

**An empirical analysis of the interrelations among
the export of red wine from France, Italy and Spain.**

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Abstract:

This paper deals with an empirical analysis of international trade data from EUROSTAT where the export of red wine from France, Italy and Spain - to Belgium, Denmark, Japan, The Netherlands, UK and USA - is investigated. Using monthly data from 1993:1 to 1998:12, trade flows, measured in quantities of red wine, from France, Italy and Spain to the before-mentioned countries are compared. The wine trade flows are modelled in a VAR (vector autoregression) framework in order to perform tests of causality. From obvious reasons red wines from the Southern European countries are expected to be close substitutes - at least concerning the receiving countries - which is tested, including price effects and political incidents as the French nuclear testings at Muroroa in 1995. The analysis reveals that, generally, the French wine export is not influenced by Italian or Spanish wines, whereas wine export from Italy seems more sensitive towards the competitors at the export markets. Concerning a negative influence on French wine export from the nuclear testing this seems to have been the case for Denmark, Japan and (probably) the UK.

JEL code: F14

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1. Introduction

During the last decades, wine consumption has increased in a number of countries, especially in places where beer has been the traditional beverage, e.g. the Northern European countries. The major wine producers in Europe - France, Italy and Spain - all benefited from an expanding wine export due to the shifts in consumer preferences towards wine. During the 1990s, wine growers in the 'New World' as Australia, Chile, South Africa and others also have gained access to the markets in most of the wine-importing countries. Obviously, wine from the different exporters must be relatively close substitutes in the wine-importing countries - apart from questions related to the specific quality segments of these markets. In order to address this question, the present paper analyses the wine export from France, Italy and Spain to six OECD countries: Belgium, Denmark, Japan, The Netherlands, the UK and the USA that all, except the latter, only have a negligible wine production. The data are obtained from the EUROSTAT trade statistics where monthly data are available, but only from January 1993.

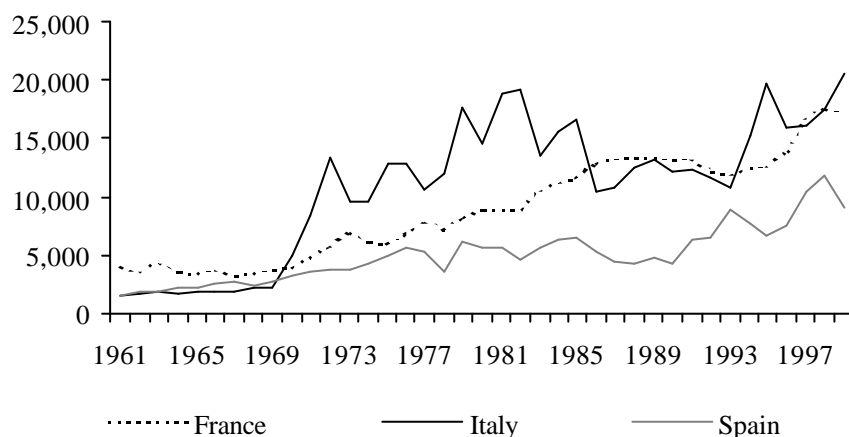
The interactions among the trade flow variables of red wine representing these three main European wine-exporting countries are in the present analysis modelled in a VAR framework where each variable is a function of past values of itself and other variables. This methodology allows for interactions among the variables and thus e.g. reduces problems with simultaneity as the distinction between endogenous and exogenous variables vanishes when all variables are treated symmetrically. The model is used for testing whether one variable significantly enters the equation for another variable and thus might (Granger) cause this, e.g. Italian wine export to a specific country will expectedly be influenced by the sale of French wine at the same market. Additionally, a variable representing the time period of the French nuclear testing in the Pacific (autumn 1995) is added to the VAR model in order to test for political effects in the trade flows of wine. Section two shortly presents the data, section three

investigates questions related to seasonal effects and unit root behaviour and section four applies the data to the VAR analysis. Section five deals with the French nuclear testing and finally section six concludes.

