Influences on the Australian Business Cycle

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The views expressed in this paper are those of the authors alone, and should not be in any way be taken as implying equivalent views on the part of the Commonwealth Treasury or the Government. The paper benefited from comments by a number of people in Treasury including in particular Andrew Johnson and Wayne Mayo and from participants at an RBA seminar in particular Palle Anderson, David Gruen, Jerome Fahrer, Guy Debelle and Gordon Menzies. Any errors of fact or logic however should be attributed to the authors alone.

ABSTRACT

The paper examines the factors that determine business cycle fluctuations in Australia and how these have changed over time. As a commodity exporter and a durable good importer the nature of our business cycle fluctuations are different to those of other industrialised countries. The cycle has also changed over time with the floating of the dollar and the increase in the size of the traded good sector of the economy. Moreover changes in the labour market, in particular the movement away from the full employment economy of the 1960s to the high unemployment rates of the 1990s have had an important bearing on how shocks are transmitted. There also appear to have been destabilising changes in the stock cycle with business inventories playing less of a buffering role. Taken together these factors appear to have offset the stabilising effects of the floating of the exchange rate and the increasing size of service sector. Overall the economy appears no more stable now than it was in the 1960s. However, both the nature of shocks and the nature of their propagation are different, implying changed policy responses relative to those that would have been adopted in the past.

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INTRODUCTION

The rise in unemployment to over a million in the most recent recession has raised the stakes in understanding fluctuations in Australian output. Why does Australian growth proceed in a boom bust cycle? Why is one recession different from another? And why do some recoveries proceed rapidly and others at a snail's pace? Generating forecasts and making decisions on how policy should respond to a cyclical upturn or downturn depend crucially on what is driving the cycle. Just as one cycle is never the same as another so the appropriate policy response will also be changing.

The long recovery in the world economy in the 1980s led many economists to hope that the business cycle had been attenuated. The relative stability of the economy during this expansion led some to argue that the large fluctuations of the past were unlikely to recur. The growth of the service sector, the increase in size of the government sector, and improved international policy coordination were all thought likely to reduce the cycle.[1] Others argued that monetary policy would have less effect in the deregulated environment of the 1980s. At the same time, the real business cycle theory of Kydland, Prescott, Nelson and Plosser et al gained increased currency[2]. (That is the idea that fluctuations are due to technology shocks within a competitive equilibrium - a theory of the business cycle which explained the salient features of the cycle without resort to sticky wages, sticky prices or monetary disturbances.) Similarly, David Lilien expounded the theory that movements in unemployment over the cycle in the US could be explained by sectoral fluctuations and compositional change. To an extent Keynesians appeared to be fighting a rear guard action in providing micro foundations for the idea that demand side factors (in combination with sticky prices and sticky wages) can play a role in explaining recessions.

The severity of the most recent world recession has led to a reassessment of some of these ideas. It is difficult to believe that the large downturns in output and large increases in unemployment in most Western countries were due to supply side shocks (especially when oil prices have remained low). Much of the focus has been on financial / demand side factors in explaining the downturn; and there has been a resurgence in interests in such factors as uncertainty as determinants of investment (eg

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[1]Macquarie Economics (1990) "Has the Business Cycle Disappeared?" *Macquarie Bank Review*, Jan 15 It should be noted that the authors were mainly talking about the international economy rather than the Australian economy.

[2]The popular characterisation of the rise in unemployment during the 1990-91 recession as being due to structural change and increased productivity was reflected at a deeper level in this theoretical debate. The real business cycle school argues that the fluctuation in unemployment in the US can be explained in theory as a result of productivity shocks in the context of an Arrow Debreu perfect equilibrium. The evidence for the real business cycle hypothesis is in three strands: evidence from studies of the times series properties of GDP itself (which show that trends are stochastic rather than deterministic (ie shocks tend to be persistent); from VAR analysis which tends to show an important role for supply side shocks; and from calibrated models (as opposed to estimated) which generate similar cycles in consumption, investment and other aggregates to those observed in the real economy. There is considerable controversy surrounding the calibrated models and they appear to be unable to explain certain relationships observed in the real world. (See for example Blanchard and Fisher 1989 320-360 - eg the fact that in the real world productivity tends to lag the cycle - falls in the early stage of a downturn and then rises when employment begins to recover.) A related idea to the real business cycle theme was that of David Lilien who argued that fluctuations in unemployment are due to sectoral shifts, which increase mismatch unemployment. Lilien found that fluctuations in the unemployment rate in the US were well correlated with fluctuations in an index which measured the dispersion of employment growth rates by industry. Lilien (1982) "Sectoral Shifts and Cyclical Unemployment" Journal of Political Economy Aug. However later work indicated a much smaller role for sectoral factors. Eg Murphy and Topel (1987) "The Evolution of Unemployment in the United States" NBER Macroeconomics Annual

Bean (1990) Dixit (1992)) and the role of information and credit constraints / fear of bankruptcy in affecting the behaviour of firms and propagating shocks (eg Stiglitz (1992), Lowe and Rohling (1993)).

However, the theoretical debate seems to generally be focused on very few factors and on transmission mechanisms rather than causes. The approach of this paper in contrast is to cast the net a little wider in the search for factors which impact on activity. (That wages, prices, uncertainty etc are constrained enough to lead to the systematic propagation of cycles is taken as given.) The main aim is to try and define the factors that can affect output and to delineate the role of each. It is also to show that these factors are very different in Australia (and to use the TRYM model of the Australian economy to illustrate the nature of our linkages).

The argument advanced is that the factors that drive the Australian business cycle are many and varied, and very different to those overseas. Other countries are not affected by drought and are usually experiencing terms of trade shock which are roughly the reverse of those for Australia (see below). Moreover the propagation mechanisms appear to be different, as are our labour market institutions. Changes in underlying productivity growth may play some role in Australian fluctuations but other, mainly demand side factors, appear to be playing the dominant role.[3]

RECENT AUSTRALIAN STUDIES

There have been a variety of studies on the Australian business cycles in recent years. Broadly speaking they can be classified into three different types. Firstly, there are studies that concentrate on the time series behaviour of GDP itself. Secondly, there are single equation models of the economy, and thirdly there are studies which either employ VAR models of the economy or structural macro econometric models such as the Murphy model or TRYM.

On the time series analysis side Strong and Tan (1991) find evidence of stochastic trends (persistent shocks) in Australian GDP data similar to those found in the US and other industrial economies by Campbell and Mankiw. They conclude that this is evidence of that real business cycle factors play a role in the Australian cycle. Layton (1993), however, finds that the stochastic trend specification is not superior if the possibility of segmented trends (the possibility of breaks in trend) are taken into account. He concludes that changes in output are only occasionally persistent. By their nature these studies can only examine the auto regressive and moving average properties of the GDP times series data itself. It is difficult to draw specific inferences from them, except broadly to conclude that supply side factors play some role, (on the basis of the assumption that supply side shocks have permanent effects while demand shocks are transitory).

On the point of disaggregating demand and supply shocks, Moreno (1992) using oil prices, labour supply and productivity as indicators of supply side shocks, in the context of a difference VAR, find that only 64 per cent of the short term movement in Australian output is explained by demand side shocks and 34 per cent by supply shocks. (As the demand shocks are transitory the supply shocks dominate in the long run). This contrasted to similar studies for the US economy by Shapiro and

[3]Fluctuations in underlying productivity growth and sectoral shifts may play a larger role in the US where terms of trade impacts are smaller, where labour market institutions keep unemployment closer to the NAIRU and where there is a more diverse regional labour market so that sectoral shifts have a greater effect on mismatch unemployment.

Watson (1988) that found that 75 per cent of the short term variation in output was due to supply shocks.

As with the analysis of the time series properties of GDP itself, the VAR results are limited in what they can say with the results being highly dependant on the specification. (Blanchard and Quah (1989) for example point out the sensitivity of VAR results to ordering, lag length, choice of variables etc). However, in combination with the time series analysis they do suggest that supply side factors do play some role in short term fluctuations in the economy and that there is persistence in these fluctuations. (Layton speculates that the persistence is due to persistence in shocks to the terms of trade.) Moreover, they suggest that fluctuations in the Australian economy are different to those overseas.

A completely different strand of evidence comes from one equation studies of the movements in Australian output. McTaggart and Hall (1993) find that growth in US output and changing rainfall patterns explain a significant proportion of the cyclical variation in Australian output. Similar results are reported by Ryder et al (1993), and by Gruen and Shuetrim (1994). Moreover Gruen and Shuetrim argue that foreign output exerts a significant influence *independent* of its effect on the terms of trade or export volumes. They report that a 1 per cent change in OECD output leads to a 1.2 per cent increase in Australian output in the long run (with *two thirds* of the response occurring within the same quarter). They speculate that the linkage is via asset markets (the stock market and property prices) and that the correlation has increased with increasing international financial integration in the 1980s.

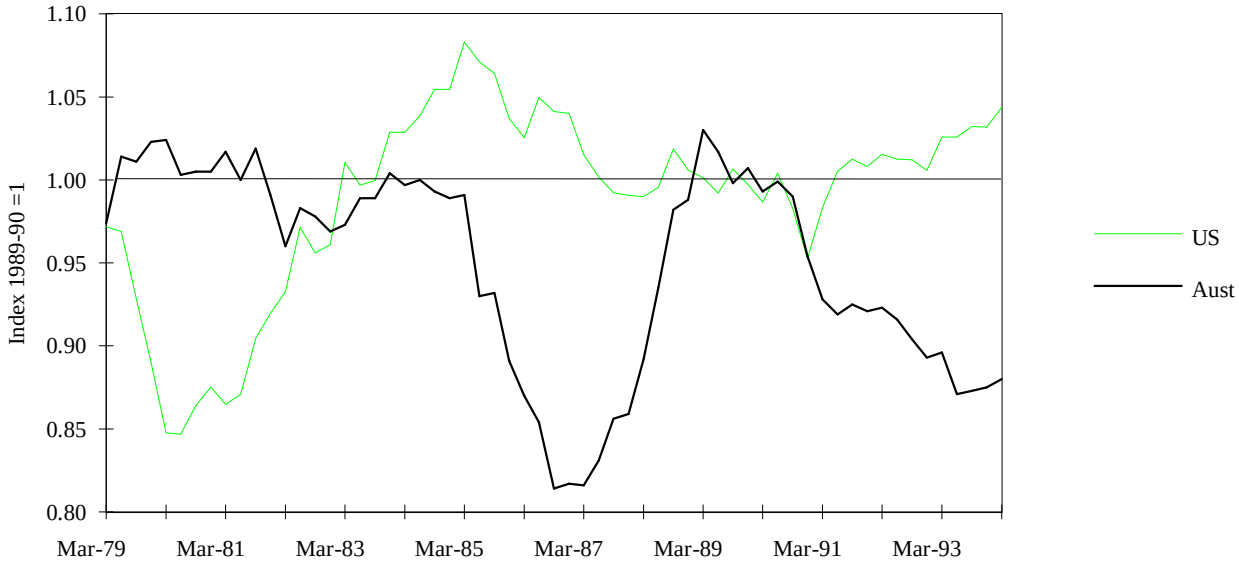
In contrast Murphy and Smith (1993), using Johansen VAR techniques and the Murphy Model to disaggregate variation in Australian GDP and unemployment, find that fluctuations in international output (*abstracting from the terms of trade influence*) have little effect on Australian activity. Rather movements in GDP are dominated by domestic demand and real wage shocks. Using the ECM VAR they find that in the short term foreign output (abstracting from terms of trade effects) accounts for only around 2 per cent of the variance in GDP growth and that domestic demand shocks and wage shocks are dominant, accounting for 73 per cent and 15 per cent respectively. A variance decomposition using the Murphy model gives similar results although with even less variance being attributable to foreign output (abstracting from terms of trade effects).

Our priors in writing this paper were inclined to the Murphy results. This is firstly because increasing world output may be accompanied by increasing world interest rates. Hence the positive effect of increasing world output on confidence etc (*abstracting from the terms of trade effect*) may be offset by the negative effects of higher costs of funds. (The terms of trade is partly affected by growth in world output but much of the volatility is due to changing supply conditions in world commodity markets.) Secondly, while day to day movements in our equity market are influenced by confidence effects stemming from overseas movements, over longer time periods they are mainly driven by fundamentals in the Australian market as are prices in our property markets (with a number of studies indicating a good correlation between vacancy rates and capital prices in both the office and housing markets). (It is hard to imagine that our vacancy rates are influenced by changes in the US property market). Property price movements may coincide with movements overseas but this does not mean that the overseas change is causative. Moreover the increasing financial integration argument does not account for why the US economy seems less correlated with Japan and Europe in the 1980s rather than more.

