QuARTERLY REVIEW OF
THE NEW ZEALAND ECONOMY

A downturn in economic activity is becoming more apparent. Consumption and investment indicators turned down towards the end of 1985 and unemployment started to increase. Reserve Bank forecasts suggest a 2 per cent contraction in Real Gross Domestic Product is possible in 1986/87.

Overview

It is now becoming clearer that the strong economic expansion of the last two years is over. Real GDP fell marginally in the March 1985 quarter, recovered just over 1 per cent in the June quarter and then contracted again marginally in the September quarter.

Although economic activity is still at an historically high level, an increasing number of economic indicators are pointing to a more definite downward trend in the economy. Consumption appears to have fallen for several months towards the end of 1985; forward indicators of investment have been turning down, albeit from generally high levels, and unemployment has started to increase again after a year and a half of sustained improvement. There has also been a pronounced and widespread downturn in short-term business confidence and expectations. The New Zealand Institute of Economic Research's (NZIER) December survey of business opinion showed that the level of expectations about the general business situation over the next six months was at its lowest level since the surveys that preceded the 1982 recession. Expected profitability had turned down quite sharply and for the first time in over two years a majority of respondents expected the level of investment to turn down over the next year.

While there is a widespread consensus that there is little prospect for further growth in the short-term, the sharpness and duration of the downturn will depend on a number of factors.

First is the degree of confidence in the medium and longer term prospects for the economy. While this will depend in part, as it has in the past, on real factors in the international economy and the way in which these impact on the demand for exports, the policy environment within New Zealand will also be important. The unexpected strength and duration of the economic upturn and of business investment in particular, would seem to indicate that the economic reforms which have been implemented since the change of government in 1984 have been favourably received by the business community and that they have reacted accordingly. While the prospect of an immediate downturn has obviously affected the degree of optimism as to short-term prospects, it appears to be accepted that the present policy regime will be sustained and this should help to underpin investment at reasonably high levels.

Against this has to be placed the impact of the recent wage round. A moderate average level of settlements and a much wider variation between awards, than has been the practice in the past, would have been consistent with the Government’s overall economic strategy. In the event, the average level of increase was high (possibly in the order of 17 — 18 per cent in the private sector) and while there were some variations in adjustments to allowances, increases in basic wages fell within a fairly narrow range.

The high wage round is likely to have a variable impact on economic activity. On the one hand, there will be an immediate increase in real household disposable incomes and this could be expected to feed through into consumption expenditures and hence into domestic output. It is quite likely, however, that this effect could be less pronounced than it has been in the past.

One of the factors which sustained economic activity
during 1985 was the resilience of consumption expenditures at a time when real disposable incomes were falling. As a consequence the household savings ratio is now at a very low level and some part of the higher salary and wage payments may well be directed to restore this ratio to a more normal level. Consumption is likely to be further constrained by the slower growth in other components of household income (with farm incomes experiencing a sharp fall) and by the continued effects of fiscal drag (the rise in average tax rates as incomes rise).

Counteracting the direct effect on incomes, the impact of the wage round on employment and investment will be contractionsary. Part of the wage round will feed through into higher prices, but the more competitive economic environment and the strength of the New Zealand dollar will ensure that much of the increase in wage costs will come out of profits. This in turn will imply higher real wages and a lower demand for labour and investment. There have already been clear indications of an easing of demand for unskilled labour.

Output

Real GDP (seasonally adjusted) fell 0.3 per cent in the September quarter, although output over the year to September was still up in annual terms by 3.2 per cent. The most significant downturns were the 1.5 per cent decline in net agricultural output and the 2.8 per cent decline in the trade, restaurants and hotels group (principally reflecting the downturn in real retail turnover over the quarter). There was no change in net output in the manufacturing sector. An increase of 0.7 per cent was recorded in the services sector and the construction sector recorded the strongest expansion, 3.9 per cent.

Incomes

Total after-tax household income appears to have fallen significantly over 1985. The increases in wages and salaries following from the recent wage round occurred too late in the year to make a significant difference to the average level of wage and salary payments. The major influence on nominal wages was the moderate round of settlements, averaging around 7 per cent which took effect early in 1985. As the consumer price index increased relatively rapidly over the first three quarters of the year, and there were no tax decreases to offset the effects of fiscal drag, real disposable incomes fell. The Department of Statistics's real disposable income index which covers average, full-time wage and salary incomes fell by 0.8 in the March quarter and then by 2 and 3 per cent respectively in the June and September quarters. The decline over the year to September was 6.8 per cent.

Five sub-indices provide some indication of the differing trends amongst wage and salary earners in different income groupings. In general, the Department's data suggest that although all groups experienced a decline in real, after-tax income, those on low incomes (represented by the lowest 20 per cent or quintile of wage and salary earners — those with incomes below $12,100) fared better than those in both the middle income groups and those in the highest income bracket. The latter group (comprising those earning $24,800 and over) recorded an 7.7 per cent decline in real disposable income in the year to September. Real disposable income for those in the lowest bracket fell by 3.7 per cent.

Consumption

There was a clear resurgence in consumption expenditure in early to mid-1985, marked by a 1.8 per cent (seasonally adjusted) increase in real retail turnover in the June quarter. Most of the expansion, however, was concentrated in the 'durable goods' outlets (in particular automotive outlets) reflecting a sharp upturn in new car sales. New car registrations in the June quarter, at 21,887, were 15.1 per cent above the number registered in the previous three months.

Turnover in the September quarter however fell by 2 per cent in real seasonally adjusted terms. The main element in the change over the quarter was again a sharp movement in 'consumer durables' sales. Turnover in the furniture, household appliances and hardware store group and the automotive store group fell by 5 per cent. New car registrations fell by an aggregate 15 per cent over four successive months from July until the decline bottomed out in December. No clear pattern is evident from the latest (nominal) monthly retail trade data. Total turnover in October fell by 2.6 per cent but this was matched by a 3.5 per cent increase in November.

