

Macroeconomic Cycles and The Wine Industry

By

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This paper has been written in cooperation with Lisa Corin Phares (2000) of the Regional Research Institute at West Virginia University, and Mathilde Auzias (2001) and Michel Terraza of LAMETA at the University of Montpellier I, France. This paper represents a revision of a paper on “Business Cycles and Wine Market Impacts” given at the CIES Wine Economics Workshop, 11-12 October 2001, Adelaide, Australia.

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Abstract: Previous research has explored the relations between international business cycles and agricultural, minerals and energy commodity markets. The analysis of the relations between international business cycles and world wine markets is somewhat more complex and more subtle. The Committee of the OIV concerning “Analyse Economique et Conjoncturelle” has dealt primarily with the impacts of fluctuations in grape and wine production on wine consumption and earnings. However, there is good reason to believe that the international wine industries also face fluctuations in international business cycles. This is not surprising given the increased globalization of the world wine market. This study expands the research that has taken place concerning the impacts of macroeconomic variables in the form of business cycles on wine market variables, such as consumption, production, prices, imports and exports. This study consists of the following parts: Business cycle Impacts, Wine market impacts, and Where do we go from here.

Introduction

Previous research has explored the relations between international business cycles and particular commodity markets, such as agricultural, minerals and energy. The analysis of the relation between international business cycles and world wine markets is somewhat more complex and more subtle. The Committee of the OIV concerning “Analyse Economique et Conjoncturelle” has dealt primarily with the impacts of fluctuations in grape and wine production on wine consumption and producer earnings. However, there is good reason to believe that the international wine industries also face uncertainty caused by national and international business cycles. This is not surprising given the increased globalization of the world wine market. Only limited research has taken place concerning the impacts of macroeconomic variables in the form of business cycles on wine market variables such as consumption, production, prices, imports and exports. This study expands this research by examining the impacts of national product, incomes and earnings on domestic wine demands, of exchange rates (including devaluation effects) on wine exports and imports, and of interest rates on new industry investments and wine production. This study consists of the following parts: Business cycle impacts, Wine market impacts, and Where do we go from here.

Business Cycle Impacts

A business cycle can be briefly described as a growth in economic activity followed by a decline succeeded by further growth. The importance of business cycle fluctuations is that strong contractions can adversely impact individual sectors, industries and markets, that is, they can impact on a wide range of variables including commodity consumption, production, employment

and wages, commodity prices, profits, and investments, i.e. see Moore (1980). Contractions that are less severe, those with lower amplitudes, have more subtle and dispersed effects on such market variables.

Cyclical Indicators and Variables

The nature of business cycles and their impacts is often evaluated in the context of leading, coincident, and lagging indicators. A leading indicator moves up or down before related market variables, i.e. see Zarnowitz (1985). A list of leading indicators includes, among other variables, interest rates, working hours, new inventory orders, building permits, packaging, stock prices, money supply, unemployment claims, and investors' expectations. The reason these variables are leading is that they are more "sensitive to changes in the economic climate as perceived in the marketplace" (Moore, 1980), and thus reflect large cyclical rises and declines as well as high volatility. Due to their sensitivity, leading indicators can forecast business cycle changes by leading other variables by one or more periods.

Because so many economic factors react to business cycle fluctuations, the observance of these cycles can predict and/or alter future economic expectations. For example if interest rates, a leading indicator, decline, one can expect to see an expansionary period in investment. This expansion will coincide with an increase in gross domestic product and will later increase the amount of commercial and industrial loans available to commodity producers and consumers as well as to the economy in general.

Coincident indicators include industrial production, gross domestic product and personal income, among others. These indicators have strong tendency to peak and bottom at the same time as business cycles. Coincident indicators clearly indicate when a nation is experiencing prosperity or depression.

Lagging indicators are those that follow coincident indicators. Indicators such as consumer prices, unemployment rates, interest rates and inventories, typically respond after major business cycle turns. Because these indicators are slower to respond, they are smoother and less erratic than leading indicators and more accurately reveal the business cycle phases of an economy. The lagging indicators help verify that cyclical declines/rises in the economy are forthcoming. They also, with some room for error, help indicate when a cyclical change began.

Finally, special leading and coincident indicators exist in the form of composite indexes, which group individual indicators together. Composite indexes can help determine when the highs and lows of a cycle might occur. A composite index combines cyclical indicators of diverse economic activity into one index, giving decision makers and economists a single measure of how changes in business cycles are affecting economic activity. Examples in the US include the long leading index, the leading manufacturing index, and the leading inflation index. Special indexes also exist such as those produced by the Michigan Consumer Survey, the National Association of Purchasing Managers, the Conference Board, and the Economic Cycle Research Institute.

Influence of Business Cycles on Commodity Markets

When a business cycle changes phases, commodity industry and market variables are also likely to experience cyclical changes (Labys et.al., 2000). Consequently, the more severe the cycle, the more unstable individual industries will be on a whole (Borensztein and Reinhart, 1994). When commodity demand rises or declines, for example, changes in business cycles serve as a causal factor. During an expansion, commodity prices may rise and in response, consumers will spend less income on a given commodity. The demand, and consequently the prices, for other commodities may also decline. If a particular market responds slowly to demand and supply changes, a temporary imbalance may occur between supply and demand, possibly

resulting in a reduction in production, a rise in inventory levels and a fall in backlogs of orders (Bosworth, 1982).

The most direct link concerning cyclical impacts on commodity markets is found between gross domestic product (GDP) and commodity demand. Assuming the income elasticity of commodity demand to be near one, increases in GDP and particularly industrial production would cause increases in the demand for a commodity. Conversely, declines in GDP would cause commodity demand to decline also. A related interaction is how inflation influences commodity prices, and vice-versa. In an overheated economy, increased futures trading activity on the part of speculators can amplify already rising commodity prices. If speculators expect demand for a good to rise, then the increased price for that good may lead to lower demand and hence to lower profits for many producers, reductions in the work force, and increasing unemployment (Cristini, 1999). This rise in unemployment will reduce disposable income and reduce commodity demand further. As discussed below, this will deter investors in a commodity market on both the national and international level. Monetary policies can provide a way out of this downward cycle by encouraging investment through lowered interest rates and an expanded money supply (Labys et.al., 1989). Technological advances such as those found in agriculture can help to expand output and to lower prices.

Grilli and Yang (1981) and Chu and Morrison (1984) have examined the commodity market impacts of macroeconomic variables as traced through the demand and supply variables of a market. Their research discusses the relationship between current prices and future supplies via the impact of current prices on investments in productive capacity, and the effect of capacity changes on commodity prices. They also explore the effects of supply shocks on commodity price fluctuations in the short-run, suggesting that the supply side can respond quickly to price increases thus decreasing the magnitude of inflation. Other studies have pointed to the impacts

of exchange rates on commodity price fluctuations, i.e. see Fleisig and van Wijnberger (1985), Maxim (1989), Reinhart (1998) and Ridler et.al. (1992). Because these works focus on aggregate market behavior, it seems important to disaggregate such an approach to a single commodity basis.