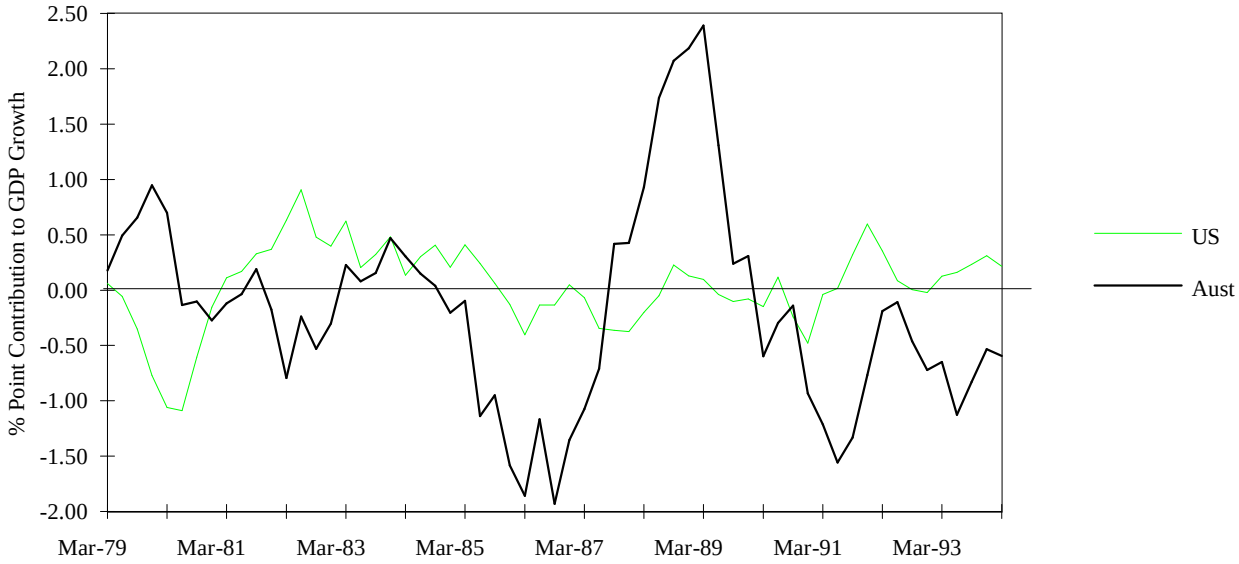
Further, the argument that the Australian cycle is driven by overseas factors *(independent of the terms of trade)* does not account for the very distinct differences between the Australian and overseas economies. In contrast to other economies the Australian economy can be characterised as being a commodity exporter and an importer of consumer durables and investment goods. Even with the rapid expansion of elaborately transformed manufactures and service exports, 61 per cent of our exports are commodities or only slightly transformed commodities, while imports service a significant proportion of our demand for plant and equipment and durable consumption goods. (Sixty per cent of our imports are manufactured goods.) As a result, our terms of trade will often move in opposite directions to that of the US or Japan. For example, Chart 1 below shows that while our terms of trade has been falling over the last three years (adding to the downturn), that of the US has been rising. In terms of contributions to growth, the US increase has added almost 1 percentage point to national income since early 1991 while our fall has subtracted almost 2 percentage points.

Moreover, there are significant differences in the propagation mechanisms with a large part of our investment and durables consumption being sourced overseas. This means that the normal propagation mechanisms (the inventory cycle and the investment accelerator) are not necessarily as effective as they are in other industrialised countries. With different shocks and different propagation mechanisms it would be surprising if any individual cycle was of a similar nature to that in other countries. (If the cause and propagation are different then the policy response should also be different.)

US and Australian Terms of Trade



US and Australian Contributions from the Terms of Trade



The hypothesis advanced here is that there are more factors bearing on the cycle in activity than commonly acknowledged. Moreover the importance of these factors is changing over time. No recession or recovery is the same. As a result there is no regular cycle in activity. The magnitude and length of booms and recessions is largely dependant on whether cycles in, for example, construction activity coincide with other factors such as fluctuations in the terms of trade and drought. How the economy reacts to these shocks is fairly consistent over time, but with important changes to the exchange rate with deregulation, and to the inventory cycle. As a small open economy the traditional propagation mechanisms such as the investment accelerator and the inventory cycle have less effect.

ENDOGENOUS FACTORS / FACTORS WHICH PROPAGATE AND FACTORS WHICH DAMPEN THE CYCLE

Comparison With the US

A few selected comparisons with other countries and with the past may help to highlight some of the factors that propagate and buffer our cycle and how these factors can change over time. Table 1 shows the volatility of the movements in some selected Australian aggregates to those in the US. In both cases the volatility is measured as the standard error of the through the year growth of the relevant aggregate.

Table 1: Volatility of Selected Aggregates: Australia compared to the US

(Standard Deviation of through the Year Growth - 1970-71:1993-94)

	Australia	United States
GDP	2.42	2.47
GNE	3.57	2.88
Employment	1.94	1.68
Terms of Trade*	1.16	0.4
IPE Investment and		
Non Farm Stocks*	1.78	1.24
Imports*	1.37	0.65

* Contribution to GDP Growth

The first point to note is that the volatility of GDP does not appear to be much greater than that of the US (which is similar to other industrial countries) despite the characterisation of Australia as a boom bust economy. On the other hand, that characterisation does appear to be true of GNE growth which is consistent with the much greater volatility in the terms of trade (particularly when expressed in terms of its contribution to national income. (Our terms of trade fluctuations are roughly twice that of most other industrialised countries (see Blundell-Wignall and Bullock (1992))[4]. The more volatile GNE growth is reflected in more volatile plant and equipment investment expenditure (IPE) and more volatile stock building (SNN). However, the greater volatility in demand leads to greater volatility in imports (again particularly in terms of contribution to growth given that we have a higher import share than the US). This dampens the effect of the higher GNE fluctuations explaining the above mentioned similarity in GDP volatility.

One interesting feature is that the volatility in our employment is greater than that of the US despite roughly the same volatility in output. This is particularly the case when the comparison is made with Japan, which has almost half our volatility in employment. (In Japan a significant part of the adjustment appears to be due to greater flexibility in hours worked.)

Comparison With the 1960s

The second table shows that the volatility of GDP was roughly the same in the late 1970s and 1980s as it was in the 1960s, despite the fact that terms of trade shocks were slightly larger in the earlier period.[5] This is surprising given that a floating exchange rate should provide better insulation against terms of trade shocks. (This seems to suggest that while flexible exchange rates insulate from inflation they do not necessarily insulate from the income and activity effects. - If income is redistributed by other means (higher wages) and the effect of relative import prices on demand are

[4]Surprisingly Japan has had higher volatility in the terms of trade than Australia over the 1970s and 1980s (being particularly affected by oil prices). Reflecting this it has had greater volatility in GNE, and yet it has had slightly more stable GDP, and significantly more stable employment.

[5]As Gruen and Shuetrim (1993) note a rising trade share leads to lower volatility in the terms of trade. However, as the trade share is higher the contribution to growth from a given movement in the terms of trade will be higher. Thus the contribution to growth will only fall slowly as the trade share rises over time.

small in the short run then the increase in insulation from moving to a float may be smaller than imagined).

Table 2: Volatility of Output, Employment and the Terms of Trade

	TOT (Contrib to GDP)	GDP	Employment	Effective Employment Demand
St Devs				
1960-61: 1976-77	1.18	2.64	1.29	1.93
1977-78: 1993-94	0.91	2.49	2.04	2.14

Table 2 also shows that employment was much less volatile in the sixties than it is now despite having similar volatility in output. (This is an important difference given that the cost of cyclical fluctuations are generally measured in terms of changes in unemployment - the perception that the 1980s have been boom bust really rests on this higher volatility in employment growth.)

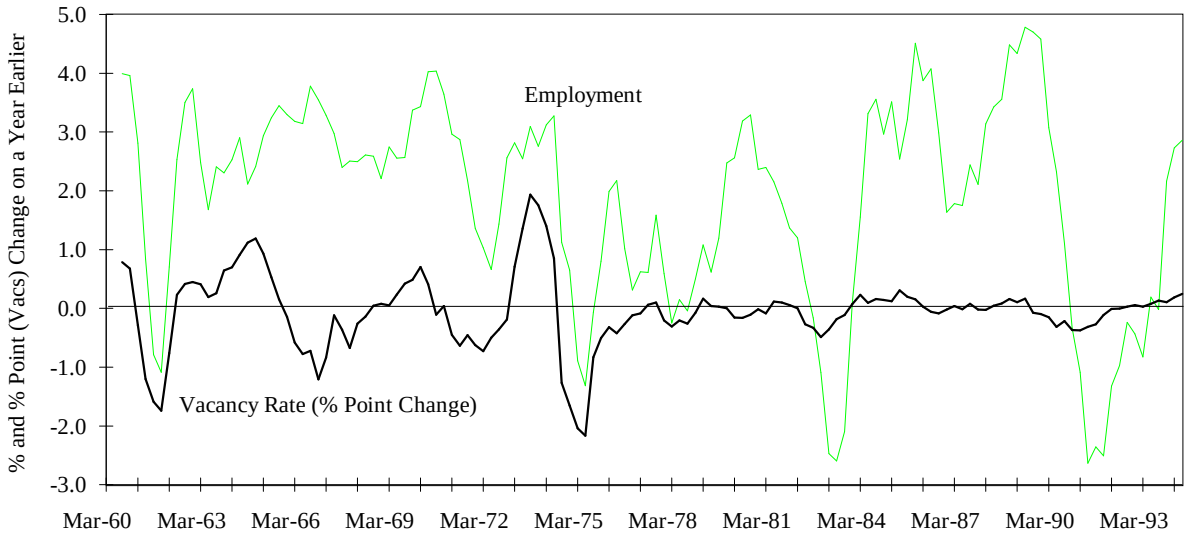
The Effect of the Rise in Unemployment on Insulation

The comparison with the 1960s highlights a major difference in the labour market in the 1960s which may have helped to buffer the economy against external shocks. That is, in the 1960s the labour market was closer to equilibrium as defined by the UV relationship. It was an economy where as the 1945 White Paper put it "there was a tendency towards a shortage of men instead of a shortage of jobs". In a full employment economy vacancies play a role in buffering demand shocks to employment levels. [See diagram below]

If the labour market is close to or below equilibrium, then employment will be on or close to being on the labour supply curve. Unfilled vacancies will be higher than unemployment, and employment lower than effective employment demand (with unfilled vacancies equalling the difference between employment and effective employment demand). When the economy is hit by a negative shock, the demand curves moves from LD1 to LD2 above. From the diagram, if employment is initially supply constrained (1960s case) this will result in a considerable reduction in unfilled vacancies . However, if the labour market is demand constrained (1990s case) then there will be little or no buffering effect from this source.[6]

Chart 3 below shows that fluctuations in unfilled vacancies and fluctuations in employment since the 1960s. As can be seen the buffering effect of changes in unfilled vacancies were quite substantial up until the mid seventies.

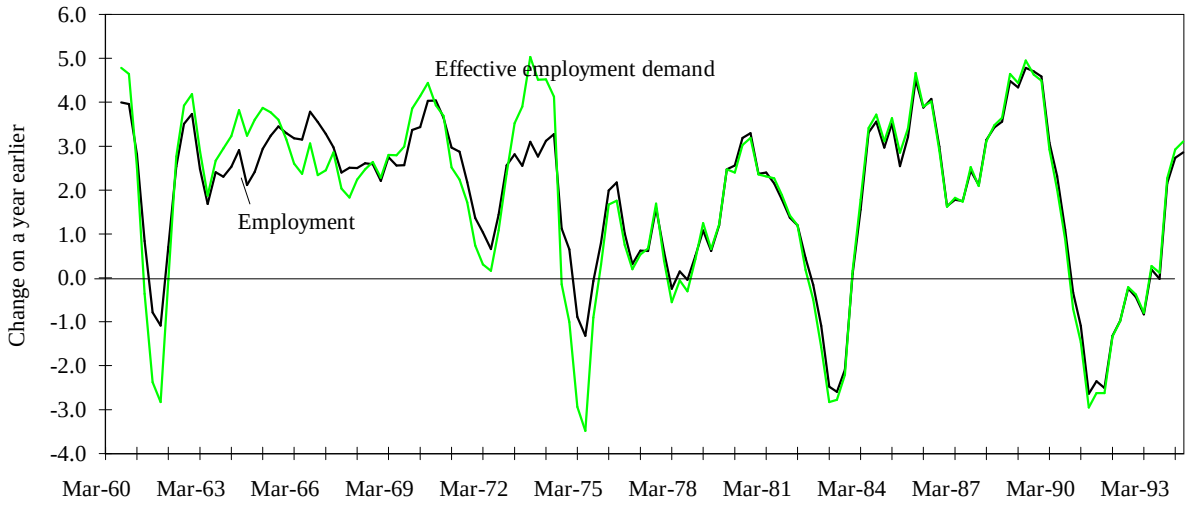
Employment Growth and Change in the Vacancy Rate



Adding back vacancy movements to employment to derive effective labour demand (chart 4 below) suggests that this difference accounts for the difference in volatility in employment in the two periods (fourth column of Table 2).

[6]Note that the curves in the diagram are not meant to imply that large wage reductions are required to reduce unemployment. The curves are meant to show short run relationships in the labour market . It may well be the case that the price setting curve is relatively horizontal in the long run, and hence that nominal wage restraint rather than large real wage reductions are what is required to reduce unemployment in a full model context (see Johnson and Downes (1994))

Fluctuations in Employment and Effective Employment Demand
1960s and early 1970s compared to the 1980s



However, with much higher unemployment in the late 1970s and 1980s there appears to have been a more direct translation of fluctuations in output and demand into unemployment. Thus higher unemployment appears to have led to greater volatility in employment. This in turn, (if hysteresis effects occur and unemployment ratchets upwards with each downturn), may have had consequences for unemployment levels themselves.

