Business Cycles and the World Wine Market

By

Lisa Corin Phares

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1999-2000 Undergraduate Research Fellow
Regional Research Institute
West Virginia University
Morgantown, WV 26506-6825

Mentor: Professor Walter C. Labys
Agricultural and Resource Economics
West Virginia University
Morgantown, WV 26506

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Abstract: Previous research has explored the relations between international business cycles and particular commodity markets, such as foods, metals and energy. These studies for the most part fail; however, to examine the wine market. Several questions are of interest in this regard. 1) As a country's national product rises, will wine consumption also rise? 2) If GDP falls, will wine consumption fall? 3) As a country's exchange rate appreciates and the dollar becomes more expensive in terms of foreign currency, will the exports of that country rise accordingly? These questions are addressed here by analyzing the relations between selected macroeconomic variables and wine market variables in the major OECD wine-related countries.

Introduction

Previous research has explored the relations between international business cycles and particular commodity markets, such as foods, metals and energy. These studies for the most part fail; however, to examine the wine market. Several questions are of interest in this regard. 1) As a country's national product rises, will wine consumption also rise? 2) If GDP falls, will wine consumption fall? 3) As a country's exchange rate appreciates and the dollar becomes more expensive in terms of foreign currency, will the exports of that country rise accordingly? These questions are addressed here by analyzing the relations between selected macroeconomic variables and wine market variables in the major OECD wine-related countries.

Commodity Markets

World commodity markets facilitate the international exchange of primary commodities, such as food, agricultural raw materials, minerals, and nonferrous metals. Changes in these commodity markets are strongly linked with changes in international economies. Extreme price fluctuations adversely affect producers and consumers in these markets. Technological advances, business cycle fluctuations, weather, and political instability are factors that cause commodity market fluctuations.

Expected Contribution

As stated at the outset, there are currently no economic studies that examine the relations between relevant wine market variables (exports, imports, consumption and prices) and macroeconomic variables across a group of countries. Other studies explore similar relationships between business cycles and other commodity markets, as mentioned above, but fail to research the important global wine market. This study provides, for the first time, results concerning international business cycles and wine market adjustments. Furthermore, the results provide insight into the behavior of wine market variables for international wine producers and consumers, by analyzing countries in which the wine industry represents an important share of total production and consumption.

Contents

This study consists of the following parts: International Business Cycles, World Wine Market, Relation between Business Cycles and the Wine Market, Measuring Business Cycle Impacts, Conclusions, References, Appendix A and Appendix B.

International Business Cycles

Introduction

Business cycles are combinations of expanding and contracting fluctuations observed over time in the aggregate economic activity of a nation. International business cycles reflect the activities of several different nations, sometimes taken collectively or by region, i.e. European Union. The expansionary period of a business cycle is defined as the recovery period following a contractionary period, also called a recession. The first peak, the highest point of a business cycle, following the recession marks the end of an expansionary period. The period that follows a peak and lasts until the next trough, the lowest point reached during a business cycle, is referred to as a recessionary period. Therefore, a business cycle is the fluctuation from trough to trough with little or no inverse turns within a given upward or downward trend.

While business cycles are recurrent, in that they occur repeatedly, they are not periodic, meaning they occur in irregular patterns. The length of a business cycle may vary from one to twelve years. Within this context, most contracting periods last a year or less. The most recent exceptions are the recessions from 1920-1921 (18 months) and from 1929-1933 (43 months). Expansionary periods, however, tend to last longer than recessionary periods.

In addition to varying in length, business cycles vary in amplitude. Amplitude refers to the "absolute rise and fall in aggregate economic activity. The amplitude of a cycle is the "mean of the difference between the peak and the trough of the detrended log price series". Measuring amplitude helps determine the severity of a business cycle.

Previous Research

Research on business cycles and their interaction with commodity markets has been a subject of interest for some time. One topic that draws a lot of attention is the use of business cycle patterns and movements among leading indicators to forecast recessions, inflation and other economic variables. Research on this topic appears in Bosworth and Lawrence (1982), Cooper and Lawrence (1975), Moore (1980), Ferderer (1996), Rogers (1998), Mork, Mysen and Olsen (1990), and Labys, Badillo and Lesourd (1998).

Some research, though, has taken the direction of analyzing the relations between business cycles and the performance of agricultural, metal and energy markets. Research on the nature of these impacts in individual commodity markets has been less. One commodity of considerable international importance, of which almost no such research has taken place, is wine. The international importance of wine as an area of research is becoming evident, however. Two studies of interest include one concerning Australia's re-emergence in the wine exporting field by Anderson and Berger (1999) and one concerning the effect of technology and innovation on old-world production traditions by Rachman (1999).

Anderson and Berger discuss Australia's developments in exports and production over the past decade. The study focuses on how Australia compares globally as a wine producer and exporter, how well is Australia penetrating various traditional wine markets, i.e. US, Europe, Asia, and how well Australia is upgrading the quality of its wine exports. The studies' findings state that from 1988 to 1997, Australia's wine export value has grown by 21.1 per cent per year and its production volume has grown by 4.6 percent per year as compared to the world's export growth of

6.5 percent and –0.8 percent, respectively. "Australia is the world's fourth largest exporter of wine in value terms, after France (alone accounting for more than 40%), Italy (17%) and Spain (9%). In distributing their exports, Australia has focused on four affluent English-speaking countries: the UK, the US, Canada and New Zealand, but has also done well in penetrating the markets in Ireland and Southeast Asia. Australia does not fair well as an exporter to East Asia or Europe. Anderson and Berger use the average export price to estimate the quality of a country's exports. At present, the average export price for Australia is a little lower than that of France. Although this average rose 52 percent over the past decade, Chile (55%), Italy (59%), New Zealand (61%) and Argentina (63%) surpassed this increase. The average export price increase in the US, South Africa and Europe's transition economies were not far behind, 44 per cent, 39 per cent and 31 per cent, respectively.

Rachman 's study discusses the impact of new-world market techniques for production and marketing on old-world traditions. The fear of the old-world, which prides itself on the diversity and geography of its wine, is that any such quality distinction will disappear with small numbers of large companies dominating the wine market in various countries such as the US, Australia and Chile. One inhibiting feature of the French wine market is the rules. French wine producers are prohibited from using irrigation to improve the grape crop, using oak chips to flavor wine, and experimenting with non-traditional grapes in making their wine. Such restrictions do not exist in new-world production thus allowing these new producers to offer more varieties to their consumers. The old-world's rules, while attempting to protect the reputation of regional wines, "has acted as a brake on innovation experimentation and proper response to changing consumer tastes." (Rachman, (1999).

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 that lower product demand and, in turn, lower employee demand, will lead to a decline in expenditures, which could lead to a recession. Rogers goes on to explain how not only income, but consumer's propensity to consume affects the trade and consumption of goods. Income, along with expectations, interest rates, and other economic variables, is a key factor in global wine production and consumption.

Borensztein and Reinhart (1994) and Chu and Morrison (1984) have reviewed the importance of analyzing interactions between national economies and commodity markets. Borensztein and Reinhart's research examines the effects of various macroeconomic determinants on commodity markets and, in turn, on commodity prices. The author's goal was to "identify the main economic fundamentals behind the behavior of commodity prices . . . and to quantify how the relative importance of each of these factors has evolved over time" (Borensztein, 1994). In an effort to determine commodity prices, more specifically the cause for price declines among non-oil commodities, Borensztein and Reinhart focus mainly on supply changes as aided by international trade and analyze the effects of technology, politics, and economic conditions, concentrating on the effects of inelastic demand shifts and economic crises. According to their findings, the inclusion of supply changes in the determination of commodity prices improves the fit of such an equation and thus better explains price changes. Such supply changes can reflect how international influences such as globalization are causing a dynamic expansion in import volumes and a fall in prices.

As mentioned, technology plays an essential role in supply changes, namely supply growth, which typically coincides with price declines. Technological advancements, often a result of new technology , especially in agricultural economies where small changes prove to have large impacts, also help expand output and in turn lower prices. Other impacting changes include those in politics and government policies that allow for a more open economy, more competition, and consequently lower commodity prices.

Chu and Morrison also researched the commodity market impacts of macroeconomic variables as contained in supply- and demand-side representations on short- and medium-term bases. 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" (Chu, 1984). They also explore the effects of supply shocks on commodity price fluctuations in the short-run. The study intends to improve and expand on their previous research in which they attempted to explain the causes of the 1981-82 recession.

Their study revealed that, in the short-run, the supply side responds rather quickly to price increases thus decreasing the magnitude of inflation. Furthermore, the research reinforced their earlier findings that commodity price fluctuations are largely influenced by such macroeconomic variables as exchange rate and industrial production. Lastly, they argue that the recession of 1981-82 is largely due to slow commodity price recovery in Europe caused by slow growth of industrial production and overall economic productivity. Chu and Morrison's work, however, reflects aggregate commodity behavior, rather than individual commodity behavior. Because these works focus on aggregate market behavior, it seems important to disaggregate such an approach on a single commodity basis.

Other studies have analyzed these macroeconomic impacts in more specific or particular ways. Labys and Maizels, for example, (1992) evaluated these impacts from the perspective of time series causality, focusing on feedback effects between commodity prices and macroeconomic variables. The purpose of this study was to use Granger-causality tests to compare “the results of the price interaction effects with those evaluated . . . in other recent studies” (Labys and Maizels, 1992)

The major value of their work, however, is that they analyzed a large number of studies dealing with macroeconomic and commodity market interactions. For example, there is a direct relationship between commodity prices and industrial production. When commodity prices rise, especially at a fast rate, consumers and often the government react strongly. Such as we are currently experiencing in the US today, high prices are causing some consumers to cut back on expenditures and are thus off-setting producer’s expected profit. Simultaneously, the government is looking to enact fiscal and monetary policies, such as higher interest rates, to cool down the economy and to temper inflation.

Labys and Maizel’s results suggest that the highest 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). The importance of their finding, as suggested, lies in the incorporation of commodity price fluctuations in determining practical and effective stabilization policies.

Cooper and Lawrence (1988) also looked at how a particular economic variable, in their case commodity prices, affects the commodity market in their research of the sharp rise in commodity prices during the 1972-75 commodity price boom. The researchers' intention was to determine how well economic analysis could explain price movements via examination of demand and supply for raw materials during the early '70s.

Mork, Mysen, and Olsen (1990) followed a similar approach when examining the impacts of crude oil prices. Concerning individual commodity impacts, Labys, Achouch and Terraza (1999) analyzed the impacts of business cycles on metal prices and Liu, et. al. (1990) evaluated their impacts on agricultural prices. My research objective varies in that it concerns how business cycles influence the global wine market rather than how wine trade and demand affects business cycles and the aggregate international commodity market.

The work of Labys and Cohen (1978) and UNIDO (1991) overcome the failure of Borensztein and Reinhart by considering changes in per capita income and quality variations when focusing on wine production, consumption, import and export patterns. Both works analyze how the quality and vintage of a wine can alter the wine market's response to changes in international business cycles. The United Nation's Industrial Development Organization's (UNIDO) report also offers more information as to why production and consumption grow and/or decline. It provides information on the role of developing countries in the wine market, the shift in exporters and importers to business cycles and the impacts of various policies previously taken to combat declining wine trade and market prices. Their research also attempts to forecast the future of developing countries in the global wine market today.

Similar to Labys and Cohen, however, UNIDO fails to provide detail as to how markets behave when confronted by changes in technology, consumer income, tariffs, GDP, inflation, exchange rates and other determining variables. In sum, these works provide general overviews of wine's significance as an important commodity in the international market and as an investment objective. Nevertheless, they overlook the intricacies of the interactions between macroeconomic variables and commodity markets in relation to the global wine market.

Cycles of Present Importance

Business cycles are defined in terms of the macroeconomic variables designated to represent underlying cyclical theories. The business cycle and macroeconomic variables of interest in this study are the consumer and producer price indices, interest rates, money supply, foreign exchange rates, gross domestic product, industrial production, stock prices, import and export levels and employment. Many of these variables serve as a guide to inflation behavior. This is important because "growth cycles are closely related to the rate of inflation", so much so that "every major decline in the inflation rate since 1948 has been associated with a growth slowdown" (Moore, 1983).

The Consumer Price Index (CPI) is an important variable in the context of the economy because it serves as an economic indicator of inflation, a deflator of other economic variables, and a measuring tool by which to adjust dollar values. The CPI index is calculated based on survey data gathered by the [1]Bureau of Labor Statistics which is then related to a market basket developed from actual expenditure information of families and individuals. In general "[t]he . . . CPI is a measure of the average change over time in the prices paid by urban consumers for a market basket of consumer goods and services" (Becker, 1997).

The government uses the CPI to evaluate and guide economic policies. More specifically the Federal Reserve Board (FED) analyzes CPI trends to aid in the creation of fiscal and monetary policies. CPI changes allow for the inflation adjustment in other economic series, i.e. earnings, income, retail sales, and the purchasing power of the dollar.

The CPI is not without limitations, however. The CPI index is:

1. designed to measure price changes in urban areas and thus may skew the consumer experience in rural areas
2. not reflective of changes experienced by subgroups: poor, women, elderly, etc.
3. not intended for cross-sectional comparisons
4. subject to sampling errors: sample does not reflect all purchased goods/services
5. subject to non-sampling errors.[1]

The Producer Price Index (PPI) is a "family of indexes that measures the average change over time in selling prices received by domestic producers of goods and services . . . from the perspective of the seller" (Becker, 1997). Similar to the CPI index, the PPI index often influences government fiscal and monetary policies and deflates other economic series. In contrast, however, the PPI reflects changes in selling prices experienced by domestic producers, rather than consumers, of goods and services. The PPI's importance is its use as a measure of raw and processed materials' price changes. Because the PPI reflects producers' costs, the PPI index is useful in forecasting input price changes for retailers and consumers.

Gross Domestic Product (GDP) is the measure of "final purchases by households, business, & government by summing consumption, investment,

[1] "price data collection, logistical lags in conducting surveys, difficulties in defining basic concepts and their operation implementations, and difficulties in handling the problems of quality change" (Gibson, 1999).

government spending and net exports (Froyen, 2000). This measure includes " all currently produced goods and services sold on the market within a given time period" (Gordon, 1998). Analyzing GDP allows one to assess the overall growth and fluctuations of an economy and to pinpoint their information by sectors. While this is an important use of GDP data, there are weaknesses. For example, while GDP analysis may highlight the fastest growing sectors, these sectors tend to be the smaller sectors and thus "contribute proportionately less to the overall increase in GDP because their growth rates apply to small initial values" (Boustead, 1998)

GDP is affected by inflation such that when actual real GDP, "the amount an economy actually produces at any given time", is low, the inflation rate for that period slows (Gordon, 1998). Expectations about inflation based on past inflationary behavior also affect GDP. Although some interpret a growth in GDP as an instantaneous rise in inflation, others engage in long-term outlooks and thus believe prices, etc. will change gradually in response to changes in GDP. Such different outlooks on the relationship between GDP and inflation will influence actual behavior trends of both.

The federal funds rate "is the interest rate charged by banks when banks borrow "overnight" from each other. The funds rate fluctuates according to supply and demand and is not under the direct control of the Fed, but is strongly influenced by the Fed's actions " (Stitts, 1997). The determination of the funds rate is based on free market transactions. In response to these transactions the Fed buys or sells US treasury securities to or from banks. In doing so, the reserves at the Federal Reserve rise or fall respectively. Because the Fed banks are required to maintain a certain level of reserves, these banks must borrow from each other to cover any discrepancies they may have. The pressure derived from such immediate borrowing and lending causes the federal funds rate to rise.

The wage rate is partly determined by price levels. As the price level rises (falls), the real wage rate, W÷P, falls (rises). When the wage rate falls, employment will rise because the real wage rate is below the employer's marginal product, which allows the employer to afford more employees. Increased employment will increase personal income and lead to increased spending. The opposite is true when the wage rate falls. Higher prices, lower real wage rates and higher employment will lead to a rise in real GDP, and vice versa.

Interest rates serve as a tool by which the government can either encourage or control savings and spending. Of present interest is the prime interest rate, "the rate charged by commercial banks for short-term loans to corporations or individuals whose credit standing is so high that little risk to the lender is involved" (Ammer, 1984). Banks also use the prime interest rate as a benchmark to establish the interest rates for various other loan types.

The choice of businesses and individuals within an economy to save, invest or consume their money is largely influenced by interest rates. Interest rates serve as a mirror of past economic decisions just as much as they influence future decisions. As spending rises the FED may decide to raise interest rates to discourage spending and encourage investment. Raising the prime interest rate makes money more expensive to borrow tends to slow the rate of inflation.

FED decisions, however, are not the only factor influencing interest rates. Consumer and business optimism or lack thereof, can shift the level of investment (inward or outward), for example, and thus cause interest rates to changes accordingly to keep the economy in equilibrium.