2. The development in the export of red wine from France, Italy and Spain

Since the 1960s the export of wine from France, Italy and Spain has increased steadily and for most of the time period Italy has been the greatest wine exporter. Figure 1 depicts the total annual export flows of red wine from the three Southern European countries.

Figure 1. The export of red wine from France, Italy and Spain, 1961-1999 (1000 hl).



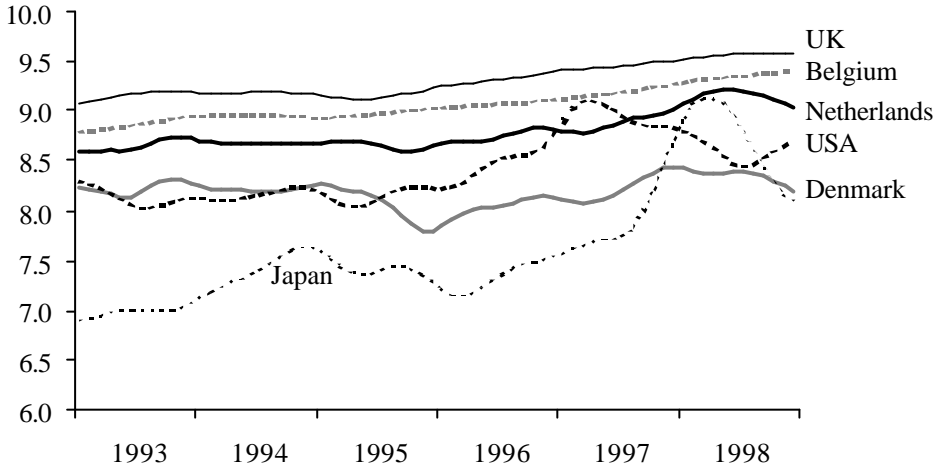
Source: Anderson, K. and D. Norman: Global Wine Production, Consumption and Trade, 1961-1999. A Statistical Compendium. Centre for International Economic Studies, Adelaide, 2001.

As evident from Figure 1 the cyclical component in the wine export is considerable and most likely due to factors as the development of the general business cycle, price effects, shifts in consumer preferences, national wine export promotion campaigns, etc.

The monthly data used in the analysis span the time period 1993:1 to 1998:12. For some of the countries data later than 1998 are available but as a mix of countries will enter the VAR analysis, the time period has to be similar in all cases and therefore the data set ends with December 1998.

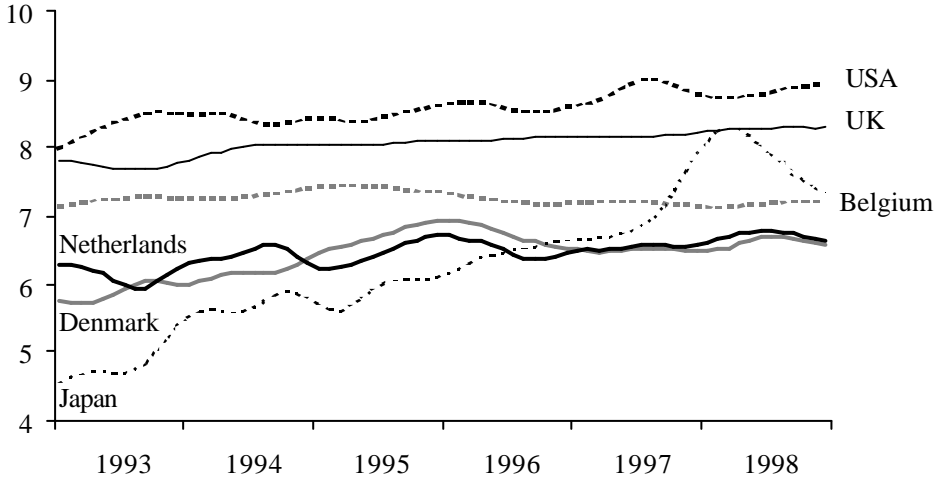
There is considerable seasonal variation in the data set and a seasonal pattern may be due to the growing season for wine, storage conditions, habits concerning the sales structure, etc. In order to extract the long-term components of the trade flows, the data have been corrected seasonally by the Census X11-procedure. Furthermore, the trend-cycle component is obtained (i.e. also correcting for the irregular components) and the results are reported in Figures 2, 3 and 4.