Table 3: Volatility of Selected Components

	Labour# Income	Goods Consumption	IDW*	IPE*	Sales	Exports (Cont to GDP)
St Devs						
1960-61: 1976-77	1.9	2.5	10.9	8.7	2.6	1.1
1977-78: 1993-94	2.7	2.5	12.5	12.1	4.1	1.1

Abstracting from real wage changes
* IDW - Private investment in dwellings
IPE - Private investment in plant and equipment

However, the greater instability in employment has not translated into greater instability in household income. Rather the fluctuations in employment have been partly offset by more volatile real wages, and by offsetting fluctuations in benefit income. Household income has roughly the same volatility in the 1980s and 1990s as it did in the 1960s. Thus, consumption is no more volatile. Rather, the instability appears to have been pushed into investment as a result of crowding in effects from increased benefit payments and the real wage/profitability effects. Plant and equipment investment has been roughly 40 per cent more volatile in the 1980s and 1990s than in the earlier period. The fact that investment has been less stable has meant that sales have been less stable - leading to greater volatility in stock building than would have otherwise been the case.

Thus changing conditions in the labour market may have contributed to greater instability in private domestic demand, offsetting the stabilising effect of the increasing size of the service sector and consumption of services.

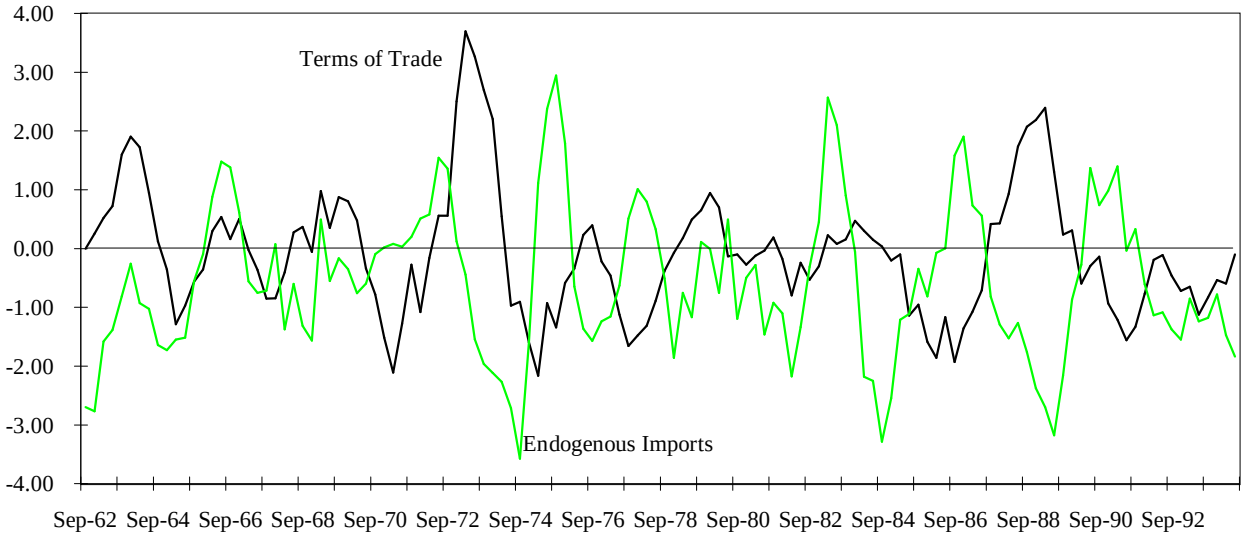
Exchange Rate Insulation

Another important change has been the move to a floating exchange rate noted above. The insulation property (of imports offsetting the demand fluctuations) in theory should have increased with the floating of the exchange rate. With a floating rate, the Australian dollar rises with the terms of trade, making imports cheaper and hence accentuating the import buffering effect mentioned above. (It also has the effect of redistributing the income gain away from producers to consumers.) Moreover, the rise in import and export shares in expenditure and output should have (a) increased the leakage out of any given terms of trade induced demand shock and (b) increased the effect of exchange rate changes on output.

The floating of the exchange rate and the removal of exchange controls has also had important effects on how fiscal and monetary policy operate and how movements in overseas interest rates affect the economy. However, the key question from a business cycle point of view is to what degree it has lessened the impact of fluctuations in commodity prices and the terms of trade on the domestic economy. Blundell-Wignall et al (1993) have shown that, since the float, the dollar has been more sensitive to the terms of trade. Moreover, the single equation results reported below tend to suggest that while the effect of the terms of trade on GNE has been unchanged, it now has less effect on GDP.

The question is how this has come about. The chart below compares direct contributions to national income from the terms of trade to contributions from changes in endogenous import volumes. The surprising thing is that the relationship does not appear to have changed that much pre and post float. This is confirmed by simple correlation analysis which indicates that simple one on one relationship was in fact stronger in the first half of the sample period (before 1977) than in the second.

Terms of Trade and Endogenous Imports Contribution to GDP Growth



However, it is not possible to draw any strong conclusion from such a simple correlation. There are a large number of factors which affect imports other than the terms of trade. For example, there were large movements in imports and stocks in both the early 1960s and early 1970s that were associated with the removal and reimposition of import quotas, which may have coincided with terms of trade movements. Moreover, it seems very likely that imports are more consistently buffering the terms of trade GNE effects given the closer correlation between the terms of trade post float and the exchange rate, and the absence of exchange rate movements in the 1960s. Also, the exchange rate will cause offsetting effects on output via a negative effect on exports which also will be more consistent and may have increased with the growing importance of price sensitive manufacturing exports.

Thus, it seems likely that the effect of the terms of trade on activity is now lower than it was in the 1960s and 1970s but that the exchange insulation is not perfect and that hence they do still play a role.

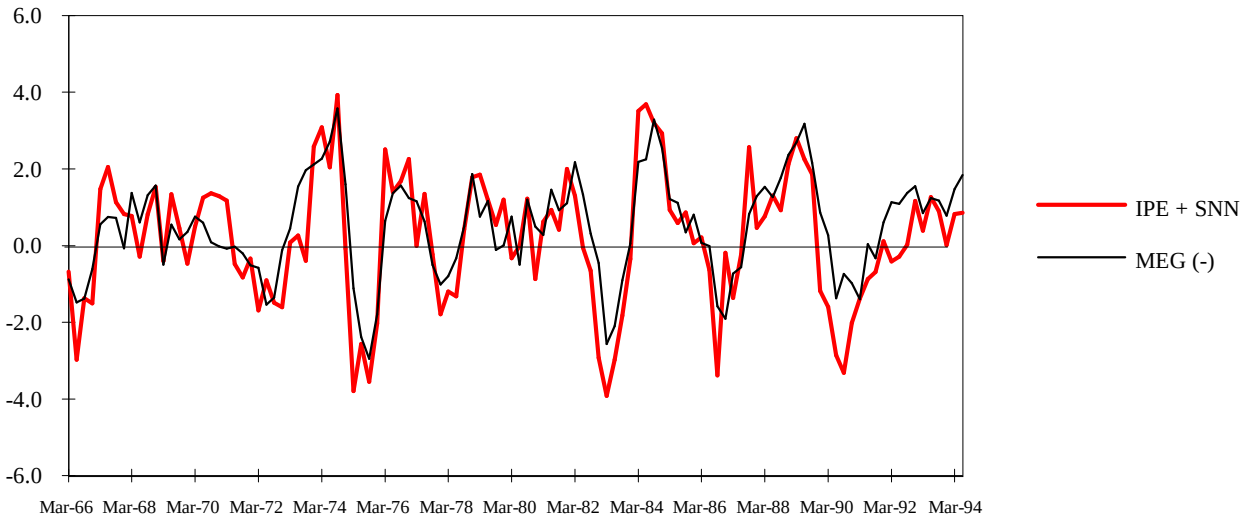
Propagation Mechanisms - Inventory Cycle and the Investment Accelerator

Inventories and business investment are dominant features of both Keynesian and real business cycle models (although the emphasis differs on the importance of such factors as time to build, uncertainty, credit constraints, confidence etc). (On the time to build point, it is hard to see that this would be a significant factor in Australia given that most of our plant and equipment is imported and hence not subject to capacity constraints in the domestic capital goods industry. The view that uncertainty or confidence play a significant role in investment decisions underlies the specification of a capacity term in the TRYM investment equation.)

These propagation mechanisms are very important in relatively closed economies such as the US. Blinder (1991) goes so far as to say for the US that "recessions *are* inventory swings". However their effect is less in a country like Australia where a large proportion of consumer durables and investment equipment is imported. More than half our plant and equipment and a considerable proportion of our

business inventories are sourced overseas. In stylised terms we export commodities and import plant and equipment and consumer durables while other industrialised countries import commodities and export equipment and consumer durables. This means that increases in plant and equipment investment and stock building tend to be offset by increases in imports. The chart below shows that the contribution to growth from plant and equipment (IPE) and private non farm stocks (SNN) is usually offset by a negative contribution from increased imports.

Plant and Equipment, Non Farm Stocks and Endogenous Imports
% Point Contribution to GDP Growth



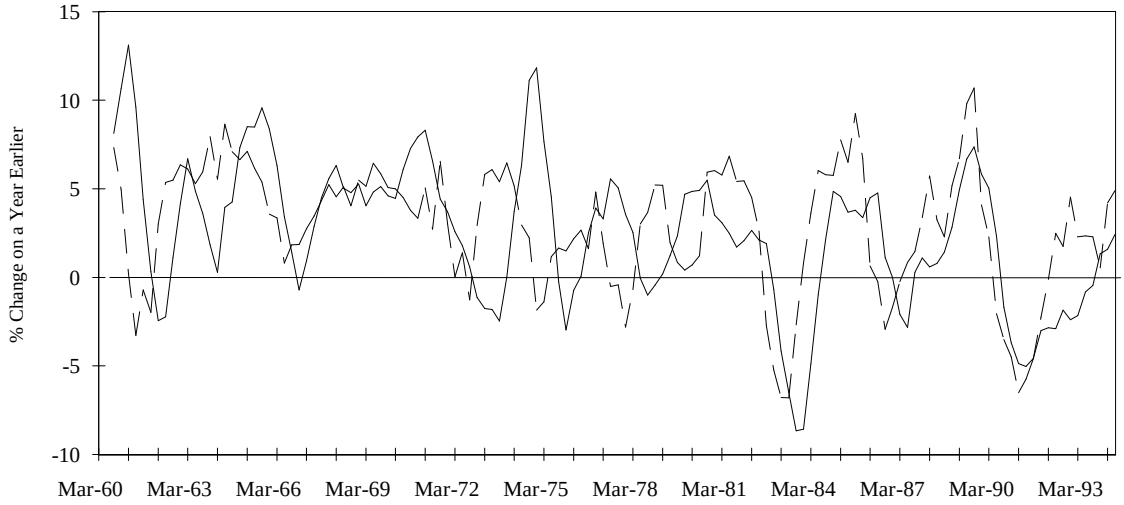
Although the chart above overstates the true relation between plant and equipment inventories and imports[7], the point remains that the leakage is large. This explains the large offsetting import effect to fluctuations in the terms of trade. However, it also means that shocks to output and demand should dampen relatively rapidly over time (compared to the US for example). As a result, fluctuations in demand and output may largely be a function of whether the various exogenous factors discussed below are offsetting or reinforcing (for example, whether a fall in the dwelling cycle coincides with or offsets a movement in the terms of trade). (The chart also appears to indicate that the relationship has not changed much over time - helping to explain the apparent lack of change in import buffering under the float compared with earlier periods noted above).

It is also interesting to note that the volatility of the combined contribution of plant and equipment and non farm stocks to GDP growth, if anything, appears to have increased slightly in the 1980s. Plant and equipment volatility is higher while stocks volatility is lower in contribution to growth terms (but not in change terms). However, while the contribution to growth from stocks has fallen (due to their smaller size) how they behave in relation to demand appears to have changed in the 1980s. In the 1960s stocks were only loosely related to sales. On average, stock building would increase at a faster rate in the first two quarters after a fall in the growth of sales leading to an initial offsetting effect on output. Moreover, there were particularly large speculative movements related to the removal and

[7]All three are coincidentally related to consumption expenditure. The direct elasticity of imports to changes in IPE and SNN in the equation attached is around 0.4 roughly half that implied by the chart. This has possibly increased in recent years with increasing import penetration.

reimposition of import quotas in 1960 and again in 1973-74 (with the latter period also being affected by anticipated changes to the exchange rate). However, in the deregulated environment of the 1980s, with the development of just in time systems, and an increase in the proportion of imported finished good stocks - see Treasury (1991) and Flood and Lowe (1993)] -stocks now appear to be much more closely aligned with sales. Thus, while stocks are smaller as a proportion of GDP, and on average make a smaller contribution to growth, the contribution they do make tends to be more systematically pro cyclical. Thus while stocks would be built up in the first two quarters following a downturn in sales in the 1960s early 1970s they now tend to fall with sales. As a result, they have made a significant negative contribution to GDP in the initial stages of the last three downturns (in 1983, 1986 and 1990).