A number of such studies have been reviewed in Labys and Maizels (1992), who also analyze causality and feedback effects between commodity prices and a variety of macroeconomic variables. Their results suggest that a higher degree of causality exists between “international primary commodity prices and national prices, selected macroeconomic indicators, and monetary variables in the major OECD countries than was previously believed” (Labys and Maizels, 1992). Cooper and Lawrence (1988) also have examined how particular macroeconomic variables affect commodity markets in their research on the sharp rise in commodity prices during the 1972-75 commodity price boom.

An obvious area of macroeconomic impacts is the metal markets and here a variety of studies have taken place, i.e. see Adams and Joaquin (1988), Davutyan and Roberts (1991), Fama and French (1988), Labys et.al. (1998,2000) and Moore (1998). Darby (1982) as well as Mork et.al. (1990) followed a similar approach when examining the impacts of crude oil prices. And Liu, et. al. (1990) evaluated macroeconomic impacts on agricultural prices.

Business Cycles and Wine Markets

The analysis of the relation between international business cycles and world wine markets is somewhat more complex and more subtle than the research mentioned above concerning impacts on commodity agricultural and mineral markets (Labys, 2000; Spahni and Labys, 1994). The work of the OIV concerning “Analyse Economique et Conjoncturelle” has dealt primarily with the impacts of fluctuations in grape and wine production on wine consumption and producer earnings. However, there is good reason to believe that the

international wine industries also adjust to changes in international business cycles. This is not surprising given the increased globalization of the world wine market (Anderson, 2001). Earlier Lindsey (1987) examined the impacts of exchange rates (and trade barriers) on the US wine industry. A study of French wine industry impacts was made by Mathis et.al. (1997). Such an approach was expanded by Phares (2000) and by Auzias (2001) who examined the impacts of a wide range of business cycles indicators on the wine industries of Australia, France, Germany, Italy, Spain, the UK and the US. Most of these studies employed broad macroeconomic and wine market variables, while the studies of Wittwer and Anderson (2001), Anderson and Berger (1999), and Wittwer et.al. (2001) benefitted from the use of more precise (disaggregated) macro and market variables. Their use of a computable general equilibrium model (FEDSA-WINE) also permitted them to avoid problems of obtaining long time series.

An important factor in the trade and consumption of wine is per capita income, as partially determined by such leading indicators as productivity, hours worked, and wages. Rogers (1998) briefly explains the role of income as “the ‘driver’ behind consumer spending”. In essence, if incomes decline, possibly due to poor consumer expectations; this in turn could lead to a decline in expenditures and possibly a recession. Rogers goes on to explain how not only income but also the propensity to consume affect the trade and consumption of goods.

In this study the following propositions are considered: (1) Are national product, incomes and earnings likely to influence domestic wine demands. Similar variables defined for wine importing countries or world incomes might be useful for explaining the wine exports of a country. (2) Do exchange rates (Including devaluation effects) explain changes in wine exports or wine imports of a country. (3) Do changes in interest rates cause increased liquidity to finance new industry investments, by varying the capital stock or by storing wines in inventory. (4)

Relative wine and consumer price effects could be intertwined, even exploring comparative advantage between countries.

Measuring Wine Market Impacts

This econometric investigation pursued is of a preliminary nature. The attempt has been mainly one of determining whether any simple relationships might be discovered for the wine market concerning the kinds of business cycle phenomena that affect other commodity markets and industries. Such are the results presented below from these by Phares (200) and Auzias (2001). Two principal problems have been encountered in performing this research. First concerning the macroeconomic variables, we have been able to employ selected OECD business cycle indicators as explained below. Omitted in the individual country analyses are particular national income categories that might better explain how income affects wine consumption, including shifts in household preferences of wine of different qualities. Appropriate data on taxes, tariffs and change in production technology also were not available. Second, concerning the wine market variables, we have not been able to deal with wines of different quality levels in consumption, production, imports, exports and prices. Obviously changes in income patterns influence the consumption of wines of higher quality different from those of lower quality.

Given these various problems, the methodologies employed are primarily investigatory and no attempt has been made, for example, to study asymmetric or nonlinear business cycle effects. We begin with tests of stationarity and cointegration to examine the time series behavior of our variables univariately, then bivariately. The analysis also includes observed correlations between the various macroeconomic and wine market variables. Tests of causality or directionality between variables are also conducted at this stage. Finally multivariate analysis is performed based on vector autoregression, including impulse function and variance

decomposition methods. A background to and explanation of the methods employed can be found in Cromwell et al. (1994a,b)

Data on the international macroeconomic variables concerning the seven major OECD countries were obtained from the Organization for Economic Cooperation and Development: France, Italy, Germany, UK, Spain, Australia and the US. These variables include GDP, interest rates, CPI, share prices, employment, interest (funds) rate, the trade balance, total imports, PPI, industrial production, earnings, hourly wages and exchange rates. The wine market data also concern the seven major OECD countries. The sources of this data are the publications from the International Office of Wines and Vines (OIV,2000) in Paris, the UN Food and Agricultural Organization in Rome (FAO,2000), and the Center for International Studies at Adelaide University (Anderson and Norman,2001). The relevant wine market variables include exports, imports, production, consumption and prices. Definitions of the variables appear in Table 1; EVIEWS software has been employed throughout this study.

Stationarity and Cointegration

Stationarity tests employing the Dickey-Fuller and Augmented Dickey Fuller tests have revealed for the most part that the underlying structure of the macro and market variables is nonstationary. Simple transforms to percentage change (changes in logarithms) of the values of each variable proved sufficient to restore stationarity. These transformed variables were employed in estimating a number of vector autoregressions; the residuals of each of the regressions were then tested for cointegration using the Johansen test. No cointegrated regressions were discovered. (Auzias, 2001, Annexes 2,3,4 ; see Appendix B)

Correlation and Causality

Economic relationships that can possibly exist between the business cycle and wine market cycles have been identified earlier. All of these relationships are based on various

macroeconomic theories, most of which have been mentioned. To facilitate the present interpretation of empirical results, the signs of the expected relationships between pairs of variables have been summarized in Table 2. These directionalities will be referred to as the discussion unfolds. Some suggestion as to how the business cycle and wine market cycles might be correlated can be seen in Figures 1-3; note that cyclical representation can be made by transforming the variables to percentage changes. For Australia, Figure 1a shows wine consumption generally to follow GNP, except in the mid-80s and after 1998. Figure 1b indicates that exports did not necessarily take advantage of declines in exchange rates. For the United States, Figure 2a implies a much closer relation between changes in wine consumption and changes in GNP. Alternatively, Figure 2b does not suggest that more wine is consumed as exchange rates fall. However, in Figure 2c wine imports appear to increase as the US dollar became stronger. For France, Figure 3a shows some relation between changes in wine consumption and exchange rates, though little theoretical basis exists for such a relationship. In Figure 3b, some closeness is seen between changes in wine imports and changes in French GNP.

Let us now consider some of the simple results obtained concerning the correlation analyses. Based on Phares (2000, Appendix A), the business cycle indicators employed as a surrogate for better income measures were gross domestic product, industrial production, employment (also unemployment) and earnings. Important price variables included consumer and share (stock market) prices. Exchange rates also were added. As noted, the wine market variables were consumption, production, imports, exports and prices. Only the statistically significant results are mentioned, using a country format.

