Macroeconomic Policy and Agricultural Cycles in Australia and the United States

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The agricultural economies of Australia and the United States experienced a major boom in the 1970s and a major bust in the 1980s. This paper examines the contribution of macroeconomic policy to these phenomena in the two countries over the last twenty years. We find that the observed agricultural cycles in the two countries were in part the unintended consequences of macroeconomic policies pursued for other reasons. Agriculture in both countries is heavily dependent on export demand and is highly capital intensive. Macroeconomic policies affecting exchange rates and interest rates are thus of considerable importance to these sectors. Implications for agricultural policy are also discussed.

1. Introduction

During the 1970s there was an agricultural boom in both Australia and the United States. In both countries this boom was followed by a major bust in the early 1980s, a mild recovery in the late 1980s, and a mild recession in the early 1990s. The correspondence between agricultural booms and busts in the two countries is rather remarkable given the differences in the overall structure and world economic significance of agriculture in the two countries, and given that economic policies in the two countries are only loosely, if at all, coordinated. Australia is a small, open economy heavily dependent on its primary industries for export earnings. It has quite small industrial sectors that are oligopolistic in nature and in many instances heavily protected from world competition. The United States, in contrast, is a large, open economy less dependent on its primary industries. It relies more on competition than protectionism for its nonagricultural economy. In 1993 Australian agricultural exports constituted 21 per cent of total exports and accounted for 73 per cent of gross value of agricultural production, in the same year United States agricultural exports constituted only 10 per cent of total exports and accounted for just 24 per cent of gross value of agricultural production.

The central purpose of this paper is to investigate the hypothesis that the observed agricultural cycles in Australia and the United States have to a significant degree been the result of macroeconomic policies affecting exchange rates and real interest rates in the respective countries. The macroeconomic-agricultural linkages have been studied by several authors in recent years but remain imperfectly understood. This paper focuses on the period during and subsequent to currency market deregulation in both countries in an effort to help clarify these linkages.

The first section of the paper reviews the essential theoretical ideas guiding this inquiry, and concentrates on the fundamentals of exchange rate determination and impacts. The second section reviews briefly the major macroeconomic policies pursued in Australia and in the United States since 1970 and highlights the fact that in both countries major macroeconomic policy changes occurred during the period under study including deregulation of the currency markets. The third section examines the empirical evidence and reveals some basic similarities in the macroeconomic-agricultural linkages in the two countries as well as some significant differences.

2. Theoretical Perspective

As several authors have demonstrated, variations in a country's exchange rate is expected to have a direct impact on its exports and imports (Dornbusch, Edwards, Hallberg, Houck, Kost, and Stockman). The value of a country's currency, say the Australian dollar ($A), depends on the demand for this currency by the rest of the world and on the supply of this currency to the rest of the world. The demand for $A depends on foreign demand for Australian goods, services, and se-

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curities while the supply of $A depends on Australia's demand for foreign goods, services, and securities. Australia must supply $A to get foreign currency with which to buy foreign goods, services, and securities.

When the $A depreciates against the currencies of its major trading partners, (1) Australia's exports of goods and services rise since they become less expensive to foreigners (that is, world prices expressed in $A fall thereby stimulating demand for Australia's exports), (2) domestic prices for these tradable goods and services rise leading to a reduction in domestic consumption and to an increase in domestic production, (3) Australian securities become less attractive to foreigners since the yield to foreigners falls, and (4) Australia's imports of goods and services from other countries fall since these goods and services become more expensive to Australians. Exactly opposite effects will be produced by an appreciation of the $A: world prices (expressed in $A) of Australian export goods and services will rise discouraging foreign demand and thus Australian exports, domestic prices of these goods and services will fall leading to an increase in domestic consumption and a decrease in domestic production, and imports of goods and services from other countries will rise.

Two additional factors affecting the value of a country's currency are relative inflation rates and relative (real) interest rates. When inflation in Australia exceeds inflation in the rest of the world, the $A must depreciate against foreign currencies in order to encourage foreigners to maintain their demand for Australian goods and services. Similarly when real interest rates in Australia fall below real interest rates in the rest of the world, the $A must depreciate against foreign currencies in order to forestall a reduction in foreign demand for Australian securities. Thus monetary and fiscal policies designed to influence inflation rates and interest rates will have an indirect impact on exchange rates.

The economic consequences of exchange rate variations, however, are not confined to trade. Depreciation of the A$ which leads to increased domestic prices and increased exports is expected to result in increased incomes for producers of export commodities which would, in turn, drive up the price of basic resources used to produce these commodities[1]. Thus when the $A depreciates, debt expansion in Australia's export industries is encouraged as collateral used to support producers' debt rises in value. An appreciation of the $A, on the other hand, could lead to substantial financial difficulties — even foreclosures — since the value of collateral used to support producers' debt falls under this scenario. If, coincident with an appreciation of the $A leading to reduced incomes and declining asset values in the export industries, real interest rates are also high, producers may find they have too little income with which to service their debt.

Offsetting the expected income gains to farmers from a depreciation of a country's currency would be any losses due to the higher cost of imported inputs. As revealed by interindustry studies of the Australian and U.S. economies, however, imported inputs constitute a very small proportion of total inputs in the agricultural sector (Australian Bureau of Statistics, U.S. Department of Commerce). Further, imported inputs incorporate substantial nontraded transportation and other marketing services as well as taxes which respond marginally if at all to exchange rate changes. Thus for the purposes of this study it is assumed changes in the cost of imported inputs in response to exchange rate variations will have only marginal affects on net returns to farmers in the two countries.

Obviously the real world is much more complex than is the theoretical world. In the first place, for the above results to hold unequivocally the dollar price of Australian goods must equal the dollar price of comparable foreign goods — i.e., "purchasing power parity" must hold. It is unrealistic to assume that purchasing power parity holds without fail in the real world. It is not unrealistic to assume, however, that changes in exchange rates will move prices of goods and services in the direction predicted by purchasing power parity. In the second place, it is clear that all currency ratios do not typically change to the same degree. Thus trade between any one country and all other countries will also not change to the same degree. Third, some countries prefer to protect their local industries, even if at considerable taxpayer expense. Thus in some cases trade flows may be prevented from changing in

[1] The elasticity of total revenue with respect to the exchange rate under the assumption of no government intervention or other market imperfection anywhere can be shown to be a function of supply and demand elasticities in all countries of the world as well as of the relative importance of supply and demand in all countries. Thus the sign and magnitude of this elasticity is largely an empirical question. Under vary general conditions, however, this elasticity is expected to be negative in countries for which exports are an important source to total revenue.

response to exchange rate variations because of domestic or foreign trade or agricultural commodity policy.

3. Macroeconomic Policies

3.1 Australia

Since the 1950s inflation in Australia has been consistently above the average rate of inflation in the industrialized economies (Hogan and Sterland). Prior to 1970 this was due to the strength of demand for goods and services in a full employment economy. But in the 1970s, inflation rose sharply following rises in wages and in oil prices in 1973-74 and again in 1978-79. In the 1970s unemployment was also high — so-called "stagflation". During the 1973-74 inflationary period real interest rates fell, but between 1976 and 1981 the Australian Reserve Bank pursued a tight monetary policy. In the mid 1980s, inflation rose again (in contrast to inflation developments in other industrialized countries) following a rise in import prices caused by a depreciation of the Australian dollar. Again a tight monetary policy was pursued.