Taking both months together, the real level of sales may have held at the September quarter level.

Stocks

Earlier signs of some build-up in stocks in some areas of the retail sector are now being reflected in official statistics. The overall retail trade stock/trade ratio rose from 0.431 in June to 0.448 in September (on the basis of seasonally adjusted variables). Although this is not high by historical standards, it is not clear what significance can be attached to past benchmarks given the structural economic changes which have occurred and are currently underway. Developments over recent years such as the deregulation of interest rates have led to an improvement in stock management and lower stock to turnover ratios could now be the norm. The NZIER business opinion survey indicates a more widespread degree of concern about stock levels than was the case earlier in the year.

A breakdown of retail stock levels by store types suggests that 'excess stocks' (stock levels inconsistent with the level of expected sales) are most likely to be in the durable consumer goods sector. Stocks in the household appliance store group in the September quarter were 40.1 per cent higher than a year earlier, and stocks in the automotive stores were 31.3 per cent up. By contrast the overall increase for all other store groups over the period was only 7.8 per cent.

Investment

Investment expenditure remained on a generally strong overall trend in the latter half of 1985, although by late in the year the forward indicators of investment were pointing to a downturn. The value of dwelling building work put in place increased by 8.3 per cent (seasonally adjusted) in the June quarter and by a further 6 per cent in the September quarter of 1985. Given the very high number of permits issued towards the middle of 1985, and the lags involved before a dwelling is actually completed, a further increase in work put in place is possible for the December quarter. In recent months there has been a downturn in the number of permits issued following an upward surge in June and July which may have been prompted by a very substantial increase in Post Office Savings Bank mortgage approvals. The number of permits issued fell by 6.7 per cent in August and by a further 3.6 and 8.9 per cent in September and October respectively before increasing by 1 per cent in November. Even at these lower levels however, the amount of dwelling construction implied is still high by recent historical standards. The total of 24,130 permits for houses and flats issued in the year to October was the highest since the calendar year 1977.

The prospect of high building costs following the imposition of the Goods and Services Tax in October 1986 is one factor which appears to be sustaining the current level of activity. The availability of considerable amounts of Housing Corporation and particularly Post Office mortgage finance at below market rates has also been important. The sharp decline in dwelling permits issued in December is the first hard evidence that the general upward movement in private mortgage interest rates over the year (to 19 per cent in September compared to 16.51 per cent in January) has had an impact. This effect may become more pronounced should inflationary expectations decline.

Fixed business investment also remains relatively buoyant. The value of other building work put in place increased by 16.1 per cent in the June quarter and by 6.4 per cent in September (both seasonally adjusted) and is now running over 30 per cent above the levels of a year earlier. This level of investment should be sustained for some time yet as the increase in the number of permits issued was particularly strong in the September quarter — up 73 per cent on the previous year. A breakdown of the permit statistics show that most of the upturn has stemmed from a strong private sector investment demand particularly for shops and for office buildings.

Although changes in the value of the New Zealand dollar make it difficult to interpret the data with any degree of precision the value of imports of machinery and electrical equipment had also been increasing strongly up until September.

More recently, however, there appears to have been a change in sentiment regarding future investment intentions. Consistent with their reports of a fall in the overall level of capacity utilisation and a deteriorating outlook for profitability, a net 14 per cent of respondents to the NZIER's December Business Opinion Survey expect investment in plant machinery
and business equipment to decline over the next twelve months. 19 per cent expect approvals for investment in buildings to decline over the same period. The more pessimistic outlook is now being reflected in surveyed import orders data. Orders for machinery and electrical equipment for the three months to October fell by 8 per cent compared to the same period one year ago, whereas over the first half of the year orders were well up (typically 50 — 60 per cent) on the previous year’s figures. Orders for transport equipment have been on a relatively strong downward track since mid-1985.

Employment

Reflecting the much slower growth in economic activity over 1985 there has been a sharp slowdown in the rate of increase in employment. Although the Labour Department’s quarterly survey of employment found that total employment in August, at 1,169,000, was 3.2 per cent above the level a year earlier, in seasonally adjusted terms this represented an increase of only 0.1 per cent on the level recorded in the previous survey in May. Earlier, employment had risen 1.5 per cent in the three months to February 1985 and 0.9 per cent in the three months to May. The decline in registered unemployment appears also to have ended. The numbers of unemployed levelled in mid-1985 and then rose 3.2 per cent in October and 5.7 per cent in November (in seasonally adjusted) terms, although there was no further increase in December. A factor which has moderated the growth rate in unemployment has been the consistently high net migration outflow. A total net outflow of 18,424 permanent and long-term migrants was recorded in the year to November 1985, as against an outflow of only 1,806 in the year to November 1984. Approximately two-thirds of these were members of the workforce although not all may have been in employment prior to migrating.

Prices

The Consumer Price Index (CPI) increased by 2.3 per cent in the December quarter. Although this represented a continued easing in the rate of increase from the 2.8 per cent recorded in September and 5.1 per cent in the June quarter, it was somewhat higher than expected. The Producer Price Output Index, which often leads the CPI had increased by only 1.7 per cent in the September quarter while the monthly Food Price Index had shown no change in October, a 0.2 per cent increase in November and a 0.6 per cent fall in December. The strength of the New Zealand dollar had also meant that the prices of some goods, with a large imported component (notably petrol) had fallen during the December quarter.