For Australia, wine consumption is correlated with gross domestic product and share prices. Wine imports are more loosely related to exchange rate changes. For the United States wine imports also exhibit some correlation with exchange rates. For France none of the correlations

make economic sense, except that wine prices seem linked to exchange rates. For the more restricted table wine category, no relationships at all could be found. Concerning the other European countries in our sample, the results are weak. For Germany and Italy, wine prices show a much weaker relation to exchange rates.

Among other ways to examine business cycle influences, wine exports would appear to depend not only on income fluctuations in other countries but also on exchange rates of those countries. In Table A.5, results of estimating the impacts of GDP in several countries and regions on wine exports from Australia, France and the United States can be observed, based on correlations in both levels and percentage changes. The correlations seem more evident for France than for Australia or for the United States. Because such analysis needs to be refined in terms of sub-periods and time lags, Figures 4a-c illustrate how the wine exports from those countries has varied with the aggregate GDP of the European Union. For each country a clear relation can be seen between exports and aggregate GDP, though the strength of the relation varies for different years.

Our causality findings are based on the Granger-causality test procedure employing Akaike and Hannan-Quinn tests of lag length (Auzias, 2001, Annex 5, see Appendix B). For Australia, weak causality appears between the interest rate and wine production. For the United States, increases in gross domestic product caused wine imports. (Much of US wine consumption is imported.) No causality between the variables was found in the case of France. Concerning the other European countries, no interesting causalities were found.

Vector Autoregression

Vector autoregression (VAR) is commonly used for forecasting systems of interrelated time series variables and for analyzing the dynamic impact of random disturbances on the system of variables. The VAR approach sidesteps the need for structural modeling by modeling every

endogenous variable in the system as a function of the lagged values of all of the endogenous variables in the system. The estimated VARs are used to calculate the percentages of each endogenous variable that can be explained by innovations in each of the explanatory variables and provides information about the relative importance of each random innovation to the variable in the VAR. This is accomplished by examining the decomposition of the variance in forecast errors and the paths of the impulse shocks. The latter involve tracing the response of each dependent variable to a shock, or innovation, in one of the other endogenous or exogenous variables in the system. The results of the preliminary vector autoregression tests have been summarized in Table 3 on a country basis. (Auzias, 2001, Annexes 2,5,7; see Appendix B)

Wine consumption more than other market variables appears to experience business cycle influences. For Australia and the United States, consumption varies with gross domestic product. Other links are weaker. For Germany, Italy, the United Kingdom and the United States, consumption also appears to be linked to employment. Wine production tends to relate more to gross domestic product than to interest rates. This is confirmed for Australia, Italy, Spain, the United Kingdom and the United States.

Concerning international trade influences, wine imports are more susceptible to business cycles than are wine exports. For Australia, the United States, Italy, Spain and the United Kingdom, gross domestic product is the most important causal factor. Exchange rate changes in one direction or another have been mentioned as a cause of changes in wine imports and exports. Our results, however, suggest this to be true only for French wine imports. At the same time patterns of US wine imports seem to vary with US bilateral exchange rates. Analysis of this hypothesis obviously depends on the acquisition of more detailed data.

The share price variable surprisingly has shown a relation to several wine variables. One might surmise that supplementary income resulting from bull market activity might well increase

the consumption of finer wines. Earlier Labys and Cohen (1978) reported that portfolio shifts during inflation suggest that commodity futures prices and wine prices rise accordingly. Regarding the vector autoregression results, French wine imports and consumption are related to share price increases, as are wine imports in the United States.

Where Do We Go From Here?

There is no doubt of the relation between business cycles and commodity markets. Because of the vagaries of agricultural production, this relation is more pronounced in the case of mineral and energy commodities. Nonetheless for many of the major agricultural commodities where extensive processing takes place, such linkages have been found. In the context of the present wine market study, the econometric results have been weak. Sometimes, however, negative results are as useful to economists as are positive results. The present findings have confirmed the relationship between domestic product or income and wine consumption. To a lesser extent, linkages exist between wine consumption and share prices, and wine imports and exchange rates.

The lack of stronger econometric evidence is surprising, given the extent of trade and globalization in the wine market. Perhaps such results should force economists to rethink their perceptions of the economic openness and performance of wine markets. Factors that inhibit this openness include: high tariffs, abnormal taxes, price supports, direct and indirect subsidies, Common Wine Policy of the EU, large firm concentration, and segmentation of wine quality and consumer preferences. Particularly in the latter case, wine consumed as table wine forming an integral part of meals in a number of countries does not vary much with income changes. Finer, higher quality wines, however are consumed in proportion to changing incomes and taste habits.

Despite such difficulties, the existence of a number of successful studies in this area provides a stimulus to continue the present research. Let me repeat several of the examples mentioned earlier. Lindsay (1987) has demonstrated how US wine imports and exports are influenced by relative prices, exchange rates, and tariff and non-tariff trade barriers. More recently Wittwer et al. (2001) have included exchange rates and incomes in modeling the world wine market and in forecasting market changes. And Wittwer (2001) has confirmed strong macroeconomic linkages in modeling the Australian wine market. Apologies are due if other such studies have been performed and I have not identified them.

What can be done to improve research in this area and to clarify how wine markets indeed are influenced by business cycle phases? A first step to be taken will be to deal with the two problems mentioned earlier. Greater effort must be placed in detailing, disaggregating or modifying macroeconomic indexes, so that they are more relevant for wine industry analysis. And the wine variables themselves must be improved in terms of quality segmentation and product differentiation. A needed second step is to expand research dealing with these interactions. Profit expectations and interest rate changes must somehow influence wine industry investments. More work should be done on relative prices and comparative advantage. And relative exchange rate changes are becoming increasingly important in determining how consumers make their wine choices.

As Anderson (2001) has proscribed, the world wine market has become more global and hence more intertwined with the business cycle conditions of a number of countries. It is the purpose of good economic analysis to cast light on such linkages, to analyze related policies, and to help the world wine industry to grow and to prosper.