Until the 1980s, the financial sector in Australia remained tightly regulated and the nominal exchange rate was fixed. A government inquiry in 1979 endorsed financial deregulation and resulted in the lifting of some interest rate controls in 1980. The Reserve Bank also began announcing a target range for M3 money supply aimed at controlling inflation. Implementation of financial reform accelerated after the election of 1983. Exchange controls were lifted and the Australian dollar was allowed to float in 1983.

A rise in interest rates tends to attract foreign funds. Prior to the float, the Reserve Bank was obligated to purchase these foreign inflows in exchange for Australian dollars which boosted the money base of the system. Any attempt to soak up this excess liquidity with domestic open market operations simply caused more funds to flow in from overseas reducing the effectiveness of monetary policy, particularly as the financial sector became increasingly integrated with overseas financial markets. Domestic interest rate ceilings were removed in 1984-85 and limited entry of foreign banks was permitted. All this was designed to assist the monetary authorities control inflation.

While deregulation enhanced the monetary authority's control over bank reserves, it also affected demand for monetary assets. M3 money supply expanded rapidly following the lifting of interest rate controls so the Reserve Bank abandoned announcing M3 targets in 1985.

Control of inflation has not, though, been the sole priority of monetary policy in Australia (Sieper and Wells). The Hawke government in 1983 entered into an agreement with organized labour to help arrest inflation, trading lower rates of wage increases for lower rates of taxation with the maintenance of reasonable rates of inflation being the anticipated outcome. The focus of monetary policy at this time was on maintaining the momentum of economic growth (Milbourne).

Beginning in 1986, the current account balance began to deteriorate as the value of the Australian dollar fell. Here the Reserve Bank tightened policy so that the price impact of devaluation would not bring on more inflation and cause a break-out of the wage accord. There was also a shift toward cutting the level of government expenditures since tax increases were ruled out by the accord. In early 1987 when the terms of trade were improving and the exchange rate was beginning to rise and there was some upward movement in economic activity, there was a concern that tight monetary policy would precipitate a decline. By early 1988 it was clear the economy was growing at a fast pace and the Reserve Bank began to tighten policy by progressively putting upward pressure on interest rates. The recent strategy has been to try to suppress domestic demand with even higher interest rates in an effort to curb inflation (Grenville). By 1992-93 the inflation picture had improved and interest rates were lowered. Unemployment and how to grow the economy were now the main policy concerns.

3.2 United States

The recession of 1969-70 (under a fixed exchange rate system) prompted a new economic policy announcement by the Nixon administration. A key feature of this policy was to devalue the U.S. dollar against the major currencies of the world in 1971 and early in 1973, and then to permit the U.S. dollar to float in late 1973. With Europe and Japan experiencing strong growth, the resulting decline in the value of the dollar led to an export boom and to a quick acceleration of prices in 1972-73. To curb inflation a second feature of the new policy was price and wage controls. Inflation was further fueled by the first oil crisis in 1973-74. Interest rates also rose as the Federal Reserve attempted to right the ship with tighter monetary

policy. The result was a severe cost-price squeeze on the final goods sectors, a severe recession in 1974-75, and relatively high unemployment — i.e., "stagflation".

In late 1975 and early 1976 the rate of inflation slowed significantly and the Federal Reserve eased up on interest rates. Subsequently the value of the dollar fell bringing prosperity back to the export industries.

By 1980, inflation was again severe and the Federal Reserve began targeting M1 money supply rather than the interest rate. Short-term interest rates increased rapidly. There was a brief recovery in late 1980 as the Federal Reserve eased up during the election year, but subsequently the dollar began to rise as short-term interest rates approached 20 per cent. In 1981 when the Reagan administration announced plans for a major increase in defense spending and tax cuts, the Federal Reserve quickly tightened again believing that the Reagan policies would be inflationary. This led to a rise in the value of the dollar which meant that U.S. prices of export commodities would have to fall or commodity prices in other countries (whose currencies were falling against the U.S. dollar) would have to rise in order to maintain purchasing power parity. With Europe and much of the rest of the world in recession the only possibility was for U.S. prices to fall.

The early 1980s was a period of rapid deflation of basic commodity prices. Crude oil prices fell as Saudi Arabia began increasing oil output in spite of the oil cartel's call for restricted output. In addition, real agricultural prices (particularly prices of crops) fell below the levels of the 1960s. Real interest rates by 1982 were at their highest level since the early 1930s. The Federal Reserve started easing up in August of 1982, but interest rates fell much more slowly than did inflation keeping real interest rates high until 1986. Inflation fell from about 10 per cent in 1981 to about 4 per cent in 1984. The combination of lower nominal interest rates, tax cuts, and increased defense spending led to a rapid recovery in the secondary industries.

While the nonagricultural economy prospered after the Federal Reserve eased up in 1982, agriculture and other export oriented industries remained depressed. The U.S. trade deficit increased to about 3-4 per cent of GDP and stayed there for most of the 1980s. The value of the dollar continued to rise until late 1985. The combination of high real interest rates and an overvalued dollar continued to depress the export industries until 1986. Through 1988 and into early 1989, the Federal Reserve maintained tight monetary policy largely to keep inflation in check. By the spring of 1989, however, growth was slowing and the upward spiral of inflation had abated. In response the Federal Reserve initiated an easy monetary policy which was continued into 1990. Through the remainder of the 1990s the main focus of attention has been on fiscal policies aimed at reducing the budget deficit.

4. Empirical Evidence

4.1 Real GDP

The paths of real GDP in agriculture and in the aggregate economy for Australia are shown in Figure 1 and for the United States in Figure 2 with trend indicated by dashed lines. (The deflator for each series is the GNP implicit price deflator so that what is shown in these graphs is real income not real output.) The aggregate economy of both countries performed remarkably alike: a mild recession in the mid 1970s, a severe recession in 1979-82, another mild recession in 1990-91, a short expansion in the early 1970s, and a longer expansion in the late 1980s.

The agricultural economies of both countries showed surges in real GDP in 1973 and 1979 and a big drop in the 1980s — the low coming in 1982 in Australia and in 1983 in the United States. The magnitude of the 1982 low in Australia and the 1983 low in the United States may in part be explained by the severe droughts in those years in the respective countries. It is interesting to note, however, that other droughts (1972, 1980, and 1984-85 in Australia, and 1974 and 1988 in the United States) appear to have had little impact on real agricultural GDP, even though some of these droughts had a more severe impact on aggregate crop yields than did the 1982 drought in Australia or the 1983 drought in the United States.

The strong surge in the Australian agricultural economy in 1979 was made possible in part by the decision of U.S. policymakers to lower the loan rate for U.S. grains in the second half of the 1970s permitting a rise in world prices when world demand was relatively high. There was a substantial recovery in Australia in 1988-89 fueled in part by very favourable wool prices, and a more modest recovery in the United States in 1989-90 followed by another dip in both countries in the early 1990s.

