value and the results

were the hypothesis that RWEV has a unit root cannot be rejected at the 5 % level. The unit root test results in level are depicted in Table 1. Here we have used the “intercept” option for unit root test and AIC is used for the Lag choices. The hypotheses used in the study are given as follows:

$$y_t - y_{t-1} \equiv \Delta y_t = (\rho - 1)y_{t-1} + \varepsilon_t$$

$$\Delta y_t = \delta y_{t-1} + \varepsilon_t$$

$$\delta = (\rho - 1)$$

$H_0: \rho \geq 1$  (Non stationary) (At least one unit root is exist)

$H_1: \rho < 1$  (Stationary)

Here, when we apply a test on the coefficient of  $RWEV_{t-1}(\gamma=0.002348)$ . Under the null hypothesis,  $\gamma$  is below the t statistics (-0.085159) meaning that the ADF test results gave the same statistical meaning. The null hypothesis and the existence of unit root are accepted. On the other hand, Philip- Perron (PP) Unit Root Test is implemented to check the result we got after the ADF Test. According to this test, PP Test Statistics is found for RWEV (0.123138) and for RER (0.123138) while the MacKinnon critical value is -2.9558. The null hypothesis can not be rejected.

**Table 1.** ADF test results level for RWEV and RER in level

Variables	France	Greece	Turkey
RWEV	- 0.304920 (AIC: 45.06455)	- 2.940742 (AIC: 44.69233)	- 1.252208 (AIC: 30.73967)
RER	- 3.299711 (AIC: 10.96262)	- 2.969897 (AIC: 11.03846)	- 2.808148 (AIC: 11.11336)

**Notes:** \*MacKinnon critical values for rejection of hypothesis of unit root 1 % critical value is -3.6852;

5 % critical value is -2.9705.

As there is a non stationary series, the first difference is depicted in Table 2. The difference at 5 % level is statistically significant meaning the hypothesis claiming that RWEV has a unit root can be rejected. So  $y_1$  is I (I).

**Table 2.** ADF test results: first difference

Variables	France	Greece	Turkey
RWEV	- 3.823291 (AIC:44.99241)	5.071840 (AIC: 44.87804)	- 3.197492 (AIC: 30.82892)
RER	- 4.666776 (AIC: 45.20876)	- 5.970388 (AIC: 46.97874)	- 4.580115 (AIC: 48.33749)

**Notes:** \*MacKinnon critical values for rejection of hypothesis of unit root. 1 % critical value is -3.6852; 5 % Critical Value is -2.9705.

The Philip- Perron (PP) Unit Root Test is implemented to justify the results of the ADF test. After that, first differences allowed us to test further. RWEV and RER are stationary and integrated at I (1) level.

## 4.2. Cointegration analysis

The results of cointegration tests determine the actual form of the data used in all subsequent regression analysis. If the time series are not cointegrated, then the first-differences form is appropriate for all test variables [33]. Alternatively, the model can be reevaluated and the inclusion of additional test variables may be considered. There is maybe several such cointegrating vectors exist so that there are a number of alternative cointegration tests.

### 4.2.1. France

There is a long run relationship between the RER and RWEV for France. First the summary of the Johansen Cointegration Test is shown in Table 3. Lag 1 is chosen since the AIC has the lowest value. The model with lag 1 was chosen with the linear deterministic test assumption.

**Table 3.** Johansen cointegration test for RWEV and RER for France

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.477400	20.11716	15.41	20.04	None <b>**</b>
2.12E-06	6.56E-05	3.76	6.65	At most 1

**\*\*** denotes rejection of the hypothesis at the 5%, 1% significance level

Under the Johansen Cointegration Test, it could be said that there is a cointegrated vector (Table 3). In Johansen's Method, the eigenvalue statistic is used to determine whether cointegrated variables exist. Cointegration is said to exist if the values of computed statistics are significantly different from zero [6]. The Likelihood Ratio is higher than 5 % critical value and the eigenvalues are found as (0.477400, 2.12E-06). Cointegrated vector for RWEV and RER is (1, -68.41360). The French wine market is affected from exchange rate volatility. Therefore the money supply, called M2, changes the real export wine value and the volume of exported wine.

### 4.2.2. Greece

Under the Johansen Cointegration Test, it could be said that there are cointegrated vectors (Table 4). The Likelihood Ratio is higher than the one found 5 % critical value and the cointegrated vector for RWEV and RER is (1, -4.000197). The Greek wine market is affected from exchange rate volatility the Likelihood Ratio test indicated 1 cointegrated equation at the 5 % significance level.

**Table 4.** Johansen cointegration test for Greece

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.285021	18.25031	15.41	20.04	None *
0.209287	7.514250	3.76	6.65	At most 1 <b>**</b>

**\*\*** denotes rejection of the hypothesis at the 5%, 1% level of significance

The coefficient of  $z_t$  is negative indicating that an increase in the value of the dollar will decrease the value of wine exports in the short run. The variable results are written on the line and t-statistics are in parentheses. This finding justified the theory of exchange rate and the value of export.