References

- Auzias, Mathilde. (2001). "L'influence des Fundamentaux sur le Marche Mondial du Vin." Memoire, LAMETA, University of Montpellier I, France.
- Adams, F. Gerard and Vial, Joaquin (1988), "Explaining Recent Metals Price Swings: Exchange Rates and Structural Considerations," *Resources Policy*, 18: 85-96.
- Anderson, Kym. (2001). "The Globalization (and Regionalization) of Wine." CIES WP 0125, Center for International Economic Studies, Adelaide University.
- Anderson, Kym and Berger, Nicholas. (1999), "Australia's Re-Emergence as a Wine Exporter: the First Decade in International Perspective", Wine Policy Brief No. 5. Center for International Economic Studies, Adelaide University
- Anderson, Kym and David Norman. (2001). *Global Wine Production, Consumption and Trade, 1961 to 1999: A Statistical Compendium*, Adelaide: Centre for International Economic Studies.
- Berger, N., Anderson, K. and R. Stringer (1998). *Trends in the World Wine Market: 1961 to 1996*. Adelaide: Center for International Economic Studies. Adelaide University
- Borensztein, E. and C.M. Reinhart (1994), "The Macroeconomic Determinants of Commodity Prices," WP/94/9, International Monetary Fund, Washington, DC.
- Bosworth, B. and Lawrence, R.Z. (1982), "*Commodity Prices and the New Inflation*", Washington, D.C.: The Brookings Institution.
- Chu, K.Y. and Morrison, T.K. (1984), "World Non-Oil Commodity Markets", *IMF Staff Papers*, 33: 139-184..
- Cooper, R.M. and Lawrence R.Z. (1975), "The 1972-75 Commodity Price Boom" *Brookings Papers on Economic Activity*, 3: 671-723.
- Cristini, Annalisa (1999). *Unemployment and Primary Commodity Prices*, London: Macmillan Press.
- Cromwell, J., Labys, W.C., and Terraza, M. (1994a), "*Univariate Tests For Time Series Models*". Thousand Oaks, CA: Sage Publications.
- Cromwell, J., Hannan, M., Labys, W.C., and Terraza, M.(1994b), "*Multivariate Tests For Time Series Models*". Thousand Oaks, CA: Sage Publications.
- Darby, R. (1982), "The Price of Oil and World Inflation and Recession," *American Economic Review*, 72: 738-751.
- Davutyan, N. and Roberts, M. (1991), "Cyclicalities in Metal Prices," *Resources Policy*, 20: 49-57.
- FAO (2000). Production, Trade and Food Balance Sheet Data Base, United Nations Food and Agricultural Organization, Rome.
- Fama, E.F. and K.R. French (1988), "Business Cycles and the Behavior of Metal Prices" *Journal of Finance*, 43: 1075-1088.
- Fleisig, Heywood and van Wijnbergen, Sweder. (1985). "Primary Commodity Prices, The Business Cycle and the Real Exchange Rate of the Dollar," Discussion Paper Series No. 90, Centre for Economic Policy Research, London.
- Grilli, R.E. and Yang C.M. (1981), "Real and Monetary Determinants of Non-Oil Commodity Price Movements", CDWP 1981-6, World Bank, Washington, D.C.
- Labys, W.C. (2000), "Structural Adjustments in the World Wine Market," Working Paper, Natural Resource Economics Program, West Virginia University.
- Labys, W.C., Achouch, A. and Terraza M. (2000), "Metal Prices and the Business Cycle," *Resources Policy*, 25:229-238.

- Labys, W.C. and Cohen B.C. (1978), "Wine as a Medium Term Investment Vehicle", *European Review of Agricultural Economics*, 5(1).
- Labys, W.C. Lesourd, J.B. and Badillo D. (1998), "The Existence of Metal Price Cycles", *Resources Policy*, 24,2:147-155.
- Labys, W.C. and Maizels A. (1993), "Commodity Price Fluctuations and Macroeconomic Adjustments in the Developed Economies," *Journal of Policy Modeling*, 15,3, 335-352.
- Labys, W.C., Thomas, H.C. and Gijsbers, D.J. (1989), "Monetary and Economic Influences in Econometric Models of International Commodity Price Behaviour," In *Modelling Financial Market Behavior*, NATO ASI Series, Vol. F54.
- Labys, W.C., Kouassi, E. and M. Terraza (2000). "Short Term Price Cycles in International Commodity Prices." *Journal of Developing Economies*, 38,3:330-342.
- Lindsay, Patricia Joan. (1987). "An Analysis of the Effects of Exchange Rates and Trade Barriers on the US Wine Trade." PhD thesis, University of California at Davis, California.
- Liu, D.J., Chung, P.J., and Meyers, W.H. (1990), "Impact of Domestic and Foreign Macroeconomic Variables on US Meat Exports", Jnl Paper No. J-15550 of the *Iowa Agriculture and Home Economics Experiment Station*, Ames, Iowa, Project.
- Mathis, A., Terraza, M. and G. Verdier. (1997). "L'influence de l'activite economique sur le marche des vins de table francais." Paper presented at VDQS conference of the (French) Applied Economic Association, Thessalonica.
- Maxim, L.D. (1989), "Exchange Rates Developments and the Primary Copper Industry," *Resources Policy*. 25: 156-168.
- Mork, Mynen and Olsen. (1990). "Business Cycles and Oil Price Fluctuations." *Research Modelling Approaches in Applied Energy Economics*, Chapter 13, London: Chapman & Hall.
- Moore, G. H. (1980), *Business Cycles, Inflation and Forecasting*, Cambridge: National Bureau of Economic Research.
- Moore, G. H. (1988), "Inflation Cycles and Metals Prices," *Mineral Processing and Extracting Metallurgy Review*, 3: 95-104.
- OIV (2000). *Situation de la Viticulture dans le Monde*, Office International de la Vigne et du Vin, Paris, various issues.
- Phares, Lisa Corin (2000). "Business Cycles and the World Wine Market," Senior Honors Thesis RP2009, Regional Research Institute, West Virginia University, Morgantown.
- Reinhart, C.M. (1988), "Real Exchange Rates and Commodity Prices in a Neoclassical Model," IMF Working Paper, Washington, DC.
- Ridler, Duncan and Yandle, Christopher A. (1992), "A Simplified Method for Analyzing the Effects of Exchange Rate Changes on Exports of a Primary Commodity," *IMF Staff Papers*: 19,3: Nov.
- Rogers, R.M. (1998) "A Primer on Short-term Linkages Between Key Economic Data Series." *Economic Review*, pp 40-54.
- Spahni, P. and W.C. Labys (1994). *Le Vin*, Paris: Economica.
- Witwer, Glyn. (2001). "Accounting for Growth in the Australian Wine Industry." CIES DP 0029, Center for International Economic Studies, Adelaide University.
- Witwer, Glyn, Nick Berger and Kym Anderson. (2001). "Modelling the World Wine Market to 2005: Impacts of Structural and Policy Changes." CIES DP 01012, Center for International Economic Studies, Adelaide University
- Zarnowitz, Victor. (1985), "Recent Work on Business Cycles in Historical Perspective," *Journal of Economic Literature*, 23: 523-580.

Table 1

VARIABLE DEFINITIONS

MARKET VARIABLES BY COUNTRY

WC=	Wine Consumption (000 hl)
WM=	Wine Imports (000 hl)
WP=	OIV Wine Price, 1986=100
WQ=	Wine Production (000 hl)
WX=	Wine Exports (000 hl)
WWC=	World Wine Consumption (000 hl)
WWD=	World Wine Disequilibrium
WWM=	World Wine Imports (000 hl)
WWP=	World Wine Production (000 hl)
WWX=	World Wine Exports (000 hl)

CIES WINE DATA SERIES

SWPC=	Per Capita Wine Consumption
SWMU=	Wine Import Unit Values
SWXU=	Wine Export Unit Values
SWTS=	Wine Special Trade Value Ratio
SWCA=	Wine Comparative Advantage Index
SWC=	Apparent Wine Consumption
SSWQ=	Wine Production
SWM=	Wine Imports
SWX=	Wine Exports
SGNP=	Gross National Product

MACRO VARIABLES BY COUNTRY

BOP=	Current Account Balance, bln
CE=	Employment in Manufacturing
CP=	Consumer Prices
CPI=	Consumer Price Index
EM=	Employees in Mining and Manufacturing
ER=	Exchange Rates
GDP=	Gross National Product, bln
HW=	Hourly Rates
IF=	Federal Funds Rate, %
IM=	Imports
IP=	Total Industrial Production
IR=	Interest Rates
M, M2=	Money Supply
NI=	National Income, bln
PI=	Personal Income, bln
PPI=	Producer Price, Intermediate Goods