The portion of the money supply analyzed here includes M_1: coins, paper currency, and demand or checking deposits. If savings deposits, money market funds and other liquid assets are included we obtain $M_{2.}$ The money supply, in addition to the Fed's monetary decisions, determines the market interest rate. The money supply is therefore also subject to inflation changes. If interest rates do not adjust to inflation, the money supply will contract thus causing the economy to either stagnant or contract.

The foreign exchange rate is the "rate, or price, at which one country's currency is exchanged for the currency of another country" (Samuelson and Nordhaus, 1995). The exchange rate has a significant affect on a country's total exports and consequently its trade balance. In the US, for example, as the exchange rate appreciates and US imports become too costly to foreign countries, US exports will fall and foreign imports will rise leading to a trade deficit.

Stock prices, the values of public company shares, are the combination of business and consumer optimism trends and interest rate trends. Stock market trends are tracked using stock-price indices, "weighted averages of the prices of a basket of company stocks" (Samuelson and Nordhaus, 1995). Because increases (and decreases) in the stock index reflect both interest rates and investor optimism and are thus also affected by inflation, stock prices serve as an alternative, if somewhat weak, indicator of macroeconomic activity. They are included here only for reflective purposes.

Import and export values are the "market sales price[s] of a good or input [that reflects] what has to be given in exchange in order to obtain a good or service"

(Johnson, 1997). The primary use of import and export values is to determine the trade performance of the US via US foreign trade value deflation. Once adjusted for inflation, changes in trade values are distinguishable between price changes and quantity changes. This adjustment also allows for a better estimation of real output, real consumption and real investment values. By determining these values, analyzers can use the index to determine the level of industrial competitiveness in relation to other countries. In addition to the international level, individual traders can use the index to compare changes in their prices with the industry's average price changes. If many domestic producers use imported inputs, prices changes, influenced by the foreign exchange rate fluctuations and indicated by import and export prices, can then foreshadow domestic inflation.

On an international scale, differences in primary commodity behavior can define how severely international market and business cycle fluctuations affect a country's economy. When an economy faces severe instability, it is necessary to implement policies to control the economy's volatility. Facing such high levels of instability on a continuous basis, such as in developing countries, makes it difficult to combat the adverse effects on the economy. Nevertheless, by observing business cycles and recognizing fluctuation patterns, policy makers can identify economic conditions that threaten an economy's stability and curb the business cycles' volatility.

In my case, the business cycle influences under consideration are those which affect particular primary commodities' demands and prices at a world level. Studies of cyclical impacts on different commodities exist, but there are no studies concerning cyclical impacts on wine trade, consumption and prices. At the global level, this market is substantial in both volumes and values. There have been requests, periodically, to determine how these cycles affect wine markets. Such suggestions have appeared in the academic literature concerning France, other European countries, the United States, and occasionally, developing countries, such as Argentina, Chile, Greece, Romania and Hungary, most of which are substantial wine exporters. Thus, there is no question as to this research project's academic nature and possibility for publication.

While the above variables are important measures of international business cycle changes they also provide information on the economy and how various sectors and markets perform in relation to the economy. In this context, the variables serve as indicators reflecting how the economy will impact these markets, in this case the wine markets of seven countries.

World Wine Market

Overview

World wine production has fluctuated widely in recent years, but after a number of years of growth, the underlying trend is now declining. Production has declined from 301 million hectoliters in 1985 to 246 in 1995 and 256 in 1998. Despite modern technology, climatic conditions still dominate supply changes. For example, exceptionally cold weather in Spain beginning early in 1998 followed by excessive rainfall and hailstorms together with an outbreak of mildew reduced production 19.6 million hectoliters. Similar cold and wet conditions prevailed in Italy, causing production to decline to 56.3 million hectoliters.

In recent years wine exports have not fluctuated as much as wine production. However, the trend growth is the opposite. From the 43.6 million hectoliters reached in 1990, world exports have grown to 67.0 in 1998, an increase of 53.6 percent. Wine imports at the global level have grown concurrently from 41.2 million in 1990 to 69.1 million in 1998, an increase of 65.5 percent. However, large stocks still remain in many of the exporting countries. Such a surplus reflects the decline in consumption

The pattern of international trade in table wine has remained relatively stable in recent years. The main exporters continue to be Italy, France, Spain and Germany. The main importers are Germany, France, United Kingdom, Belgium and United States. Much of Germany's exports are accounted for by their considerable amounts of re-exports – exporting imported wine after blending. Unlike many exporters, Spain shows

Source: Labys, W.C. (2000), "Structural Adjustments in the World Wine Market," Working Paper, Natural Resource Economics Program, West Virginia University.

an export decline owing to a substantial reduction in its sales to Hungary and the USSR. Where export patterns can be traced within total country exports, increases can be found for what are termed quality wines of controlled denomination of origin, particularly in Australia, France, Italy and United States.

The recent increase in California wine exports to Europe has been notable. Exports jumped by 165.5 percent between 1990 and 1998, reaching 2.5 million hectoliters. California remains the major wine-producing region in the United States, accounting for 90.2 percent of total production and 82 percent of total consumption in 1998. California wine consumption in the United States though increasing in total volume appears to be sensitive to exchange rates, declining relative to foreign imports when the purchasing power of the dollar rises, and increasing when the dollar falls. Even more notable, Australian wine exports have increased some 755 percent, from 0.4 million hectoliters in 1990 to 3.1 in 1998. Wine production in Australia has increased from 4.4 million hectoliters in 1990 to 7.4 in 1998.

While new technology and favorable market conditions have caused production to expand in most countries, consumption has not kept pace. Factors responsible for this decline include the recent emphasis on reduced alcohol consumption, improved fitness and health, and lower real incomes. Regarding the first of these, efforts have been made not only to reduce consumption of alcoholic drinks to cope generally with alcoholism, but also to reduce specific problems such as drunken driving, alcohol-induced diseases and alcoholism among teenagers.

The decline in wine consumption is best reflected in changing patterns of per capita consumption. For example, per capita consumption in liters declined in France from 91.0 in 1980 to 72.7 in 1990 and to 60.1 in 1997. In Italy, the decline was from

80.0 liters per capita in 1980 to 61.4 in 1990 and to 56.0 in 1997. In the United States, where consumption had been rising, a more steady decline is occurring – consumption down from 8.0 liters per head in 1980 to 7.7 in 1990 and to 7.4 in 1997. In the United Kingdom, the previous rise continued - from 8.0 liters per capita in 1980 to 11.6 in 1990 and 14.0 in 1997.

The major international wine problem that must be dealt with is the substantial increase in existing world wine production relative to declining consumption. The most recent serious world surplus, which occurred between 1986-90, appears to have been temporarily checked. The estimated surplus in 1998 is relatively lower at 27.0 million hectoliters, most of which lie in stock. The greatest impact of the disequilibrium between production and consumption appears to be in the European Union (EU). The disequilibrium has lowered, however, from 50.4 million hectoliters from 1986-90 to 28.3 in 1998. While wine management programs have resulted in severe reductions in the surfaces planted, restructuring and replanting activities have resulted in increases in productivity. The general trend is in the direction of expanding the production of wine of better quality, although table wine production remains relatively large.

Because the disparities between wine production and the actual grape varieties vary appreciably from country to country, it is difficult to determine how wine prices move in the face of wine market disequilibria. Wine prices have fluctuated considerably since 1980, reflecting the impact of unstable wine production relative to a fairly constant, but steadily declining, demand.

In general, wine prices have risen moderately in Europe. Relative wine surpluses in the United States have been reduced leading to increases in domestic wine prices. Sharp price increases can be detected, however, particularly in the case of rare wines sold at auctions. Several recent factors are attributing to wine price recoveries: the number of lower-quantity vintages in 1988-1989 throughout many major producing countries, the strengthening of market interventions to remove market surpluses and the increase in EU allocations wine acreage reducing structural programs.

Wine Production, Consumption and Prices

Production. Wine processed from grapes is a heterogeneous product classified into a number of types and categories. The most basic distinction is between still wines and sparkling wines. Still wines are typically further classified into table wines, quality wines, dessert and other fortified wines, and vermouths and other flavored wines. In this study, wine production, consumption, export and import values include transactions of still wines and sparkling wines. It would be preferable just to analyze the table wine market, but existing data are not as disaggregated as needed. We do have a table wine data set for France, however, which will be used to check over results.

The highest production of wine has traditionally been found in Mediterranean countries. More recently production has spread not only across continental Europe, but also to Asia, Australia, Japan, New Zealand, North and South America and South Africa. As shown in Table I, France and Italy are the largest producers, each averaging from 55 million to 65 million hectoliters per year. Among new entrants to the traditional groups of wine producing countries, the United States produced 17.3 million hectoliters in 1998 (6.8 percent), while Argentina produced 12.5 million hectoliters (4.9 percent) and Australia produced 7.4 million hectoliters (2.9 percent).

Table 1

World Production of Wine, 1985 to 1998

Major Countries and Regions	***Production***				Percentage Change	Percentage Share	
	1985	1990	1995	1998	1990-1998	1990	1998
	(thousand hectoliters)				(%)	(%)	(%)
France	69249	65529	55610	54280	-17.17	22.09	21.22
Italy	63340	59000	56294	57006	-3.38	19.89	22.28
Spain	33103	40377	19640	28484	-29.46	13.61	11.13
USSR	34025	17984	9075	6990	-61.13	6.06	2.73
Argentina	15741	20520	16443	12547	-38.86	6.92	4.90
US	17204	15998	15800	17308	8.19	5.39	6.77
Germany	5402	8514	11050	14318	68.17	2.87	5.60
Romania	8700	5900	6720	5002	-15.22	1.99	1.96
SA	8314	8988	7546	7380	-17.89	3.03	2.88
Portugal	9744	11372	7132	3657	-67.84	3.83	1.43
Australia	4026	4446	5028	7416	66.79	1.50	2.90
Greece	4559	3525	3841	4000	13.48	1.19	1.56
Yugoslavia	3660	5170	5219	6886	33.18	1.74	2.69
Chile	3500	3978	3167	5475	37.63	1.34	2.14
Hungary	2890	5472	3289	4333	-20.81	1.84	1.69
Brazil	4005	3108	3128	2182	-29.80	1.05	0.85
Bulgaria	3400	2925	2200	1659	-43.28	0.99	0.65
Austria	1126	3166	2229	2703	-14.62	1.07	1.06
Algeria	1010	477	500	315	-33.91	0.16	0.12
Tunisia	567	268	292	352	31.46	0.09	0.14
Europe	240901	232216	185014	192704	-17.02	78.27	75.32
EU	185729	185036	152482	160557	-13.23	62.37	62.76
America	42585	46668	41349	40236	-13.78	15.73	15.73
Africa	10312	10192	8637	8448	-17.11	3.44	3.30
Oceania	4622	4936	5587	8014	62.37	1.66	3.13
Asia	2273	2679	5836	6436	140.23	0.90	2.52
World	301237	296691	246423	255838	-13.77	100.00	100.00

Source: Office international de la vigne et du vin, *Situations de la viticulture dans le monde* (Paris, various issues); FAO, *Production Yearbook* (Rome, various issues).

While the total production area has stabilized, yields over time have increased, generally as a result of improvements in cultivation methods. Using France and Italy as examples, production in the former rose from an average of 49.4 million hectoliters for the period 1955-1957 to a high of 74.4 million in 1970. Italy increased its production from an average of 54.7 million hectoliters in 1955-1957 to 74.7 hectoliters in 1967. World production of wine during the same period increased from 214.7 million hectoliters between 1955-57 to 255.8 million in 1998.

Consumption. Most of the world's wine consumption wine is concentrated in the Europe. Of the major producers, France and Italy are also the major consumers with 35.5 million hectoliters and 32.0 million hectoliters consumed, respectively in 1998. Both countries together accounted for 31.5 percent of total consumption in that year. Table 2 shows a leveling-off, if not a reduction, in wine consumption since 1985 in a number of countries.

Table 2

World Consumption of Wine, 1985 to 1998

Major Countries and Regions	***Consumption***				Percentage Change	Percentage Share	
	1985	1990	1995	1998[a]	1990-1998	1990	1998
	(thousand hectoliters)				(%)	(%)	(%)
France	43550	41157	36515	35500	-13.74	17.40	15.52
Italy	46301	35394	35623	32000	-9.59	14.96	13.99
Spain	16908	16500	15336	15400	-6.67	6.98	6.73
USSR	36033	20069	13222	11776	-41.32	8.48	5.15
Argentina	18522	20000	13888	12786	-36.07	8.46	5.59
US	21849	19234	17791	21100	9.70	8.13	9.22
Germany	15538	16292	18580	18930	16.19	6.89	8.27
Romania	6833	6635	6554	5889	-11.24	2.81	2.57
SA	3152	3497	4102	3800	8.66	1.48	1.66
Portugal	8900	5007	5695	5000	-0.14	2.12	2.19
Australia	3327	3110	3275	3600	15.76	1.31	1.57
Greece	3635	3305	3200	2958	-10.50	1.40	1.29
Yugoslavia	3660	4420	5051	6649	50.43	1.87	2.91
Chile	4800	3690	2132	2000	-45.80	1.56	0.87
Hungary	2642	2480	2719	2945	18.75	1.05	1.29
Switzerland	3113	3188	2800	2900	-9.03	1.35	1.27
Netherlands	2143	2404	2165	2607	8.44	1.02	1.14
Austria	2588	2689	2640	2420	-10.00	1.14	1.06
Poland	3167	900	341	515	-42.78	0.38	0.23
United Kingdom	5734	6331	6303	7994	26.27	2.68	3.49
Europe	210593	174182	163891	154406	-11.35	73.64	67.49
EU	137645	129947	125855	127827	-1.63	54.94	55.87
America	53218	50113	39321	44205	-11.79	21.19	19.32
Africa	6028	6488	5716	9650	48.74	2.74	4.22
Oceania	3765	3602	3664	3843	6.69	1.52	1.68
Asia	1957	2149	5876	12645	488.41	0.91	5.53
World	274661	236534	218468	228800	-3.27	100.00	100.00

Source: Office international de la vigne et du vin, *Situations de la viticulture dans le monde* (Paris, various issues) ; FAO, *Food Balance Sheets* (Rome, various years).
a. Preliminary estimates.

Decreases among the high consumption countries can be attributed to decreases in the relative lower-income workforce population (typically consumers of relatively large quantities of low-quality wines in some European countries), increases in per capita income encouraging trading in a lower volume of much higher-priced, higher-quality wines and a change in preferences toward other beverages. The net result is a decreased consumption of ordinary wines and an increased demand for quality wines. In contrast, increases in income and the proportion of the white-collar labor force are associated with increased wine consumption.

Changes in wine consumption trends are normally analyzed using per capita consumption. Table 3 shows that these figures have declined steadily since 1980.

Table 3

Per Capita Wine Consumption by Major Consuming Countries, 1980 to 1997

Major Countries	***Per Capita Consumption***				Percentage Change
	1980	1990	1995	1997	1990-1997
	(liters)				(%)
France	91.0	72.70	63.00	60.13	-17.29
Italy	80.0	61.45	59.56	58.05	-5.53
Spain	60.0	41.97	39.16	36.87	-12.15
Luxembourg	48.2	58.20	50.00	63.30	8.76
Argentina	76.3	52.10	42.32	39.38	-24.41
Germany	25.5	26.00	22.90	22.84	-12.15
Romania	28.9	26.00	28.80	25.39	-2.35
Portugal	70.0	50.00	58.11	53.02	6.04
Australia	17.4	18.30	18.20	18.95	3.55
Greece	44.9	32.80	30.93	30.05	-8.38
Uruguay	25.0	25.00	30.70	33.57	34.28
Denmark	12.8	21.10	25.24	29.14	38.10
Chile	50.3	29.50	15.00	13.57	-54.00
Hungary	35.0	24.00	30.00*	28.54	18.92
Switzerland	47.1	47.41	41.50	49.40	4.20
Bulgaria	22.0	12.43	12.43**	7.69	-38.13
Austria	35.5	35.00	31.00	31.87	-8.94
Belgium	14.3	21.10	25.60**	24.34	15.36
United Kingdom	7.5	11.60	13.00	13.99	20.60
United States	8.0	7.72	6.71*	7.38	-4.40
Average	40.0	33.7	28.5	32.4	-1.9

Source: Office international de la vigne et du vin, *Situations de la viticulture dans le monde* (Paris, various issues).
*. 1994 data.
**. 1993 data.

Average world per capita consumption of 32.4 liters in 1997 was less than the 1980 average of 40.0 liters. In some of the major wine-producing countries, per capita consumption continued to decline as a result of changing consumption habits. Since 1997, per capita consumption in France and Italy declined by 17.3 percent and 5.5 percent, respectively. In Spain it declined by 12.2 percent, or to 36.9 liters, and in Germany to 22.8 53 liters. Per capita consumption rose considerably, however, in Denmark and the United Kingdom, while it reached a plateau in the United States.

Market Imbalances and Prices. The relative growth of wine production vis-à-vis consumption in the 1980s has led to a structural change in world wine imbalances. Table 4 reflects the disequilibrium between production and consumption in major producing countries and the world as a whole from 1975-1998.