Figure 1: Index of Real GDP in Agriculture and Aggregate Economy (1973=100), Australia

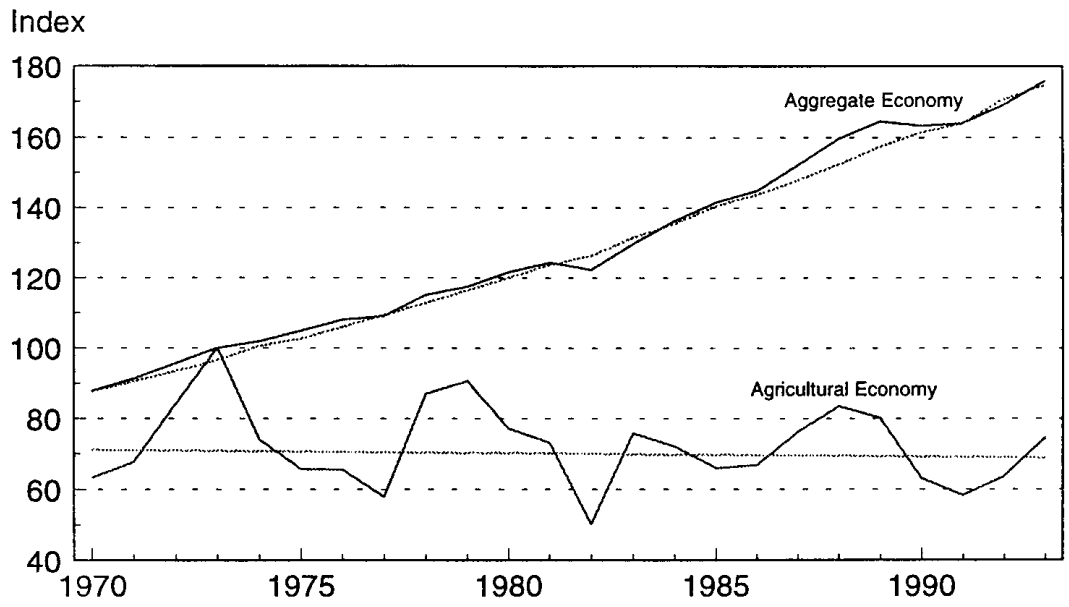
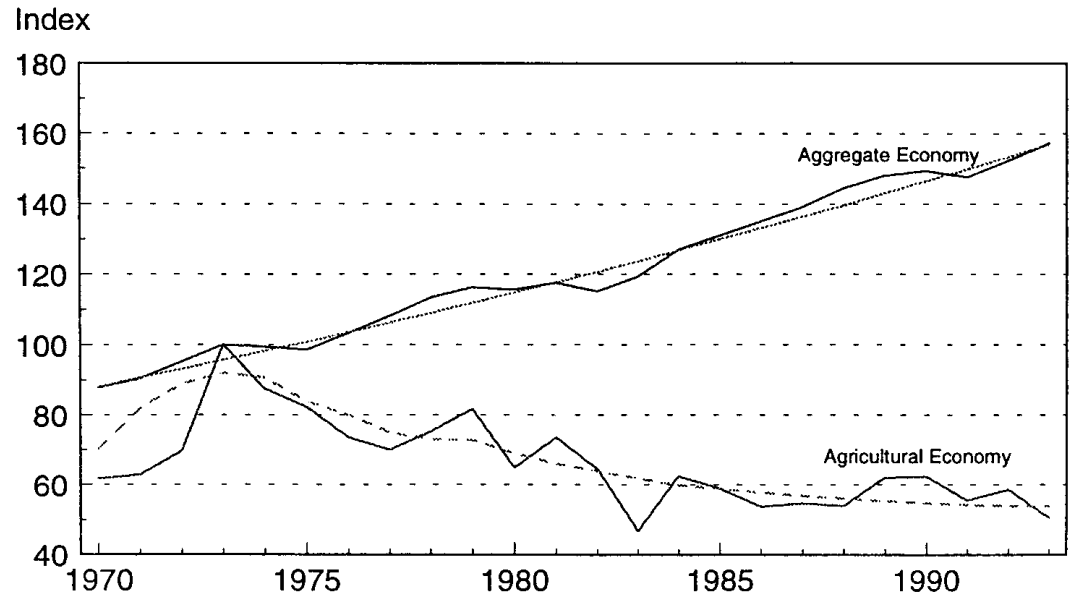


Figure 2: Index of Real GDP in Agriculture and Aggregate Economy (1973=100), United States



4.2 Inflation, Interest Rates, and Exchange Rates

Rates of inflation and short-term interest rates are shown in Figure 3 for Australia and in Figure 4 for the United States (using the bank bill rate for Australia and the commercial paper rate for the United States). In both countries there was a surge in inflation in the mid 1970s, and again in the late 1970s in the United States and early 1980s in Australia. Inflation then dropped rapidly in the United States and somewhat less rapidly in Australia, increased again in Australia in the mid 1980s and in the United States in the late 1980s before declining again beginning in 1990. Interest rates in both countries followed the same pattern as inflation albeit generally with a short lag and with different intensities.

Figure 3: Short Term Interest Rate and Inflation Rate, Australia

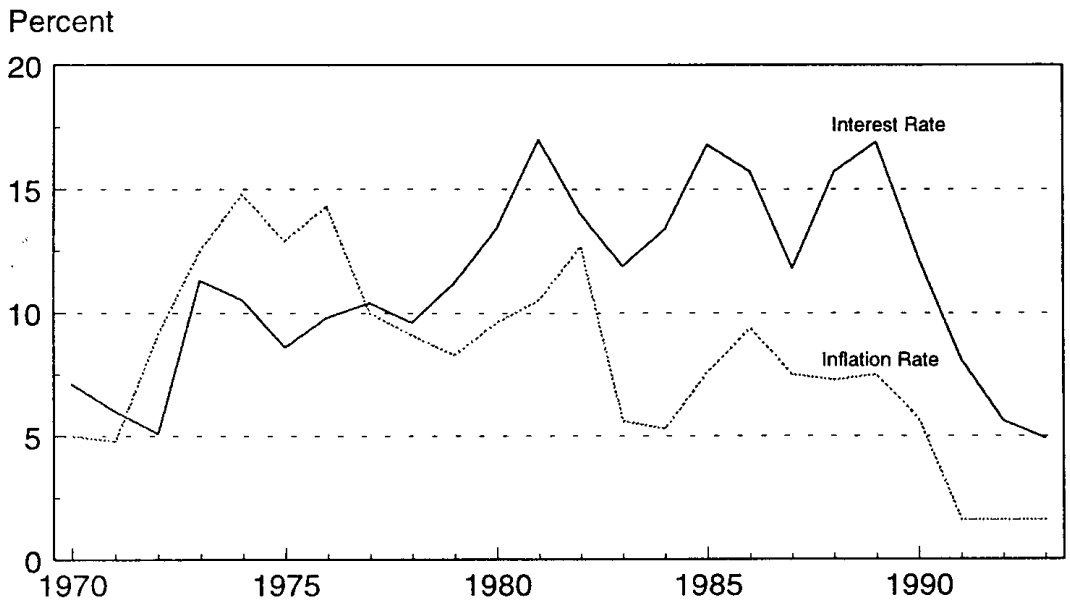
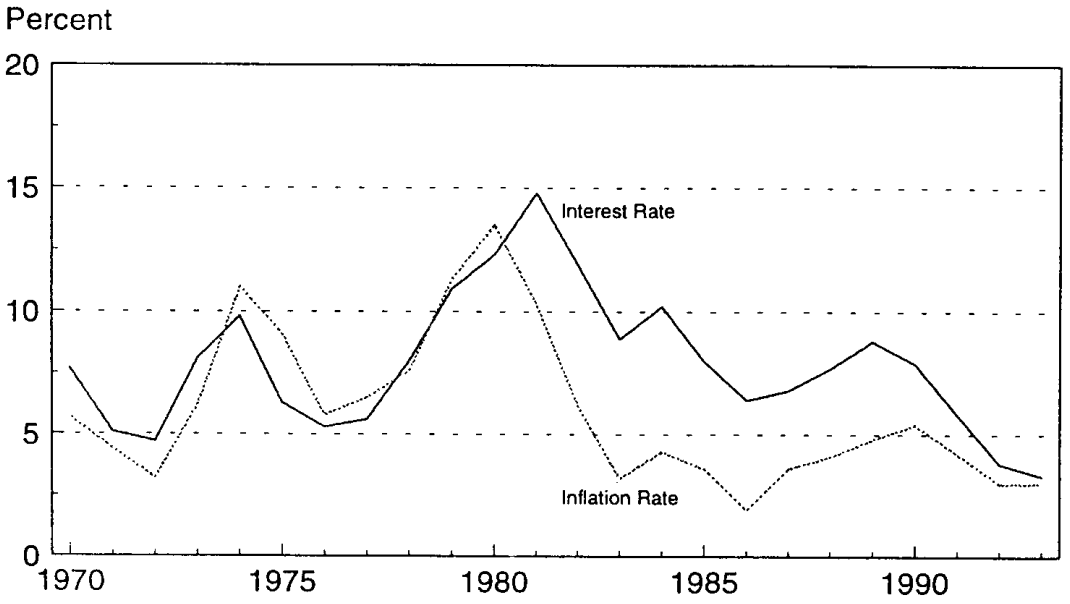