RU=	Registered Unemployment
SP=	Share Prices
TB=	Trade Balance
TU=	Total Unemployment
ULC=	Labor Cost : Engineering Industries
UR=	Unemployment Rate
WW=	Monthly Earnings

Source: Macroeconomic variables appear from OECD Economic Indicator files. Wine market variables appear from the International Office for Wines and Vines. CIES variables appear from Anderson and Norman (2001)

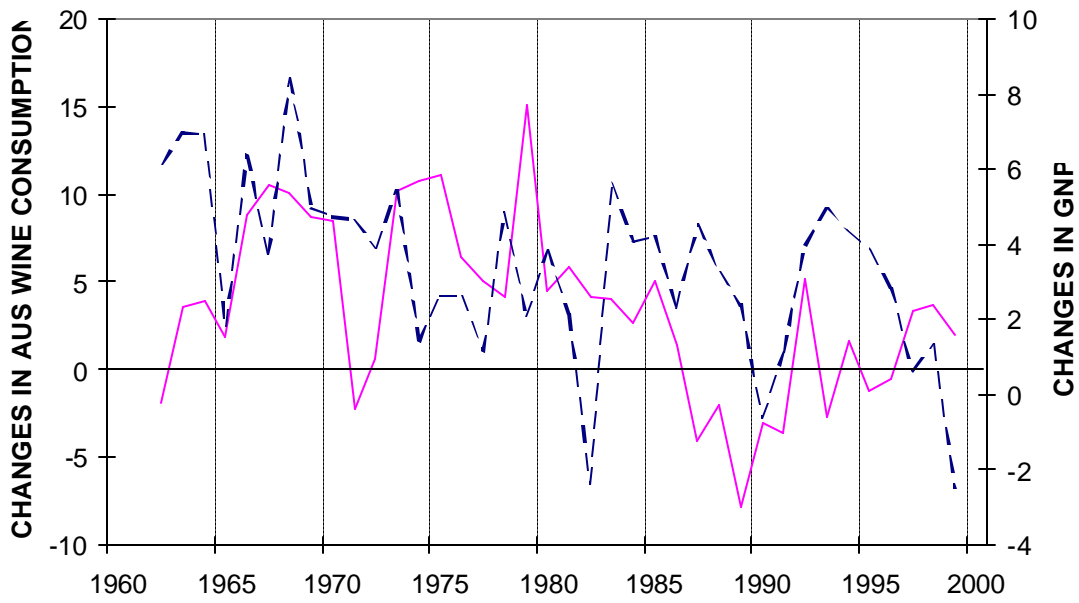
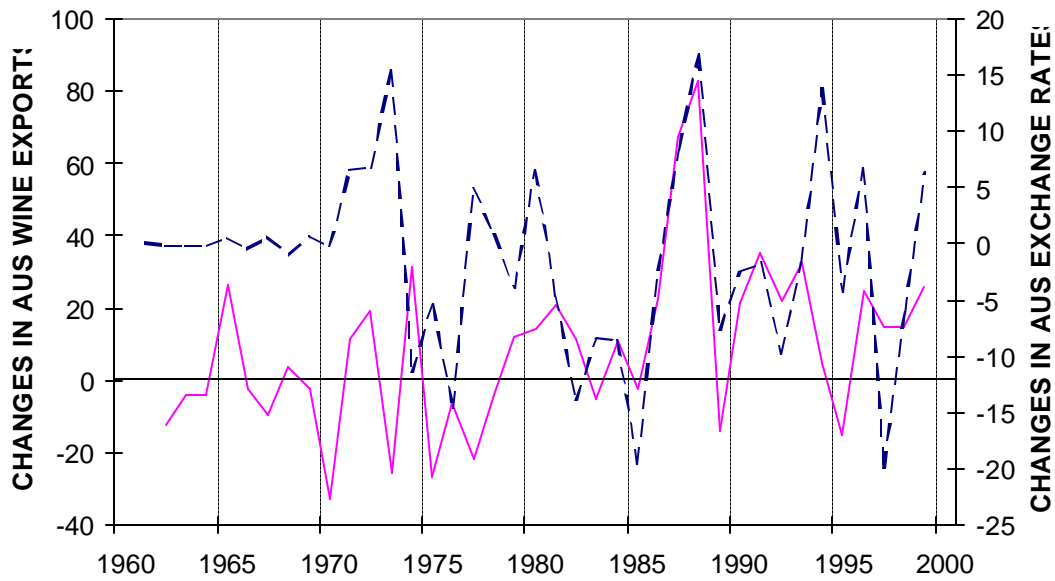


Fig. 1a. Changes in Australian Wine Consumption and in GNP



Changes in Australian Wine Exports and in Exchange Rates

Fig. 1b.