In part the relatively high December CPI figure is explained by technical factors. Almost half of the overall increase stemmed from the housing group, reflecting higher mortgage costs and rents. However, because of the lags involved in collecting the necessary statistics, the cost increase measured actually related to a period six months earlier, in mid-1985. The housing group increased 4.9 per cent in the quarter, whereas the food group increased only 1.1 per cent, the household operations group rose 1.8 per cent, and the transportation group fell 0.2 per cent. Of the remaining groups within the index, the miscellaneous group (covering the broad range of other supplies and services consumed by households) rose 2.2 per cent and the apparel group rose 4.1 per cent.

The Government Sector

The fiscal deficit (on a Budget Table 2 basis) for the eight months to November 1985 was $2,991.2 million, 26.3 per cent above that for the same period a year earlier. Net expenditure in the period rose 18.7 per cent and revenue 16.2 per cent.

Major contributions to the outcome were a 43.3 per cent increase in debt servicing expenditure (to $2,189.9 million) and a 17.7 per cent increase in social services expenditure (to $3,434 million). On the receipts side, income taxes rose 24.4 per cent to $4,904.2 million.

Conclusion

The long-expected downturn is now clearly established and no further growth in activity is likely for the New Zealand economy over the short-term. Reserve Bank forecasts indicate a 2 per cent contraction is possible in 1986/87, although other forecasts suggest the downturn may not be as sharp or as protracted. Even if the Bank’s forecast outcome does eventuate, the overall level of activity and employment will remain high by historical standards. The underlying rate of inflation should continue to moderate, although this process will be interrupted by the introduction of the Goods and Services Tax (GST) in October 1986.

Over the longer term, the continuation of present structural adjustment and firm financial policies give the best chance for significant and sustained growth after the current period of adjustment. The costs associated with this adjustment and hence the extent and duration of the current downturn will depend significantly on the speed with which decision makers adapt their production, investment, pricing and wage settling policies and practices to the new policy environment.
EXCHANGE RATE OVERSHOOTING

This article examines the phenomenon known as exchange rate overshooting where exchange rates sometimes diverge from their long run or 'normal' values.

Introduction

Since the move towards a freer system of international exchange rates in the early seventies, the foreign exchange markets have shown a considerable degree of volatility. There has also been a feeling amongst some business people and economists that certain exchange rates have deviated from their long-run or 'true' values for considerable periods of time. For example, during 1980/81 the pound sterling was widely regarded as 'overvalued', while more recently the sustainability of the US dollar exchange rate has been questioned. When an exchange rate persistently deviates from its perceived long-run value it may be said to have 'overshot'.

One form of 'overshooting' sometimes follows an economic shock, such as an increase in the money supply. The exchange rate does not immediately move to its new long-run 'normal' value, but rather moves beyond or overshoots that point. In recent years, beginning with an important article by R. Dornbusch,1 economists have been attempting to explain why this might happen.

Overshooting in Response to a Monetary Shock

Consider the case of a hypothetical country which was open to international trade and to international capital flows and which was operating a 'floating' exchange rate. Suppose the central bank allowed the money supply to increase by 10 per cent. In the long run the increased money supply would normally cause a 10 per cent price increase. The rise in the general price level would result in a loss of competitiveness of this economy compared to the rest of the world, since goods produced would be 10 per cent dearer. To restore the original level of competitiveness — or in other words, to restore the original 'real' exchange rate — the exchange rate would need to depreciate by 10 per cent. Thus the long-run position would be one where there had been no change in the 'real' exchange rate, the rise in money supply and prices having been exactly offset by a fall in the 'nominal' exchange rate.

However, the exchange rate might not move to its new long-run value immediately, and this could happen even if all the participants in the foreign exchange market were fully aware that the long-run value of the exchange rate had changed. The reason for this is that because prices do not react instantly to changes in the money supply, an increase in the money supply would probably lead initially to a temporary fall in domestic interest rates. This would reduce the attractiveness of holding interest-bearing domestic assets.

Participants in the foreign exchange markets, in deciding where to place their capital, would weigh up the interest they could earn on any given currency against the extent to which that currency was expected to depreciate in value. In this instance they would know two important facts; namely, that the new long-run exchange rate was 10 per cent lower, and that the return on holding domestic assets had been reduced. Both of these factors would contribute to an outflow of capital and to a depreciation of the exchange rate. But because the domestic interest rate had been reduced, the exchange rate would have to fall to a point where the expectation of a future increase in the value of the currency was sufficient to compensate investors for the reduced interest rates. In other words the exchange rate would have to fall beyond the long-run level. The exchange rate would fall by an amount in excess of the rise in the money supply, which would amount to a 'real' exchange rate depreciation. The exchange rate would have effectively 'overshot' its long-run value.

This short-run overshooting would have occurred because participants in the foreign exchange market would have fully reacted to the 'news' of the increase in

the money supply before the full effects of the money supply increase had worked their way through the domestic economy. Eventually domestic prices would rise forcing domestic interest rates to return to normal levels. Then and only then would foreign exchange participants no longer demand an ‘expectation of appreciation’ premium on their holdings of domestic assets, and the exchange rate would move back up to its long-run value.

Briefly, the consequences of the opposite case where the money supply decreased by 10 per cent would be the following:

Foreign exchange market participants would form the view that the long-run value of the exchange rate would be 10 per cent higher. Concurrently interest rates would rise. Arbitrage in the foreign exchange market would cause the exchange rate to appreciate beyond the new long-run value to the point where the higher interest rate earned on domestic assets was just offset by the expectation that the exchange rate would eventually fall back to its long-run level. The higher domestic prices and interest rates had fully adjusted to their long-run levels the exchange rate would return to its own long-run level.

The Basic Cause of Overshooting

What causes the exchange rate to overshoot in this manner?

It is the imbalance that comes about when one market — the foreign exchange market — is quicker to react to new information than the rest of the economy. In the cases outlined above, the ‘news’ was that there had been a change in money supply, which implied a change in the long-run value of the exchange rate. If all the price setters in the domestic economy had reacted to the change in the money supply by promptly changing their prices by the same amount, interest rates would not have been pushed out of line, and the exchange rate would then have moved straight to its new long-run value. But because the domestic economy is slow to adjust, the ‘disequilibrium’ that temporarily arises in the domestic economy spills over to affect the exchange rate.