Figure 4: Short Term Interest Rate and Inflation Rate, United States



When inflation surged in the 1970s, the Reserve Banks of both countries were reluctant to push short term interest rates high enough to keep real rates positive (Figures 5 and 6). In the 1980s, on the other hand, the Reserve Banks of both countries prevented interest rates from declining as fast as inflation. Real interest rates are still quite high in Australia whereas they have been coming down since 1989 in the United States until almost zero in 1993.

Also shown in Figures 5 and 6 is the real value of the dollar in the respective countries. In the United States the real value of the dollar moved quite closely with the real interest rate over the entire 24 year period. In the United States the Federal Reserve, intentionally or not, was impacting the exchange rate by influencing real interest rates.

Figure 5: Real Short Term Interest Rate and Real Exchange Rate, Australia

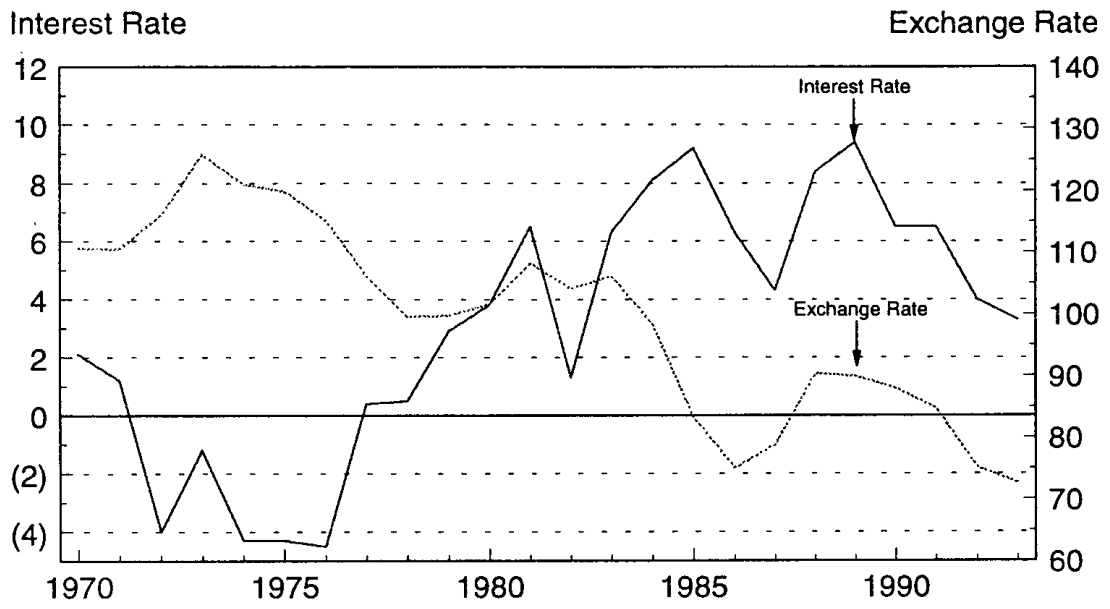
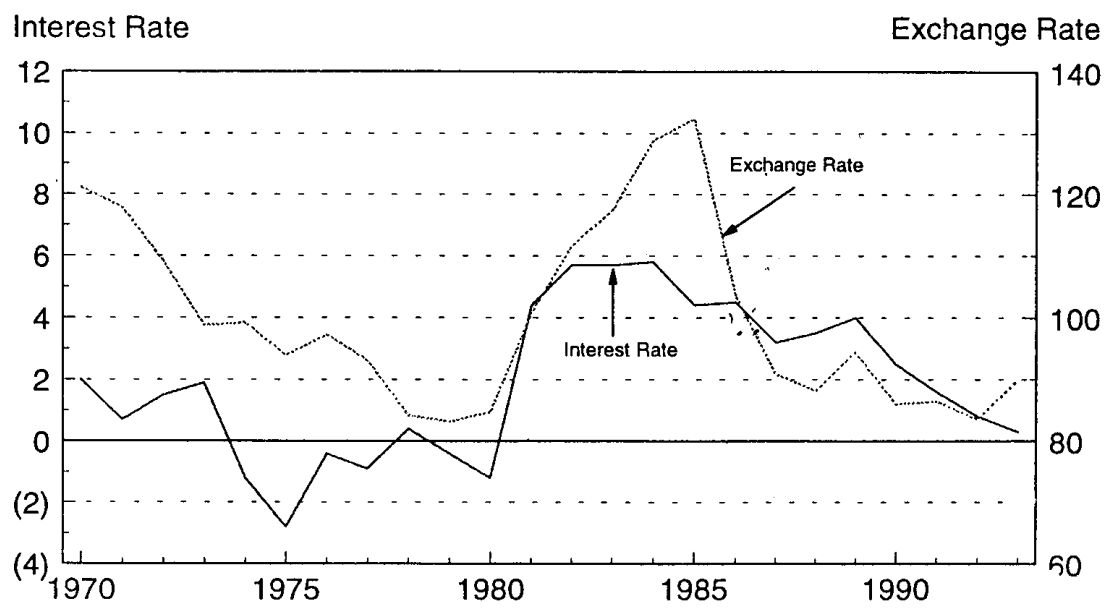


Figure 6: Real Short Term Interest Rate and Real Exchange Rate, United States



In Australia the real value of the dollar also moved closely with the real interest rate following the decision to allow the $A to float in 1983. Prior to 1983, however, there is a negative correlation between the two series. From 1970 to 1983 the Australian monetary authorities acted mainly to keep inflation in check allowing the real interest rate to fall substantially below the real interest rates of other industrialized countries. The policy pursued certainly affected foreign demand for Australian securities. The real exchange rate, however, rose during the mid 1970s and stayed relatively high until it was permitted to float. Since 1983 the Australian Reserve Bank has been in a position to influence the real exchange rate by its policies and, as Figure 5 suggests, it has been fairly successful in doing so. During this period the Australian real interest rate has been maintained well above real interest rates in other industrialized countries.