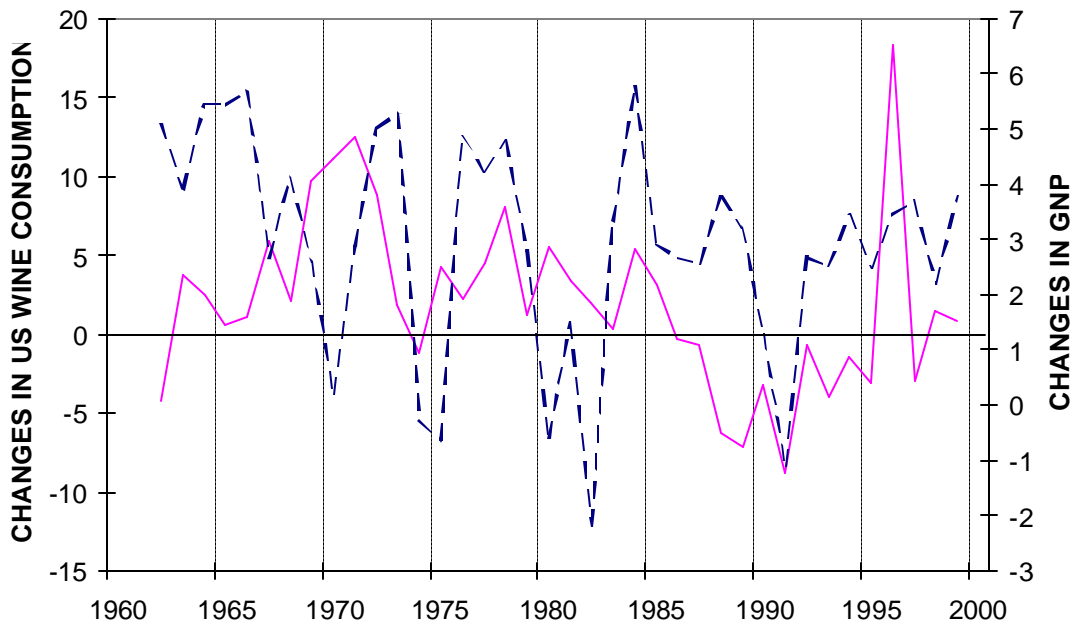
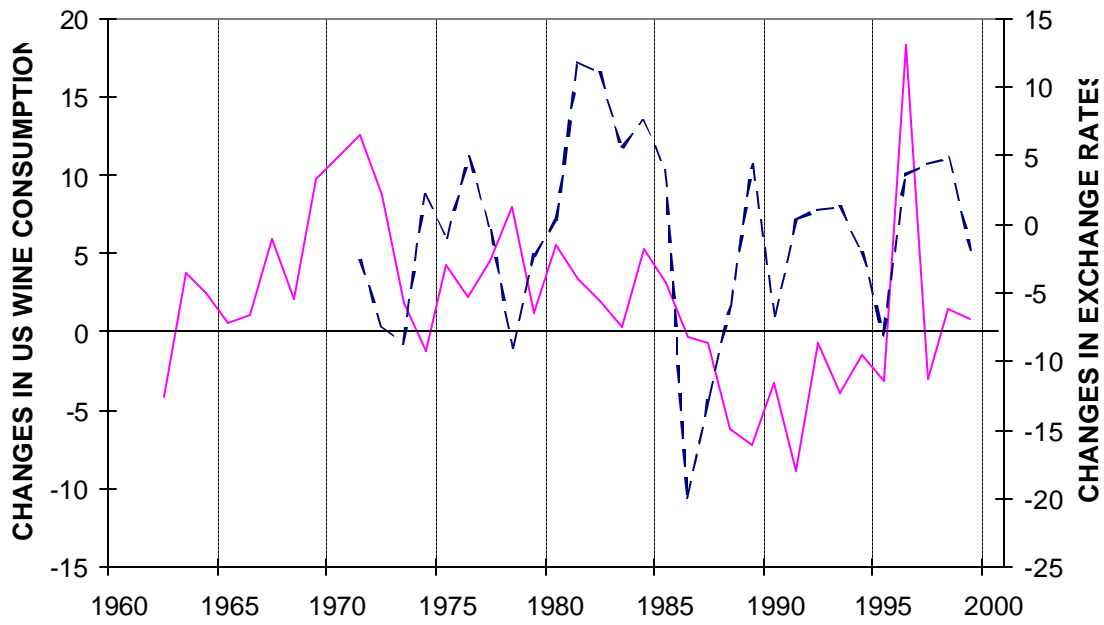
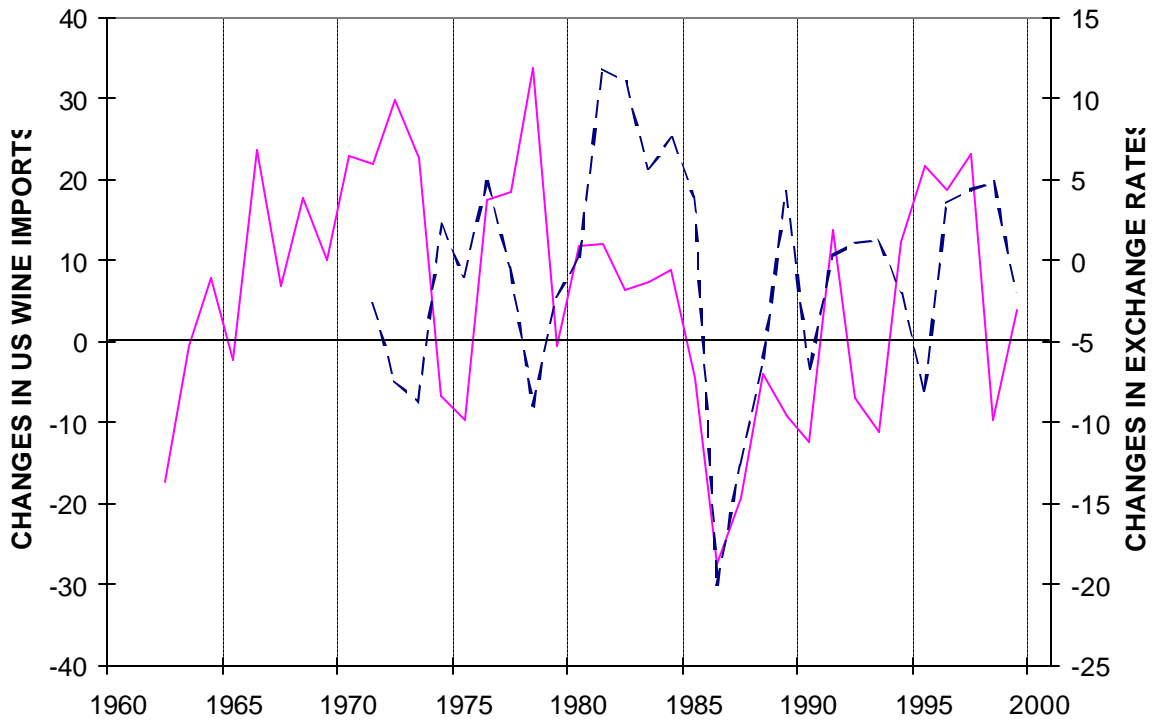


Fig. 2a. Changes in US Wine Consumption and in GNP



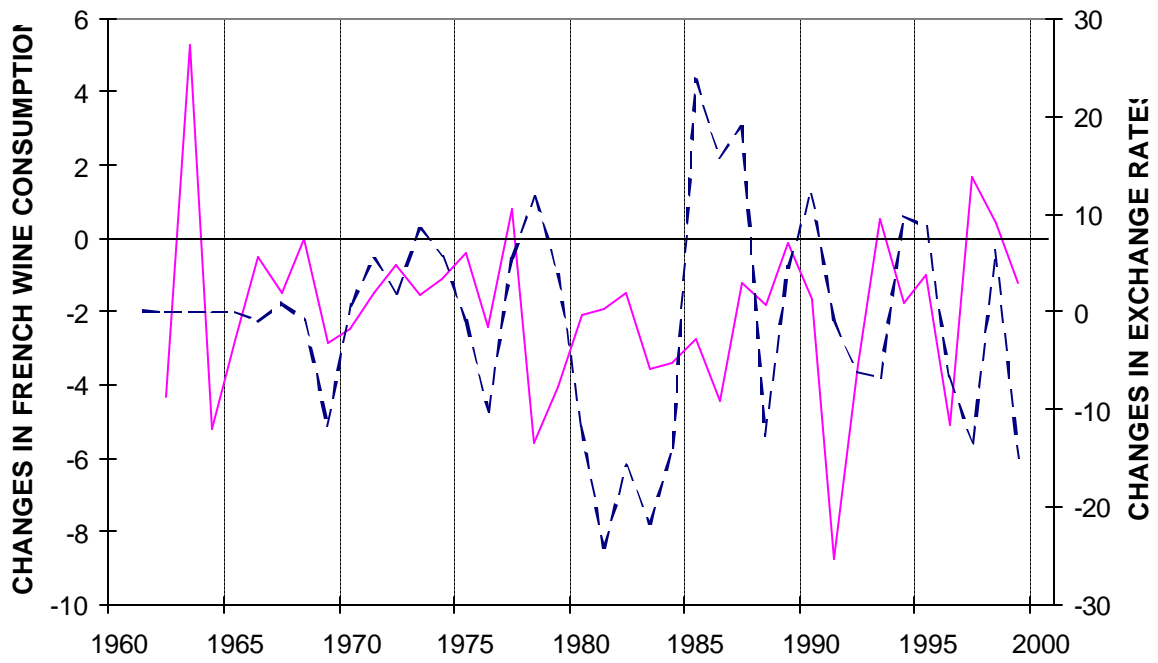
2b. Changes in US Wine Consumption and in Exchange Rates