Figure 2. The export of red wine from France, Trend-cycle component, 1993:1-1998:12.



Note: Log values of export in metric tons used in the graphs.
 Source: Intra- and extra-EU Trade, EUROSTAT, var. issues.

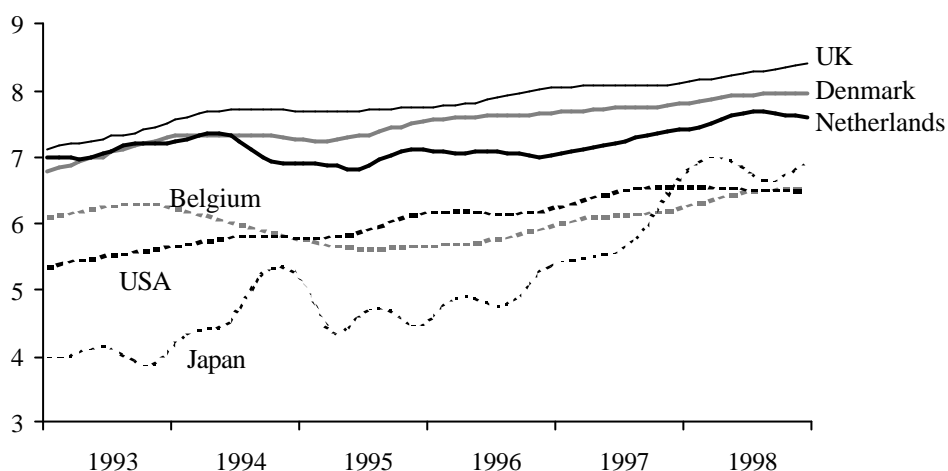
Figure 3. The export of red wine from Italy, Trend-cycle component, 1993:1-1998:12.



Note: Log values of export in metric tons used in the graphs.

Source: Intra- and extra-EU Trade, EUROSTAT, var. issues.

Figure 4. The export of red wine from Spain, Trend-cycle component, 1993:1-1998:12.



Note: Log values of export in metric tons used in the graphs.

Source: Intra- and extra-EU Trade, EUROSTAT, var. issues.

In most of the cases, the trend-cycle components extracted from the monthly wine data in most of the cases reveal - even when applying log values as done in Figures 2, 3 and 4 - considerable fluctuations that may reflect closer interrelationships which is the topic of the following VAR analysis. In the case of export to Japan, the data exhibit two periods (late 1994 and 1997/98) of extreme variation, which may be linked to internal developments of the Japanese economy.

3. Seasonality and unit roots

Before using the data as presented in section two for further analysis, the time series properties of these variables are analysed. Many economic time series variables, e.g. income variables, are often found to be non-stationary in levels, i.e. they are not mean-reverting processes with constant unconditional means and variances, and have to be differenced once (or more, when integrated of higher orders) in order to obtain stationarity as a precondition for standard statistical inference. Furthermore, as monthly data are used in the present analysis, seasonality has to be taken into consideration, both regarding the

question of unit root behaviour of the data series and the possibility of similar seasonal effects that may be (falsely) interpreted as interactions or causality among the export of red wine from the respective countries. One often applied solution is to adjust the data seasonally, e.g. by the Census X11 procedure, but this is not necessarily a neutral method of correction as the seasonal adjustment filter itself may affect eventual stochastic trends in the time series and also involve further statistical problems, see the discussion in Franses (1996).