Table 4

World Wine production and Consumption Imbalance, 1975 to 1998

Major Countries and Economic Grouping	Year or Period				
	1971-1975	1981-1985	1986-1990	1995	1998
	(thousand hectoliters)				
France					
Production	68742	67462	65344	55610	54280
Consumption	54886	46161	41715	36515	35500
Difference	13856	21301	23629	19095	18780
Italy					
Production	69557	72146	60226	56294	57006
Consumption	60515	46301	37376	35623	32000
Difference	9042	25845	22850	20671	25006
Spain					
Production	32189	33964	33656	19640	28484
Consumption	25887	19681	17278	15336	15400
Difference	6302	14283	16378	4304	13084
USSR					
Production	28128	34439	18140	9075	6990
Consumption	30500	36033	16726	13222	11776
Difference	-2372	-1594	1414	-4147	-4786
United States					
Production	13223	17710	17121	15800	17308
Consumption	13259	20305	20864	17791	21100
Difference	-36	-2595	-3743	-1991	-3792
Argentina					
Production	22778	20463	18836	16443	12547
Consumption	19472	20188	17803	13888	12786
Difference	3306	275	1033	2555	-239
EU					
Production	152328	162470	183111	153785[a]	156103
Consumption	133199	123686	132739	125855	127827
Difference	19129	38784	50372	27930	28276
World					
Production	313115	330575	290053	246423	255838
Consumption	281356	281876	237019	218468	228800
Difference	31759	48700	53034	27955	27038

Source: Office international de la vigne et du vin, *Situations de la viticulture dans le monde* (Paris, various issues).
a. EU-12.

It is important to realize that these surpluses largely reflect the production of table wines. The growing relative increase in higher-quality wine consumption has been noted in the previous section and has absorbed any increases in quality wine production. Table wine surpluses grew quickly among the major EU producers (France, Italy and Spain) until 1986-90 and now appear to have leveled off. In other parts of the world, the production and consumption imbalances appear to have declined and are closer to what could be considered a stable market equilibrium. As will be explained later, the rather large surpluses have created particular problems for the EU, where the Common Agricultural Policy has been continuously modified to deal with that situation. There is no doubt that the decline in these surpluses has stabilized table wine prices.

Wine Trade

Trade Patterns and Flows. Exports of wine are even more strongly dominated by Europe than is wine production. Italy and France together account for almost one half of world exports, Europe for 81.0 percent, and the EU for 71.7 percent, as shown in Table 5.

Table 5

World Exports of Wine, 1985 to 1998

Major Countries And Regions	***Exports***				Percentage Change	Percentage Share	
	1985	1990	1995	1998	1990-1998	1990	1998
	(thousand hectoliters)				(%)	(%)	(%)
France	11617	12308	11396	16365	32.96	28.23	24.43
Italy	17988	12940	15832	15191	17.40	29.68	22.68
Spain	6481	4430	6260	10249	131.35	10.16	15.30
USSR[a]	546	408	1841		351.23	0.94	3.19
US	242	949	1329	2520	165.54	2.18	3.76
Germany	2919	2776	2302	2226	-19.81	6.37	3.32
Portugal	1389	1563	1553	2248	43.83	3.58	3.36
Australia	88	368	1148	3146	754.89	0.84	4.70
Greece	1308	972	544	593	-38.99	2.23	0.89
Yugoslavia[a]	1252	954	1005		5.35	2.19	1.74
Hungary	3221	1287	1269	1076	-16.39	2.95	1.61
Cyprus	342	581	504	64	-88.98	1.33	0.10
Bulgaria	2974	1729	1897	1526	-11.74	3.97	2.28
Austria	269	130	137	200	53.85	0.30	0.30
Algeria	1300	264	128	97	-63.26	0.61	0.14
Tunisia	394	71	103	54	-23.94	0.16	0.08
Europe	51023	40030	46789	54223	35.46	91.81	80.96
EU	36123	34463	38691	48021	39.34	79.04	71.70
America	584	2083	4959	7345	252.62	4.78	10.97
Africa	1947	429	1608	1210	182.05	0.98	1.81
Oceania	91	409	1220	3301	707.09	0.94	4.93
Asia	435	650	1140	898	38.15	1.49	1.34
World	54080	43601	57716	66977	53.61	100.00	100.00

Source: Office international de la vigne et du vin, *Situations de la viticulture dans le monde* (Paris, various issues) ; FAO, *Trade Yearbook* (Rome, various years).

a. Data reliable only to 1995. Percentage changes and shares are 1990-1995.

Wine imports are somewhat less concentrated than are exports, although Europe still accounts for more than 66.1 percent of the market. The EU's share is somewhat lower for imports than for exports at 54.2 percent, and the distribution among member countries is uneven. Both the United Kingdom and the United States are important to the wine import market, while the United States and Australia show growth as exporters.

The greatest part of trade involves wine in bulk containers. Trade in bottled wines is far less significant except for trade with the United States, which consists almost entirely of bottled wines. This difference is partly due to United States tariffs, which are higher for bulk wines than for bottled wines. Bulk wines may be bottled in the importing country without further finishing, as is the case in Sweden, or used to blend with domestic wines, as in Japan. Much of the wine trade takes place among EU member countries, a pattern that has persisted since 1980. In 1985, 83 percent of EEC member countries' wine imports (excluding vermouth) came from other EU countries, while 70 percent of their exports were destined to remain within the EU.

<u>Exports</u>. World exports of wine increased in 1995 and in 1998. While consignments to the major European importing countries have risen by 31.5 percent to supplement domestic production or to meet rising market requirements, little growth can be found in other regions except for the United States and America collectively.

In 1998, world exports were 65.5 percent above the 1990 level. The trade value expressed in dollar terms rose considerably, but this reflected relative exchange rate changes relative to the dollar. Exports from France registered a growth of 33.0 percent between 1990 and 1998 as a result of larger shipments of wines with controlled origin denominations and a rise in table wine exports. Shipments from Spain rose by 131.4 percent above those of 1990. The largest jumps occurred among the countries that are relative newcomers to the world wine market. Australian exports grew by 754.9 percent between 1990 and 1998, while those of the United States grew by 165.5 percent.

Imports. Table 6 shows that global import requirements have risen to new levels beyond that of the early 1980s and 1990s. The USSR, formerly the world's second largest importer of wine, accounting for between 6 million and 7 million hectoliters annually, sharply reduced import levels to 3.6 million in 1995. This development has resulted in a sharp downward shift in world demand for bulk table wines, of which the former USSR was the major outlet, and thus has aggravated European wine surplus problems.

Table 6

World imports of Wine, 1985 to 1998

Major Countries and Regions	*Imports*				Percentage Change	Percentage Share	
	1985	1990	1995	1998	1990-1998	1990	1998
	(thousand hectoliters)				(%)	(%)	(%)
France	6842	4504	6000	5469	21.43	10.78	7.91
Italy	697	701	178	863	23.11	1.68	1.25
UK	5881	6395	6394	8573	34.06	15.31	12.40
USSR[a]	6780	2300	3620		57.39	5.51	7.57
U S	5185	2418	2753	4004	65.59	5.79	5.79
Germany	9568	9464	8771	11631	22.90	22.66	16.83
Netherlands	2282	2088	1883	1999	-4.26	5.00	2.89
Switzerland	2051	1828	1874	1877	2.68	4.38	2.72
Belgium	2317	2303	2299	2520	9.42	5.51	3.65
Canada	1421	1442	1477	2030	40.78	3.45	2.94
Hungary	757	209	90	25	-88.04	0.50	0.04
Sweden	938	1068	874	1121	4.96	2.56	1.62
Denmark	1058	1109	1298	1699	53.20	2.66	2.46
Poland	486	738	600	649	-12.06	1.77	0.94
Europe	40745	34745	39225	45679	31.47	83.19	66.09
EU	28915	29057	31555	37499	29.05	69.57	54.25
America	6754	4579	5174	7190	57.02	10.96	10.40
Africa	1838	1115	1435	1277	14.53	2.67	1.85
Oceania	263	270	557	596	120.74	0.65	0.86
Asia	601	1059	1422	14379	1257.79	2.54	20.80
World	53663	41768	47813	69121	65.49	100.00	100.00

Source: Office international de la vigne et du vin, *Situations de la viticulture dans le monde* (Paris, various issues) ; FAO, Trade Yearbook (Rome, various issues).

a. Data reliable only to 1995. Percentage changes and shares are 1990-1995.

Another development, which may help stabilize shipments, is the growing production self-sufficiency in many countries where substantial imports traditionally met domestic demand. In the United States, ample wine availabilities, slower wine demand growth and the weakness of the dollar led to a contraction of imports between 1985 and 1995 and only recently have imports increased again. Imports into Germany, Denmark, Belgium, Sweden Switzerland and the UK rose, as did imports into France, up 21.4 percent, and into Italy, up 23.1 percent.

The Future

The world wine-processing industry appears to be undergoing structural adjustment in which a leveling of activities is taking place following years of slow but steady growth. Except for the high levels of world production in particularly abundant years, production has tended to remain just below 300 million liters per year. While wine prices have shown increases that might warrant further investments in wine production capacity in certain countries, imbalances still exist between wine production and consumption in the important EU markets. The imbalance between wine production and consumption is likely to continue. The effects of changes in the EEC's Common Agricultural Policy towards restricting wine production are not likely to lead to a reduction in this imbalance. At the same time, any increases in consumption likely to occur will be concerned with quality wines, and such effects will not reduce the imbalance.

Stagnation in the growth of the wine consumption seems to be the major deterrent to further immediate growth in the industry. The factors that have been mentioned as reducing demand are likely to continue. In particular, an effort is being made to reduce the number of road accident caused by excess drinking of alcohol. Similarly, an attempt is being made in many countries to reduce alcoholism. Even if wine may have only a minor role in both cases, there is no doubt that wine consumption has been adversely affected. In the case of the United States and several other countries, increased import tariffs and domestic taxes on wine will also ultimately affect consumption.

World wine trade will continue to be influenced by changes in exchange rates, corresponding relative price levels, tariff and non-tariff barriers, and commercial trading arrangements. Not only are wines likely to have an export advantage because of lower production costs and prices, changes in exchange rates make these wines more favorable in certain countries, also. This advantage is reflected in imports induced by the weakening of the dollar versus the major currencies. Exports in some countries will grow because of marketing initiatives and improved trading policies. Countries whose exports have increased in this respect include Australia, Chile and the United States.

There is also concern that another swing in the international business cycle causing reduced economic activity if not recession will have a weakening affect on wine consumption and imports. The table-wine market seems to be destined for production excess, given the difficulties of enacting stabilization policies that will effectively reduce production. But in the case of quality wine consumption that has been growing relative to production, continued increases in personal income and improvements in taste habits will stimulate further expansion. While the former depends on economic expansion in the major economies, the latter depends on reshaping consumer markets, most probably through increased brand promotion and market segmentation. Once such adjustments take place, the wine industry may again see steady growth, albeit at slower rates than previously.

Relation between Business Cycles and the Wine Market

How do business cycles affect market behavior?

The importance of business cycle fluctuations is that they can adversely impact individual sectors, industries and markets, e.g. impacts on production, employment and wages, commodity prices, profits, investments, stock prices, and nearly all other facets of an industry. Contractions that are less severe, those with lower amplitudes, have more subtle and dispersed effects, however, on such market 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 other variables in a business cycle's upturns and downturns. A list of leading indicators includes, among other variables, interest rates, weekly hours, new inventory orders, building permits, stock prices, M_2, weekly unemployment claims, and investors' expectations. The reason these economic factors are leading is because they are more "sensitive to changes in the economic climate as perceived in the marketplace" (Moore) and thus reflect large cyclical rises and declines as well as high volatility. In other words these variables' cycles turn, or respond, before the corresponding turn, response, of a business cycle. Due to their sensitivity, leading indicators serve as forecasters of both business cycle changes and "future values of macroeconomic aggregates" (Zarnowitz, 1985) 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, rise, we can expect to see an expansionary period in the business cycle. This expansion will coincide with an increase in GDP 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, GNP and personal income among others. These indicators have a strong tendency to peak and bottom at the same time as business cycles. Coincident indicators denote when a nation is experiencing prosperity or depression. Because coincident indicators move with business cycles, the National Bureau of Economic Research (NBER) uses a group of coincident indicators' clusters of turning points to date business cycle peaks and troughs.

Lastly, lagging indicators are those which move up or down after coincident indicators. Such lagging indicators as CPI, unemployment rates, interest rates and inventories, typically respond after the corresponding business cycle response. These indicators' trends are more cyclical and smoother, less erratic, than leading indicators. The slow response of these indicators reveals more accurately the effects a business cycle has on 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 the cyclical change started.

How does a change in a cycle's direction affect market variables?

When a business cycle's direction changes, toward either contraction or expansion, economic variables react. Therefore, the more severe the change, the more unstable individual industries will be on a whole. When commodity demand rises or declines for example, changes in business cycles serve as a causing factor. During an expansion, commodity prices may rise and in response, consumers will spend more income on a given commodity. Given the (in)elasticity for a given commodity consumers will have less money to spend on other commodities. The demand, and consequently the prices, for the other commodities will decline granted the interactions take place in a market economy in which the money supply is controlled. If a particular market responds slowly to demand and supply changes, a "temporary imbalance(s) between supply and demand" will occur and consequently be "met by variations in production, inventory levels and backlogs of orders" (Bosworth, 1982).

Variable Relations

The expected signs of the relationships between macroeconomic and commodity variables are given in Table 7.

Table 7

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	+	+	+	-	-

The most direct link concerning cyclical influences on the commodity market is that between GDP and wine demand. Assuming the income elasticity of wine demand to be near one, increases in GDP and particularly consumer income would cause increases in the demand for wine. Conversely, declines in GDP would cause wine demand to decline also. A decline in demand will either cause an increase in wine production to meet such demands or an increase in wine prices to curb demand. The first will most likely lead to a surplus while the latter can lead to inflation.

Another commonly cited relationship is that between commodity price increases and inflation. Inflation can be caused by consumer's, producer's and investor's expectations of the future. "In an overheated economy, increased futures trading activity on the part of speculators can amplify already rising commodity prices." (Labys, 2000). In this case, if speculators expect demand for a good to rise, the price for that good will lead the increase in demand thus leading to higher consumer prices. In the wine industry, for example, if there is an increase in wine production due to speculation and that production exceeds wine demand, there will be a surplus causing exports to rise and imports to fall. This was the case in Australia it's exports grew by 16% (volume terms) from 1988 to 1997. If wine prices increase to curb wine demand, this will raise the CPI and possibly cause inflation. If inflation ensues, this will again raise the CPI and the PPI as well.

Because a rise in inflation will lower profits for many producers, they will have to lay off workers, thus increasing the level of unemployment. This rise in unemployment will reduce disposable incomes, reduce wine demand and thus cause a surplus of wine given there is not a reduction in wine production. The combination of lower wages, higher unemployment and an increased CPI will create a recessionary cycle: decreased wine demand in addition to overall demand, fall in GDP, further decline in disposable income, increased decline in elastic goods demand, inventory surplus, increased exports coupled with decreased imports, worsened trade imbalance . . .. The worse the trade balance becomes, the worse the economic environment appears to foreign investors. As discussed below the deterrence of investors can be damaging to both individual producers and the wine industry as a whole on both the national and international level. Monetary policies provide a way out of this cycle. Such policies include decreasing interest rates, which encourage investment, and expanding the money supply, which promotes investments in wine acreage and processing facilities.

Also affecting imports and exports is the exchange rate. For example, in the United States consumer wine demand will often shift toward foreign wines where the exchange of the dollar has become strong. In the 1980s**,** French wines lost ground in the US market because of the dollar's weakness against the French franc. During this same time, Australian wines became popular because of the US dollar's strength against the Australian dollar.

Monetary and financial variables can affect wine markets through the impact of borrowing costs. This impact can be seen as possibly limiting the investment expansion in wine processing facilities and new vineyards. "High interest rates can also reduce [producers' and merchants'] abilities to hold commodity inventories and to continue proposed investments in production facilities such as new [vineyards]." (Labys, 2000) An inability to hold wine stocks will force suppliers to import wines from other countries when the domestic stocks do not satisfy domestic demands. Labys work on market volatility and metals and minerals, for example, discusses the US dependence on imported minerals due to the production reduction of US mining. One consequence of import dependency is a markets extreme sensitivity to commodity price swings.

High interest rates can also discourage investors who provide capital and funds to wine producers. A loss of this money can hinder the wine industry because without the needed money and capital, producers will be unable to develop their facility by ways of production, variation and innovation. Investors also encourage developments in the wine industry as a whole. Through investor's assistance, the wine industry is able to support new competition, create new technology and expand production. This can lead to new wine varieties, lower cost production processes, efficient acreage usage and trade expansion (open trade/fewer tariffs), all of which can lead to lower market prices, demand increases, and surplus decreases.