4.3 Exports and Exchange Rates

Figures 7 and 8 show the index of real agricultural and total economy exports and the real exchange rate for Australia and the United States, respectively. From these figures it is clear that agricultural and total economy real exports followed the same general pattern of ups and downs in both countries. It is also clear from these figures that agricultural exports as a per cent of total exports has been getting progressively smaller in both countries since 1970.

Figure 7: Real Exchange Rate and Index of Real Value of Agricultural and Aggregate Economy Exports (1973=100), Australia

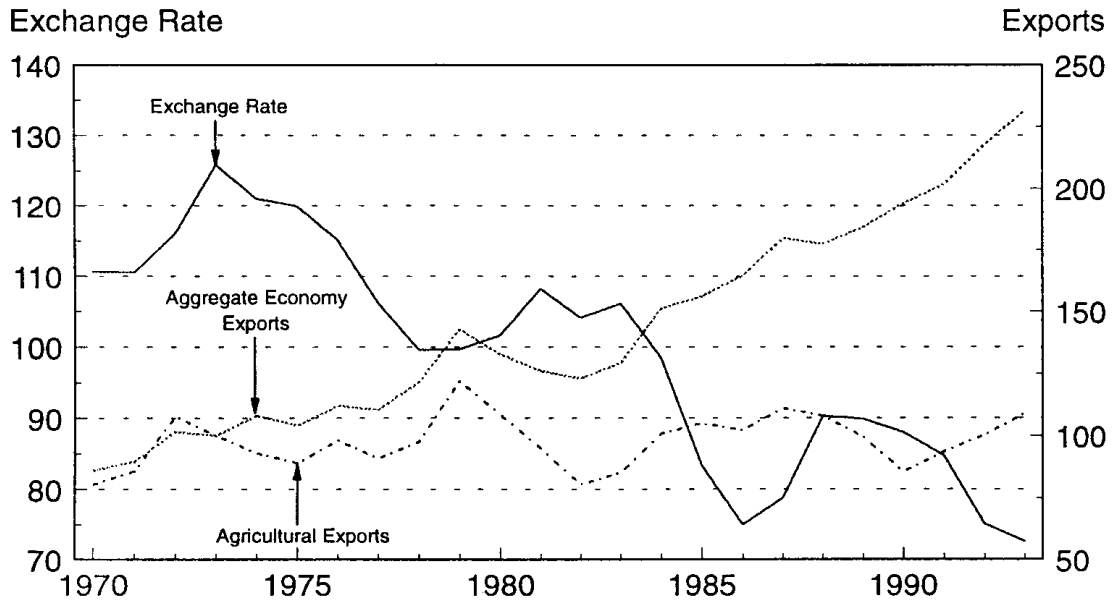
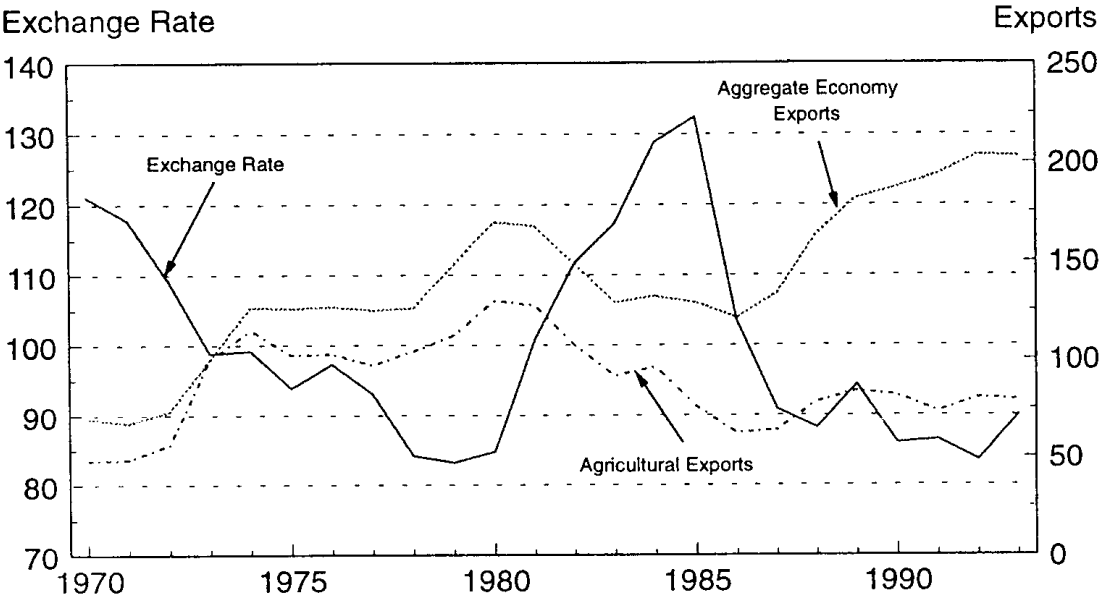


Figure 8: Real Exchange Rate and Index of Real Value of Agricultural and Aggregate Economy Exports (1973=100), United States



Of more significance to the argument of this paper is that when the real value of the U.S. dollar fell by about 16 per cent between 1971 and 1974, real U.S. agricultural exports increased by over 36 per cent, and when the real value of the U.S. dollar fell again in the late 1970s by almost 15 per cent, real U.S. agricultural exports increased by another 13 per cent. When the real value of the U.S. dollar rose between 1980 and 1985 by 56 per cent, real U.S. agricultural exports fell by over 40 per cent. And again in the late 1980s when the real value of the U.S. dollar fell by nearly 30 per cent, real U.S. agricultural exports rose by 11 per cent.

In Australia comparable movements in the real exchange rate and real agricultural exports took place over the 1970-93 period except between 1970 and 1975 when real Australian agricultural exports increased by 12 per cent despite the fact that the real value of the Australian dollar rose by 8 per cent. The strong surge in Australian exports during the 1970-75 period, even in the face of an increase in the real exchange rate, was no doubt due to strong world demand during this period as evidenced by high and sustained increases in world real GDP. For subsequent years, although the magnitudes of changes differ somewhat in the two countries, there is a clear negative association between movements in the real exchange rate and real agricultural exports in both countries. There appears to be less correspondence between real agricultural exports and real total economy exports in Australia than in the United States although again the similarities are striking.

To provide further evidence on the association between real agricultural exports and real exchange rate variations in the two countries, multiple regression was used to incorporate other variables hypothesized to affect exports. The real exchange rate was lagged one year on the assumption that the agricultural sector can only react with some delay to exchange rate movements. The coefficient on this variable is expected to be negative. The per cent change in the index of world real GDP was used to reflect changes in the intensity of world demand for agricultural exports. The coefficient on this variable is expected to be positive. The per cent change in real GDP in the respective countries was used on the assumption that changes in domestic demand as reflected by changes in aggregate income should condition policymakers' interests in implementing policies designed to dispose of surplus agricultural output on the international market. The coefficient on this variable is expected to be negative.