### 4.2.3. Turkey

The Likelihood Ratio rejects any cointegration at the 5% significance level. There is no cointegrated vector derived from for the REWV and RER. The Turkish wine export value and the Real exchange rate are not cointegrated. Cointegrated vector for RWEV and RER is found as 1 and -588.5248. The possible reasons for noncointegration are small quantity of wine export quantity and fixed exchange regime for some years before 1980s. Since there was not any volatility for the some years, variables couldn't cointegrated. If there are any changes in the exchange rate policy, this can not lead to any changes for the value of Turkish export value. Thus, exchange rate policy changes can not imply changes in the value of Turkish export. To increase wine export, exchange rate changes should not be used as a foreign trade policy tool.

The result of the cointegration does not allow us to implement the ECM Test. However, since it is not feasible to implement ECM Test, it could be stated that there is no short run relation between 2 variables in the long run.

**Table 5.** Johansen cointegration test for Turkey

Eigenvalue	Likelihood Ratio	Critical Value (5 %)	Critical Value (1 %)	Hypothesized No. of CE(s)
0.323779	12.77162	15.41	20.04	None*
0.007847	0.252098	3.76	6.65	At most 1**

\*(\*\*) denotes rejection of the hypothesis at the 5% (%1) significance level

### 4.3. Error correction model

The ECM determines whether a portion of the disequilibria from one period is corrected in the next period. For example, the change in price in one period may upon the degree of excess demand in the previous period <sup>[34]</sup>.

#### France

To apply ECM, the first differences of variables are taken. Both of the two differences of variables are then tested for ECM. As a conclusion, the results of the ECM estimations are stated at about 6 % of disequilibria "corrected" each year by changes in D (RER) and about 1 % of disequilibria "corrected" each year by changes in D (RWEV).

$$D(RWEV)_t = -0.0162660566(RWEV_{t-1}) + 45.6507395(RER_{t-1}) + 2700689137 - 0.0626694236D(RWEV_{t-1}) - 0.27994229D(RWEV_{t-2}) + 0.4113213194D(RER_{t-1}) + 0.0835810748D(RER_{t-2}) + 3326245.06$$

$$D(RER)_t = -0.0606854013(RWEV_{t-1}) + 45.6507395(RER_{t-1}) + 2700689137 - 0.3864629512D(RWEV_{t-1}) + 0.4661458588D(RWEV_{t-2}) + 0.580208754D(RER_{t-1}) + 0.0724569493D(RER_{t-2}) + 3601595.83$$

#### Greece

The coefficient of  $z_t$  is negative indicating that an increase in the value of the dollar will decrease the value of wine exports in the short run. The variable results are written on the line and t-statistics are in parentheses. This finding justified the theory of exchange rate and the value of export. The results of the ECM estimations are stated at about 14 % of disequilibria “corrected” each year by changes in D (RER) and about 7 % of disequilibria “corrected” each year by changes in D (RWEV).

$$D(RWEV) = -0.070505^* (RWEV(-1)) + (-8.205271^* RER(-1)) \\ - 5.7700689137 + 0.143336^* D(RWEV(-1)) - 0.462146^* D(RWEV(-2)) \\ - 0.462146^* D(RER(-1)) + 0.0111472^* D(RER(-2)) + 84140827$$

$$D(RER) = 0.143336^* RWEV(-1) + 8.205271^* RER(-1) \\ + 5.77E+ 08 - 0.060527^* D(RWEV(-1)) - 0.043595^* D(RWEV(-2)) \\ + 0.367406^* D(RER(-1)) + 0.446326^* D(RER(-2)) + 94488248$$

## 5. Results and Discussion

In this study, the impact of the real exchange rate variations on real wine exports value is examined from 1970- 2003. In some previous studies, cointegrations tests between wine and alcoholic beverages were tested by using the Johansen Cointegration test. However, the relation between the Mediterranean wine export values and the real exchange rates were not explored with time series data in such an analysis <sup>[6]</sup>.

First, both RWEV and RER data sets were found to be integrated of the same order. Then, it could become possible to investigate the existence of a long-run relationship between exchange rates and agricultural exports, and afterwards cointegration analysis was conducted. For that reason, unit root ADF tests were carried out for stationarity. Integration was found to exist. After that, because the series were integrated in the same order we searched the long term relationship between variables. The RER and the RWEV were found to be cointegrated for all countries in the context of this study. It was found that French and Greek monetary policies have affected on wine export prices and volume throughout the years. Following the 33 years of annual observations, these 2 variables were not found to be stationary separately, but when the analysis was conducted with both variables together, they were found to be cointegrated and they moved together in the long run. It could be concluded that any changes for each country’s monetary policy will affect export volume. Therefore, any depreciation of local currency in dollar terms will lead to an increase of exports and vice versa.

The theory of exchange rate volatility was justified one more time in this study. One further step of this study was the implementation of the ECM to determine whether there were any short term relations and impacts of exchange rate variations on wine exports. We provided this short term relationship by the ECM test results. On the other hand, the Turkish wine export value and the real exchange rate were not cointegrated. Thus, any exchange rate policy changes can not imply changes for the Turkish export value. To increase wine export, exchange rate changes should not be used as a foreign trade policy tool. For France and Greece, short term relation through real exchange rates and real export wine volume exist. However, for Turkey, we could not find any cointegration vector and for that reason our hypothesis about this country did not hold true.

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