A second important link is between producer prices, or consumer prices, and wine prices. As mentioned, a rise in producer prices will cause wine prices to increase. This will cause a decline in overall wine demand, but may spur interest in the high-quality, high-priced wines as well as an increase demand for cheap table wines. A rise in wine prices causes adjustments in consumer expenditures. Because wine is a luxury good, consumers will decrease their demand for wine and spend their income on cheaper, necessary goods. This will cause the cycle of surplus, trade imbalance and unemployment to start again.

Measuring Business Cycle Impacts

Methods of Measurement

The methodology employed in this study reflects the issues raised in the problem statement. That is, as a country's GDP rises, will the consumption of table wines also rise and, conversely, if GDP falls, will the consumption of table wines fall? In addition, as a country's exchange rate depreciates, will the exports of that country rise accordingly? The analysis looked at the relations between international business cycles and changes in the international wine market. An appropriate analysis of the examined business cycle relationships is based on economic time-series analysis. This type of analysis involved these steps:

1. Analyze the time-series behavior of each variable, using stationarity, normality and dependence tests.
2. Analyze the dependence structure of each series. When dependence exists, it usually appears in the form of trend, cyclical, seasonal or Markov patterns. The nature of these patterns will be analyzed using simple and partial auto-correlation coefficients.
3. Examine the correlation between macroeconomic variables and wine market variables. This will be done using tests of correlation and covariance between variables, as well as considering lags and cross-correlations.
4. Perform multiple regression and causality regression analysis. This will permit me to determine the influence of independent variables on the dependent wine market variables. See Cromwell, Hannon, Labys, and Terraza (1994).

Using EVIEWS software the relations between variables, as evaluated above, were subjected to appropriate time-series tests, analyzed statistically, and related to real-world behavior in the respective countries and markets. Variable definitions appear in Table 8.

Table 8

VARIABLE DEFINITIONS

MARKET VARIABLE BY COUNTRY	
WC =	Wine Consumption (000 hl)
WM =	Wine Import (000 hl)
WP =	OIV Wine Price, 1986 = 100
WQ =	Wine Production (000 hl)
WX =	Wine Export (000 hl)
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 =	US Exchange Rate: cents/foreign currency
GDP =	Gross Domestic Product
GDP =	Gross Domestic Product, bln
HW =	Hourly Rates, 1990=100
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, 1990=100
RU =	Registered Unemployment
SO =	Commodity Output – Crude Steel, tons '000
SP =	Share Prices
TB =	Trade Balance
TU =	Total Unemployment
ULC =	Labor Cost: Engineering Industries, 1990=100
UR =	Unemployment Rate
WW =	Monthly Earnings
SPECIAL VARIABLES	
BWINEP =	French Beaune Auction Price, 1986 = 100
EUC =	EU Wine Consumption
EUD =	EU Market Disequilibrium (EUQ-EUC)
EUQ =	EU Wine Production
FTWP =	French Table Wine Price, 1986 = 100
USGTWP =	US Grape Table Wine Price, 1986 = 100
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)

Source: Macroeconomic variables appear in OECD Economic Indicator files. Wine market variables appear in International Office for Wines and Vines.

Data

Data on the international macroeconomic data 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. This data is attainable from the OECD in CD format. In analyzing this data, I examined how the macroeconomic activity of the seven major OECD countries influences the international wine market. The macroeconomic variables relevant to this analysis of international business cycles include (GDP), interest rates, (CPI), share prices, employment, the funds rate, the trade balance, total imports, PPI, industrial production, earnings, hourly wages and exchange rates.

The wine market data concerns the seven major OECD countries. The sources of this data are the publications from the International Office of Wines and Vines (OIV) in Paris, France. The relevant wine market variables include exports, imports, production, consumption and prices.

Univariate Behavior Results

Because of the lack of time for a more thorough analysis, univariate dependence tests could not be performed so the data were transformed to be stationary by using percentage changes ($\Delta \log X$). The importance of computing differences, as we will see again in the analysis of the regressions, is to rid the relationship between variables of a dominant trend factor.

Correlation Results

Correlation coefficients were computed between each macroeconomic and commodity variable over the years 1960 to 1997 in levels and percentage change. In creating the correlation summary tables, the macroeconomic variables were divided into three categories: income (GDP, employment, unemployment rate, industrial production, commodity output and earnings), prices and wages (consumer prices, producer prices, share prices, interest rates, funds rate and wages) and trade (trade balance, total imports and exchange rates). The highlighted correlations are those that are both significant and have the correct expected sign.

Incomes. In levels the results for Australia show that the strongest correlations are between GDP and wine imports, prices, production and exports, employment and wine consumption, industrial production and wine imports, prices, production and exports, commodity output and wine imports, prices, production and exports and earnings and wine imports and production. (Table A.1.b.) The correlation coefficients as computed in differences confirm the levels correlations between GDP and wine production and industrial production and wine imports and prices. (Table A.1.a.) Economic theory further supports these confirmed relationships. Such theory stipulates that when GDP, of which industrial production is a function, rises, prices will rise to curb demand and production will rise, as will imports, to meet the increased demand. Imports also rise to compete with rising domestic prices.

For France, in levels, there are strong correlations between GDP wine prices, employment and wine consumption, the unemployment rate and wine consumption and prices, industrial production and wine prices and exports and commodity output and wine prices and exports. (Table A.2.b.) The correlation coefficients for differences confirm the relationships for prices and exports. (Table A.2.a.) An interesting correlation is that between GDP and wine consumption, which is negative. As previously noted there is and has been a trend in France toward healthier lifestyles and less alcoholism. This trend helps explain the untypical negative correlation between GDP wine consumption. What is interesting about French table wine is the unexpected signs of the correlation coefficients between employment and wine consumption and the unemployment rate and wine consumption in differences. (Table A.3.a.) A possible explanation is that if employment rises and thus more people have some amount of money, more money may go to the consumption of more expensive wine over the cheaper table wines. Consequently, if the unemployment rate rises, then consumption of table wines may also rise because people can no longer afford expensive wine, but, out of tradition, still purchase (table) wine.

Following economic theory, the strongest correlation coefficients in levels for Germany are between GDP and wine consumption and prices, employment and wine prices, production and exports, the unemployment rate and wine prices and production, industrial production and wine consumption and imports and commodity output and wine prices and production. (Table A.4.b.) Those confirmed by differences include employment and wine prices and production, the unemployment rate and wine prices, industrial production and wine prices and production and commodity output and wine prices and production. (Table A.4.a.) Italy shows similar trends, but has more significant correlations between macroeconomic variables and wine exports. Italy's strong correlations in levels are between GDP and wine prices and exports, employment and wine imports and production, industrial production and wine prices and exports and commodity output and wine prices and exports. (Table A.5.b.) Those supported by differences include GDP and wine prices, employment and wine imports and industrial production and wine exports. (Table A.5.a.)

In Spain, the correlation coefficients calculated for differences provide little support for the strong relationships found in levels. (Table A.6.b.) In levels, there are strong correlations between GDP and wine imports, prices and exports, employment and wine prices, the unemployment rate and wine consumption and production and industrial production and wine prices. Of these, correlations with differences confirm two levels correlations: employment and wine prices and industrial production and wine prices. (Table A.6.a.) This pattern is also found in the United Kingdom and the United States. In levels in the UK, there are strong correlations between GDP and wine consumption, imports, production and exports, industrial production and wine consumption, commodity output and wine imports, production and exports and earnings and wine consumption, imports, production and exports. (Table A.7.b.) Only one of these, that between GDP and wine exports, is confirmed in differences. (Table A.7.a.) In the US, levels shows strong correlations between GDP wine prices, production and exports, employment and wine consumption, the unemployment rate and wine prices and production, industrial production and wine prices, production and exports, and earnings and wine prices, production and exports. (Table A.8.b.) In differences, however, only the correlations between GDP and wine exports and industrial production and wine production are confirmed. (Table A.8.a.) The correlation results for the world wine variables versus US macroeconomic variables in levels reveals strong correlations between US GDP and world wine exports, US employment and world wine consumption and production, US industrial production and world wine exports, and US earnings and world wine imports and exports. (Table A.9.b.) The correlation results in differences confirm none of these relationships. (Table A.9.a.)

Prices and Wages. For Australia, there are strong correlations between consumer prices and wine consumption, prices, production and exports, share prices and wine imports, prices, production and exports, interest rates and wine imports, production and exports and hourly wages and wine production in levels. (Table A.1.b.) Of these, the correlations computed in differences support the relationships between shares prices and wine production and exports. (Table A.1.a.) The strong correlations for French wine are between consumer prices wine consumption and prices, share prices and wine prices and exports, interest rates and wine exports and hourly wages and wine prices. (Table A.2.b.) The differences correlations confirm the relationships between consumer prices and wine prices, share prices and wine exports and hourly wages and wine prices. (Table A.2.a.) An interesting relationship found among French wine is that between wages and wine consumption, which is negative. As previously noted, a trend in high consumption countries is that toward decreases in overall consumption due to decreases in the relative population of the lower-income workforce who are typically consumer of relatively large quantities of low-quality wines. Furthermore, increases in per capita incomes encourage trading in small quantities of higher-priced, higher-quality wines (see p. 20). This trend is also evident in the data for French table wine in which the correlation between wages and wine consumption is negative.

In Germany, the strongest correlations exist between consumer prices and wine prices, producer prices and wine prices, production and exports, share prices and wine consumption, imports and prices and hourly wages and wine consumption and prices. (Table A.4.b.) The correlation results in differences confirm the correlations between producer prices and wine prices and exports and hourly wages and wine consumption.

(Table A.4.a.) Similar to the results of income correlations, Italy's strongest correlations exist between macroeconomic variable and wine exports, particularly between consumer prices and wine consumption, imports, prices and exports, producer prices and wine consumption, prices and production, share prices and wine exports and interest rates and wine exports. (Table A.5.b.) The results in differences only support the relationship between share prices and wine exports, however. (Table A.5.a.)

Comparable to the results of income correlations, Spain's correlation results in differences provide little support for those found in levels. Consumer prices and wine consumption, prices and exports, share prices and wine prices, interest rates and wine exports and hourly wages and wine prices and exports are the significant correlations in levels, but the results for differences only confirm the relationship between hourly wages and wine exports.

The UK and US also follow this non-confirming pattern. (Table A.6.b. and Table A.6.a.) In the UK, the results from levels show strong correlations between consumer prices and wine production and exports, producer prices and wine imports, share prices and wine consumption, imports, productions and exports, and interest rates and wine imports and exports. (Table A.7.b.) The results in differences, however, only confirm the relationship between consumer prices and wine production. (Table A.7.a.) Similarly, the US levels coefficients reveal strong correlations between consumer prices and wine prices and exports, producer prices and wine prices, share prices and wine prices, production, and exports, and the funds rate and wine exports. (Table A.8.b.) Of these, only the relationship between consumer prices and wine exports and share prices and wine exports are confirmed in differences. (Table A.8.a..) The strongest relationships between US macroeconomic variables and world wine variables, in levels, exist between US consumer prices and world wine consumption and exports and US producer prices and world wine consumption and imports, none of which are supported by the correlations in differences. (Table A.9.b. and Table A.9.a.)

Trade. For Australia, the correlation summary in levels reveals a strong relationship between total imports and wine imports and the exchange rate and wine production and exports. (Table A.1.b.) In differences, however, only the relationship between the exchange rate and wine production and exports is supported, but the relationship appears weaker. The strong relationships between macroeconomic variables and wine variables supported by differences include those between the trade balance and wine consumption, imports and production, imports and wine consumption, and the exchange rate and wine imports. (Table A.1.a.) The relationship between imports and wine consumption may be attributed to the still emerging market in Australia. Because Australia's goal is to expand wine exports and become a major player in the world market, they have taken advantage of the relatively favorable exchange rate with respect to other countries domestic demand is mainly met by wine imports, especially from Europe.

The strongest trade relationships in France lie between the trade balance and wine consumption and the exchange rate and wine prices. (Table A.2.b.) Of these, the correlations as calculated in differences support the relationship between the exchange rate and wine prices, but also supports a strong relationship between the exchange rate and wine exports. (Table A.2.a.) Similar to French table wines, there is little evidence of any relationships between macroeconomic variables and wine variables. In levels, the only strong relationship exists between the trade balance and wine exports, while in differences, there appear to be no strong relationships. (Table A.3.b. and Table A.3.a.)

In Germany, strong relationships appear in both levels and differences, however, only one is overlapping. In levels, the strongest relationships exist between the trade balance and wine consumption and prices and total imports and wine consumption and production. (Table A.4.b.) Correlations in differences support the relationship between the trade balance and wine consumption, but also reveal relationships between the trade balance and wine exports, imports and wine prices and the exchange rate and wine prices. (Table A.4.a.)

Similar to Germany, there is little or no support of strong variable relations between trade and wine variables in levels and differences in Italy, Spain, the UK, the US and the world. In levels for Italy, the strongest relationships occur between the trade balance and wine imports and exports, imports and wine production and the exchange rate and wine imports and exports. (Table A.5.b.) The only strong variable relationship in differences, however, exists between the exchange rate and wine prices. (Table A.5.a.) In Spain, the most important variable correlations exist between the trade balance and wine exports, imports and wine production and the exchange rate and wine consumption, in levels. (Table A.6.b.) The correlation results in differences support none of these correlations, but shows a solid correlation between the trade balance and wine prices. (Table A.6.a.) In the UK, the two soundest correlations in levels are between imports and wine consumption and imports. (Table A.7.b.) The two soundest correlations in differences are between the trade balance and wine consumption and imports and wine production. (Table A.7.a.) The UK imports most all its wine, which might explain the strong relationship between the UK's imports and wine consumption.

In the US, the correlation results in levels are strongest between the trade balance and wine imports and the exchange rate and wine imports and exports. (Table

A.8.b.) The opposite relationship between the exchange rate and wine imports and exports is to be expected since as exports rise or fall, imports must react in an opposite direction. Furthermore, as stated in ***Variable Relations***, as the exchange rate rises, it is cheaper for a country to import foreign goods and export the more expensive domestic goods.

In levels, the US also shows strong opposite relationships between the exchange rate and wine imports and exports, but also shows a strong relationship between the trade balance and wine imports. The relationship between the exchange rate and wine imports is supported in differences. (Table A.8.a.)

Lastly, the correlations between the world's commodity variables and US macroeconomic variables reveal solid relationships between the US trade balance and world wine consumption and US imports and world wine production. (Table A.9.b.) None of these relationships are supported by the correlations in differences, however. (Table A.9.a.) Further research on world relationships would require using aggregate OECD business cycle variables.

Regression Results

The regressions included in this study are estimated using OLS and are based on those variables which had a significant correlation coefficient with the independent variable and/or are supported by theory. See Appendix B. Those countries with no regression equations reported had no significant correlations between wine and macroeconomic variables.

<u>Consumption</u>. Consumption for Australia is a function of GDP, consumer prices and the exchange rate. (Table B.1.a.) While the sample size used in the regression for

Australia is significant, the regression itself is relatively poor. Two of the three included regressors have incorrect coefficient signs possible suggesting an omitted variable. The t-statistics suggest the coefficients are not significantly larger than zero. This is further supported by the low F-statistic. The adjusted R^2 value suggests that the inclusion of some of the independent variables does not increase the quality of the regressions fit. The Durbin-Watson statistic indicates no evidence of serial correlation.

Consumption for Germany is a function of GDP, consumer prices and the interest rate. (Table B.1.b.) The regression for Germany is considerably better. All the t-statistics suggest all the independent variables are significant which is supported by the high F-statistic. The adjusted R^2 value is high thus indicating the regression is a good fit. The Durbin-Watson statistic is again high enough to indicate no evidence of serial correlation. The two drawbacks of this regression, however, are the unexpected sign for GDP's coefficient, suggesting a possible omitted variable and the high value of the log likelihood statistic.

Similar to Germany, Italy's consumption regression has a good sample size, but this regression is less efficient. Consumption for Italy is a function of share prices, consumer prices and the exchange rate. (Table B.1.c) The coefficients for share prices and consumer prices are different from their expected signs. The standard errors are low, but so are the t-scores are low for consumer prices and the exchange rate. The f-statistic also indicates that, on a whole, no coefficients are significantly different from zero. The adjusted R^2 value is low enough to indicate a poor fit for the regression. The log likelihood statistic is high, thus indicating a possible mis-specification of the regression's functional form. Again, though, the Durbin-Watson statistic indicates no evidence of serial correlation.

There is no regression for Spain's consumption because there were no significant correlations between the wine variables and the macroeconomic variables. Consumption for the UK is a function of GDP, consumer prices and the interest rate. (Table B.1.d.) For the UK, there is only one unexpected sign, that for interest rates, but the regression is similar to that of Italy's in that it is a poor estimation in respect to the sample data. The other problems with this regression are the low t-statistics and F-statistic indicating that the coefficients are not significantly larger than zero. However, the sample size is sufficient, the standard errors are low are there is no evidence of serial correlation.