Testing for seasonal unit roots is most often done by applying the HEGY-methodology (Hylleberg, Engle, Granger and Yoo, 1990), but a slightly simpler strategy is applied in the present analysis as the main purpose is not to deal with seasonal unit roots and further issues involving cointegration relationships. Assuming the seasonal patterns are purely deterministic - with the economic arguments as presented in the section two - a Dickey-Fuller type of unit root test is performed in a two-step procedure, Enders (1995, 1996). In the first regression (1) of a given variable z_t , seasonal dummies are included to remove the deterministic seasonal components and also a deterministic time trend is included in order to give strength to an alternative hypothesis of trend-stationarity:

$$z_t = \alpha + \beta t + \gamma_1 D_1 + \gamma_2 D_2 + \dots + \gamma_{11} D_{11} + \hat{\epsilon}_t \tag{1}$$

The residuals from (1) are used in the DF-test, i.e. testing for whether the variable is integrated, I(1), or stationary, I(0), and are done by running the following regression where lags are included on the right-hand side of (2) in order to whiten the errors:

$$\hat{\epsilon}_t = \delta + \sum_{i=1}^n \lambda_i \hat{\epsilon}_{t-i} + \eta_t \tag{2}$$

The results of the Dickey-Fuller test for unit roots are reported in Table 1 for the respective variables, i.e. in total thirty cases. The notation is Q_t for the exported quantities of red wine (metric tonnes) and P_i/P_j for the relative prices derived as average wine export prices as EUROSTAT also reports the export values (ECU/Euro).

Table 1. Unit root tests.

Variable:	Q_F	Q_t	Q_S	P_1 / P_F	P_s / P_F	P_s / P_1
Belgium	-3.33{2}	-4.48{1}	-2.04{2}	-3.26{1}	-3.99{1}	-3.11{1}
Denmark	-3.31{1}	-2.39{1}	-5.86{0}	-3.72{1}	-6.70{0}	-3.08{1}
Japan	-2.42{0}	-3.82{0}	-4.00{1}	-6.38{0}	-7.83{0}	-6.92{0}
The Netherlands	-3.37{1}	-7.47{0}	-3.51{1}	-6.16{0}	-4.82{1}	-6.66{0}
UK	-2.89{2}	-6.94{0}	-6.69{1}	-3.07{1}	-6.57{1}	-3.39{1}
USA	-2.83{1}	-7.07{0}	-8.66{0}	-2.74{1}	-4.43{1}	-5.25{1}

Note: Log values of the variables used in the tests and the critical value of the DF τ -statistic is -3.50 and -3.18 at the 5% and the 10% levels of significance, respectively, N=50; critical values reprinted in e.g. Enders (1995). { } denotes the included lags in the Augmented DF test.

From a majority of the test results reported in Table 1 it is concluded that most of the variables seem to be stationary when allowing for both a trend and deterministic seasonal patterns. Therefore, level values of the respective variables are used - also including the deterministic components - when estimating the VAR-models and performing the subsequent causality tests. This may be an incorrect procedure in some cases - especially for the French data as evident from Table 1 - but differencing the time series inevitably filters out any long-run information in the data and thus influences on the search for interrelationships among the variables, see Enders (1995) and Doan (2000) for a discussion. As some ambiguity exists from the unit root tests, the VAR models are also estimated using data where the first difference filter and the seasonal filter have been applied and thus avoiding the deterministic terms.

4. VAR models and causality tests

In order to analyse further the interactions among the export of red wine from France, Italy and Spain, vector autoregressive models (VAR) are estimated with variables representing trade flows of red wine (measured in quantities) and relative prices. The VAR methodology is regularly applied in the empirical international trade literature as questions of interrelationships and causality often arise in these connections. In this framework no distinction is made between endogenous and exogenous variables as all variables are treated symmetrically. This might be an appropriate estimation methodology to choose in the present case as it can be difficult *a priori* to decide on the endogeneity-exogeneity question. The VAR analysis is performed on a bivariate case, i.e. for each of the six wine-importing countries a VAR model is estimated for each pair of wine exporters (France-Italy, France-Spain and Italy-Spain). This estimation strategy has been necessitated by the available number of observations as a VAR with three variables and a reasonable number of lags - as monthly data are used - very quickly reduce degrees of freedom. In a compact form the VAR is written as:

$$X_t = A_0 + A_1 X_{t-1} + \dots + A_p X_{t-p} + \epsilon_t \tag{3}$$

The 3x1 vector X_t represents log values of the variables from section two, i.e. $\log Q_{F,t}$, $\log Q_{I,t}$, $\log(P_I/P_F)_t$, when analysing the French-Italian case and similar variables for the combinations France-Spain and Italy-Spain. A_0 is the matrix of intercept terms, deterministic trend terms and the monthly seasonal dummies. Additionally, a dummy variable representing the French nuclear testings in the Pacific (from September 1995 to February 1996) may be added to the VAR allowing an exogeneous, political shock to influence the export of French red wine. $A_1 \dots A_p$ are 3x3 matrices of coefficients to the lagged values of X_t and finally the error terms are represented by the vector ϵ_t .

As the unit root tests in section three in most cases reveal that the variables are reasonably described as trend-stationary variables with a deterministic seasonal pattern, the VAR models are estimated in levels. Therefore, the alternative methodology of differencing, i.e. a first-difference filter and a seasonal-difference filter applied to the time series data, was not pursued as the conclusions from such a methodology not necessarily would be more revealing about the true interrelationships among the trade flows of red wine.

In order to find the appropriate lag length of the VAR, the model is tested down beginning with lag length of order twelve, and subsequently stepwise reducing to the order of eight and six, respectively - and each time applying two different types of test statistics. Firstly, the multivariate generalizations of the Akaike information criterion (AIC) and the Schwartz criterion (SC) are calculated, see Enders (1995):

$$\begin{aligned}
 AIC &= N \log | \Sigma | + 2k \\
 SC &= N \log | \Sigma | + k \log \frac{N}{N-k}
 \end{aligned}
 \tag{4}$$

k = number of parameters
 $| \Sigma |$ = determinant of the variance / covariance matrix of the residuals.

The minimum values of these test criteria select the appropriate lag length. Additionally, a likelihood ratio test is used in order to decide whether the last lags in the model can be deleted, and this test statistic is calculated as:

$$LR = N \left(C \log | \Sigma_r | - C \log | \Sigma_{ur} | \right) \quad (5)$$

C = number of parameters in each unrestricted equation.
 $| \Sigma_r |, | \Sigma_{ur} |$ = determinants of the variance / covariance matrices of the restricted and unrestricted systems, respectively.

The LR-test statistic is χ^2 distributed with degrees of freedom as the number of restrictions in the VAR. Hopefully, the two sets of test statistics will not be too contradictory with respect to the optimal number of lags to include in the VAR. All regressions and test statistics are calculated using the time series software package RATS, see Doan (2000) or Enders (1995, 1996) for further details.

From the lag length test criteria VAR models were in most cases tested down to the order of six, cf. the notes to Tables 2, 3 and 4. The likelihood ratio test indicates in most cases that lags above six months are not binding restrictions in the VAR models, and therefore the fluctuations in the wine trade flows do seem to be of a primarily short-term nature.

Having determined the appropriate lag length order of the VAR model, a test of Granger causality is straightforwardly done as a test of whether lags of one variable enter into the equation for another variable. In terms of the model as stated in (3) the variable j does not Granger cause variable i if all the coefficients of $A_{ij}(L)$ - L is the lag-operator - are zero, and this is usually done by an F -test for a restriction where all the coefficients are set equal to zero. The test is not a test for exogeneity among the variables as only past values (and not current values) of the variables enter the analysis, Enders (1996). Tables 2, 3 and 4 report the causality tests done on a bivariate basis including three variables in the VAR, i.e. the exported quantities of red wine and the relative prices.

Table 2. Tests of Granger causality: F -tests for France-Italy.