The lagged value of the dependent variable was used in each regression in an effort to capture some of the dynamics of adjustment in the agricultural sector as well to help ameliorate autocorrelation problems. An additional variable included in preliminary regressions was the deviation from trend in crop production per crop area designed to capture the effect of droughts in the two countries. However, this variable did not produce a coefficient that was significantly different from zero in either regression so it was removed from the regressions shown below. The final regression results are:

Australia

$$\begin{aligned} EXPORTS_t = {} & 1.683 - 0.196EXCH_{t-1} + 0.014WORLD_t \\ & (3.89) \quad (1.81) \qquad\quad (2.23) \\ & + 0.005GDP_t + 0.322EXPORTS_{t-1} \\ & (1.10) \qquad\quad (2.07) \\ R^2 = {} & 0.576 \end{aligned}$$

United States

$$\begin{aligned} EXPORTS_t = {} & 1.029 - 0.415EXCH_{t-1} + 0.052WORLD_t \\ & (1.87) \quad (2.02) \qquad\quad (2.55) \\ & - 0.017GDP_t + 0.833EXPORTS_{t-1} \\ & (1.50) \qquad\quad (7.02) \\ R^2 = {} & 0.810 \end{aligned}$$

where the coefficients in parentheses are student-t ratios and:

EXPORTS= logarithm of real agricultural exports in Australia or the United States,

EXCH= logarithm of real effective exchange rate in Australia or the United States,

WORLD = per cent change in index of world real GDP, and

GDP = per cent change in real GDP in Australia or the United States.

EXPORTS was deflated by the GNP deflator. The IMF series for WORLD was used here. All other data were obtained from Australian Bureau of Agricultural and Resource Economics, and the U.S. Council of Economic Advisers.

These regressions confirm what the graphical results show. In both countries increases in exchange rates are associated with decreases in agricultural exports even in the presence of other variables affecting trade. The hypothesis concerning the impact of growth in

world real GDP was confirmed in both countries. The impact of changes in real domestic GDP, however, was weak in both cases and had an unexpected sign for Australia.

The estimated short- and long-run exchange rate elasticities for Australia are considerably lower than for the United States indicating that the U. S. agricultural sector is much more responsive to changes in the exchange rate than is the Australian agricultural sector. While this may well be the case due in large part to the greater adjustment possibilities of farmers in the United States, the results for Australia are suspect in view of the fact that the $A was not permitted to float until about mid-way through our sample period. More precise comparisons of exchange rate elasticities must await further study.

4.4 Commodity Prices and Exchange Rates

Figures 9 and 10 show the per cent change in prices of crops and livestock and the per cent change in the inverse of the real exchange rate lagged one year for Australia and for the United States respectively. The inverse of the real exchange rate provides a measure of the price of foreign exchange — when the exchange rate falls, the price of foreign exchange rises. The relation is lagged one year because changes in the price of foreign exchange are expected to show up as commodity price changes a year later.

In the early 1970s commodity prices went up faster than did the price of foreign exchange in both Australia and the United States. This implies that foreign prices of these commodities were rising but at a slower rate than the rate of increase in Australia or United States. With a high world demand for agricultural commodities this is what should be expected. In the late 1980s the price of domestic commodities fell but the price of foreign exchange fell faster than did the price of domestic commodities. With world demand now depressed, part of the effect of a falling dollar showed up as falling prices in other countries.

To verify the relationship between exchange rates and commodity prices, multiple regression was used to estimate reduced form relations of the form:

$$PR_t = a + b_1PDN_t + b_2GDP_{t-1} + b_3EXCH_{t-1} + b_4PR_{t-1} + b_5WORLD_t$$

where

PR = logarithm of index of prices received by farmers for crops or livestock,

PDN = logarithm of index of crop or livestock output,

EXCH = logarithm of real exchange rate,

Figure 9: Annual Percent Change in Inverse of Lagged Real Exchange Rate, Index of Price of All Crops, and Index of Price of All Livestock, Australia

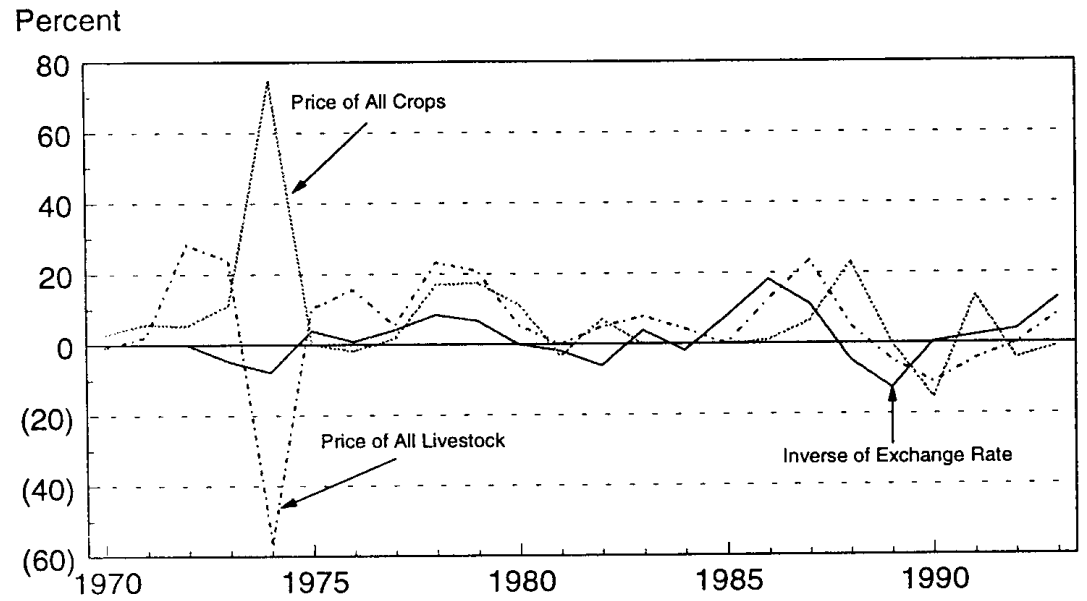
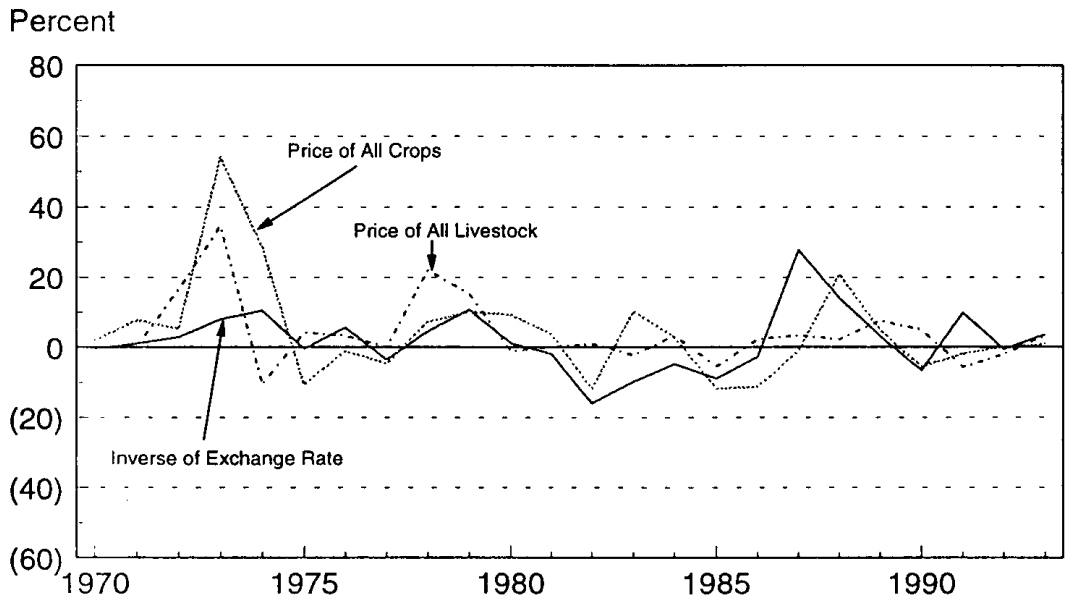