The regression for the US is very similar. Consumption for the US is a function of GDP, consumer prices, employment and the exchange rate. (Table B.1.e) There are two unexpected signs, those for employment and the exchange rate. The standard errors are low and the sample size is sufficient, but that is the extent to the positive qualities of this regression. The t-statistics are low as is the F-statistic indicating the insignificance of the variable coefficients. The adjusted R^2 value is low which is indicative of a poor fit of the regression. The Durbin-Watson test indicates evidence of serial correlation and the log likelihood statistic indicates a mis-specification of the model's functional form.

Production. Production for Australia is a function of the exchange rate and the unemployment rate. (Table B.2.a.) The regressors used in the wine production estimation for Australia and France do not provide a good fit. The coefficients of the regressors for Australian production do have the correct sign and are significantly different from zero as indicated by their t-statistics and the F-statistic. Production for France is a function of the exchange rate and the trade balance. (Table B.2.b.) Of those for French production, the coefficient for the exchange rate is unexpected. The adjusted R^2 values for both countries are low indicating the possible need for more regressors. The Durbin-Watson statistic for both Australia and France indicates no evidence for serial correlation in the wine production regressions in each respective country.

Production for Germany is a function of employment, industrial production and consumer prices. (Table B.2.c.) The regression for wine production in Germany provides a relatively good fit between the regression and the sample data. All coefficients have the expected sign and are significantly different from zero as indicated by their t-statistics and the F-statistic. The large standard error for consumer prices is a concern, but there is no evidence of multicollinearity, serial correlation or a mis-specification of the functional form.

Production for Italy is a function of the exchange rate, GDP and consumer prices. (Table B.2.d.) For Italy, the regression for wine production is not a good fit in respect to the data sample. The coefficient for the exchange rate has an unexpected sign. The t-scores for all the regressors less the exchange rate indicate that the coefficients are not significantly different from zero as supported by the F-statistic. The low adjusted R^2 value provides evidence of inclusion of irrelevant variables. There is no evidence of serial correlation, but possible evidence of a mis-specification of the functional form.

Production for Spain is a function of employment, industrial production and commodity output. (Table B.2.e.) The regression for wine production in Spain is not a good fit in respect to the data sample. While there does not seem to be evidence of irrelevant variables being included the combination of low adjusted R^2 value, high standard errors and significant t-scores, supported by a high F-score, provides evidence of multicollinearity, possible between commodity output and industrial production. There also is evidence of serial correlation and a mis-specification of the functional form.

Production for the UK is a function of GDP, the exchange rate and share prices. (Table B.2.f.) The regression for wine production in the UK is a seemingly good fit to the sample data. The only unexpected sign is that for share prices, but maybe share prices really do not influence production. Share prices are not deleted from the regression because doing so has a devastatingly negative affect of the value of R^2 and significantly changes the coefficients of the remaining regressors. The t-statistics indicate that most regressors are significantly different from zero. There appears to be no evidence of serial correlation, a mis-specification of the functional form or of multicollinearity.

Production for the US is a function of producer prices and consumer prices. (Talbe B.2.g.) The regression for US wine production is quite different. While there is no evidence of serial correlation or multicollinearity, there appears to be evidence of a mis-specification of the functional form and the regression is a poor fit in respect to the sample data. The coefficient for consumer prices has an unexpected sign and both regressors prove to be insignificant.

Trade. For Australia, the regressions for imports and exports are not similar in significance. (Table B.3.a.) Imports for Australia are a function of the exchange rate, GDP, share prices and the trade balance. The regression for imports has a small sample size due to the inclusion of the trade balance, the adjusted R^2 value is low, indicating the possible inclusion of irrelevant variables and the coefficient signs for GDP and commodity output are different from their expected signs. The low t-statistics and the low F-statistic indicate that the regressor's coefficients are not significantly different from zero. The Durbin-Watson statistic indicates there is serial correlation among the error terms. Exports for Australia are a function of wages, GDP and share prices. (Table B.4.a.) The coefficients in the regression for exports all have unexpected signs. The t-statistics and the F-statistic indicate the regressors are significant, however. The adjusted R^2 statistic is low indicating a poor fit for the regression. The Durbin-Watson statistic indicates no evidence of serial correlation.

There is no regression for French imports due to a lack of significant correlation coefficients. Exports for France are a function of total imports, GDP and consumer prices. (Table B.4.b.) The regression for exports reveals unexpected signs for the coefficients of total imports and GDP. The t-statistics are low, but the F-statistic reveals the coefficients are significantly different from zero. While the Durbin-Watson statistic is low, it is high enough to indicate no evidence of serial correlation.

Imports for Germany are a function of producer prices, consumer prices and the trade balance. (Table B.3.b.) For German imports, the regression is a relatively good fit to the sample data. The only unexpected sign is that of producer prices. Although the t-statistics indicate that all of the coefficients are significantly different from zero, the F-statistic does not support that claim. The Durbin-Watson statistic indicates no evidence of serial correlation and there appears to be no indication of a mis-specification of the functional form. Exports for Germany are a function of producer prices, the interest rate and industrial production. (Table B.4.c.) The equation for exports appears to be a better overall regression. There are no unexpected signs, the t-statistics and the F-statistic indicate all coefficients are significantly larger than zero. There is no evidence of a mis-specification of the functional form and, based on the adjusted R^2 value, the regression is a good fit. Because the number of observations is so small, determination of serial correlation based on the Durbin-Watson statistic is inclusive.

There is no regression for Italy's imports because there were no statistically significant correlation coefficients between the wine variables and the macroeconomic variables. Exports for Italy are a function of the exchange rate, GDP, and commodity output. (Table B.4.d.) The regression for exports is statistically a poor fit in respect to the sample data as indicated by the adjusted R^2 value. The sign for GDP's coefficient is unexpected. The t-statistics are low and the insignificance of the regressors is supported by the F-statistic. The Durbin-Watson statistic provides evidence of serial correlation.

Imports for Spain are a function of the unemployment rate, share prices and the trade balance. (Table B.3.c.) The regression for Spain's imports appears to be one of the best fitting regressions in the study. All the t-statistics are high and the significance of the regressors is supported by the F-statistic. The adjusted R^2 statistic indicates that the regression fits the sample data well. The standard errors are low and there is no evidence of serial correlation. The problem, however, lies in the unexpected signs for the coefficients of the unemployment rate and the trade balance, both of which are expected to be negative. These characteristics are also found in the regression for Spain's exports. Exports for Spain are a function of the trade balance, the exchange rate and industrial production. (Table B.4.e) The t-statistics are high and the significance of the regressors is supported by the F-statistic. The adjusted R^2 statistic indicates the regression fits the sample data well. The standard errors are low and there is no evidence of serial correlation. The problem is that all the coefficients have unexpected signs.

There is no regression for the UK's imports because there were no statistically significant correlation coefficients between the wine variables and the macroeconomic variables. Exports for the UK are a function of the exchange rate, GDP and commodity output. (Table B.4.f.) The regression for the UK's exports is of interest. Similar to Spain, the regression appears to be a good fit to the sample data. The adjusted R^2 value is high, the t-statistics are high and the significance of the regressors is supported by the F-statistic. There is no evidence of serial correlation or mis-specification of the model's functional form and there is only one unexpected sign, that of GDP. What is interesting is the large standard errors of nearly all the terms.

Imports for the US are a function of earnings, consumer prices, producer prices and share prices. (Table B.3.d.) In the regression for US imports, all the coefficients have the expected signs. The t-statistics are high for employment and consumer prices, but are borderline for producer prices and share prices. The F-statistic, however, indicates that all of the coefficients are significantly larger than zero. The Durbin-Watson statistic is high enough to indicate no evidence of serial correlation. Exports for the US are a function of GDP and producer prices. (Table B.4.g.) The regression for US exports is not as good as a fit as that for imports. The t-statistics are low except for producer prices in which the coefficient has an unexpected sign. The F-statistic, however, indicates that all the included regressors are significant. According to the Durbin-Watson statistic, there is no evidence of serial correlation.

Prices. Prices for Australia are a function of the exchange rate, GDP, consumer prices and earnings. (Table B.5.a.) In the regression for prices in Australia, the only coefficients with the expected sign are GDP and earnings. The t-statistics are low for most regressors and their insignificance is supported by the F-statistic. The Durbin-

Watson statistic indicates evidence of serial correlation and the adjusted R^2 value indicates a poor fit between the regression and the sample data.

Prices for France are a function of the exchange rate and employment. (Table B.5.b.) Although there are only two regressors in the regression for French wine prices, they both have the expected signs and they are both significant as indicated by the t-statistics and the F-statistic. There is no evidence of serial correlation, the standard errors are low and the adjusted R^2 value indicates a good fit between the regression and the sample data. Similar characteristics are found in the regression for German wine prices although there does appear to be evidence of serial correlation. All coefficients have the expected signs and they are significant as indicated by the t-statistics and the F-statistic. The standard errors are low and the adjusted R^2 value indicates a good fit between the regression and the sample data.

Prices for Germany are a function of employment, industrial production and producer prices. (Table B.5.c.) The regression appears to be a good fit to the sample data. All the coefficients have the expected signs. The t-scores are high, the adjusted R2 value is high indicating all including variables are relevant, the log likelihood statistic does not indicate any mis-specification of the model, and the Durbin-Watson statistic is inconclusive of any evidence of serial correlation.

Prices for Italy are a function of the exchange rate and consumer prices. (Table B.5.d.) In the regression for Italian wine prices, both coefficients have the expected signs. The adjusted R^2 value is relatively high indicating a tolerable fit between the sample data and the regression. The t-statistics are low except for the employment rate. The low t-statistics in combination with a relatively high adjusted R^2 value may be evidence of multicollinearity. As for serial correlation, the Durbin-Watson statistic indicates there is no evidence of this problem.

Similar to the regressions for imports and exports in Spain, the regression for wine prices in Spain appears good. Prices for Spain are a function of employment, wages and the trade balance. (Table B.5.e.) The value of the adjusted R^2 is high, indicating a good fit between the regression and the sample data. All the t-statistics are significant which is supported by the F-statistic. There is no evidence of serial correlation, multicollinearity or a mis-specification of the functional form. The problem, however, is the unexpected signs of the of employment and wages coefficients.

There is no regression of wine prices in the UK because the data for wine prices were not available. Prices for the US are a function GDP. (Table B.5.f.) The regression for US prices is interesting because it has only one regressor, yet the t- and F-statistics are high, and the value for the adjusted R^2 is relatively high. There is evidence of serial correlation and possible a mis-specification of the functional form, but there is no evidence of multicollinearity.

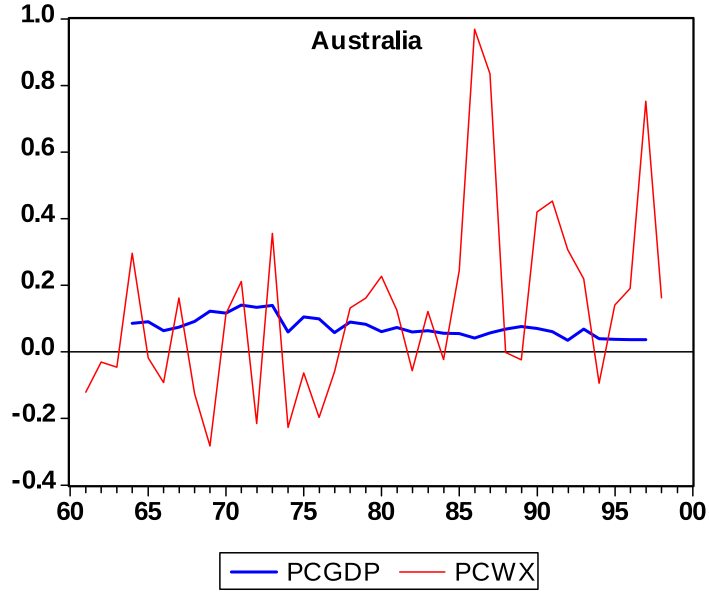
Conclusions

This study attempts to show the relationships between macroeconomic variables and wine commodity variables. The most interesting features of this relationship occur in Australia and France. Despite a stabilization of GDP, exports have increased markedly in Australia due to their efforts to emerge onto the international wine market. See Graph 1. In France, we observe a decline in overall wine consumption of almost 23,000 hl despite a steady increase in nominal GDP. This is due to France's trends toward healthier lifestyles and the consumption of more expensive wines. See Graph 2.

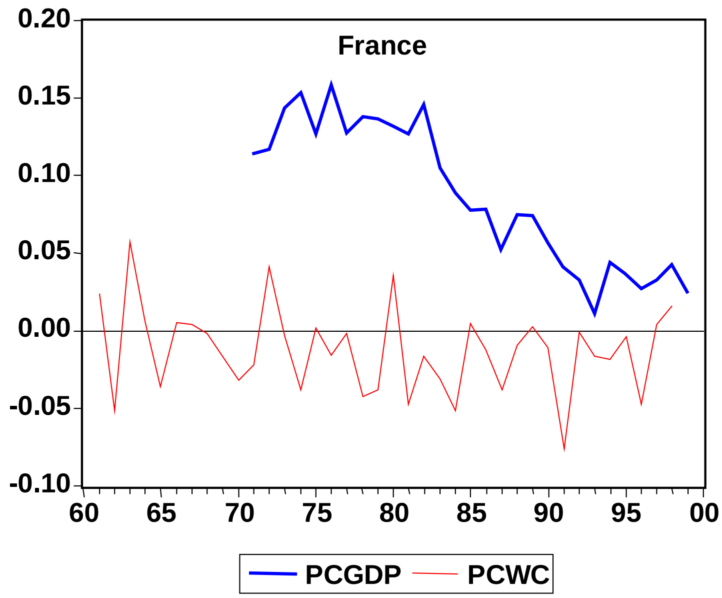
In answering the initial questions of 1) As a country's national product rises, will wine consumption also rise? 2) If GDP falls will wine consumption fall? 3) As a country's exchange rate rises and the dollar depreciates, will the exports of that country rise accordingly? we look to trended graphs relating wine consumption and GDP and wine exports and the exchange rate in each country. In Australia (until the early 1990s), Germany (based on what few observations of GDP were available), the UK and US, wine consumption rises as nominal GDP increases. In France, Italy and Spain, consumption falls with increases in nominal GDP. See Graphs 3-9. In Australia (until the mid-1990s) and Germany, exports rise as the exchange rate rises (US dollar weakens against foreign currency). In France, where there was an unstable exchange rate throughout the 1980s, Italy, Spain, the UK and US, exports fall as the exchange rate rises. See Graphs 10-16.

Further research on this topic would involve disaggregating total wine numbers to determine the traded values of quality and table wines separately, such as was done in France. Examining the effect of the exchange rate vis-à-vis individual exporting countries would also be of interest.