	Dependent variable:					
	Q_F		Q_I		P_I / P_F	
	L	D	L	D	L	D
Belgium:						
Q_F	1.86	4.79**	2.34**	2.88**	1.16	0.95
Q_I	1.78	3.20**	0.93	7.43**	0.48	0.79
P_I / P_F	0.85	2.55**	3.89**	4.80**	3.26**	2.40**
Denmark:						
Q_F	0.88	2.43**	2.41**	2.26*	2.00*	0.94
Q_I	1.50	0.63	3.49**	1.50	0.96	0.41
P_I / P_F	0.24	0.45	2.09*	0.46	1.42	2.51**
Japan:						
Q_F	6.92**	0.89	1.10	0.68	0.71	0.95
Q_I	0.32	1.03	0.77	3.05**	0.47	0.88
P_I / P_F	0.31	0.62	0.90	1.51	0.96	1.47
The Netherlands:						
Q_F	3.24*	2.45*	0.12	0.24	0.32	0.51
Q_I	0.77	0.87	1.02	2.90**	0.56	0.96
P_I / P_F	0.65	1.56	1.08	2.01*	1.29	1.68
UK:						
Q_F	0.90	7.59**	0.83	0.75	0.91	1.42
Q_I	0.43	0.30	0.50	3.64**	0.53	0.27
P_I / P_F	0.42	0.19	0.29	0.14	3.78**	1.19
USA:						
Q_F	1.55	1.85	0.86	0.33	0.29	0.54
Q_I	1.32	1.57	0.36	3.26**	0.32	0.92
P_I / P_F	2.07*	2.97**	0.95	0.32	2.39**	1.72

Notes: The model estimated in levels (including trend and seasonal dummies) is marked by 'L', and the differenced data model by 'D'. A lag length of six is used in all cases, except USA (l=8, level model). The level of significance is denoted by * and ** for the 5% and the 10% levels, respectively.

Table 3. Tests of Granger causality: *F*-tests for France-Spain.

	Dependent variable:					
	Q_F		Q_S		P_S / P_F	
	L	D	L	D	L	D
Belgium:						
Q_F	0.76	4.01**	0.18	0.58	0.24	0.67
Q_S	0.76	1.23	0.32	5.25**	0.94	0.97
P_S / P_F	1.17	1.17	0.42	1.64	0.34	6.03**
Denmark:						
Q_F	2.96**	1.52	0.36	1.06	0.86	0.91
Q_S	0.45	1.04	1.98*	3.34**	0.54	0.54
P_S / P_F	0.97	1.66	1.10	1.62	0.36	2.54**
Japan:						
Q_F	3.82**	1.22	1.93*	0.85	1.59	1.72
Q_S	0.77	0.91	1.81	1.14	1.10	2.04*
P_S / P_F	0.48	1.13	0.63	1.89	0.69	5.82**
The Netherlands:						
Q_F	2.39**	2.54**	3.57**	1.90*	3.03**	2.33**
Q_S	1.97*	1.73	2.89**	1.41	2.94**	3.20**
P_S / P_F	1.86	1.10	2.72**	2.04*	3.07**	8.51**
UK:						
Q_F	1.31	9.08**	2.32**	4.38**	0.59	0.74
Q_S	1.05	2.61**	1.08	5.43**	0.29	0.41
P_S / P_F	0.63	1.28	0.40	1.24	0.65	2.88**
USA:						
Q_F	1.98*	1.74	0.41	0.25	0.83	1.27
Q_S	0.52	0.92	0.38	5.04**	0.68	1.19
P_S / P_F	1.36	0.48	1.00	2.63**	0.66	5.02**

Notes: The model estimated in levels (including trend and seasonal dummies) is marked by 'L', and the differenced data model by 'D'. A lag length of six is used in all cases, except for the Netherlands (l=8) and Japan (l=8, diff. model). The level of significance is denoted by * and ** for the 5% and the 10% levels, respectively.

Table 4. Tests of Granger causality: *F*-tests for Italy-Spain.