Figure 10: Annual Percent Change in Inverse of Lagged Real Exchange Rate, Index of Price of All Crops, and Index of Price of All Livestock, United States



GDP = per cent change in aggregate economy real GDP, and

WORLD = per cent change in index of world real GDP.

following in part the logic of Kitchen and Mack. PDN was used to reflect what is available for export in the two countries. The coefficient on PDN was expected to be positive. Increases in aggregate real GDP in the respective countries should lead to increases in real interest rates which should, in turn, lead to declines in prices of farm commodities. The coefficient on GDP is thus expected to be negative. Increases (decreases) in world real GDP should drive commodity prices up (down). The coefficient on WORLD is thus expected to be positive. Consistent with the theoretical arguments above, the coefficient on EXCH is expected to be negative. The lagged value of the index of prices received was included for reasons stated in the previous section.

In the relations for Australia a U.S. price variable was also included to examine the hypothesis that Australian crop and livestock prices are determined in part by the respective U.S. prices. The coefficients on the U.S. price variables are expected to be positive. Since this is a reduced form relationship, however, the precise causal connection between Australian and United States prices cannot be inferred from these estimates.

In the regressions shown below only those variables that yielded a coefficient significantly different from zero at the 10 per cent level or better were retained. World real GDP was significant in both livestock-price regressions but in neither crop-price regressions. The livestock-price regression for the United States was the most sensitive to alternative specifications although the relation between exchange rates and prices was still in the expected direction.

Australia

$$PR(CROP)_t = \underset{(2.00)}{0.828} - \underset{(3.25)}{0.644}EXCH_{t-1} + \underset{(5.09)}{0.783}PR(CROPUS)_t + \underset{(4.55)}{0.436}PR(CROP)_{t-1}$$

$$R^2 = 0.967$$

$$PR(LIVE)_t = \underset{(2.52)}{2.450} - \underset{(3.15)}{1.044}EXCH_{t-1} + \underset{(1.86)}{0.377}PR(LIVEUS)_t + \underset{(2.58)}{0.361}PR(LIVE)_{t-1} + \underset{(2.08)}{0.022}WORLD_t$$

$$R^2 = 0.881$$

United States

$$PR(CROPUS)_t = \underset{(3.16)}{1.294} - \underset{(2.00)}{0.320}EXCH_{t-1} + \underset{(7.85)}{0.672}PR(CROPUS)_{t-1}$$

$$R^2 = 0.814$$

$$PR(LIVEUS)_t = \underset{(1.58)}{0.476} - \underset{(1.18)}{0.139}EXCH_{t-1} + \underset{(13.39)}{0.880}PR(LIVEUS)_{t-1} + \underset{(2.43)}{0.013}WORLD_t$$

$$R^2 = 0.923$$

where the coefficients in parentheses are student-t ratios and all data is from sources cited in the previous section.

The results of the estimations emphasize that commodity prices in both countries do respond to exchange rates and in the direction hypothesized. The results also suggest that Australian crop prices are influenced by U.S. crop prices and thus also by U.S. farm policy. When U.S. loan rates for grains were lowered beginning in 1977 the stage was set for an upsurge in Australian wheat prices in 1978-79. Similarly when U.S. production controls were tightened and export subsidies initiated in 1985, Australian grain prices failed to rise as rapidly as did U.S. grain prices. The impact of U.S. livestock prices on Australian livestock prices is less strong but still significant and positive. Even though the United States only exports about 5-6 per cent of its meat production, it is still a big enough player internationally to have some influence on international livestock prices.

4.5 Farm Debt and Real GDP

Figures 11 and 12 show the trend in total real farm debt (with the GNP implicit price deflator) per hectare for Australia and for the United States compared with the index of real GDP in agriculture in the respective countries. The agricultural boom of the 1970s encouraged U.S. farmers to incur ever increasing levels of debt for output expansion until a plateau was reached in the early 1980s. But by 1982 real interest rates in the United States had reached their highest level since the early 1930s and real farm prices were at their lowest level in several years. Agriculture, especially in the grain producing regions, plunged from high prosperity to severe recession. Farmers with high debt loads now had less income with which to pay higher interest charges on their debt, and the collateral to support this debt was rapidly falling in value due to the low commodity prices. During this period the midwest experienced the worst agricultural debt crisis since the great depression. Many rural banks were in trouble. The Farm Credit Administration was on the verge of collapse. Both survived only with infusions of money from Congress or the Federal Deposit Insurance Corporation.

Real debt per hectare in the United States began to fall quite quickly from 1984 until 1990 at which time it stabilized at a level of about 50 per cent of its peak

Figure 11: Index of Real Farm Debt per Hectare and Index of Real GDP in Agriculture (1973=100), Australia