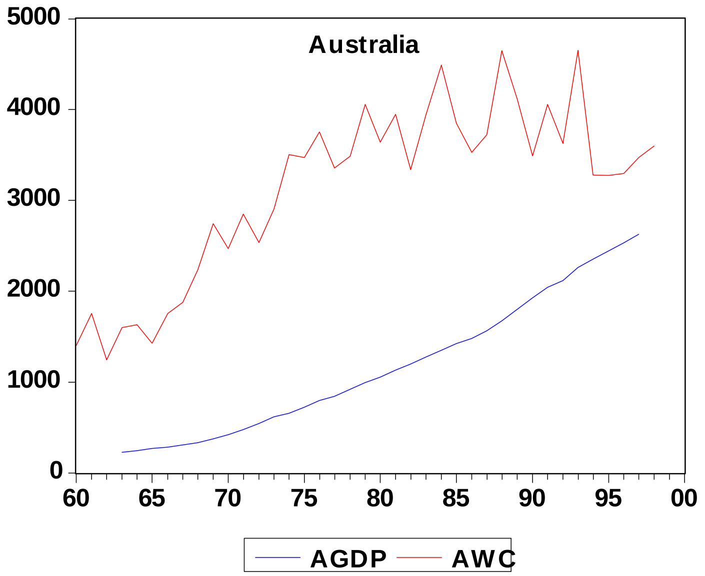
Graph 1



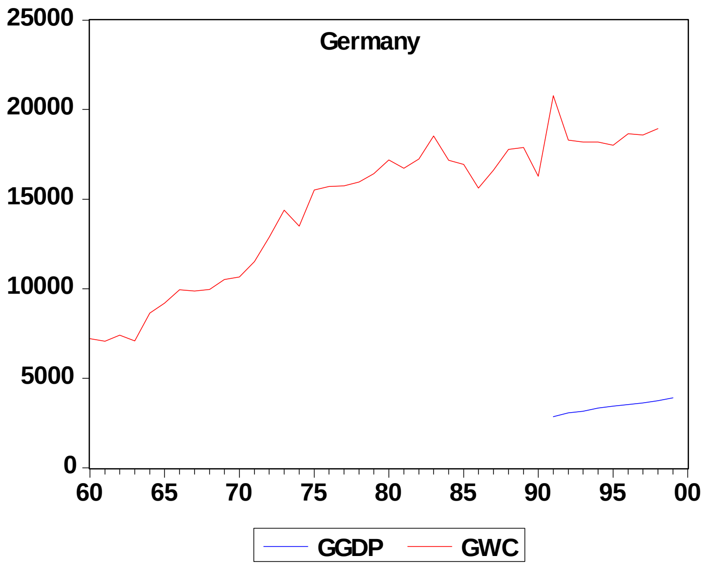
Graph *2*



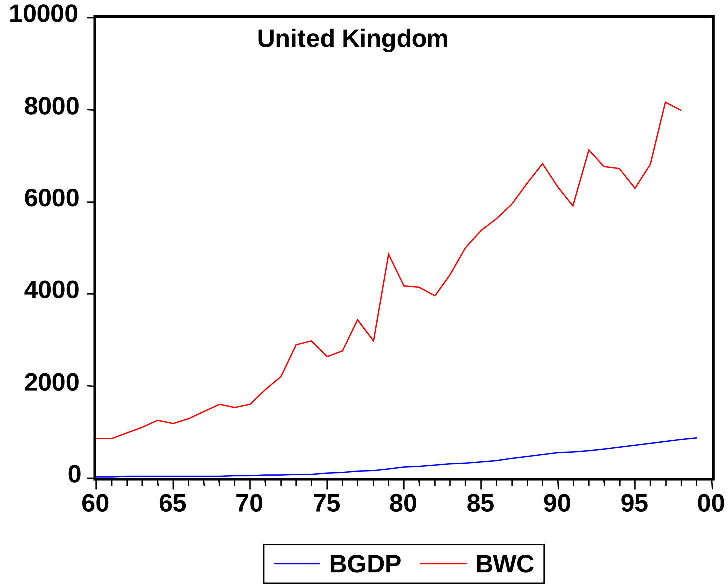
Graph 3



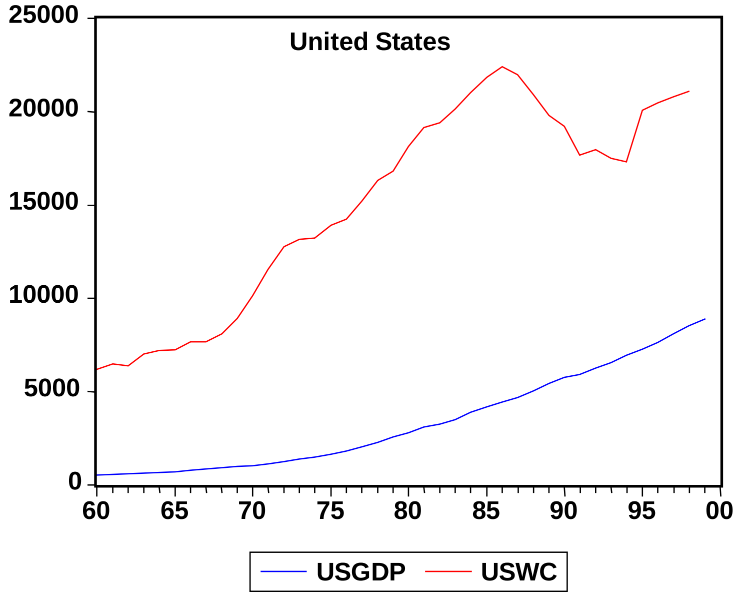
Graph 4



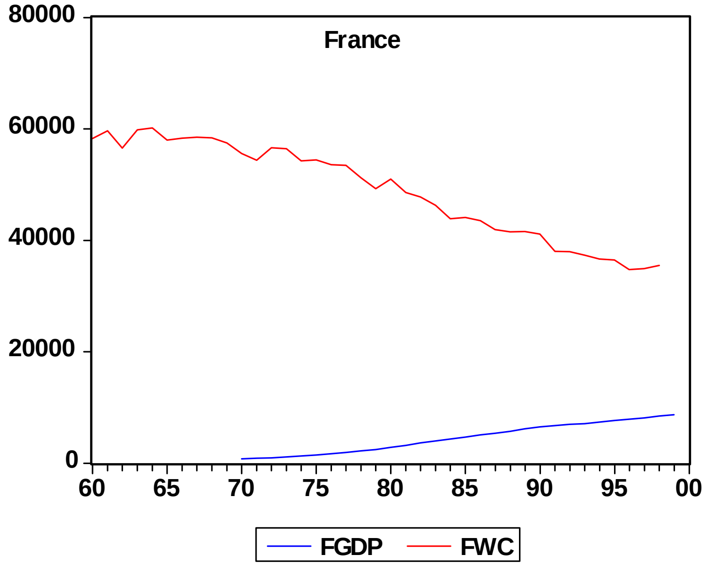
Graph 5



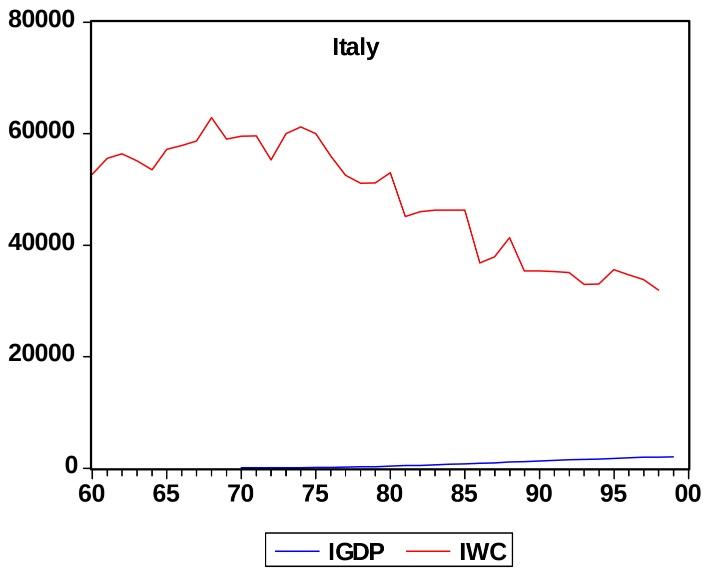
Graph 6



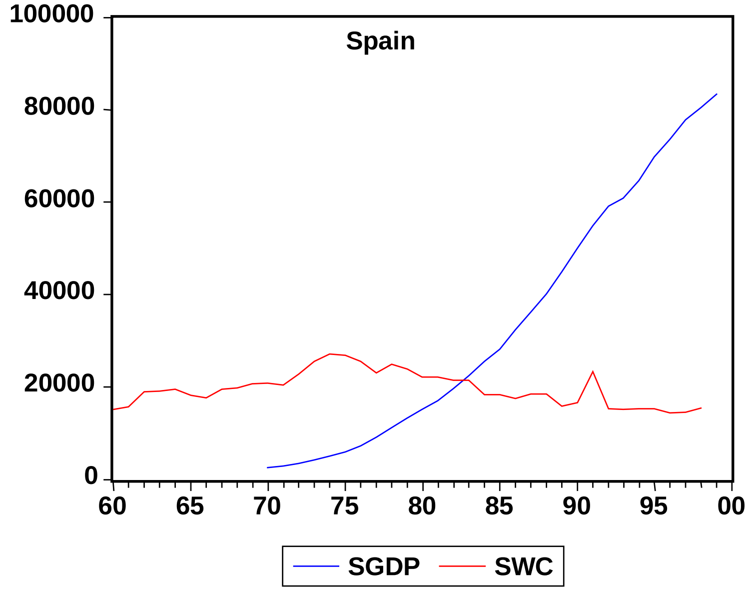
Graph 7



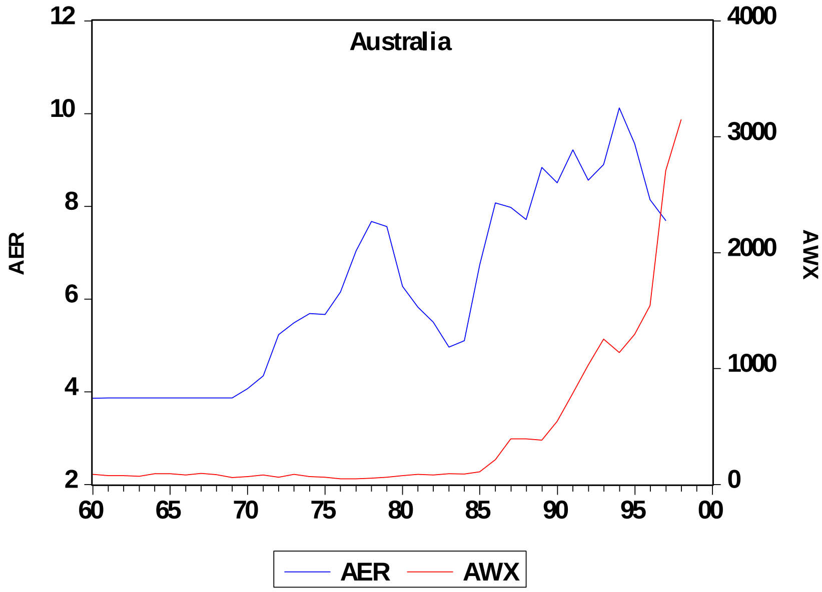
Graph 8



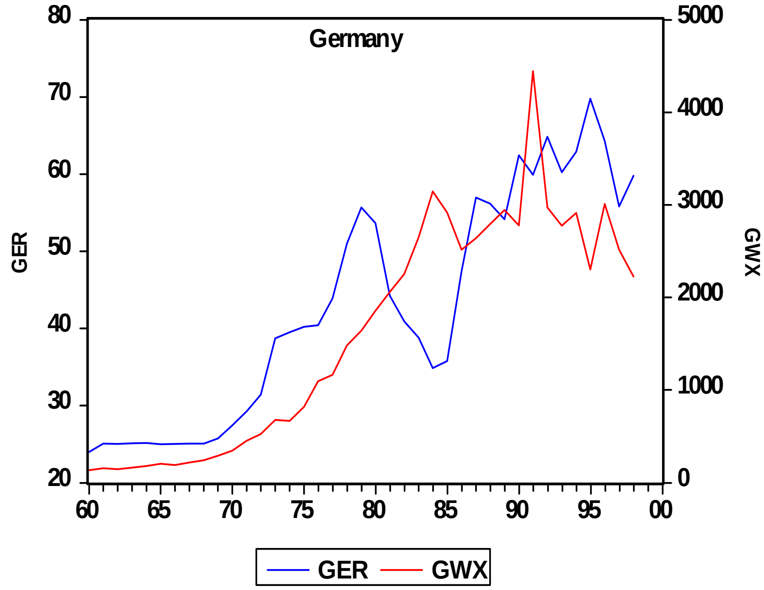
Graph 9



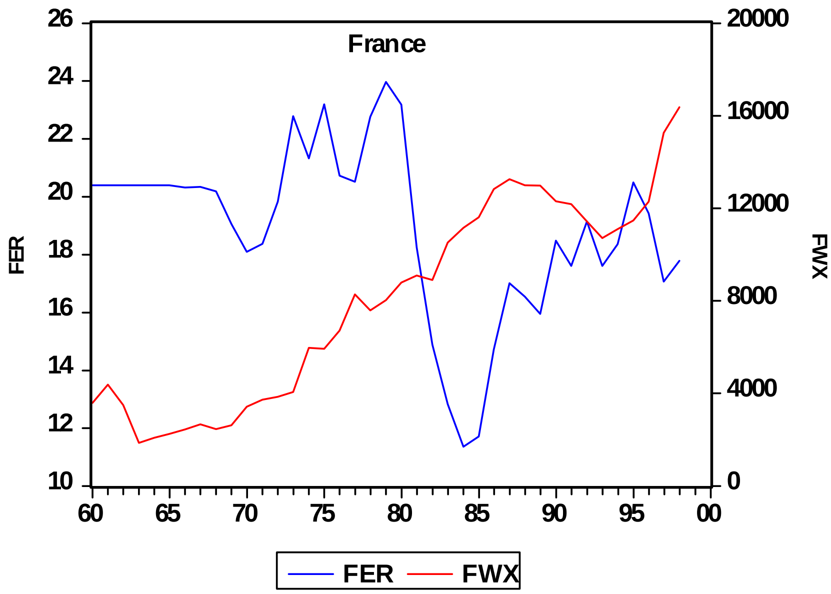
Graph 10



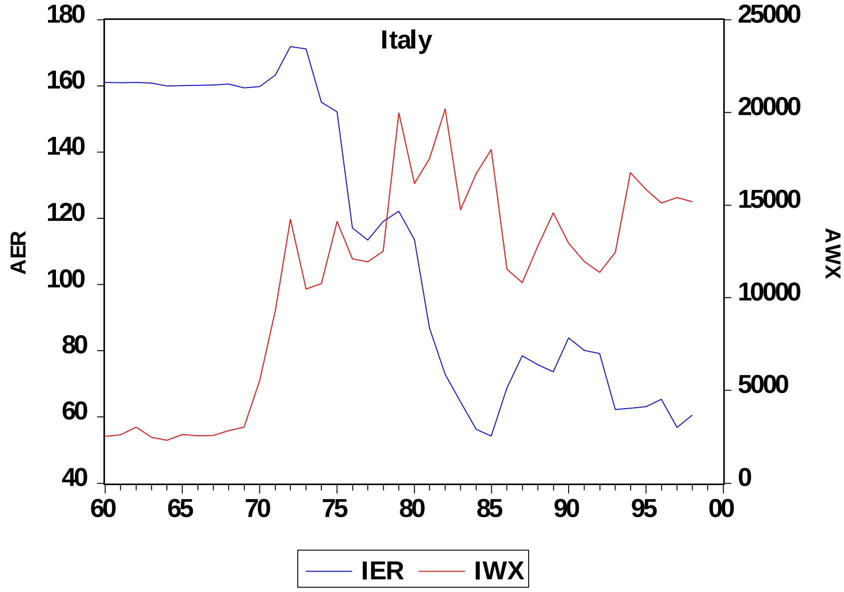
Graph 11



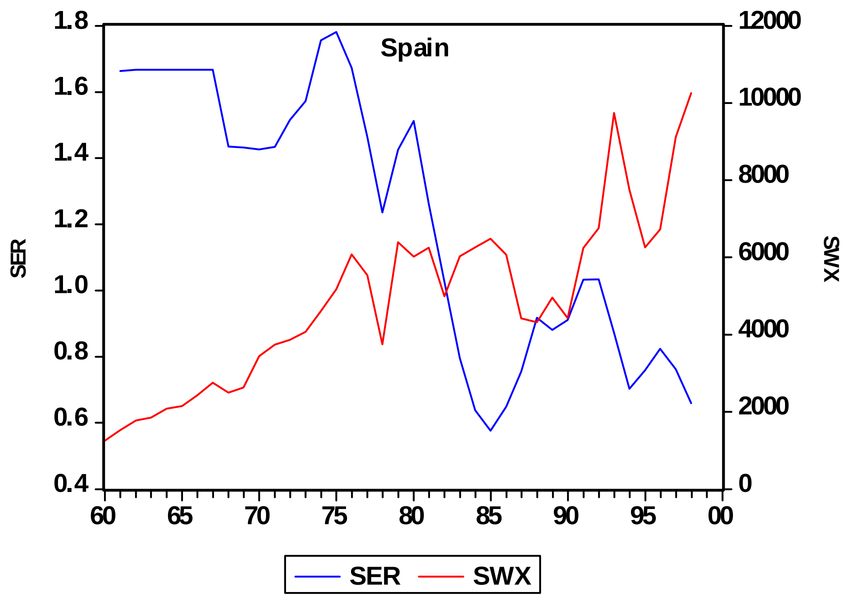
Graph 12



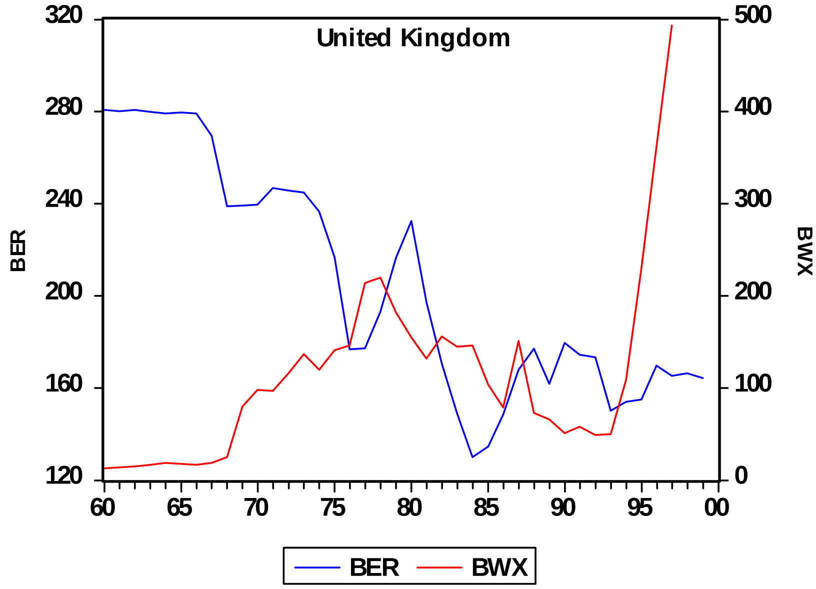
Graph 13



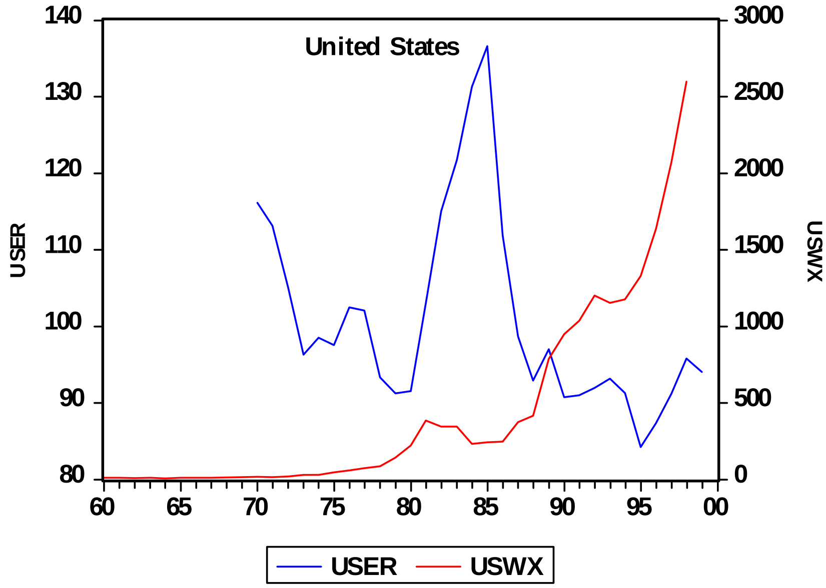
Graph 14



Graph 15



Graph 16



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Appendix A

Wine Correlation Summary – Differences

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

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.3.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.4.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.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