	Dependent variable:					
	Q_I		Q_S		P_S / P_I	
	L	D	L	D	L	D
Belgium:						
Q_I	1.26	3.29**	0.41	2.51**	0.75	0.66
Q_S	2.38**	0.85	0.34	7.32**	0.80	1.07
P_S / P_I	4.61**	1.64	0.67	2.08*	0.69	6.18**
Denmark:						
Q_I	1.50	11.95**	0.64	2.00	1.91*	1.30
Q_S	0.39	3.66**	0.94	2.22*	2.51**	1.36
P_S / P_I	3.12**	4.11**	1.03	1.06	4.09**	2.45*
Japan:						
Q_I	3.12**	3.04**	1.04	2.10*	1.49	1.99*
Q_S	2.36**	1.43	3.32*	0.52	1.80	2.76**
P_S / P_I	2.08**	1.46	1.19	1.93	1.30	5.03**
The Netherlands:						
Q_I	1.60	1.69	0.56	2.41**	1.46	1.40
Q_S	0.48	0.64	2.86**	2.18*	0.62	2.07*
P_S / P_I	1.69	1.95*	0.97	1.77	1.00	3.07**
UK:						
Q_I	1.29	7.19**	0.59	0.29	0.34	0.81
Q_S	2.14*	3.23**	1.26	1.42	0.37	0.36
P_S / P_I	2.97**	2.98**	1.15	0.90	2.00*	3.04**
USA:						
Q_I	1.52	5.17**	0.86	0.63	1.93*	2.35*
Q_S	1.65	1.34	0.79	6.89**	0.82	1.32
P_S / P_I	1.50	1.09	2.15*	3.57**	0.62	2.93**

Notes: The model estimated in levels (including trend and seasonal dummies) is marked by 'L', and the differenced data model by 'D'. A lag length of six is used in all cases, except for Denmark (l=8, level model; l=12, diff. model) and the Netherlands (l=8, diff. model). The level of significance is denoted by * and ** for the 5% and the 10% levels, respectively.

In general, there are only relatively few significant parameters found in the Granger causality tests indicating that lags of one variable significantly enter the equation of another variable, e.g. in Table 2 for Denmark where French wine Granger causes Italian wine according to both versions of the model - and no reverse effect is present. Additionally, the test statistics from the level models and the differenced models do not seem to differ that much - in some of the significant cases the effect refers to a variable Granger causing itself and therefore less relevant concerning the discussion of interrelationships. With respect to the Granger causality, one of the main conclusions from Tables 4, 5 and 6 seems to be that French wines (Q_F) only in a few cases are influenced by Italian or Spanish wine or by price effects. Italian wines, in contrast, are in more cases influenced by the other variables according to either the level version or the differenced version of the VAR, and finally Spain seems to be the middle case. For the relative prices, fluctuations in these variables seem in most cases to be influenced by the trade flows (quantities) and only to a lesser degree the opposite case shows up significantly.

5. The French nuclear testings in 1995 at the Mururoa atoll

The tests for any effects on the export of French red wine from the 1995 nuclear testings can be directly investigated in the VAR analysis. The testing period was from September 1995 until February 1996 and hence a dummy variable for this time span can be added as an exogenous variable in all the bivariate cases from section four which involve France. The dummy variable enters all the equations of the VAR as an effect also might show up as e.g. an increase for the export of Italian red wine - while the French red wine export stagnates. Then an exclusion restriction for the nuclear dummy is tested, i.e. a high p -value for this restriction indicates that the dummy belongs in the system, and thus a hypothesis of a (probably) negative effect from the nuclear incident cannot be excluded. Of course, also the sign of

any significant dummy variable will have to be evaluated with respect to an economic interpretation of the results.

Table 5. Test results for the ‘nuclear dummy’: France-Italy.

	Dependent variable:			LR-test, $\chi^2(3)$
	Q_F	Q_I	P_{IF}	
 \hat{D}_{NUCLEAR}			
Belgium	0.06 (0.07)	-0.03 (0.07)	0.12 (0.07)	2.78 (p=0.43)
Denmark	-0.32* (0.17)	0.24 (0.16)	0.02 (0.16)	13.87 (p=0.00)
Japan	-0.42** (0.14)	-0.09 (0.21)	-0.09 (0.12)	8.28 (p=0.04)
The Netherlands	-0.06 (0.11)	0.47 (0.29)	-0.08 (0.17)	4.45 (p=0.22)
UK	-0.12 (0.08)	-0.04 (0.11)	0.02 (0.08)	1.87 (p=0.60)
USA	0.20 (0.17)	0.23 (0.19)	-0.04 (0.14)	4.25 (p=0.24)

Note: Standard errors in parentheses and the level of significance is denoted by * and ** for the 5% and the 10% levels, respectively, for the parameter estimates of the nuclear dummy (1995:9-1996:1).