Change in Stocks against Change in Sales



Thus, the contribution to growth from stocks may have been more pro cyclical in the 1980s than in earlier periods, offsetting the stabilising effects of the smaller size of the stock holding sector (and stocks themselves) in relation to the rest of the economy, the increasing size of the service sector, and the increased size of the government sector (and hence fiscal drag). The overall volatility of demand in relation to shocks appears to be little changed over the last thirty years.

Thus, in conclusion, there are two points to draw out:

- Firstly, unlike other countries there is a large leakage out of the normal propagation mechanisms - the investment accelerator and the inventory cycle. Thus, more than other countries, our cycle may be dependant on whether shocks coincide (whether the various exogenous factors discussed below reinforce each other or are offsetting).

- Secondly, the overall volatility of demand and output in response to shocks seems to be broadly unchanged. This is despite a number of factors which would have been expected to lead to a more stable economy, such as:

  – the growth of the service sector;

  – the increased size of government and hence fiscal drag;

– more diversified exports and a slightly smaller average contribution from the terms of trade;

– the insulation gained from moving to a floating exchange rate; and

– the smaller size of stocks in relation to the rest of the economy.

The unchanged volatility appears to be due to: greater volatility in investment; a more systematically pro cyclical contribution from the stock cycle, and greater volatility in employment for a given change in demand. This last factor appears to be partly due to the higher levels of unemployment and may in turn be leading to hysteresis effects and a ratchetting up of unemployment itself.

EXOGENOUS FACTORS / FACTORS DRIVING THE CYCLE

This section looks at a list of potential factors that can affect the Australian economy, and employs the TRYM model to discuss some of the linkages.

The first part looks at factors which can have persistent (as opposed to temporary) effects on Australian output - factors such as world growth and interest rates, the terms of trade, agricultural conditions, mineral discoveries and mining output, labour supply, productivity and the NAIRU. Permanent changes in these factors will possibly have permanent affects on Australian output. They will also have temporary effects as they change over time.

The second part looks at factors that lead to mainly temporary effects such as the dwelling cycle, the office cycle, fiscal policy, monetary policy and financial shocks. In simple time series analysis of the characteristics of GDP (as in the real business cycle models), these temporary factors would be read as being demand side while the effect of the factors above would be interpreted as being supply side. However, in practice it is difficult to exactly categorise the persistent factors as supply side and the temporary factors as demand side. (For example, the dwelling cycle has the effect of producing fluctuations in demand but is largely due to supply side dynamics. A permanent increase in world interest rates would have significant effects on investment and output beyond the short term, but would be difficult to categorise as a supply side shock.)

FACTORS WITH POTENTIAL LONG RUN EFFECTS

World Output and Interest Rates

As a small open economy (a commodity exporter at that) with free capital flows, what happens in overseas economies will obviously have an important bearing on Australia. However, we need to be careful about the linkages, as how an increase in world growth affects the Australian economy may depend on what is driving that growth. Ignoring for the moment confidence effects in financial markets there are three important linkages:

- Effects of changing world demand on world interest rates and hence on Australian interest rates and the exchange rate.

- Effects on world output on demand for Australian exports. (However, as a small producer in a large world market, our exports are largely limited by our potential to supply, and hence are more sensitive to supply determinants.)

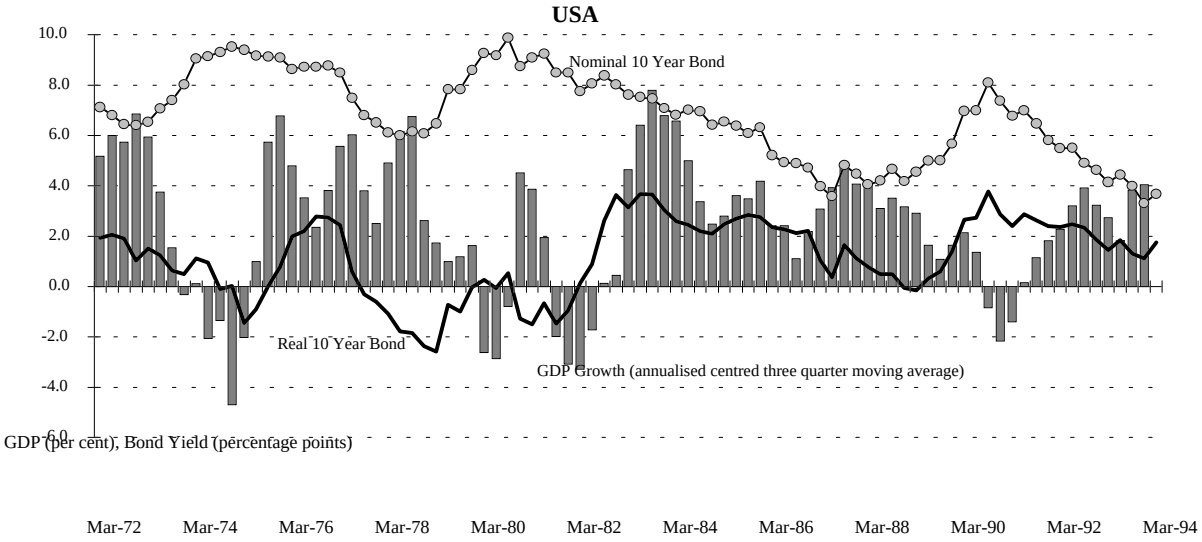
- Effects of world demand on commodity prices. Blundell-Wignall and Bullock(1992) show that there is a reasonable link between OECD industrial production and IMF commodity prices. However, Australia's commodity bundle is a subset of the IMF bundle, and in our case it appears that world output only explains around a quarter of the fluctuation in our commodity prices, and that there is hence a large role played by supply in commodity auction markets.

Given that there is not a strong linkage between world output and export volumes, the effect of changes in world output growth (independent of their effects on the terms of trade - ie confidence effects etc) may well depend on whether it is demand or supply side factors which are driving the increase, and to what extent it is accompanied by changes in world real interest rates. (In this context it is useful to recall the numerous VAR findings that a significant part of the fluctuation in US growth

is due to supply side factors. If growth is being driven by supply side factors - say increased productivity or increased participation - then real interest rates will tend to stay low. However, if growth is being driven by demand side factors eg world fiscal expansion - then real interest rates should rise.)

The chart below for example shows nominal and real US 10 year bond rates against US GDP growth. It indicates that real bond rates remain low in the late eighties boom. This may have reinforced the positive effect on the Australian economy of that growth. Similarly, the rise in US 10 year bond rates in 1990 may have accentuated the negative effects of that downturn on the Australian economy.

Chart 1: Output Growth and Bond Yields

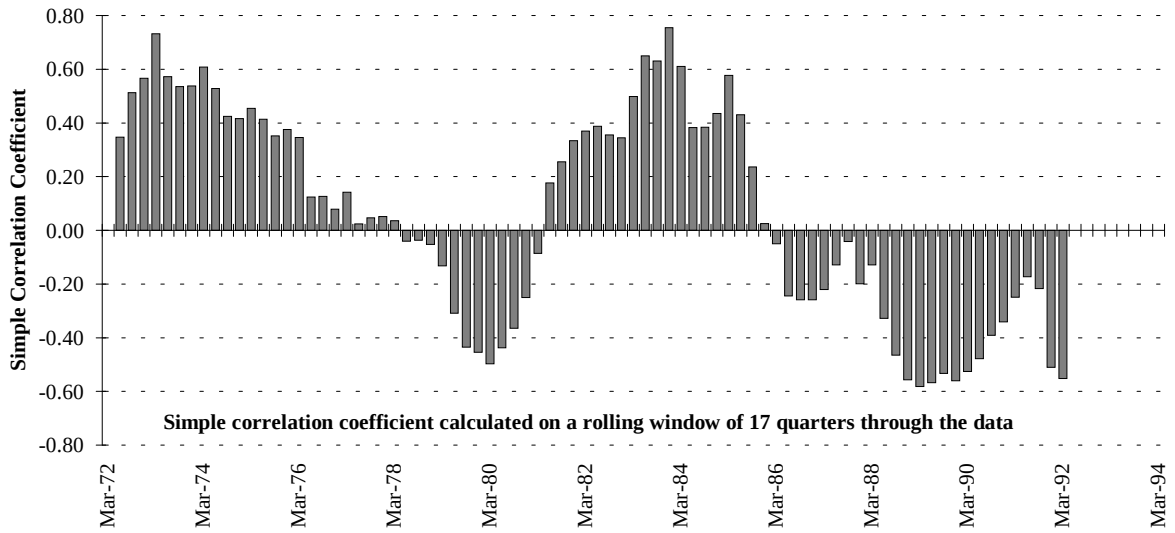


What effect of overseas growth therefore partly depends on whether it is accompanied by rising or falling interest rates. However, there does not appear to be a stable relationship over time between world output and world real interest rates. The chart below shows a rolling sample correlation coefficient[8] between quarterly US GDP growth and US real 10 year bond yields[9]. This switches round over time being positive with the inflationary supply side shocks of the two oil booms, but negative with falling oil prices (rising terms of trade in overseas countries) in the 1980s.

[8]Based on a 17 quarter window rolled through the data.

[9]These two charts are sourced from Johnson A., (1994) "World Growth and Interest Rates and their Impact on the Australian Economy: MSG2 and TRYM Model Analysis", *Treasury Mimeo.*

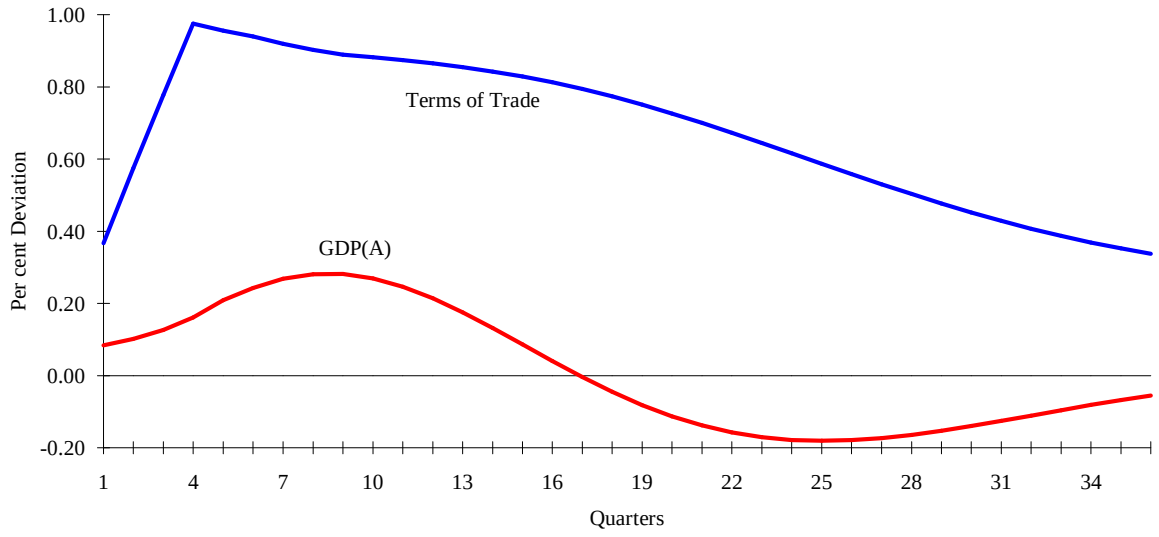
Chart 2: Correlation Between Growth and Real Yields



It appears possible that the current recovery in world activity will be accompanied by rising real interest rates and hence the correlation may again become positive. If that is the case the observed coincidence of US and Australian cycles in the 1980s, and the argument that there is an effect on Australian growth independent of the effect on the terms of trade (Gruen and Shuetrim (1994)), may break down in the 1990s.

Macro model simulations indicate that an increase in world demand has a positive effect on the Australian economy, while increased world interest rates have a negative effect. The effect of a TRYM simulation of an increase in world output with world real interest rates unchanged is shown in the chart below. (World growth is increased by 1 per cent for one year. In level terms world output is permanently 1 per cent higher. The results below are in deviation from baseline terms.)