Why is the foreign exchange market likely to react more quickly to news than the domestic markets for goods and services?

It is not necessarily due to foreign exchange market participants being more ‘rational’ than price setters in the rest of the economy. Rather it comes about from inherent differences in the nature of the respective markets. The exchange rate can be viewed as the price of an asset traded in an organised market. This puts it in the same class as other assets traded in organised markets such as gold and stocks. Typically such markets are heavily influenced by the public’s expectations of future events, and when new information comes along there are rapid changes in asset prices to eliminate unexploited profit opportunities through arbitrage. So long as relevant new information continues to occur the asset prices remain volatile.

This ‘anticipation’ feature of exchange rate setting is not found to the same extent in the markets for goods and services where present circumstances tend to dominate, partly because of the existence of a host of contractual arrangements. In these markets very rapid adjustment of prices is sometimes not practicable.

Obviously if there were restrictions on the flow of capital across national frontiers, or if for some reason the participants in foreign exchange markets were slow to react to new information, then the exchange rate might not overshoot. In fact, to the extent that the foreign exchange market was itself slow to adjust compared to the speed of adjustment in domestic markets, the exchange rate might even undershoot. However, with international controls on capital movements having been largely abolished in the developed world, exchange rates are much more likely to exhibit overshooting than undershooting.

Complications

Many other factors may be important in determining the extent to which an exchange rate will overshoot in response to a change in the money supply. To the extent that trade flows react to the movement of the exchange rate there will be a current account effect serving to reduce the size of the overshoot. Exchange rate movements also have a feedback effect on the value of holdings of wealth, which may in turn affect the exchange rate. The scale of the overshoot depends also on the size of the initial interest rate response to the change in the money supply. Clearly there are numerous factors which need to be taken into account, making an accurate prediction of exchange rate movements very difficult.

Of course, in reality most countries’ money supplies are continually expanding, and the exchange rate of one country follows a long-run ‘trend’, with its rate of depreciation or appreciation being roughly equal to the difference between the domestic and foreign rates of inflation. The unanticipated ‘event’ which may cause the exchange rate to overshoot is a change not in the actual level of the money supply, but in the rate of growth of the money supply.

If for instance the central bank suddenly slowed the rate of growth of the money supply — in other words if it ‘tightened’ monetary policy — this would result in temporarily higher interest rates as well as an expectation of a new long-run trend for the exchange rate. Eventually the economy would shift to a lower rate of inflation and lower interest rates, matched by a stronger exchange rate. But in the short-run, before interest rates had fallen, foreign exchange market participants would bid up the exchange rate to a level above the new long-run trend, the temporarily high interest rates being matched by an expectation that the exchange rate would subsequently fall. Once again the exchange rate would have overshot.

This may have been what happened to the UK exchange rate over 1980/81. Though there are other explanations for the strong sterling appreciation over those years — North Sea Oil for instance — it seems probable that a contributing factor was the move to a tighter monetary policy.

So far this article has considered only the case of overshooting resulting from unanticipated changes in the money supply, which is the case that has attracted most attention. Other events such as a sudden change in the terms of trade can also under certain circumstances cause an exchange rate to overshoot. The principle behind the overshooting phenomenon is in all cases the same: some markets are slow to adjust, the foreign exchange market is not.

Options for Intervention

Given that overshooting sometimes takes place, is it a problem that requires corrective action from the authorities?

The case for some form of intervention in the foreign exchange market in order to smooth fluctuations in the exchange rate depends on the soundness of three assertions, namely:

1. That exchange rate deviations from their long-run trend have a negative effect on national income or some other policy target.
2. That the authorities can perceive the true long-run trend that the exchange rate should be converging to.
3. That exchange market intervention will be effective and not in itself harmful.

False price signals are implicit in overshooting, and an associated misallocation of resources is likely to be involved. Moreover, to the extent that overshooting adds to the volatility and general unpredictability of exchange rates, it may discourage international trade and capital flows, with a consequent negative effect on national income. This may occur despite the existence of a forward exchange market and risk spreading through asset diversification. Misaligned exchange rates can thus have a negative effect on national income.

But for intervention to be successful the authorities must be able to gauge the extent to which the current exchange rate deviates from its long-run trend. Given the present state of knowledge this can often prove to be very difficult.

There also has to be an effective means of intervening in the foreign exchange market that does not in itself create more problems than it solves. ‘Unsterilised’ intervention, where the authorities simply buy or sell foreign exchange without offsetting the impact of this on the domestic money supply, may indeed be effective in shifting the exchange rate. The difficulty is that undesirable consequences for domestic monetary conditions may be involved.

It is possible to use ‘sterilised’ intervention, which involves selling (or buying) domestic securities to offset the domestic monetary consequences of foreign exchange purchases (sales). This leaves the domestic money supply unchanged, but its impact on the exchange rate is unlikely to be strong or lasting.

An alternative to direct intervention in the foreign exchange market is a tax or exchange control aimed at discouraging capital flows in order to prevent the exchange rate from overshooting when monetary policy is tightened. This ‘sand in the cogs approach’ would have to be of short duration if it were not in itself to be a major distortion. Also, it does not solve the problem of knowing when and by how much an exchange rate is misaligned.

A more fundamental objection is that this type of intervention simply attempts to cure one distortion by introducing another. Overshooting arises because certain markets are slow to adjust. An effective policy approach must in the first instance be aimed at increasing the speed of adjustment in these markets, not in ameliorating the consequences elsewhere.