The nuclear tests were announced well before the actual events took place, and therefore the trade flows of French red wine in the autumn of 1995 might be influenced - although some lags exist between the decision to buy French wine and the later appearance of the subsequent trade flow in the EUROSTAT. Experimenting with lags of a few months duration in the model did not influence much on the conclusions obtained why the nuclear dummy was maintained similar to the actual testing period. Tables 5 and 6 report the results of an exclusion restriction of this dummy variable for the French export of red wine vis-a-vis Italy and Spain, respectively, and for the level version of the VAR model.

Table 6. Test results for the ‘nuclear dummy’: France-Spain.

	Dependent variable:			LR-test, $\chi^2(3)$
	Q_F	Q_S	P_{SF}	
 \hat{D}_{NUCLEAR}			
Belgium	0.08 (0.07)	-0.14 (0.26)	-0.17 (0.16)	6.40 (p=0.09)
Denmark	-0.24* (0.14)	0.06 (0.12)	0.05 (0.11)	8.16 (p=0.04)
Japan	-0.17 (0.14)	-0.25 (0.28)	0.22 (0.16)	4.58 (p=0.21)
The Netherlands	-0.11 (0.09)	0.09 (0.14)	0.17** (0.08)	10.52 (p=0.01)
UK	-0.17** (0.07)	-0.07 (0.13)	-0.11 (0.08)	7.76 (p=0.05)
USA	0.05 (0.12)	0.26 (0.13)	0.19 (0.21)	5.00 (p=0.17)

Note: Standard errors in parentheses and the level of significance is denoted by * and ** for the 5% and the 10% levels, respectively, for the parameter estimates of the nuclear dummy (1995:9-1996:1).

The dummy variable for the nuclear testing period is expected to show up with a negative sign in the French wine export - and with a positive sign in the Italian and Spanish cases. The conclusion is that the testing seems to have had a negative impact on the French wine export to Denmark, Japan and maybe also to the United Kingdom. The effect is most convincingly demonstrated in the Danish case as the nuclear dummy is significantly negative vis-a-vis both Italy and Spain, and the parameters for the latter countries are positive. The likelihood-ratio test rejects in all the before-mentioned cases a hypothesis of removing the nuclear dummy variable from the VAR system.

6. Conclusion

The export of red wine from France, Italy and Spain to six other OECD countries have been analysed in a VAR modelling framework. There is a considerable seasonal pattern in the wine trade flow which has to be dealt with explicitly in order not to ascertain any common seasonal effects to e.g. causal links among the wine export. The seasonal effects are modelled either by including seasonal dummies or applying suitable differencing of the data. From the VAR analysis the conclusions are that the French red wine export hardly is related to - or Granger-caused - by the Italian or Spanish competitors, i.e. country-specific factors have to be used when explaining the French wine export. For Italy, the export is probably more sensitive to the development in French and Spanish wine export (quantities and/or relative prices). In the case of Spain, some evidence of links to the competitors is also revealed. Finally, the French wine export was negatively influenced by the 1995 nuclear testings concerning Denmark and probably also for Japan and the UK.

References

Anderson, K. and D. Norman (2001): *Global Wine Production, Consumption and Trade, 1961-1999. A Statistical Compendium*. Centre for International Economic Studies, Adelaide.

Doan, T. (2000): *RATS User's Manual*. Evanston, Ill.: Estima.

Enders, W. (1995): *Applied Econometric Time Series*. Wiley, New York.

Enders, W. (1996): *RATS Handbook for Econometric Time Series*. Wiley, New York.

Franses, P.H. (1996): *Periodicity and stochastic trends in economic time series*. Oxford University Press.

Hylleberg, S. , R.F. Engle, C.W.J. Granger and B.S. Yoo (1990): *Seasonal Integration and Cointegration*. *Journal of Econometrics*, 44, 215-38.

Intra- and extra-EU Trade, EUROSTAT, var. issues.