Wine Correlation Summary – Levels

Table A.1.b

Australia

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	-0.537	0.839	0.704	0.748	0.830
Employment	0.415	-0.638	-0.300	-0.619	-0.653
Unemployment Rate	-0.398	0.740	0.718	0.546	0.972
Industrial Production	-0.619	0.877	0.759	0.682	0.735
Commodity Output	-0.547	0.629	0.622	0.745	0.740
Earnings	-0.603	0.743	0.331	0.430	0.382
Prices and Wages					
Consumer Prices	-0.565	0.810	0.594	0.703	0.749
Share Prices	-0.547	0.629	0.622	0.745	0.740
Interest Rates	0.487	-0.733	-0.383	-0.622	-0.615
Wages	-0.603	0.743	0.331	0.430	0.382
Trade					
Trade Balance	-0.202	-0.107	0.252	-0.438	-0.339
Imports	-0.501	0.833	0.840	0.771	0.875
Exchange Rate	0.001	-0.183	-0.548	-0.643	-0.699

Table A.2.b

France

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	-0.955	0.346	0.926	-0.273	0.261
Employment	0.922	-0.543	-0.777	0.255	-0.058
Unemployment Rate	-0.895	0.577	0.702	-0.232	0.053
Industrial Production	-0.230	-0.246	0.500	0.015	0.848
Commodity Output	-0.463	-0.105	0.579	-0.043	0.774
Prices and Wages					
Consumer Prices	-0.963	0.384	0.907	-0.274	0.178
Producer Prices	0.328	-0.271	-0.045	0.182	0.314
Share Prices	-0.463	-0.105	0.579	-0.043	0.774
Interest Rates	0.826	-0.325	-0.714	0.271	-0.423
Wages	-0.971	0.395	0.905	-0.289	0.173
Trade					
Trade Balance	0.680	-0.208	-0.592	0.087	-0.211
Imports	-0.645	0.008	0.784	-0.173	0.731
Exchange Rate	-0.415	0.085	0.625	0.133	-0.458

Table A.3.b

France Table Wine

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	-0.980	-0.321	-0.630	-0.717	0.634
Employment	0.943	0.105	0.609	0.738	-0.495
Unemployment Rate	-0.907	-0.017	-0.641	-0.705	0.460
Industrial Production	-0.313	-0.708	-0.041	-0.117	0.813
Commodity Output	0.062	-0.406	0.065	0.087	0.531
Earnings					
Prices and Wages					
Consumer Prices	-0.983	-0.289	-0.627	-0.725	0.589
Producer Prices	0.274	-0.738	0.706	0.266	0.410
Share Prices	-0.707	-0.256	-0.624	-0.466	0.780
Interest Rates	0.847	0.308	0.440	0.667	-0.799
Wages	-0.988	-0.227	-0.692	-0.736	0.541
Trade					
Trade Balance	-0.944	-0.260	-0.756	-0.649	0.636
Imports	-0.687	-0.666	-0.341	-0.449	0.884
Exchange Rate	-0.440	-0.310	-0.005	-0.149	0.004

Table A.4.b

Germany

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	0.513	0.336	0.774	-0.821	-0.433
Employment	-0.419	-0.259	-0.621	0.913	0.431
Unemployment Rate	0.595	0.429	0.620	-0.815	-0.327
Industrial Production	0.504	0.424	0.869	0.034	-0.189
Commodity Output	0.249	0.156	0.731	-0.384	-0.592
Prices and Wages					
Consumer Prices	0.450	0.274	0.650	-0.903	-0.443
Producer Prices	0.487	0.241	0.886	-0.760	-0.517
Share Prices	0.633	0.459	0.703	-0.588	-0.353
Interest Rates	-0.436	-0.295	-0.623	0.901	0.372
Wages	0.594	0.388	0.735	-0.855	-0.346
Trade					
Trade Balance	0.649	0.440	0.794	-0.780	-0.346
Imports	0.562	0.339	0.699	-0.789	-0.455
Exchange Rate	-0.551	-0.462	-0.028	0.137	-0.103

Table A.5.b

Italy

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	-0.660	-0.365	0.773	-0.732	0.689
Employment	0.399	0.644	-0.305	0.477	-0.763
Unemployment Rate	0.357	-0.257	-0.148	-0.308	0.460
Industrial Production	-0.416	-0.310	0.653	-0.898	0.816
Commodity Output	-0.591	-0.273	0.566	-0.740	0.665
Prices and Wages					
Consumer Prices	-0.677	-0.408	0.744	-0.699	0.695
Producer Prices	-0.650	-0.373	0.733	-0.681	0.678
Share Prices	-0.276	0.042	-0.070	-0.309	0.481
Interest Rates	0.336	0.530	-0.207	0.587	-0.706
Trade					
Trade Balance	-0.542	-0.656	0.408	-0.515	0.727
Imports	-0.562	-0.401	0.690	-0.761	0.773
Exchange Rate	0.479	0.544	-0.047	0.327	-0.666

Table A.6.b

Spain

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	-0.558	0.466	0.714	-0.548	0.519
Employment	0.317	-0.304	0.601	0.372	-0.332
Unemployment Rate	-0.556	0.738	0.526	-0.649	0.230
Industrial Production	0.055	0.048	0.718	-0.049	-0.268
Commodity Output	-0.250	0.378	0.194	0.200	0.339
Prices and Wages					
Consumer Prices	-0.594	0.513	0.638	-0.614	0.538
Share Prices	0.248	-0.005	0.605	-0.210	-0.135
Interest Rates	0.494	-0.363	-0.608	0.532	-0.553
Wages	-0.593	0.469	0.634	-0.575	0.572
Trade					
Trade Balance	-0.649	0.309	0.208	-0.554	0.701
Imports	-0.529	0.416	0.748	-0.530	0.463
Exchange Rate	0.602	-0.494	-0.328	0.437	-0.346

Table A.7.b

United Kingdom

	Consumption	Imports	Production	Exports
Incomes				
GDP	0.648	0.904	0.694	0.938
Employment	-0.336	-0.306	-0.135	-0.214
Industrial Production	0.556	0.775	0.472	0.768
Commodity Output	0.371	0.663	0.439	0.783
Earnings	0.655	0.852	0.635	0.861
Prices and Wages				
Consumer Prices	0.646	0.860	0.672	0.873
Producer Prices	0.540	0.818	0.644	0.843
Share Prices	0.700	0.923	0.682	0.934
Interest Rates	-0.373	-0.478	-0.231	-0.425
Trade				
Trade Balance	-0.043	0.127	0.332	0.161
Imports	0.600	0.846	0.603	0.876
Exchange Rate	-0.115	-0.154	0.108	-0.071

Table A.8.b

United States

	Consumption	Imports	Prices	Production	Exports
Incomes					
GDP	-0.355	-0.049	0.890	0.437	0.970
Employment	0.653	0.267	-0.373	0.059	-0.545
Unemployment Rate	-0.320	-0.169	-0.488	-0.484	-0.374
Industrial Production	-0.114	0.132	0.949	0.607	0.922
Earnings	-0.341	-0.016	0.902	0.453	0.973
Prices and Wages					
Consumer Prices	-0.450	-0.140	0.845	0.344	0.963
Producer Prices	-0.457	-0.221	0.809	0.266	0.957
Share Prices	-0.093	0.257	0.957	0.675	0.952
Interest Rates	0.412	0.041	-0.111	0.100	-0.233
Funds Rate	0.618	0.243	-0.311	0.090	-0.517
Trade					
Trade Balance	-0.451	-0.619	-0.755	-0.794	-0.428
Imports	-0.182	0.084	0.945	0.545	0.932
Exchange Rate	0.488	0.545	-0.548	0.014	-0.682

Table A.9.b

World (vs. US Indicators)

	Consumption	Imports	Production	Exports
Incomes				
GDP	-0.850	0.409	-0.608	0.547
Employment	0.585	0.080	0.602	0.001
Unemployment Rate	0.413	0.334	0.222	0.225
Industrial Production	-0.800	0.468	-0.538	0.606
Earnings	-0.750	0.507	-0.507	0.605
Prices and Wages				
Consumer Prices	-0.794	0.466	-0.555	0.585
Producer Prices	-0.651	0.577	-0.417	0.666
Share Prices	-0.905	0.269	-0.668	0.453
Interest Rates	0.376	0.454	0.545	0.473
Funds Rate	0.501	0.377	0.656	0.345
Trade				
Trade Balance	0.755	-0.430	0.440	-0.502
Imports	-0.838	0.429	-0.580	0.589
Exchange Rate	0.459	0.089	0.351	-0.072

Appendix B

Percentage Change, Static Regressions

<u>Consumption</u>

Table B.1.a

Australia

LS // Dependent Variable is PCWC
Date: 04/29/00   Time: 15:26
Sample(adjusted): 1964 1997
Included observations: 34 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.06262	0.067768	-0.924042	0.3628
PCGDP	1.121608	1.137657	0.985893	0.3321
PCCP	0.551804	1.537212	0.358964	0.7221
PCER	-0.435347	0.254839	-1.708319	0.0979

R-squared	0.147277	Mean dependent var	0.033387
Adjusted R-squared	0.062005	S.D. dependent var	0.146337
S.E. of regression	0.141728	Akaike info criterion	-3.797563
Sum squared resid	0.602603	Schwarz criterion	-3.617992
Log likelihood	20.31467	F-statistic	1.727142
Durbin-Watson stat	2.767276	Prob(F-statistic)	0.182562

Table B.1.b

Germany

LS // Dependent Variable is PCWC
Date: 04/17/00 Time: 14:21
Sample(adjusted): 1992 1998
Included observations: 7 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.067119	0.02146	3.127656	0.0522
PCGDP	-1.313558	0.608403	-2.159026	0.1197
PCCP	-1.562792	0.668087	-2.339204	0.1013
PCIR	-0.112411	0.05752	-1.954289	0.1457
R-squared	0.931265	Mean dependent var		-0.012083
Adjusted R-squared	0.862531	S.D. dependent var		0.05029
S.E. of regression	0.018646	Akaike info criterion		-7.668691
Sum squared resid	0.001043	Schwarz criterion		-7.699599
Log likelihood	20.90785	F-statistic		13.54872
Durbin-Watson stat	2.012134	Prob(F-statistic)		0.029953

Table B.1.c

Italy

LS // Dependent Variable is PCWC
Date: 04/17/00 Time: 14:32
Sample(adjusted): 1976 1998
Included observations: 23 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.003169	0.024529	-0.129187	0.8986
PCSP	-0.114374	0.034608	-3.304872	0.0037
PCCP	0.00964	0.242423	0.039764	0.9687
PCER	0.016891	0.115387	0.14639	0.8852
R-squared	0.371508	Mean dependent var		-0.0245
Adjusted R-squared	0.272273	S.D. dependent var		0.069068
S.E. of regression	0.05892	Akaike info criterion		-5.506385
Sum squared resid	0.065959	Schwarz criterion		-5.308908
Log likelihood	34.68784	F-statistic		3.743704
Durbin-Watson stat	2.061521	Prob(F-statistic)		0.028731

Table B.1.d

United Kingdom

LS // Dependent Variable is PCWC
Date: 04/17/00 Time: 13:28
Sample(adjusted): 1972 1998
Included observations: 27 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.038913	0.072203	0.538937	0.5951
PCGDP	0.825605	1.278808	0.645605	0.5249
PCCP	-0.868351	1.1383	-0.762849	0.4533
PCIR	0.254263	0.133185	1.909102	0.0688

R-squared	0.20248	Mean dependent var	0.064794
Adjusted R-squared	0.098456	S.D. dependent var	0.161668
S.E. of regression	0.153504	Akaike info criterion	-3.612108
Sum squared resid	0.541958	Schwarz criterion	-3.420132
Log likelihood	14.45212	F-statistic	1.946471
Durbin-Watson stat	3.094983	Prob(F-statistic)	0.15028

Table B.1.e

United States

LS // Dependent Variable is PCWC
Date: 04/25/00 Time: 20:50
Sample(adjusted): 1971 1998
Included observations: 28 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.056563	0.035238	-1.605158	0.1221
PCGDP	1.356962	0.591202	2.295261	0.0312
PCCE	-0.59497	0.431815	-1.377836	0.1815
PCER	-0.113609	0.146627	-0.77482	0.4463
PCCP	-0.431201	0.46176	-0.933821	0.3601

R-squared	0.22477	Mean dependent var	0.027965
Adjusted R-squared	0.089947	S.D. dependent var	0.05439
S.E. of regression	0.051886	Akaike info criterion	-5.756975
Sum squared resid	0.06192	Schwarz criterion	-5.519081
Log likelihood	45.86737	F-statistic	1.667154
Durbin-Watson stat	1.306244	Prob(F-statistic)	0.191833

Production

Table B.2.a

Australia

LS // Dependent Variable is PCWQ
Date: 04/29/00 Time: 18:14
Sample(adjusted): 1961 1997
Included observations: 37 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.079026	0.025846	3.057623	0.0043
PCER	-0.590052	0.255689	-2.307695	0.0272
PCUR	-0.361051	0.175868	-2.052962	0.0478

R-squared	0.180621	Mean dependent var	0.050543
Adjusted R-squared	0.132423	S.D. dependent var	0.154163
S.E. of regression	0.143593	Akaike info criterion	-3.803934
Sum squared resid	0.701048	Schwarz criterion	-3.673319
Log likelihood	20.87206	F-statistic	3.747427
Durbin-Watson stat	3.005449	Prob(F-statistic)	0.033825

Table B.2.b

France

LS // Dependent Variable is PCWQ
Date: 04/25/00 Time: 19:21
Sample(adjusted): 1971 1997
Included observations: 27 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.006081	0.040201	-0.151256	0.881
PCTB	0.002905	0.001522	1.908955	0.0683
PCER	0.463467	0.350539	1.322154	0.1986

R-squared	0.198403	Mean dependent var	0.009448
Adjusted R-squared	0.131603	S.D. dependent var	0.220624
S.E. of regression	0.205594	Akaike info criterion	-3.059263
Sum squared resid	1.014456	Schwarz criterion	-2.915281
Log likelihood	5.988706	F-statistic	2.970118
Durbin-Watson stat	2.768711	Prob(F-statistic)	0.070384

Table B.2.c

Germany

LS // Dependent Variable is PCWQ
Date: 04/13/00   Time: 22:45
Sample(adjusted): 1992 1998
Included observations: 7 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.364635	0.33044	-1.103485	0.3504
PCEM	17.65954	7.588071	2.327276	0.1024
PCIP	5.944275	3.941469	1.508137	0.2286
PCCP	49.58487	22.37009	2.21657	0.1134
R-squared	0.702768	Mean dependent var		0.087954
Adjusted R-squared	0.405537	S.D. dependent var		0.324575
S.E. of regression	0.250252	Akaike info criterion		-2.475015
Sum squared resid	0.187878	Schwarz criterion		-2.505923
Log likelihood	2.729981	F-statistic		2.364379
Durbin-Watson stat	3.147589	Prob(F-statistic)		0.24909