Movements in exchange rates provide useful signals, which wherever possible should not be overridden and distorted. Policies aimed at removing rigidities in price setting and wage setting and at increasing the flexibility of the labour market offer a better solution to the problem of overshooting. There is, of course, a limit to the extent that such policies will work. These markets, even after unnecessary rigidities had been eliminated, would still be slower to adjust than the foreign exchange market.

In addition, overshooting would be minimised to the extent that the rate of growth of the money supply followed a smooth course, and to the extent that economic policy is set within a reasonably stable medium-term framework. The aim must be to minimise the incidence of unanticipated ‘shocks’.

The New Zealand Context

This article has been mainly concerned to give a theoretical discussion of exchange rate overshooting. It may, however, be interesting to consider briefly the New Zealand context.

The main features that will determine whether or not the New Zealand exchange rate overshoots in response to a sudden tightening or loosening of monetary policy, are likely to be the speed of adjustment of the foreign exchange market compared to the speed of adjustment in the goods and labour markets. Exchange controls have been abolished recently, and there is no longer any reason to doubt that speed of adjustment in the foreign exchange market is reasonably high.

Furthermore, while present Government policies are aimed at increasing the flexibility of goods and labour markets, the domestic economy may still be characterised by a relatively inflexible wage setting system and a persistence of the cost-plus approach to price setting in the markets for goods and services. It seems that, at least in the present environment, the difference in the speed of adjustment in the foreign exchange market and the domestic goods market is unlikely to be less pronounced here than elsewhere. Some overshooting of the exchange rate in response to a sudden change in the rate of growth of the money supply would thus appear to be a strong possibility. Certainly it has been a widely held view that the Government’s firm monetary policy has contributed at times over the past year to high exchange rate levels that may be above their longer term equilibrium. While this view cannot be substantiated, the Government does recognise that a high exchange rate, as well as high interest rates, may be unavoidable for a time in order to reduce the inflation rate to a more acceptable level.

Overshooting and Fiscal Deficits

A factor that can prolong an overshoot of the exchange rate is the persistence of a large fiscal deficit. This can be seen in the case of the United States.

The US dollar has now been considered ‘overvalued’ for a number of years. It seems plausible that the initial strong appreciation of the dollar resulted from the tightening of monetary policy that took place after the Federal Reserve changed its operating procedures in 1979. This does not, however, explain the continuing overshoot over time unless one believes, somewhat
implausibly, that year after year the US economy has continued to fail to adjust to persistently tight money. It seems likely that the main factor preventing the US dollar from returning to a more 'normal' level is the development and persistence of a large fiscal deficit. A fiscal deficit that is financed by borrowing usually raises interest rates which in turn puts upward pressure on the exchange rate and worsens the current account position. In the sense that US private savings are insufficient to finance the large fiscal deficit, the current account deficit — and the corresponding foreign capital inflow — is unavoidable so long as the large fiscal deficit persists.

Conclusions

It seems clear that when exchange rates deviate from their long-run trend values this is not necessarily due to "irrational" behaviour on the part of participants in foreign exchange markets, but is more likely a result of a fast foreign exchange market reaction to important economic news.

A large number of factors were seen to be involved in determining whether or not, and for how long, an exchange rate is likely to overshoot. These factors include the stance of monetary policy, the extent to which the domestic economy correctly anticipates the monetary policy, the extent of rigidities in price and wage setting mechanisms, and the extent to which fiscal policy puts upward pressure on the exchange rate.

It was also noted that, if overshooting were to be seen as a problem at all, the logical policy approach would be to attack the root causes, rather than to attempt to regulate exchange rate movements which are only symptomatic of the underlying factors. As Dornbusch has recently stated, 'Few would argue that bond markets need intervention just because interest rates are unusually high. It is well understood, at least by those who understand, that this is a reflection of the policies that influence demand and supply conditions in the bond market. The same is true for the exchange market and the answer is more sensible policy mixes (monetary, fiscal and incomes policy), not schemes to fix interest rates or exchange rates.'

A BEGINNER’S GUIDE TO THE RBNZ MODEL OF THE NEW ZEALAND ECONOMY

For 15 years the Reserve Bank has used an econometric model of the New Zealand economy to generate forecasts and to perform policy analysis. This article provides a non-technical introduction to the Bank’s model.

Introduction

When confronted for the first time with an econometric model, many people are confounded by what appears to be page upon page of indecipherable mathematics. To compound matters, the text accompanying the exposition of most models is usually couched heavily in economic and statistical jargon. In order to go some way towards redressing this situation, this article attempts to describe the Reserve Bank model in a straightforward, easily digestible manner. Economic terminology will not be avoided where it is necessary to the exposition. However, where it is used, an attempt is made to explain each word or phrase in clear terms and a glossary of the key words (highlighted in the text) is provided.

For those readers who wish to examine the RBNZ model in greater detail, a Research Paper will be forthcoming in the near future describing in a more technical manner the latest version of the model.

What is a Model?

Economies are undoubtedly complex and the reason for using a model arises out of this complexity. A model is an abstraction from reality, drawn in such a way as to reveal the major features of the system. Any real world problem will, in general, involve a large number of complex relationships. If any headway is to be made in the analysis of such situations, it is necessary to try and isolate the most important elements and relationships. Clearly, there can be ‘good’ and ‘bad’ models. If the abstraction is taken too far, the model may have little to say about the corresponding real world situation. If, on the other hand, the abstraction is not taken far enough, the model may be too complex to be of value in gaining insights into the workings of the real system.

A useful analogy to summarise the use of a model is that of a flight simulator. The simulator embodies the essential characteristics of an aircraft in flight and the would-be pilot acquires experience without leaving the ground and so without putting an actual plane at risk in the learning process. Similarly an economic model can be used to study the impact of alternative shocks to the economy which could not otherwise be conducted in a real world situation. This comparison can only be taken so far. The flight simulator is a mechanical construct which utilises well established physical principles with near certainty. In economics, the theories developed are much less firmly established. Moreover, economies are liable to change over time and are characterised by considerable uncertainty.