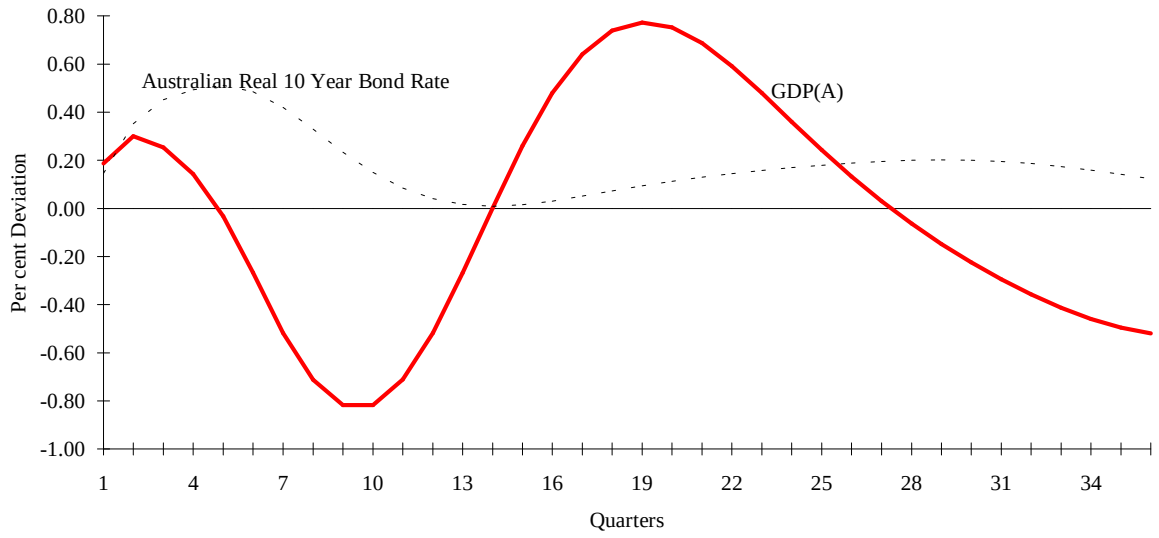
Permanent 1 % Increase in World Output



The positive effect comes predominantly through the terms of trade, and as mentioned above, the translation of world growth into a terms of trade increase depends very much on supply conditions in Australia's commodity markets. (The rough elasticity in the TRYM commodity price equation is about three to one (three per cent increase in commodity prices for each one per cent increase in world output). The effect on GDP is partly offset by an appreciation of the real exchange rate, which interacts with rising real wage effects and cyclical investment and inventory effects to produce a cyclical downswing in GDP after the fourth year. The overall effect however is positive, although the simulation results should be treated with caution (particularly the cyclical effects which depend on the interaction of a large number of factors).

In contrast an increase in world interest rates has the opposite effect. The chart below shows the results of a temporary 1 per cent increase in world real 10 year bond rates using the TRYM model. (World interest rates are increased in the first year and phased out over the next two years.)

Temporary 1 % Increase in World Interest Rates



The results indicate that an increase in world real long bond rates leads to an increase in Australian real long bond rates of about half the amount, and a fall in the Australian real exchange rate. The increase in Australian long bond rates has a negative effect on dwelling investment and business investment by increasing the cost of funds / hurdle rates of return, and a negative effect on consumption by reducing the market value of wealth. The depreciation of the exchange rate has a positive effect on GDP and these come through in the third and fourth years after the shock as the real interest rate effects are unwound. The negative effects on GDP depend on how much of the increase in the 10 year bond rate translates into domestic lending and hurdle rates, and as with all model results, should be interpreted with caution.

Terms of Trade

As mentioned above world demand is only one part of the explanation for the movement in commodity prices and our terms of trade can change as a result of changing supply conditions in world commodity markets. The world demand variable in the TRYM equation only accounts for around a

quarter of the total variation in commodity prices, (which leaves a large role for supply effects). If supply conditions change, then the terms of trade can change without a change in world growth.

An improvement in the terms of trade is unambiguously positive on Australian activity. Higher income growth leads to higher GNE growth. This generally leads to a net export detraction particularly given the high import penetration of the volatile components of demand (discretionary expenditure items) such as plant and equipment investment and consumer durables. (Hence the effect on the CAD tends to be ambiguous.)

The insulation property (of imports offsetting the demand effects) in theory should have increased with the floating of the exchange rate. With a floating rate, the exchange rate rises with the terms of trade making imports cheaper and hence accentuating the import buffering effect mentioned above. (It also has the effect of redistributing the income gain away from producers to consumers.) However, as noted earlier, the import intensive composition of the volatile components of GNE has probably limited the extent to which the exchange rate has insulated activity.

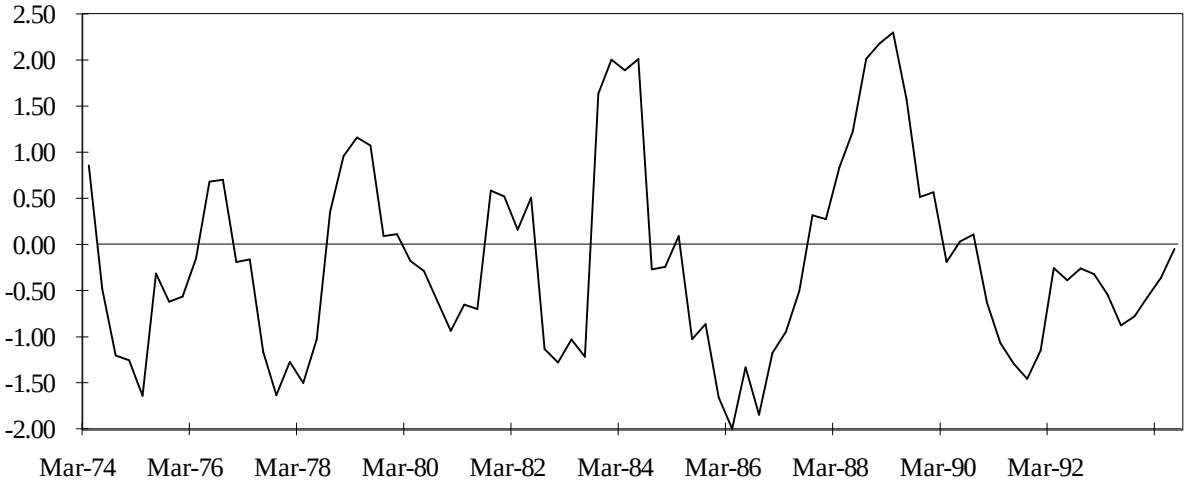
In terms of the rough magnitude of the effect, the model results indicate that a one off 10 per cent increase in the terms of trade will lead to an increase in GNE of around 3 per cent after 2 years a detraction from net exports of a little under 1 per cent, and hence an increase in GDP of a little over 2 per cent. This compares with a direct income effect (ABS methodology) of around 2 per cent. Similar results are generated by the Murphy model. Both models are based on time series data and estimated over the period from the early seventies to the present.

Rain and Farm Output

McTaggart and Hall (1993) and Ryder et al (1993) have shown that fluctuations in rain and farm output have had a significant effect on the Australian economy. In theory, changes in farm output and exports should have a similar effect on national income as fluctuations in the terms of trade. A rise in farm income will lead to increased expenditure and a rise in the demand for imports. Export income will rise leading to a rise in the exchange rate (assuming an unchanged saving investment imbalance). The rise in the exchange rate will accentuate the demand impacts on imports. These features are reflected in the TRYM model simulations of the effect of an increase in the rainfall index, which are shown in the attached charts.

The Chart below adds the direct contribution to GDP from farm output to that of the terms of trade. The estimates should be regarded as illustrative only.

Terms of Trade and Farm Output - Contribution to GDP Growth



As can be seen the direct fluctuations in income stemming from these factors are quite large particularly over the last ten years. The effect of farm output was particularly large in 1982-83, subtracting almost one and a half per cent from GDP growth, and adding almost two per cent to income in the recovery of 1983-84. In contrast, farm output subtracted about half of a percentage point from GDP growth in 1991-92.

(Similarly changes in mining production may be considered to be mainly exogenous being relatively unrelated to domestic GDP growth and significantly affected by mineral discoveries and conditions in overseas commodity markets as in the mineral booms of the 60s and early 1980s.)

Wage Shocks

Wage shocks are another source of fluctuation in activity. A significant part of wage movement is of course endogenous, depending on for example changes in unemployment, overtime, taxation, and inflation expectations. However, this systematic part of the movement in wages appears to be relatively small in the case of Australian wage equations, accounting for only about a third of the quarterly movement. Clearly, there is a large role for institutional factors and factors we do not understand well, (factors which are not directly due to feedback from the rest of the economy). (Economists often talk about animal spirits in relation to investment but compared to wages, investment is relatively well determined.)

Obviously, a domestic wage shock will have consequences independent of what is going on overseas, and should be included in any assessment of what is driving the domestic economy. The nominal wage explosions of 1974 and 1981 had a significant adverse impact on growth, while wage restraint under the Accord in the 1980s was associated with strong growth in employment and activity.

Productivity Growth

Related to wages is the question of productivity growth. The slow down in productivity growth in the early seventies obviously has a large impact on the difference in average GDP growth between the

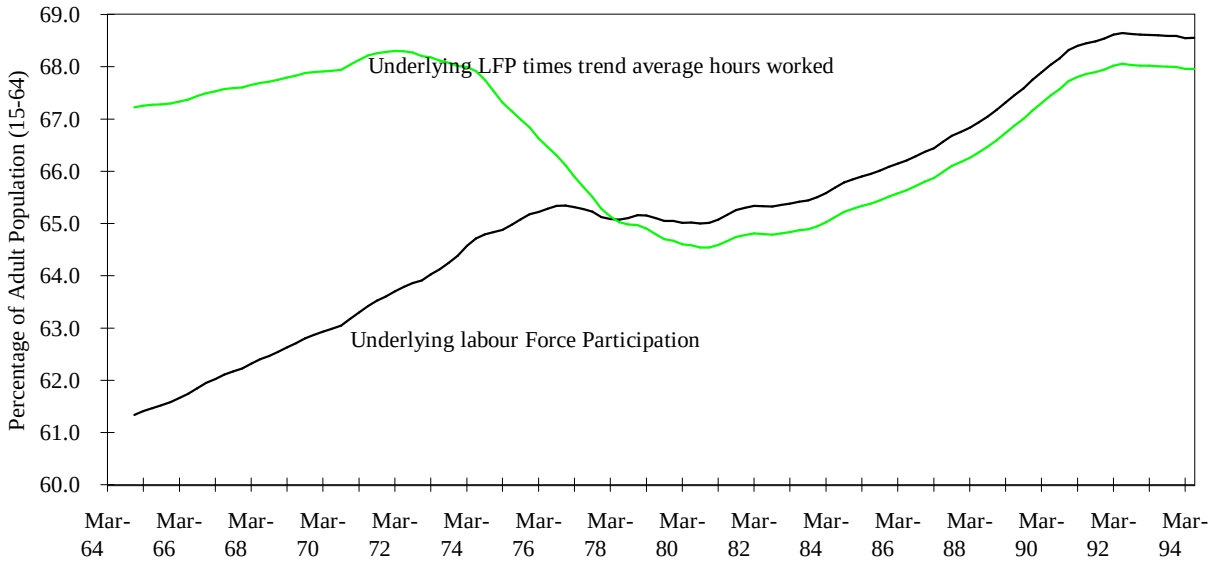
1960s and the latter period. It may also have had significant effects on household saving. There can also be significant cyclical effects as shown in real business cycle models, if trend productivity growth is fluctuating over time. However, since the early 1970s there appears to be little evidence of a break in trend productivity growth. Changes in labour productivity appear to be well explained by normal cyclical lags and labour hoarding effects, and by changes in relative factor prices. Similarly, in the most recent period there appears to be little evidence of a break in normal productivity relations at the aggregate level although it may be the case that capital productivity has improved. (Changes in working arrangements due to enterprise bargaining, for example, may initially show up as changes to capital productivity and only as labour productivity with time).

Labour Supply Shocks

Another source of change to output comes from social changes that lead to increases in labour supply per head of population. Changes in participation trends will feed back to changes in GDP growth (just as changes in population growth and immigration lead to changes in employment and GDP growth). Since the second world war, a declining trend in hours worked has broadly offset an increasing trend in participation. (In the long run labour supply appears to be relatively invariant to real labour income.) However, they have not offset at all times. In the 1970s, a decline in hours worked more than offset the increasing trend in participation. In the 1980s, hours were relatively unchanged while there was a very strong trend increase in participation, reflecting social changes in relation to female work.

The chart below shows the participation rate loosely abstracting from encouraged worker effects, and an index of total labour supply per head of population (obtained by multiplying the underlying participation rate series by an index of trends in hours worked). Again the estimates are illustrative only.

Underlying Labour Force Participation and Labour Supply



As can be seen there was a considerable reduction in labour supply per head of population in the late 1970s, with the thirty five hour week campaign, and an increase in supply in the late 1980s mainly due

to a marked increase in married female participation. The model results shown in Attachment C indicate that, given a fixed NAIRU, changes in labour supply can have a significant affect on activity. The key linkage here is through wages. The initial reaction of an increase in participation is a small rise in unemployment which leads to lower nominal wage outcomes, which in turn allow the additional workers to be accommodated in the employed labour force. Thus, the labour supply variable would not be expected to work in a simple single equation model where wages are also included as an explanatory variable as in the results reported below.