Table B.2.d

Italy

LS // Dependent Variable is PCWQ
Date: 04/17/00   Time: 14:35
Sample(adjusted): 1971 1998
Included observations: 28 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.06273	0.046427	-1.351148	0.1892
PCCP	0.467212	1.021294	0.45747	0.6514
PCER	0.513164	0.222951	2.301692	0.0303
PCGDP	0.232173	0.791166	0.293457	0.7717
R-squared	0.220267	Mean dependent var		-0.001273
Adjusted R-squared	0.1228	S.D. dependent var		0.121548
S.E. of regression	0.11384	Akaike info criterion		-4.214356
Sum squared resid	0.31103	Schwarz criterion		-4.024041
Log likelihood	23.27071	F-statistic		2.259917
Durbin-Watson stat	2.215962	Prob(F-statistic)		0.107266

Table B.2.e

Spain

LS // Dependent Variable is PCWQ
Date: 04/25/00 Time: 19:00
Sample(adjusted): 1974 1997
Included observations: 24 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.417128	0.41922	0.99501	0.3316
PCSO	17.63255	6.082231	2.899026	0.0089
PCIP	-12.92877	10.18179	-1.269794	0.2187
PCEM	33.73589	15.53805	2.171179	0.0421
R-squared	0.382555	Mean dependent var		0.373672
Adjusted R-squared	0.289939	S.D. dependent var		2.059069
S.E. of regression	1.735077	Akaike info criterion		1.253116
Sum squared resid	60.20988	Schwarz criterion		1.449458
Log likelihood	-45.09191	F-statistic		4.130523
Durbin-Watson stat	1.287432	Prob(F-statistic)		0.019705

Table B.2.f

United Kingdom

LS // Dependent Variable is PCWQ
Date: 04/17/00 Time: 13:34
Sample(adjusted): 1980 1997
Included observations: 18 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.079691	0.319353	-0.249538	0.8066
PCGDP	11.04368	3.47974	3.173709	0.0068
PCER	-0.818685	1.113971	-0.734925	0.4745
PCSP	-3.8663	1.022924	-3.779656	0.002
R-squared	0.616678	Mean dependent var		0.315858
Adjusted R-squared	0.534537	S.D. dependent var		0.633965
S.E. of regression	0.432521	Akaike info criterion		-1.483117
Sum squared resid	2.619047	Schwarz criterion		-1.285256
Log likelihood	-8.192843	F-statistic		7.507597
Durbin-Watson stat	2.261946	Prob(F-statistic)		0.003113

Table B.2.g

United States

LS // Dependent Variable is PCWQ				
Date: 04/13/00 Time: 23:28				
Sample(adjusted): 1961 1998				
Included observations: 38 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.060873	0.045808	1.328883	0.1925
PCCP	-0.179697	1.477884	-0.121591	0.9039
PCPP	-0.172004	0.958954	-0.179367	0.8587
R-squared	0.010679	Mean dependent var		0.046047
Adjusted R-squared	-0.045854	S.D. dependent var		0.127796
S.E. of regression	0.130693	Akaike info criterion		-3.994145
Sum squared resid	0.597827	Schwarz criterion		-3.864862
Log likelihood	24.9691	F-statistic		0.1889
Durbin-Watson stat	2.793502	Prob(F-statistic)		0.828708

<u>Imports</u>

Table B.3.a

Australia

LS // Dependent Variable is PCWM				
Date: 04/17/00 Time: 13:17				
Sample(adjusted): 1992 1997				
Included observations: 6 after adjusting endpoints				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.969354	1.025686	0.945078	0.518
PCER	3.727507	2.202268	1.692577	0.3397
PCGDP	-12.42011	22.88352	-0.542754	0.6834
PCSO	-2.241056	2.208302	-1.014832	0.4953
PCTB	-0.901432	7.505161	-0.120108	0.9239
R-squared	0.837332	Mean dependent var		0.216884
Adjusted R-squared	0.18666	S.D. dependent var		0.398826
S.E. of regression	0.359682	Akaike info criterion		-2.17016
Sum squared resid	0.129371	Schwarz criterion		-2.343694
Log likelihood	2.99685	F-statistic		1.286874
Durbin-Watson stat	0.883322	Prob(F-statistic)		0.572178

Table B.3.b

Germany

LS // Dependent Variable is PCWM
Date: 04/17/00 Time: 14:24
Sample(adjusted): 1992 1997
Included observations: 6 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.247822	0.102988	2.406321	0.1379
PCPP	-14.32394	5.619234	-2.549091	0.1256
PCTB	0.515253	0.292016	1.764466	0.2197
PCCP	-8.956143	4.208451	-2.128133	0.1671

R-squared	0.810933	Mean dependent var	0.000654
Adjusted R-squared	0.527332	S.D. dependent var	0.13289
S.E. of regression	0.091363	Akaike info criterion	-4.551115
Sum squared resid	0.016694	Schwarz criterion	-4.689942
Log likelihood	9.139715	F-statistic	2.859418
Durbin-Watson stat	1.769507	Prob(F-statistic)	0.26974

Table B.3.c

Spain

LS // Dependent Variable is PCWM
Date: 04/25/00 Time: 19:01
Sample(adjusted): 1991 1997
Included observations: 7 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.434349	0.062134	6.990526	0.006
PCUR	20.6827	0.596704	34.66156	0.0001
PCTB	7.671663	0.33911	22.62295	0.0002
PCSP	4.551772	0.512252	8.885799	0.003

R-squared	0.998109	Mean dependent var	1.041588
Adjusted R-squared	0.996219	S.D. dependent var	2.303607
S.E. of regression	0.141656	Akaike info criterion	-3.61315
Sum squared resid	0.060199	Schwarz criterion	-3.644058
Log likelihood	6.713454	F-statistic	527.9046
Durbin-Watson stat	2.910374	Prob(F-statistic)	0.000139

Table B.3.d

United States

LS // Dependent Variable is PCWM
Date: 04/29/00 Time: 15:29
Sample(adjusted): 1966 1998
Included observations: 33 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.050809	0.078191	-0.649797	0.5211
PCW	7.244236	1.654531	4.378423	0.0002
PCCP	-6.594509	2.108948	-3.126919	0.0041
PCPP	1.280144	1.268438	1.009229	0.3215
PCSP	0.442218	0.250446	1.765724	0.0883

R-squared	0.457737	Mean dependent var	0.075582
Adjusted R-squared	0.380271	S.D. dependent var	0.196165
S.E. of regression	0.154426	Akaike info criterion	-3.597348
Sum squared resid	0.66773	Schwarz criterion	-3.370605
Log likelihood	17.53128	F-statistic	5.908874
Durbin-Watson stat	1.911939	Prob(F-statistic)	0.001408

Exports

Table B.4.a

Australia

LS // Dependent Variable is PCWX
Date: 04/17/00 Time: 13:23
Sample(adjusted): 1968 1997
Included observations: 30 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.481415	0.130805	3.680396	0.0011
PCSP	-0.403368	0.201209	-2.004721	0.0555
PCHW	-3.35024	1.71203	-1.956882	0.0612
PCGDP	-0.877311	2.06667	-0.424505	0.6747

R-squared	0.308037	Mean dependent var	0.153865
Adjusted R-squared	0.228195	S.D. dependent var	0.305038
S.E. of regression	0.267983	Akaike info criterion	-2.510095
Sum squared resid	1.867193	Schwarz criterion	-2.323268
Log likelihood	-0.916734	F-statistic	3.858086
Durbin-Watson stat	1.118925	Prob(F-statistic)	0.020821

Table B.4.b

France

LS // Dependent Variable is PCWX
Date: 04/20/00 Time: 23:09
Sample(adjusted): 1971 1998
Included observations: 28 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.025151	0.039967	0.6293	0.5351
PCCP	0.475263	0.855324	0.555652	0.5836
PCIM	0.681729	0.204604	3.33195	0.0028
PCGDP	-0.780308	0.947616	-0.823444	0.4184

R-squared	0.408915	Mean dependent var	0.06255
Adjusted R-squared	0.33503	S.D. dependent var	0.113186
S.E. of regression	0.092299	Akaike info criterion	-4.633889
Sum squared resid	0.204457	Schwarz criterion	-4.443574
Log likelihood	29.14416	F-statistic	5.534438
Durbin-Watson stat	1.927041	Prob(F-statistic)	0.004935

Table B.4.c

Germany

LS // Dependent Variable is PCWX
Date: 04/17/00 Time: 14:26
Sample(adjusted): 1992 1998
Included observations: 7 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.111835	0.076326	-1.465222	0.2391
PCPP	-12.31009	5.602012	-2.19744	0.1154
PCIR	-1.029627	0.339651	-3.031427	0.0562
PCIP	1.557078	1.21441	1.282169	0.2899

R-squared	0.836905	Mean dependent var	-0.075631
Adjusted R-squared	0.673811	S.D. dependent var	0.20616
S.E. of regression	0.117744	Akaike info criterion	-3.982928
Sum squared resid	0.041591	Schwarz criterion	-4.013836
Log likelihood	8.007677	F-statistic	5.131412
Durbin-Watson stat	1.976559	Prob(F-statistic)	0.106176

Table B.4.d

Italy

LS // Dependent Variable is PCWX
Date: 04/17/00 Time: 14:35
Sample(adjusted): 1971 1998
Included observations: 28 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.133497	0.105232	1.268603	0.2167
PCSO	0.600108	0.791355	0.75833	0.4556
PCER	-0.186772	0.460043	-0.405988	0.6883
PCGDP	-0.6494	0.741548	-0.875735	0.3899

R-squared	0.047708	Mean dependent var	0.062997
Adjusted R-squared	-0.071328	S.D. dependent var	0.249119
S.E. of regression	0.257851	Akaike info criterion	-2.579185
Sum squared resid	1.595688	Schwarz criterion	-2.38887
Log likelihood	0.378312	F-statistic	0.400785
Durbin-Watson stat	1.842715	Prob(F-statistic)	0.753692

Table B.4.e

Spain

LS // Dependent Variable is PCWX
Date: 04/25/00 Time: 18:59
Sample(adjusted): 1991 1997
Included observations: 7 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.144688	0.084814	1.705958	0.1866
PCTB	-1.137331	0.559329	-2.033383	0.1349
PCER	2.089173	1.067943	1.956259	0.1454
PCIP	-5.048305	3.037406	-1.662045	0.1951

R-squared	0.710527	Mean dependent var	0.138244
Adjusted R-squared	0.421054	S.D. dependent var	0.273048
S.E. of regression	0.207758	Akaike info criterion	-2.847205
Sum squared resid	0.12949	Schwarz criterion	-2.878114
Log likelihood	4.032649	F-statistic	2.454555
Durbin-Watson stat	2.369384	Prob(F-statistic)	0.240094

Table B.4.f

United Kingdom

LS // Dependent Variable is PCWX
Date: 04/17/00 Time: 13:37
Sample(adjusted): 1991 1997
Included observations: 7 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.60741	5.346649	2.545036	0.2383
PCGDP	-346.3386	127.4083	-2.718336	0.2244
PCER	-21.45456	7.541692	-2.844794	0.2152
PCEM	194.6195	60.78052	3.202004	0.1927
PCCP	258.4146	77.69421	3.326047	0.1859
PCIR	-12.19364	3.667609	-3.324684	0.186

R-squared	0.979177	Mean dependent var	0.461399
Adjusted R-squared	0.875059	S.D. dependent var	0.522618
S.E. of regression	0.18473	Akaike info criterion	-3.609349
Sum squared resid	0.034125	Schwarz criterion	-3.655712
Log likelihood	8.700152	F-statistic	9.404534
Durbin-Watson stat	2.734925	Prob(F-statistic)	0.242435

Table B.4.g

United States

LS // Dependent Variable is PCWX
Date: 04/13/00 Time: 23:29
Sample(adjusted): 1961 1998
Included observations: 38 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.067738	0.132892	0.509722	0.6134
PCGDP	0.242753	1.908257	0.127212	0.8995
PCPP	2.657961	1.057226	2.51409	0.0167

R-squared	0.223924	Mean dependent var	0.186468
Adjusted R-squared	0.179577	S.D. dependent var	0.272786
S.E. of regression	0.247082	Akaike info criterion	-2.720414
Sum squared resid	2.136732	Schwarz criterion	-2.591131
Log likelihood	0.768198	F-statistic	5.049338
Durbin-Watson stat	2.325327	Prob(F-statistic)	0.011839

Prices

Table B.5.a

Australia

LS // Dependent Variable is PCWP
Date: 04/17/00 Time: 13:19
Sample(adjusted): 1986 1997
Included observations: 12 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.337619	0.171575	1.967768	0.0898
PCGDP	1.388289	3.393081	0.409153	0.6947
PCCP	-19.56558	7.342323	-2.664767	0.0322
PCWW	4.4601	2.768057	1.611274	0.1512
PCER	-0.411558	0.517428	-0.795391	0.4525

R-squared	0.519913	Mean dependent var	0.077432
Adjusted R-squared	0.245578	S.D. dependent var	0.159508
S.E. of regression	0.138544	Akaike info criterion	-3.658795
Sum squared resid	0.134361	Schwarz criterion	-3.456751
Log likelihood	9.925508	F-statistic	1.895175
Durbin-Watson stat	2.712475	Prob(F-statistic)	0.216183

Table B.5.b

France

LS // Dependent Variable is PCWP
Date: 04/20/00 Time: 23:08
Sample(adjusted): 1990 1997
Included observations: 8 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.090622	0.025531	3.549537	0.0164
PCEM	2.453627	1.122236	2.186374	0.0805
PCER	0.711965	0.179569	3.964852	0.0107

R-squared	0.866846	Mean dependent var	0.058393
Adjusted R-squared	0.813585	S.D. dependent var	0.103421
S.E. of regression	0.044653	Akaike info criterion	-5.93768
Sum squared resid	0.009969	Schwarz criterion	-5.90789
Log likelihood	15.39921	F-statistic	16.27531
Durbin-Watson stat	2.045933	Prob(F-statistic)	0.00647

Table B.5.c

Germany

LS // Dependent Variable is PCWP
Date: 04/13/00 Time: 22:51
Sample(adjusted): 1992 1997
Included observations: 6 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.044858	0.077158	0.58137	0.6198
PCEM	1.598893	1.295346	1.234337	0.3424
PCIP	1.300968	0.971831	1.338677	0.3126
PCPP	9.479085	3.711798	2.553772	0.1252

R-squared	0.921926	Mean dependent var	0.036156
Adjusted R-squared	0.804816	S.D. dependent var	0.136768
S.E. of regression	0.060424	Akaike info criterion	-5.378024
Sum squared resid	0.007302	Schwarz criterion	-5.516851
Log likelihood	11.62044	F-statistic	7.872289
Durbin-Watson stat	1.662966	Prob(F-statistic)	0.114794

Table B.5.d

Italy

LS // Dependent Variable is PCWP
Date: 04/26/00 Time: 17:14
Sample(adjusted): 1987 1997
Included observations: 11 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.003349	0.134737	-0.024854	0.9808
PCER	1.045186	0.327266	3.193691	0.0127
PCCP	1.482145	2.647884	0.559747	0.591

R-squared	0.628877	Mean dependent var	0.056649
Adjusted R-squared	0.536096	S.D. dependent var	0.145448
S.E. of regression	0.099065	Akaike info criterion	-4.396948
Sum squared resid	0.078512	Schwarz criterion	-4.288431
Log likelihood	11.57489	F-statistic	6.778104
Durbin-Watson stat	2.254471	Prob(F-statistic)	0.01897

Table B.5.e

Spain

LS // Dependent Variable is PCWP
Date: 04/13/00 Time: 23:11
Sample(adjusted): 1991 1997
Included observations: 7 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.206036	0.301906	3.99474	0.0281
PCEM	-6.793284	3.196514	-2.125217	0.1236
PCHW	-15.72548	4.349317	-3.61562	0.0364
PCTB	1.509951	0.340329	4.436744	0.0213

R-squared	0.929667	Mean dependent var	0.092438
Adjusted R-squared	0.859333	S.D. dependent var	0.270655
S.E. of regression	0.101511	Akaike info criterion	-4.279621
Sum squared resid	0.030913	Schwarz criterion	-4.310529
Log likelihood	9.046103	F-statistic	13.218
Durbin-Watson stat	3.114659	Prob(F-statistic)	0.030989

Table B.5.f

United States

LS // Dependent Variable is PCWP
Date: 04/13/00 Time: 23:27
Sample(adjusted): 1987 1997
Included observations: 11 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.277156	0.088217	3.141736	0.0119
PCGDP	-3.876795	1.527078	-2.5387	0.0318

R-squared	0.417287	Mean dependent var	0.058512
Adjusted R-squared	0.352541	S.D. dependent var	0.078741
S.E. of regression	0.063359	Akaike info criterion	-5.354909
Sum squared resid	0.036129	Schwarz criterion	-5.282564
Log likelihood	15.84367	F-statistic	6.445
Durbin-Watson stat	1.536982	Prob(F-statistic)	0.031778