Models can exist in many forms. The models with which the economist is typically concerned are expressed in mathematical form. This characteristic may be distracting for some, but the mathematics is no more than a useful tool for representing the relationships in the economy.

Suppose, for example, we wanted to know how much consumption in New Zealand is likely to change for a given change in the income of New Zealanders. To make progress, the relationship between consumption and income must be given some explicit form. One way in which this can be done is to observe past income and consumption patterns. A theory may then be developed which is consistent with the observed historical behaviour and this may be represented by a mathematical relationship.

If our theory stated that consumption depended only on the level of income, then the relationship, between total consumption (C) and national income (Y), could take the form:

\[ C = 10 + 0.8 Y \]  \hspace{1cm} (1)

This statement of the relationship between C and Y is an equation. As noted, C and Y are our measures of consumption and income which will have different values at different points of time (i.e. C and Y are variables). The numbers 10 and 0.8, on the other hand, are fixed, and so while C and Y both vary over time, it is assumed (in this example) that the relationship between them does not.

For example, suppose that consumption and income are observed over two periods of time as set out below:
Econometrics is thus a discipline combining aspects of economics, mathematics and statistics. The econometrician is an economist who, in trying to understand the workings of economic systems, combines economic theory, statistics and past observations of economic data to estimate mathematical relationships which are representative of economic behaviour.

**Systems of Equations**

A model can be made up of a single equation or, as is usually the case, a number of equations representing a complete economic system. The Reserve Bank model of the New Zealand economy comprises several equations explaining different aspects of the economy such as consumption, investment, prices etc.

It is often the case that an explanatory variable in one equation might be the dependent variable in another equation. For example, while the level of consumption in an economy might depend on the income available in that economy, that income may in turn be partly influenced by the level of consumption. In other words both C and Y in this example are determined simultaneously within the system.

The Reserve Bank model is a simultaneous system of equations which seeks to explain the major elements of the New Zealand economy. In particular, the model is primarily concerned with explaining the country’s gross domestic product (or national income (Y)) which is defined as the sum of a range of expenditures, including consumption (C), investment (I), government spending (G) and the net outcome of the balance of payments, i.e. exports (X) less imports (M). This requirement, that national income be equal to the sum of these expenditures, is expressed by an identity as:

\[ Y = C + I + G + (X - M) \]  

In the context of this simplified representation, G and X are examples of economic variables that are determined outside of the model framework (in this case by the Government and foreigners demand respectively). In technical terms this sort of variable is known as an exogenous variable, a variable which, although perhaps playing an important role in the model, is determined by forces outside the model. The counterpart to an exogenous variable is an endogenous variable which is explained within the model and, as such, is represented by an equation.

The equations which explain the endogenous variables in equation (2) can be conveniently written using the notation where \( f \) reads as 'is a function of'. Thus, using this notation, equation (1) would become:

\[ C = f(Y) \]  

i.e. consumption is a function of income.

If it is assumed that investment depends on the level of national income, and the current interest rate (i) then we may also write:

\[ I = f(Y, i) \]  

i.e. investment is a function of Y and i.

As national income changes so too does the amount of imports purchased so that:

\[ M = f(Y) \]  

Finally, while equation (2) states the accounting
requirement for national income, income itself is also influenced by the interaction between the supply of productive capital (K) and the level of employment (L):  

\[ Y = f(K, L) \]  

(5)

In summary, the simplified model structure is:

\[
\begin{align*}
Y &= C + I + G + (X - M) \\
C &= f(Y) \\
I &= f(Y, i) \\
M &= f(Y) \\
Y &= f(K, L)
\end{align*}
\]

This system of equations represents the essential relationships which underlie the basic structure of the Reserve Bank model. If this model were to be used for forecasting, it is clear that to forecast C, I and M we would need to know the value of Y (and i). However, before we can forecast Y we need to know the values of C, I and M (as well as G and X). This illustrates the essence of a simultaneous equation model. The forecasts of the variables must be determined simultaneously (i.e. jointly). For a large system of equations this is a very complex exercise although it is handled easily by today's computers.

Construction of a Model

The process of constructing a model involves considering both economic theory and the structure of the economy; the availability and quality of data; the estimation of the parameters of the relationships; and the analysis of the fully constructed model.

Sound economic theory should provide the basis for any economic model that is expected to represent the main structural relationships in the real economy and thus be a useful tool for policy analysis and forecasting. This approach forces the model-builder to state explicitly the characteristics and assumptions underlying the model.

The set of relationships that make up the model must take account of not only established economic theory but also factors peculiar to the economy under consideration. For example, in the New Zealand context, in addition to incorporating the usual sorts of policy variables — such as tax rates and government expenditure — there has been a need in the past to allow for other aspects such as controlled interest and exchange rates. As these sorts of controls have changed or have been abolished the structure of the model has required updating. Also, the emergence of new types of financial institutions and financial assets further complicates model construction.

Once an adequate theoretical framework for the model has been derived it is necessary to obtain historical statistical data for all the variables in the model. In many cases, adequate series of data over time may be already regularly published by various statistical agencies. But in other cases deficiencies in the availability of appropriate data mean that series may have to be constructed from scratch.

Each variable to be explained by the model must be represented by an equation or mathematical relationship of some form using the techniques discussed above. A range of statistical tests are used to help determine the properties of individual equations and to assist in assessing the historical importance (based on empirical evidence) of the different explanatory variables entering each equation. These tests help to provide some indication of the relative qualities of the various model equations. If a relationship performs badly in these tests it may then be necessary to go back and reconsider the structure of the equation and the quality of the underlying historical data. Economic theory unfortunately does not prescribe a unique set of explanatory variables for each structural relationship and consequently, a degree of experimentation is required to determine which structures give the best historical explanation. The final specification of the model is thus the net result of an interaction between theory and empirical testing. The intention is that this should lead to a model which is both theoretically plausible and statistically acceptable in the sense of being able to explain past behaviour.