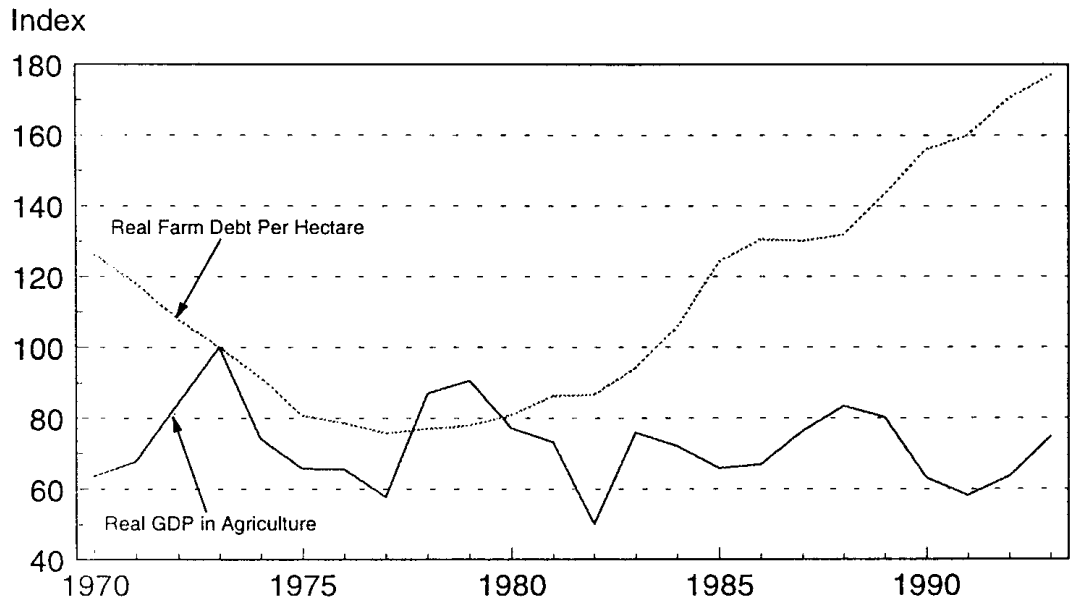
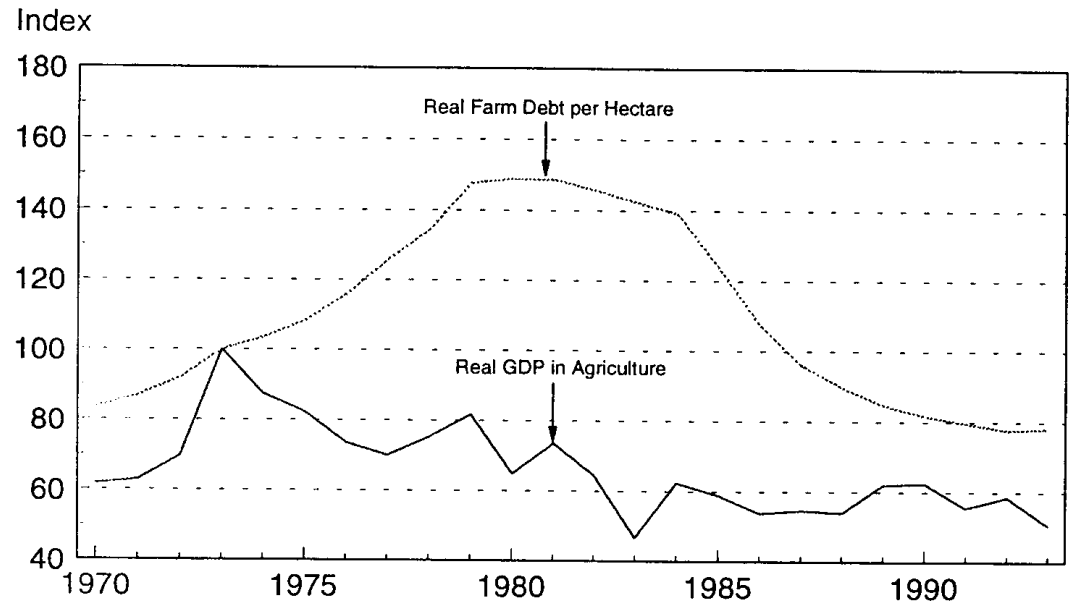


Figure 12: Index of Real Farm Debt per Hectare and Index of Real GDP in Agriculture (1973=100), United States



level in the early 1980s. During this period, per farm real gross receipts from farming was declining and did not turn around until 1987, suggesting that farm growth in the United States had slowed substantially.

In Australia, real agricultural debt per hectare was falling during and subsequent to the boom of the early 1970s and continued its decline throughout most of the late 1970s. Real agricultural debt per hectare began to rise during the agricultural recession of the early 1980s and has been rising steadily ever since. Much of the latter must be attributed to a strong desire on the part of Australian farmers to expand farm size and/or to improve the stock of existing physical capital. Indeed Australian farm size as measured by real gross value of production per farm rose sharply during the 1986-89 period and, after flattening out in 1990-91, has been rising steadily since.

Although Australian interest rates are not now as high as they have been in years past, real interest rates in Australia are still positive. Given current high debt loads among Australian farmers, and increasing calls for higher interest rates with which to forestall inflation, the situation could become grave for Australian farmers in the near future.

5. Summary and Conclusions

The agricultural business cycles of the 1970s and 1980s in Australia and in the United States were only loosely related to the aggregate business cycle. A major driving force for agricultural prosperity and depression during these years in both countries was changes in agricultural exports. Other factors of importance, but by no means dominant, were agricultural droughts and the strength of world demand for the exportable agricultural commodities of the two countries. In addition, Australia's crop sector is heavily influenced by U.S. farm policy. Finally, interest rates were particularly important for the U.S. agricultural sector in the early 1980s and threaten to be a major factor in Australian agriculture in the future given the current high debt levels among Australian farmers.

Australian and U.S. agricultural exports are strongly influenced by changes in the value of the respective country's currency. This study indicates that the exchange rate elasticity in both countries is negative and larger in absolute value in the United States than in Australia. This would appear to be explainable by the fact that there are more adjustment possibilities for farmers in the United States than in Australia, at least in the longer term.

The impact of exchange rate variations goes far beyond that portion of agricultural output actually exported. Since feed grains, food grains, and oil crops are highly homogeneous products, their domestic prices must increase (decrease) as the dollar falls (rises). Higher (lower) prices for feed grains, food grains, and oil crops pass through to higher (lower) prices for livestock products, cereals, and baked goods.

Changes in exchange rates are in part a product of monetary and fiscal policy — policy pursued for macroeconomic objectives unrelated to agriculture. In the late 1960s, expansive fiscal and monetary policy led to an overvalued U.S. dollar on the fixed exchange rate system and also built up pressure for the dollar to be devalued. Much the same thing can be said for Australia prior to currency deregulation in 1983. When the U.S. dollar was allowed to float in 1973 at the same time that monetary policy was highly expansive, there followed a rapid fall in the value of the U.S. dollar and a rapid acceleration of inflation. When the Australian dollar was allowed to float in 1983 at the same time that monetary policy was expansive, there followed a decline in the value of the Australian dollar and a subsequent rise in the inflation rate.

Low real interest rates in the United States brought about by expansive monetary policy contributed to an undervalued U.S. dollar throughout the 1970s. This together with strong world demand for agricultural commodities contributed to U.S. agriculture's prosperity. When real U.S. interest rates increased in the 1980s due to restrictive monetary policy, the value of the U.S. dollar rose and the process was reversed. Falling commodity prices led to a rapid deceleration of inflation. Expansive fiscal policy and easier monetary policy allowed the economy to expand after 1982. Because high real interest rates kept the U.S. dollar overvalued until 1986, the agricultural sector remained depressed. Only when the value of the U.S. dollar fell, starting in late 1985, did this sector finally recover.

The Australian agricultural sector also experienced prosperity in the 1970s but mostly because of strong world demand and low interest rates. The $A was overvalued, but could not respond because of the fixed rate system then employed. Rising interest rates due to restrictive monetary policy and a continued overvaluation of the $A just prior to currency market deregulation in 1983 kept agriculture depressed in the early 1980s. This sector finally recovered in the late 1980s after the value of the $A had reached its low, but the recovery was short-lived as the value of the $A rose again in the early 1990s.

The major conclusion of this paper is that exchange rates and macroeconomic policies impact on inflation and interest rates, which in turn impact on agriculture in both Australia and the United States. In countries where exports are a strong component of agriculture's earnings, prosperity in this sector cannot be assured without consideration of the directions of monetary and fiscal policy — regardless of the structure and world economic significance of the country. Thus, policymakers who wish to stabilize farm prices and incomes should look to ways to stabilize real interest rates and real exchange rates. Price supports, production controls, and export subsidies are short-term palliatives — they do not deal with the primary causes of agricultural distress. They also have the undesirable effect of restricting output in countries with low-cost producers while higher cost producers in other nations suffer few if any output restraints. Furthermore, given the nature of the political process the latter are not likely to be implemented or changed so as to be appropriately coordinated with the timing of monetary and fiscal policy changes. Monetary policy should aim more at maintaining approximate purchasing power parity rather than concentrating primarily on the domestic economy (as suggested by McKinnon).

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