TEMPORARY FACTORS

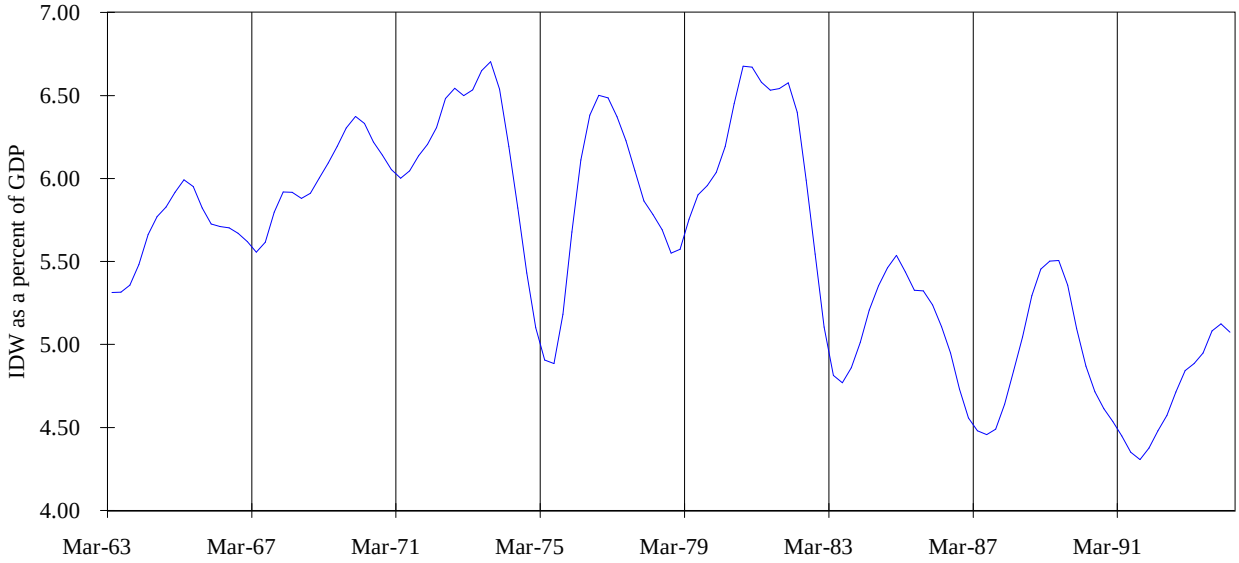
Dwelling and Non-Dwelling Construction.

Another possible source of fluctuation comes from stock adjustment cycles. These will possibly occur where there are significant lags in the response of supply to fluctuations in demand (ie the familiar cobweb model). These would be expected where entry costs are low, there are a large number of small firms, and consequently coordination failure in the supply response. This is possibly a good description of the building industry. One thing that would be expected from a cobweb model is a regular cycle. There appears to be some evidence from the auto regressive characteristics of the dwelling investment and some components of non dwelling construction that periods of over-building and under-building occur on a regular basis. This can be seen, for example, in the Indicative Planning Council for the Housing Industry (IPCHI) estimates of actual construction against underlying demand for dwellings which indicate regular periods of overbuilding and underbuilding.

There are relatively short lead times involved in increasing the supply of dwellings leading to a fairly regular four year cycle. The lead times in non dwelling construction on the other hand are much longer, 5 to 6 years for major projects, leading to a cycle of 15 to 20 years.

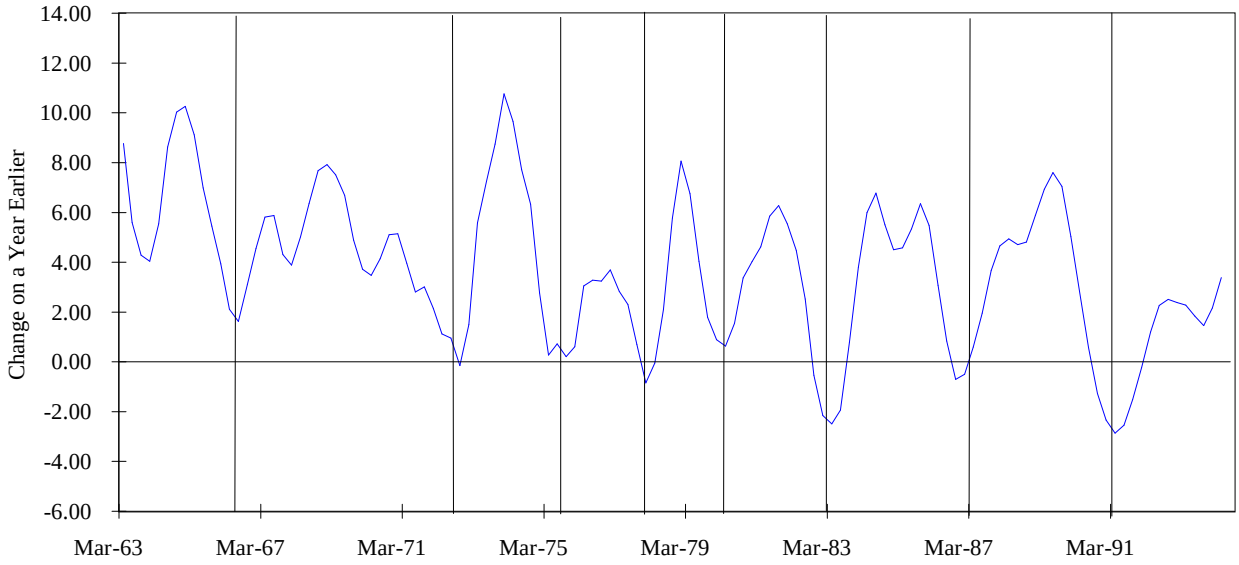
The regular 4 year cycle in dwelling construction can be seen below:

Regular Cycle in Dwelling Investment - IDW/GDP



As can be seen the downturn in dwelling investment in 1990-91 was not particularly large, much smaller in fact than the downturns in 1974-75 and 1982-83. The distinguishing feature of the dwelling cycle is its regularity (which as noted above is suggestive of a cobweb style stock adjustment cycle). In contrast, there is no regular pattern in the other components of GNE as can be seen below.

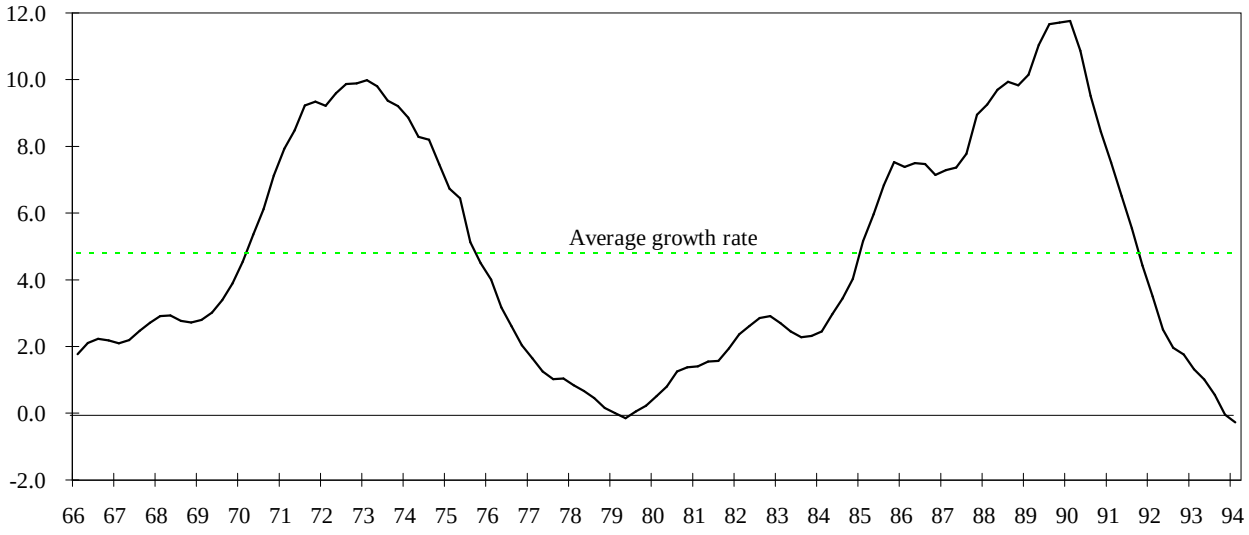
GNE less IDW - % Change on a Year Earlier



One possible view is that the depth of the cycle depends on whether a downturn in the regular dwelling cycle coincides with downturns in the terms of trade, farm output or non dwelling construction. Non dwelling construction (IOB) is another component which is affected by a long

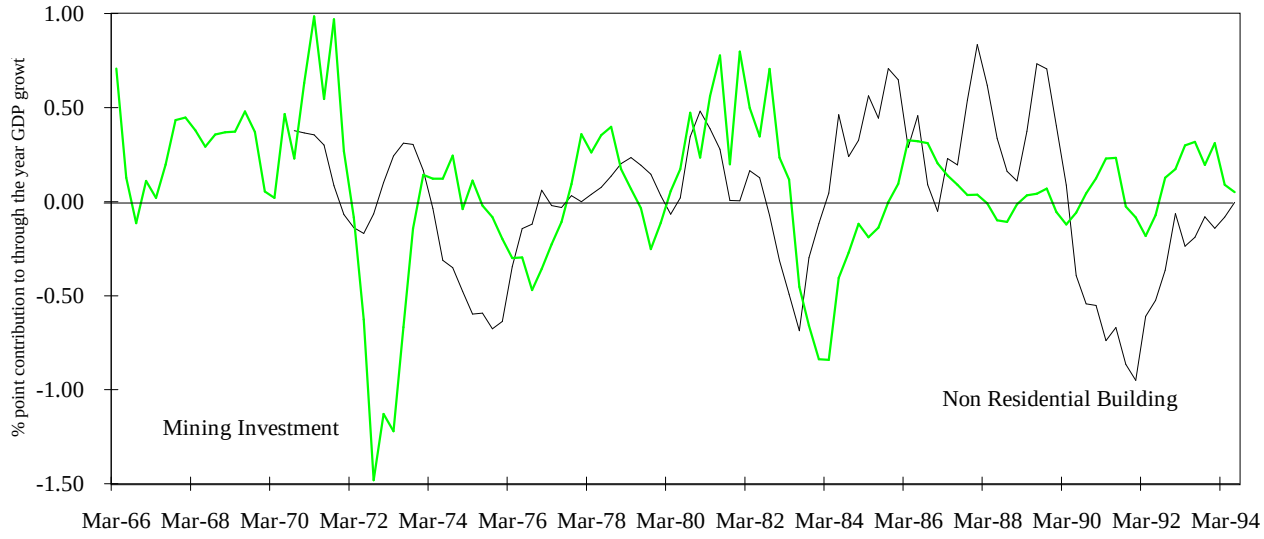
stock adjustment cycle. This cycle is evident in the office building as can be seen below. (Office Building on average makes up about a quarter of non residential construction.)

Stock Adjustment Cycle in Office Building - Imputed office Capital Stock
Percentage Change on a Year Earlier



The national accounts measure of non dwelling construction (IOB) includes engineering construction and hence is also affected by large movements in investment in the mining industry following mineral discoveries and movements in commodity prices, both essentially exogenous. The fall in commercial building in 1990-91 (a stock adjustment to overbuilding in the late 1980s) has made a large negative contribution to GDP in the current downturn, as can be seen below:

Non Residential Building and Mining Investment Contribution to GDP Growth

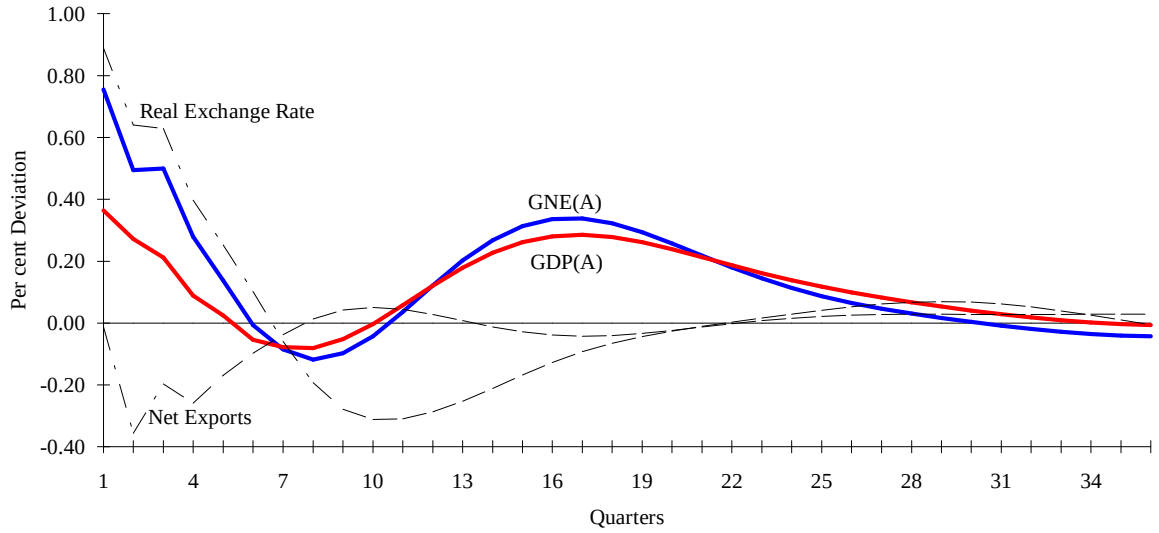


The direct cumulative effect of the falls in non residential construction since late 1989 has been to

subtract two percent from GDP. The effect has been larger than the downturn following the previous period of commercial over building in the early 1970s and much larger than the short building downturn in 1983. On the other hand, mining investment has been making a positive contribution to GDP growth in the last three years. This is in contrast to the large negative impact it had following the resources boom of the early eighties.

The chart below shows the effect on GDP of a 5 per cent temporary increase in business investment in the TRYM model. As can be seen the effects are partially offset by a leakage into imports (negative net exports). This leakage is accentuated by an increase in the real exchange rate, as real interest rates rise in response to the greater demand for funds. (The leakage into imports would be less in the case of non residential construction investment alone given that it has a very small import component compared to plant and equipment). The effect on activity of a temporary increase in dwelling investment is similar, as can be seen in the attached charts.