The ability of the model to track out the path of past economic history is tested by using the model for various simulation tests. Simulation involves using a computer to solve the system of equations to generate values for all the variables it is designed to explain. The results produced by the model can then be compared with what actually happened to see how closely the model explains past history.

History of the Reserve Bank's Model

Fifteen years have passed since the first version of the Reserve Bank's econometric model of the New Zealand economy was published in 1971. Since then the first model a number of different versions have been produced and published. However, throughout this time, the major objectives of the Bank's modelling programme have remained essentially unaltered: to improve our understanding of the way in which the economy functions; to provide forecasts of the likely future path of the important economic variables; and to provide a framework for further debate and analysis of economic policy options available to New Zealand.

The construction of the early models was hampered by severe data limitations which meant that a large part of the model development involved the collection and organisation of data. The lack of adequate official quarterly series describing output and expenditures, and incomplete data on government accounts, constituted major gaps in the statistical framework from which the model could be built. Equations were based on unofficial quarterly aggregate expenditure series produced by the Bank that approximated, but did not necessarily correlate, with the official national accounts. With the introduction in 1978 of New Zealand's new system of national accounts (SNA) the Bank undertook a major exercise to provide a quarterly set of national accounts beginning in 1961 that were fully consistent with the official annual SNA data series. The results of this work were published in 1981 and the first model based on these data was published in 1983.

The nature and detail of the model has evolved in response to more appropriate data becoming available, to developments in economic theory, and to changes in the structure and nature of the New Zealand economy. The model has drawn on various strands of theory with the intention of producing an integrated model which

approximates real world economic behaviour in a realistic manner. As the emphasis in the mainstream economic literature has moved from one strand of the theory to another, the model has tended to reflect these trends. The need to take account of the particular institutional characteristics of the New Zealand economy has continually posed problems for the model builder. Not only is it difficult to quantify in an objective manner many institutional influences on the New Zealand economy (such as those due to regulations and restrictions) but the institutional characteristics have also often been subject to numerous, and in some cases substantial, changes. In addition to changes initiated by government, the economy has also developed as a result of the impact of technological changes, such as the increasing use of computers, and as a result of the changing tastes and preferences of the community.

Technology has had its own significant impact on the methods of construction and use of the Bank's model. The phenomenal advances made in the capacity and power of computing facilities over the period of the model project have removed many of the technical constraints that originally existed. More sophisticated techniques of analysis are now available and the reduction in computer processing time has meant that a greater proportion of resources can be devoted to exploring and understanding the properties of the model.

Throughout the history of the Reserve Bank model the variables on which most attention has focused have remained largely unchanged. Table 2 sets out some of these more important variables with brief non-technical notes on the economic factors which are currently incorporated in the equations for these variables.

Use of the Reserve Bank’s Model

As the objectives for the overall modelling programme suggest, the main purposes for which the model is used within the Bank are to assist in the analysis of policy options and to provide short-term forecasts. In fulfilling these functions the model also provides a basis for improving our general understanding of economic structures and the role of alternative assumptions and theories in shaping economic outcomes.

The model can be used to examine a variety of alternative policy options. For instance the model may be used to assess how the economy would have reacted if average personal income tax rates had been 10 per cent lower than they actually were from 1979. By altering the path of an exogenous variable in the model it is then possible to examine the impact of this change on the endogenous variables. In this way policy options and alternative policy combinations can be analysed.

If the model is being used for forecasting then the values of all exogenous variables required by the model must themselves be forecast, usually for a period of about two years ahead. Such variables include policy variables such as tax rates and government expenditure as well as external variables such as trade prices and volumes. Assumptions may also be required as to average wage settlements over the forecast period. A major source of the differences over time between actual outcomes and the paths forecast by the model can

<table>
<thead>
<tr>
<th>Selected Variable*</th>
<th>Major Explanatory Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Consumption</td>
<td>Personal disposable income (i.e. after tax income), the difference between desired and actual holdings of money.</td>
</tr>
<tr>
<td>Private Investment</td>
<td>Private sector output, output price relative to the cost of capital goods, availability of finance.</td>
</tr>
<tr>
<td>Exports of Goods and Services</td>
<td>Overseas aggregate demand, price competitiveness.</td>
</tr>
<tr>
<td>Imports of Goods and Services</td>
<td>Domestic activity, relative cost of imports.</td>
</tr>
<tr>
<td>Gross Domestic Product</td>
<td>Determined jointly by aggregate demand and aggregate supply.</td>
</tr>
<tr>
<td>Consumer Price Index</td>
<td>Weighted average of prices of domestically produced goods and assets, and imported goods.</td>
</tr>
<tr>
<td>Employment</td>
<td>Private sector output, real wage costs.</td>
</tr>
<tr>
<td>Personal Disposable Income</td>
<td>The main components are determined by wage and employment levels, farm incomes and personal taxes.</td>
</tr>
</tbody>
</table>

* All variables and their determinants are expressed in real terms (i.e. price deflated).

be attributed to changes in government policy or international economic developments which render one or more of the assumptions inappropriate. The forecasts are generally compiled on the basis of no change in government economic policies.

The case for including an econometric model in the forecaster’s tool-kit rests on three main points. First, a model provides a systematic framework for the storing and processing of the various pieces of information employed by forecasters. Secondly, a model imposes strict requirements on the internal consistency of forecasts. Thirdly, the explicit theoretical and quantitative assumptions required as input into the model help to identify potential sources of error as well as aiding in the analysis and discussion of the forecast results obtained.