Fig.



g. 2c. Changes in US Wine Imports and in Exchange Rates

Fi



ig. 3a. Changes in French Wine Consumption and in Exchange Rates

F

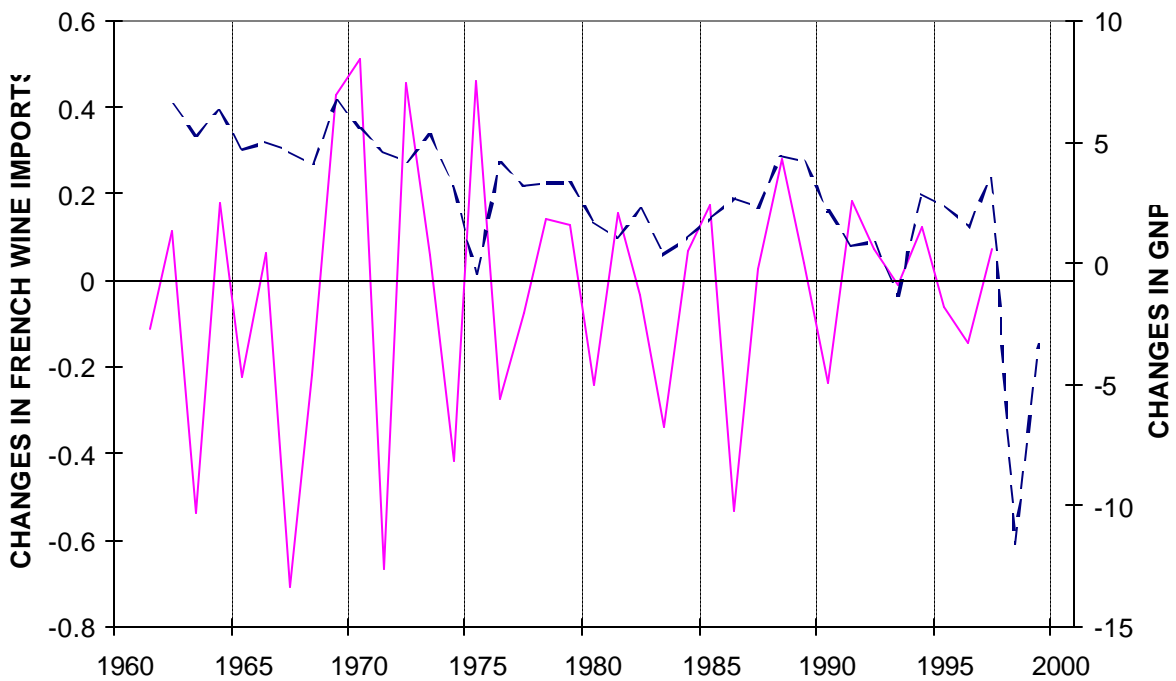


Fig. 3b. Changes in French Imports and in GNP

Appendix A

SUMMARY OF CORRELATIONS BETWEEN MACRO AND MARKET VALUES

Table A.1.a AUSTRALIA

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	0.707	-0.098	-0.510	0.490	-0.130
Employment	-0.094	0.487	0.824	-0.026	-0.096
Unemployment Rate	-0.112	0.225	-0.014	-0.560	0.811
Industrial Production	-0.005	0.472	0.456	0.073	-0.532
Commodity Output	-0.261	-0.377	0.119	0.315	-0.289
Earnings	-0.229	-0.224	-0.511	-0.104	-0.519
Prices and Wages					
Consumer Prices	-0.038	-0.284	-0.650	-0.006	-0.414
Share Prices	0.906	-0.492	-0.430	0.755	0.516
Interest Rates	-0.164	0.025	0.551	0.045	0.383
Wages	-0.209	0.236	-0.217	-0.304	-0.634
Trade					
Trade Balance	0.607	-0.513	-0.751	0.501	0.293
Imports	0.508	0.175	0.294	0.466	0.003
Exchange Rate	-0.291	0.603	0.241	-0.385	-0.469

Table A.2.a GERMANY

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	-0.396	-0.042	0.332	0.374	-0.151
Employment	0.289	0.154	0.696	0.532	0.014
Unemployment Rate	0.268	0.321	-0.936	-0.110	0.358
Industrial Production	0.024	0.174	0.811	0.807	-0.046
Commodity Output	-0.480	-0.259	0.431	0.493	-0.496
Prices and Wages					
Consumer Prices	-0.390	-0.302	-0.792	-0.653	-0.165
Producer Prices	-0.499	-0.575	0.840	-0.087	-0.607
Share Prices	0.076	0.202	-0.124	0.548	-0.005
Interest Rates	-0.460	-0.527	0.199	0.010	-0.674
Wages	0.468	0.309	-0.460	-0.447	0.542
Trade					
Trade Balance	0.713	0.685	-0.465	-0.026	0.841
Imports	-0.314	-0.375	-0.529	-0.276	-0.428
Exchange Rate	-0.350	-0.288	0.637	-0.079	-0.247

Table A.3.a FRANCE

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	-0.023	-0.106	0.759	0.124	-0.044
Employment	0.075	-0.428	0.669	-0.058	0.399
Unemployment Rate	-0.241	0.441	-0.709	0.095	-0.269
Industrial Production	0.347	0.005	0.425	0.088	0.660
Commodity Output	0.476	0.142	0.186	-0.019	0.806
Prices and Wages					
Consumer Prices	-0.218	-0.143	0.466	0.120	-0.754
Producer Prices	0.364	0.025	0.349	0.032	0.124
Share Prices	0.247	0.104	-0.427	0.002	0.692
Interest Rates	0.382	-0.128	0.593	0.261	-0.318
Wages	-0.245	-0.037	0.423	0.081	-0.410
Trade					
Trade Balance	0.135	-0.204	-0.497	-0.587	0.279
Imports	0.125	0.105	0.333	-0.052	0.638
Exchange Rate	0.314	-0.406	0.860	0.520	-0.526

Table A.4.a FRANCE TABLE WINE

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	0.090	0.111	-0.193	0.169	0.135
Employment	-0.135	0.058	-0.554	0.090	0.071
Unemployment Rate	0.188	0.051	0.622	-0.318	0.024
Industrial Production	0.228	0.260	-0.288	0.230	0.066
Commodity Output	0.075	0.232	-0.029	-0.008	-0.136
Prices and Wages					
Consumer Prices	-0.077	-0.180	-0.411	0.237	0.176
Producer Prices	0.250	-0.102	-0.806	0.708	0.018
Share Prices	-0.128	0.311	0.453	-0.522	-0.066
Interest Rates	-0.388	0.076	-0.607	0.042	0.185
Wages	-0.281	0.014	0.115	-0.413	0.068
Trade					
Trade Balance	-0.253	-0.466	0.209	0.163	-0.605
Imports	0.416	0.093	-0.320	0.313	-0.031
Exchange Rate	-0.234	0.291	-0.595	0.346	0.538