Temporary 5% Increase in Business Investment

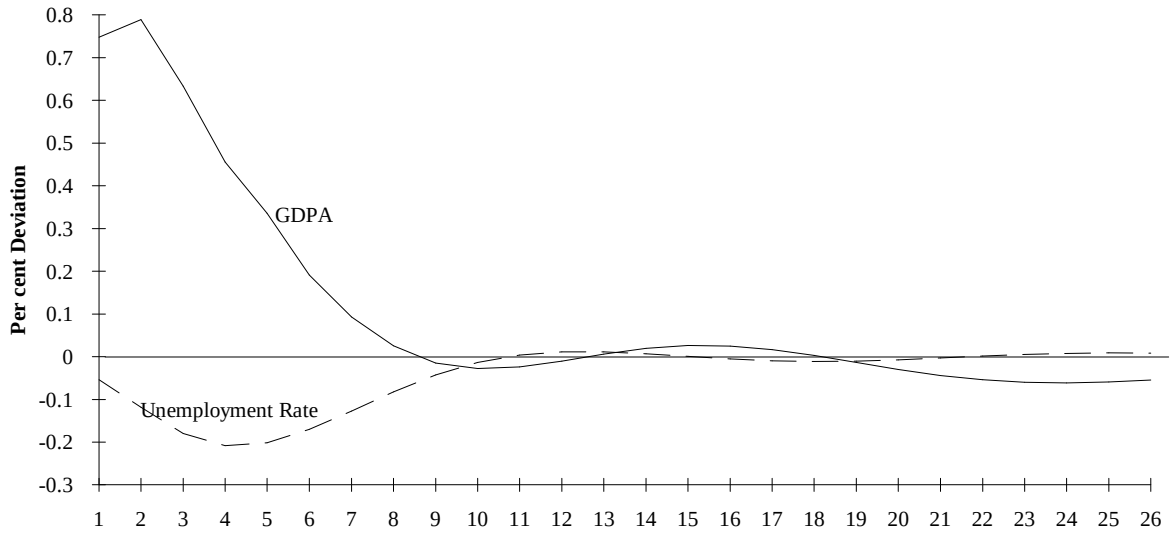


Fiscal Policy

Just as some of the factors above are partly endogenous, so to are fiscal and monetary policy. A large part of the movement in the governments budget balance is due to fiscal drag. For example, the National Fiscal Outlook (1993) attributed more than half of the increase in the Commonwealth Budget deficit between 1990-91 and 1992-93 to falling revenue and rising benefit pay outs as a result of the recession. However, at the same time the Government made significant decisions in a series of Fiscal statements to boost expenditure in an attempt to ameliorate the effects of the recession.

The chart below shows a TRYM simulation of the effect on GDP and unemployment of a permanent one percentage point increase in the PSBR (as a percentage of GDP).

Permanent 1 Percentage Point Increase in the PSBR



As can be seen the results are consistent with the usual Mundell Fleming IS-LM outcomes for a small economy with free capital flows. The fiscal expansion has little or no effect on activity in the medium term (due to a combination of internal and external crowding out), but a more long lasting effect on the external balance (via its effect on national saving). However, there are significant short term effects on activity and unemployment. Again the model results should be treated as illustrative as they depend on the interaction of a large range of factors.

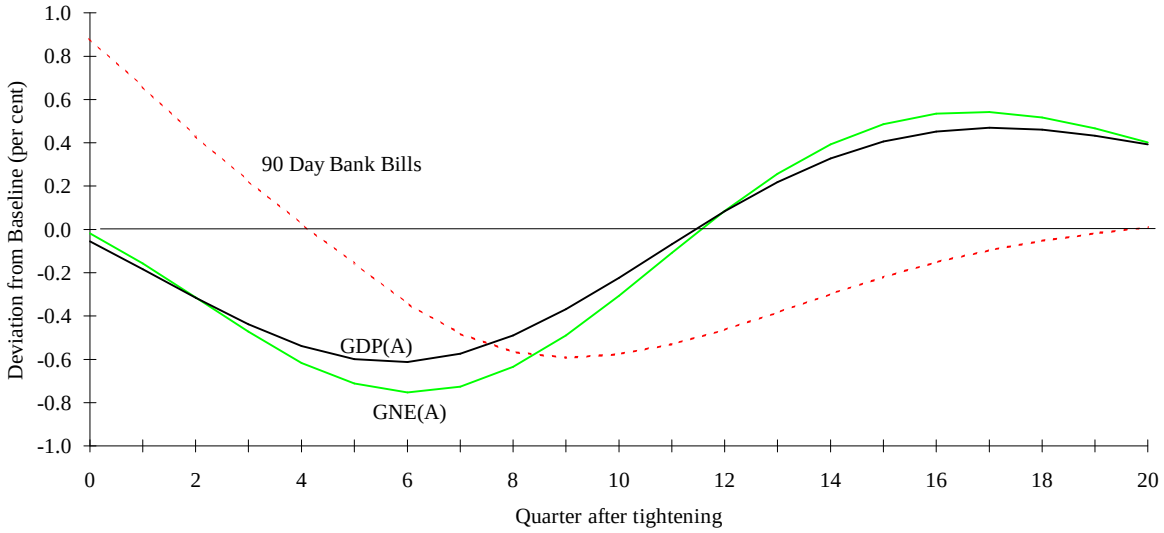
It is interesting to note that the discretionary changes in the Commonwealth budget balance, as a per cent of GDP, have averaged almost 1 percentage point a year (both up and down) over the last seven years (National Fiscal Outlook 1993). The model results indicate that these changes would have had a significant effect on activity. It may be the case that policy makers are reacting in a systematic way to fluctuations in the economy. But this does not take away the fact that their actions are having an effect.

Monetary Policy

As with fiscal policy, monetary policy may respond in a systematic way to exogenous shocks. However, that does not mean that it does not have an effect, and at any stage when it reacts in an unusual way as in "short sharp shock" of 1974 or if the target of policy changes over time then there will appear to be an independent effect from monetary policy in a reduced form single equation model of the economy.

The chart below show a TRYM model simulation of the effect on GDP and GNE of a temporary increase in short term interest rates.

Temporary Increase in Interest Rates



As before, the model results should be treated as illustrative rather than definitive. The fall in GDP is mainly driven by the effects of interest rates on dwelling and business investment and these are highly uncertain depending on, for example, how quickly changes in the bill rate are reflected in lending rates and hurdle rates. The interest rate increase is also quickly unwound in the simulation, as activity falls. This is a function of the policy reaction function that is imposed in the model. It is likely that an interest rate increase that was maintained for a longer period would have larger effects.

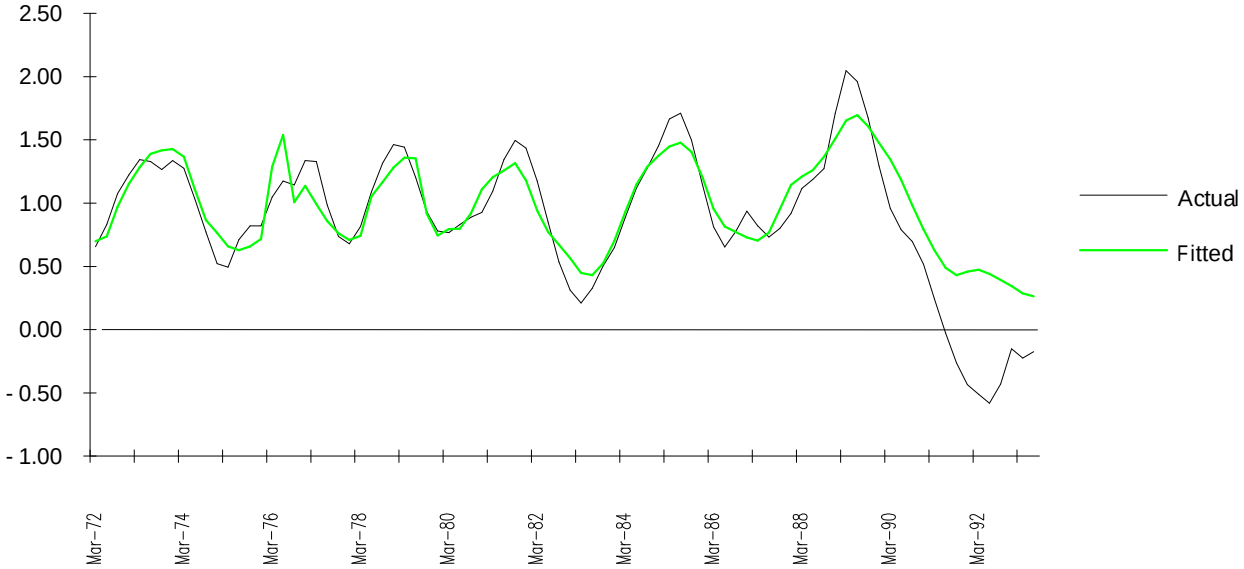
Although the model results should be treated with caution, it is clear that discretionary changes in monetary policy will have some effect on activity, and that the effects may be significant if the discretionary change is large.

Financial Factors

The effect of the factors outlined above on demand may be accentuated by financial factors. For example, there was an unusually sharp financial contraction following on from the asset price increases and high corporate debt levels of the late eighties. These asset price / corporate debt level factors appear to have had little effect on household behaviour. (Private consumption and dwelling investment responded in the usual way to changes in income and interest rates in the 1980s.) However, there does appear to have been a significant effect on business investment. The combination of high gearing, high interest rates, falling asset prices, constrained cash flows and rising bankruptcies appears to have had a significant effect on plant and equipment investment in the 1990-91 recession. (It would also have added to the fall out in non-residential property investment mentioned above.)

The chart below shows growth rates of the underlying plant and equipment capital stock that would normally be expected to occur given capacity utilisation, output growth and profitability and those that actually occurred. The effect of falling asset prices cash flow constraints and rising bankruptcies appears to have reduced investment levels by around 18 per cent, a direct detraction of about 1 per cent to GDP over two years.

Actual and Fitted Change in Non Mining Plant and Equipment Capital



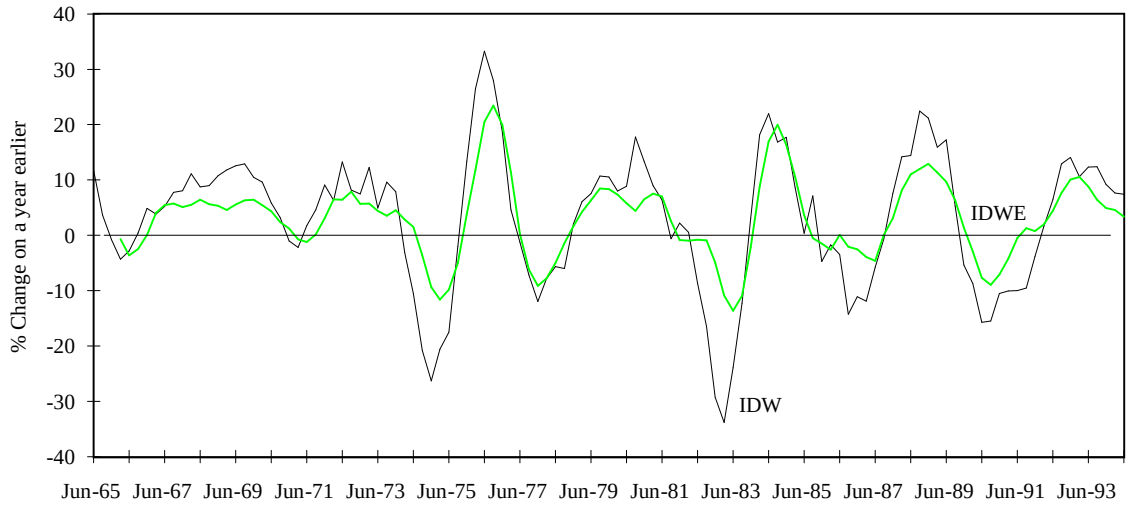
Of the factors discussed above it is these financial movements that seem most likely to have been influenced by developments overseas, given that similar financial contractions occurred in a number of countries.

SINGLE EQUATION RESULTS

The section above has outlined a large number of factors which can affect the business cycle. This section looks at a single equation which attempts to incorporate some of these features in a simple reduced form model of the economy. These equations are based on the important assumption that the propagation mechanisms are systematic and do not change over time. However, the argument above has been that there have been changes (possibly offsetting) in the inventory cycle, the financial sector, the exchange rate, the labour market and the composition of the economy. Therefore, the single equation results should be treated with more than the usual amount of caution. Given the large changes between the full employment fixed exchange rate environment of the sixties the regressions are run from the early seventies onwards.

Another problem in the single equation model is the possibility of simultaneous equations bias given that we want to estimate the effects of dwelling and non dwelling construction and the PSBR. To avoid the problems of simultaneity biasing the results in the case of IOB, IDW and the Net PSBR, the exogenous component of the first two variables only were included while only changes in the structural deficit were included. The exogenous component of IDW and IOB are estimated by isolating the auto-regressive cyclical components from simple equations of these two variables. The chart below shows the auto regressive components of dwelling investment compared to changes in actual dwelling investment.