Table A.5.a ITALY

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	0.321	0.084	0.537	-0.158	-0.135
Employment	0.093	0.405	0.417	-0.286	-0.242
Unemployment Rate	0.316	-0.215	-0.065	-0.153	0.419
Industrial Production	0.395	-0.115	-0.015	-0.564	0.572
Commodity Output	-0.011	0.036	-0.015	-0.588	0.293
Prices and Wages					
Consumer Prices	-0.070	-0.125	0.395	0.284	-0.235
Producer Prices	-0.078	0.078	0.264	0.259	-0.173
Share Prices	-0.620	0.311	-0.263	-0.368	0.444
Interest Rates	0.070	0.158	0.432	0.331	-0.232
Trade					
Trade Balance	-0.338	-0.223	-0.328	-0.435	0.200
Imports	0.229	-0.026	0.131	-0.380	0.379
Exchange Rate	0.305	0.063	0.784	0.197	-0.339

Table A.6.a SPAIN

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	0.354	0.153	0.347	-0.136	-0.204
Employment	0.170	-0.024	0.630	0.400	-0.268
Unemployment Rate	-0.146	0.783	0.103	-0.268	-0.459
Industrial Production	-0.031	-0.017	0.528	-0.179	-0.340
Commodity Output	0.076	0.151	0.046	0.725	0.165
Prices and Wages					
Consumer Prices	0.066	0.219	-0.167	-0.768	-0.117
Share Prices	0.392	-0.125	0.089	-0.305	-0.011
Interest Rates	-0.199	0.101	0.291	-0.378	-0.251
Wages	0.181	-0.173	-0.655	-0.307	0.447
Trade					
Trade Balance	0.196	0.459	0.759	0.048	-0.571
Imports	0.165	0.117	-0.366	-0.076	0.140
Exchange Rate	0.292	-0.308	0.182	-0.210	0.032

Table A.7.a UNITED KINGDOM

	Consumption	Imports	Production	Exports
Incomes				
GDP	-0.185	0.306	0.243	0.794
Employment	0.067	0.262	0.014	0.758
Industrial Production	-0.131	0.194	-0.301	-0.479
Commodity Output	0.029	0.139	-0.340	0.484
Earnings	0.064	-0.312	0.125	-0.528
Prices and Wages				
Consumer Prices	-0.082	-0.158	0.490	-0.213
Producer Prices	-0.761	-0.135	0.605	0.039
Share Prices	0.024	0.342	-0.184	-0.304
Interest Rates	0.267	0.265	0.337	0.601
Trade				
Trade Balance	0.626	0.381	-0.371	-0.173
Imports	-0.207	-0.305	-0.514	-0.153
Exchange Rate	0.241	-0.055	0.012	0.501

Table A.8.a UNITED STATES

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	-0.201	-0.230	-0.646	-0.157	0.541
Employment	0.370	0.068	0.024	0.256	0.118
Unemployment Rate	-0.330	-0.006	-0.032	-0.278	-0.126
Industrial Production	0.526	0.290	0.194	0.435	-0.081
Earnings	0.087	0.686	0.066	0.156	0.298
Prices and Wages					
Consumer Prices	-0.533	-0.633	-0.448	-0.629	0.452
Producer Prices	0.066	-0.529	-0.182	-0.580	0.505
Share Prices	0.267	0.605	0.244	0.275	0.476
Interest Rates	0.064	-0.111	-0.102	0.119	-0.028
Funds Rate	0.064	0.023	-0.067	0.167	-0.189
Trade					
Trade Balance	0.337	0.377	0.085	0.281	-0.263
Imports	0.490	0.035	0.135	0.027	-0.028
Exchange Rate	-0.216	0.607	-0.340	0.188	0.098

Table A.9.a WORLD (vs. US INDICATORS)

	Consumption	Imports	Production	Exports
Incomes				
GDP	0.190	0.160	0.098	0.217
Employment	-0.001	0.253	0.207	0.332
Unemployment Rate	0.174	-0.149	-0.207	-0.204
Industrial Production	-0.049	0.268	0.159	0.304
Earnings	0.367	0.099	0.064	0.104
Prices and Wages				
Consumer Prices	0.204	-0.046	-0.004	0.102
Producer Prices	0.379	0.040	0.110	0.194
Share Prices	-0.392	-0.166	-0.075	-0.247
Interest Rates	0.118	0.235	0.397	0.313
Funds Rate	0.136	0.332	0.438	0.348
Trade				
Trade Balance	-0.306	0.334	0.018	0.212
Imports	0.139	0.003	0.125	0.087
Exchange Rate	0.050	-0.016	-0.148	0.102

Appendix B

**SUMMARY OF RESULTS
FOR STATIONARITY, CAUSALITY,
VECTOR AUTOREGRESSIONS**

These results can be obtained from the following pdf file:
www.rri.wvu.edu/papers/2001wp.htm "wine cycle annex"

Table 2

**RELATION BETWEEN BUSINESS CYCLES AND THE WINE MARKET:
EXPECTED SIGNS BETWEEN VARIABLES**

Wine Variables	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	+	+	+	+	+
Employment	+	+	+	+	+
Unemployment Rate	-	-	-	-	-
Industrial Production	+	+	+	+	+
Commodity Output	+	+	+	+	+
Earnings	+	+	+	+	+
Prices & Wages					
Consumer Prices	-	-	+	+	+
Producer Prices	-	+	+	-	-
Share Prices	+	+	+	+	+
Interest Rates	-	-	+	-	-
Funds Rate	-	-	+	-	-
Wages	+	-	+	+	+
Trade					
Trade Balance	+	-	+	+	+
Imports	+	+	-	-	-
Exchange Rate	+	+	+	-	-

Table 3

POSSIBLE IMPACT OF BUSINESS CYCLES ON WINE MARKET VARIABLES
 (Results of Vector Autoregression Analysis)

Wine Market Variables	Macroeconomic Variables
	AUSTRALIA
Consumption	Gross domestic product, interest rate, share prices, employment
Production	Gross domestic production, Producer prices
Imports	Gross domestic product
Exports	Exchange rate
	FRANCE
Consumption	Exchange rate, share prices, employment
Production	Industrial production
Imports	Exchange rates, share prices
Exports	Exchange rates
	GERMANY
Consumption	Employment
Production	Industrial output
Imports	Industrial output
Exports	Industrial output
	ITALY
Consumption	Gross domestic product, employment, Exchange rates
Production	Gross domestic product, industrial production, employment
Imports	Gross domestic product, industrial production, employment
Exports	None logical
	SPAIN
Consumption	Gross domestic product
Production	Gross domestic product
Imports	Gross domestic product
Exports	None logical

UNITED KINGDOM

Consumption	Gross domestic product, exchange rates
Production	Gross domestic product
Imports	Gross domestic product
Exports	None logical

UNITED STATES

Consumption	Gross domestic product, employment, producer prices
Production	Gross domestic product, employment, producer prices
Imports	Gross domestic product, share prices
Exports	Exchange rates

Source: Auzias (2001, p75). Detailed results available in Appendix B in pdf format.