Dwelling Investment (IDW): Autoregressive Component (IDWE) and Total



The table below reports results for single equations for GNE and non farm GDP including US GDP as an explanatory variable. The first column shows an equation including many of the factors discussed above. The second and fourth columns show the results after dropping insignificant variables from the first equation.

Table 3: Single Equation Results 1972-1994

Dependant Variable

	ΔLn(GNE)	ΔLn(GNE)		ΔLn(GDP)	
Variable					
Constant	-0.378	-0.354		-0.349	
	(-2.8)	(-2.2)		(-3.1)	
TOTC	0.437	0.452		0.177	
	(4.6)	(4.5)		(2.6)	
ΔSPSBR	-0.094				
	(-1.1)				
ΔLn(MTAK)	0.031	0.024		0.021	
	(2.4)	(1.7)		(2.1)	
ΔLn(GFP)	0.04	0.05		0.02	
	(5.83)	(5.6)		(2.7)	
ΔRWG	-0.024				
	(-0.5)				
ΔLSUP	-0.04				
	(-0.35)				
ΔLn(IDWE)	0.056	0.064		0.041	
	(2.9)	(4.1)		(3.9)	
ΔLn(IOBE)	0.037	0.037		0.021	
	(4.1)	(4.62)		(3.8)	
ΔLn(USA)	-0.012	-0.005		0.071	
	(-0.2)	(-0.1)		(2.1)	
Corr R2	0.63	0.62		0.58	
St Err Y	0.87	0.92		0.63	
Durbin Watson	2.5	2.4		2.3	

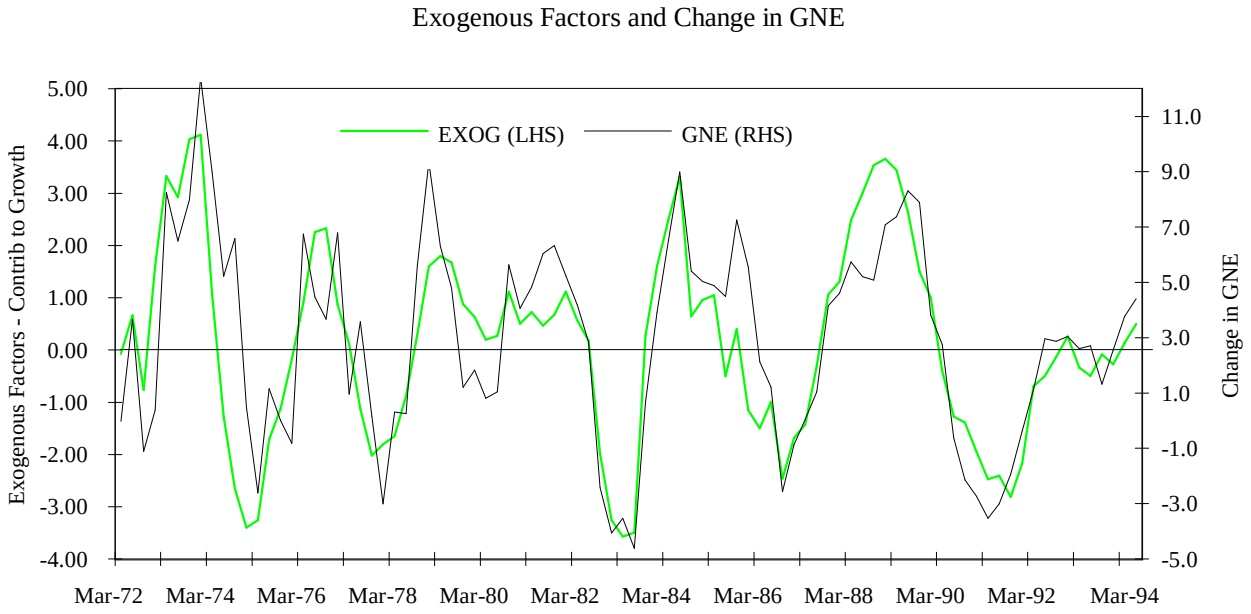
Figures in parentheses are t statistics

There are obviously a number of potential problems with the equations above. However, the parameters for the equations shown in columns two and four did appear to be reasonably stable when the sample period was split in two. Interestingly, one parameter that did change was that on the terms of trade in the GDP equation. This appeared to fall significantly in the second half of the sample (1983-94). However, the coefficient on the terms of trade in the GNE equation was broadly unchanged. While by no means being conclusive, this is consistent with the speculation above that the floating of the dollar and the increase in import and export shares may have reduced the impact of the terms of trade on GDP (but not on GNE). (Moreover, a simple check of the covariance between changes in export volumes and changes in the terms of trade indicates that they tended to be positively correlated in the sixties and seventies, but negatively related in the 1980s. This is consistent with terms of trade effect on the exchange rate which has an offsetting effect on export volumes, as discussed above). Also interesting was the fact that the coefficient on US GDP in the GDP equation became larger and more significant. However, it remained small and insignificant in the GNE equation. This is very puzzling from the confidence linkages point of view. If the increased correlation between US and Australian GDP in the 1980s were due to confidence effects and increasing informational integration as proposed by Gruen and Shuetrim, then there should be a higher correlation between US GDP and Australian investment and consumption in the 1980s. The absence of a significant effect of US GDP on Australian GNE tends to suggest that the correlation of US and Australian GDP in the 1980s is coincidental rather than causative, and that the main linkages are the more mundane ones working through the terms of trade, export volumes and interest rates. Overall, the results of the single equation regressions appear to be broadly consistent with the linkages and model results discussed above.

One important apparent difference however, is in the response to the fiscal and monetary policy variables. As can be seen changes in the structural budget balance are insignificant in the results reported in the first column. It is important to note that this does not imply that fiscal policy has no effect on GNE. It does seem to suggest, however, that discretionary changes have been fairly consistently related to changes in economic conditions. (That is the structural deficit is increased to offset the effects of falling GDP and hence appears to have a negative relationship.) In reality, GDP is far too complex a process to be captured by single equation methods. The effects of discretionary changes can only really be assessed in the context of a fully articulated structural model. There are similar simultaneity problems with the real money supply (which is only one of a large number of possible indicators of the stance of monetary policy). However, the significant positive coefficient tends to suggest that monetary policy reactions have been less consistently counter cyclical than fiscal policy.

The five most significant variables explaining short run movements in GNE appear to be the terms of trade (TOTC), change in farm output (GFP), the auto regressive components of dwelling investment (IDWE), and non dwelling construction (IOBE), and growth in real money supply (MTAK). In all cases, as mentioned, there is the possibility of simultaneous equations bias affecting the results. Overall however, the results appear to be consistent with both the results obtained by Murphy and Smith (1993) using an ECM VAR and the Murphy model, the TRYM results and the results of our own attempts to reproduce the Murphy Smith VAR work some of which is reported in Attachment B. None of these models have world output exercising a significant effect on domestic activity independent of its effect on the terms of trade.

The close relationship between the main variables (dwelling investment, farm output, non dwelling construction and the terms of trade) and GNE can be seen in the chart below. (The chart simply sums the direct contributions to growth from IDW, farm output, IOB and the terms of trade.)



CONCLUSIONS

The paper has canvassed a wide variety of factors that can lead to fluctuations in business output in Australia. Above all, we hope the paper has shown the need to look behind simple correlations and reduced form equations, to delve into the complexities and grapple with the changing structural relationships beneath. The single equation results reported above and the VAR model results outlined in Attachment B are subject to a large number of caveats, and will be the subject of further work. Similarly, the results from the TRYM and Murphy models are necessarily qualified and can vary with changes in specification and assumptions, particularly with regard to expectations and financial variables. However, the results as they stand seem to be consistent across a range of techniques (single equation, ECM VAR, change VAR, and structural model). Each technique has its limitations, but taken together the evidence appears to suggest that: the US does not have as significant a role in driving Australian growth as might appear from the simple correlation of growth rates in the 1980s.

The paper has discussed a number of other features of the business cycle including the changes that have occurred due to the floating of the exchange rate, changes in the stock cycle and the rise in unemployment. The large leakage out of the volatile component of expenditure tends to suggest that the normal investment accelerator and stock cycle propagation mechanisms are less important than in other countries. Thus more than other countries our cycle may be less regular / more difficult to predict, depending on whether various exogenous factors coincide.

The floating of the exchange rate appears to have reduced the impact of the terms of trade on GDP and prices, but not on GNE. Similarly, it has changed the relative effectiveness of monetary and fiscal policy. The reduction in the impact of the terms of trade on GDP relative to GNE, highlights the need to be careful in interpreting what is driving GNE growth in a deregulated floating rate environment. If a rise in the terms of trade is driving growth in GNE there may be fewer implications for output and prices and consequently a lessened need to respond with a monetary policy tightening. Similarly investment and consumption may have different effects on activity and inflation in a floating rate environment. For example, growth driven by investment may have fewer implications for inflation.

Moreover, the increased volatility in employment in response to a given shock in the 1980s and 1990s, increases the need for flexibility in product markets and labour market institutions to respond to these fluctuations. It also increases the need for macro policy to respond to unanticipated swings in demand (tends to suggest a need for discretion rather than rules). And, at the same time as it increases volatility and uncertainty, it places a greater burden on forecasters to correctly anticipate the course of the economy so that the policy response can be effective (pro-active rather than reactive).

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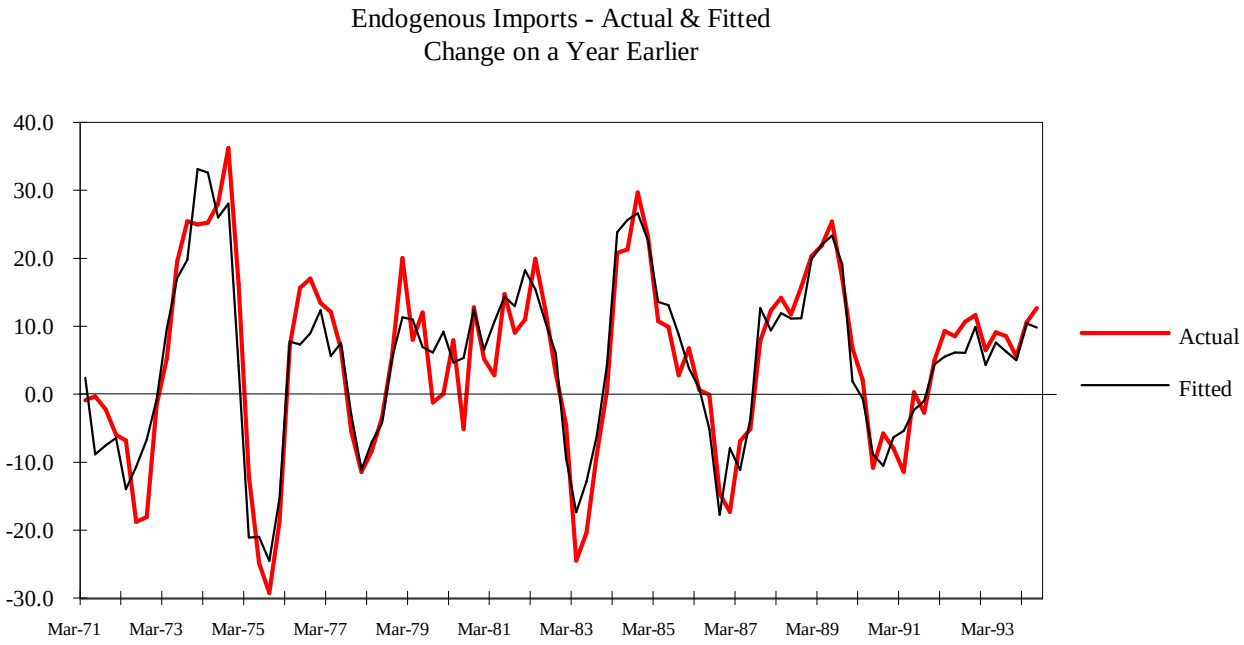
Attachment A - Model for MEG using GNE Components

This attachment reports results of a simple error correcting equation for endogenous imports. The main aim of the equation is to illustrate the import elasticity of various components of expenditure. The chart below shows actual and fitted values for the equation estimated in change terms. The table below shows the regression results for this equation. The second column shows the regression results for the equation estimated with the dependant variable expressed in contribution to growth terms. The coefficients in this column give a rough indication of how much of the contribution to growth of the various components is offset by endogenous imports.



The first column of the table below shows the results in change terms, and the second column in terms of contributions to growth:.

Table: Simple Model for Endogenous Imports

	Change Terms	Contrib to Growth
Intercept	0.750	0.125
	(0.9)	(1.3)
ΔLn(Rel PMEG)	-0.34	-0.034
	(-4.1)	(-3.6)
IPE+SNN (cont to growth)	4.09	0.46
	(9.7)	(10.0)
CON-CSRV (cont to growth)	2.86	0.303
	(2.8)	(2.8)
ΔLn(MANUF)	3.11	0.25
	(3.9)	(2.9)
ERR Corr	-0.6	-0.056
	(-7.5)	(-6.4)
Corr R2	0.86	0.85