Conclusion

An econometric model is neither magic nor mysterious. It may appear mathematically complicated but this is only because it endeavours to represent an
economic system which is itself complex. Of course, this is one of the major advantages of using a model — that it can cope with a multitude of relationships and a large number of economic variables in a systematic and efficient manner. However, a model is not a substitute for sound subjective judgement and should be viewed as just one of a number of tools which can be used to improve our understanding of the economy.

Glossary

Dependent Variable: A variable whose value depends on the values taken by other variable(s). Sometimes also referred to as an endogenous variable.

Econometrics: The combination of economic theory, and mathematical and statistical techniques to establish economic relationships and obtain estimates of a model’s parameters.

Empirical Evidence: Evidence obtained by analysing historical data or facts.

Endogenous Variable: A variable explained within the model (i.e. represented by an equation).

Equation: Statement, in mathematical form, which describes a relationship between variables.

Exogenous Variable: A variable determined outside the model (i.e. does not require an equation).

Identity: A particular form of equation which defines a variable by an accounting relationship with other variables.

Explanatory Variable: A variable which helps explain the behaviour of another.

Model: A relationship or set of relationships which attempt to reflect the essential elements of a situation in the real world.

Parameter: A constant value which determines the strength of the relationship between variables.

Sampling Errors: The difference between the outcome predicted by the model and the actual historical outcome.

Simulation: The use of a model to attempt to reproduce the essential workings of some system or process.

Simultaneously: Occurring or operating at the same time.

Theory: The expression of ideas or general principles explaining some concept or relationship.

Variable: A measure of a quantity (such as consumption, prices etc.) which is capable of taking different values over time.
billion in the first three weeks of February. This high level of primary liquidity is necessary to accommodate the strong withdrawals which will occur in March as a result of tax payments to government.

Treasury bills amounting to $340 million of Treasury bills were sold by tender during January. Of these, $73 million were January maturities, $167 million February maturities, and $100 million were March maturities. The first three tenders held in February sold $390 million of Treasury bills. Of these, $175 million were February maturities and $215 million were March maturities. The choice of maturities reflected the Bank's desire to match Treasury bill maturities with forecast liquidity withdrawals from the system.

The Reserve Bank conducted open market operations on six occasions during January and on two occasions during the first three weeks of February. Three of these operations were sales of Treasury bills which were carried out in response to strong forecast cash injections on these days. On four occasions the Bank conducted sell-back transactions in order to moderate the tightening of liquidity conditions which was expected to occur on these days. On 27 January, the Bank offered to purchase $75 million of government securities, but since most of the bids were below market rates, it purchased only $6 million of securities.

Stock settlements in January totalled $317 million, $198 million was received for stock sold in Tender 25 and $119 million for stock sold in Tender 26. Stock tender settlements during the first three weeks of February totalled $503 million, $240 million for stock sold in Tender 26, $93 million for stock sold in Tender 27 and $170 million for stock sold in Tender 28. In line with past months, a large proportion of Tender 25, 26 and 27 settlements were received on the final day of the settlement period for each of these tenders.

Liquidity Projections

The Governor of the Reserve Bank, Mr S.T. Russell, released on 19 February 1986, revised liquidity projections, following the announcement of a revised 1985/86 fiscal deficit by the Minister of Finance, the Hon. R.O. Douglas. Mr Russell said that a $1.7 billion fiscal deficit implied a net public sector injection of $2.9 billion, the amount that has been raised through tender sales of government stock this financial year.

Reserve Bank Prepares Modifications to Tender Procedures

The Reserve Bank has prepared modifications to the procedure for tendering for government securities but they will not be put into effect until they have been discussed with the market, the Governor of the Reserve Bank, Mr Spencer Russell, said on 21 February 1986.

“We want to be sure that they are reasonable and workable and, above all, that they do not adversely affect the widespread participation in the system which has produced funds for the Government at the lowest market-related cost”, he said.

The changes, which will be circulated to dealers in government securities in a discussion paper, include:

— A review of the existing exemptions from the deposit requirement with the intention of making the exemptions limited to an amount which would be negotiated between the Bank and the registered bidder.

— As a general rule, the limit to be related to the financial substance of the bidder.

— Special limits to be granted to a particular bidder in an individual tender where these can be justified to the Bank.

— For registered bidders without an exemption, the deposit requirement to be 10 per cent instead of the present 5 per cent.

In addition, consideration will be given to changing the settlement period for tenders and to a number of other minor changes.

Mr Russell said that the modifications resulted from the internal examination which had begun when the Bank learned that Rakurau Holdings Limited had defaulted after making a successful tender for Government stock.

“There can never be a positive guarantee that such an incident will not recur but our aim is to reduce the possibility as much as possible without unduly limiting the competition which is the major advantage of the present system.

We will now invite the comments of the market which shares with the Bank the desire that the system be fair and efficient and we expect that changes will be made shortly.”
ECONOMIC UPDATE

Monetary Indicators

The Money Supply (M3) is estimated to have grown 1.5 per cent in December after rising 1.4 per cent in November. For the year ended December M3 rose 20.1 per cent compared with a 19.6 per cent increase for the November year (D1, D2, D3).

Private Sector Credit (PSC) rose by 0.3 per cent over December following 1.4 growth in November. Over the twelve months to December PSC is estimated to have risen 21.1 per cent which compares with a 24 per cent increase for the year ended November (D2, D3, D4).

Trading bank lending rose 20.2 per cent in the year to January having risen 23.9 per cent in the year to December. Trading bank deposits over the same period were up 34.5 per cent, unchanged from the December year increase (D2, B3, B4, B7, B8, B11). As a result, the trading banks' lending to deposits ratio rose to 72 per cent in January compared with 71.4 per cent in the previous month and 80.9 per cent in January 1985.

Total credit limits at trading banks in December were 19.2 per cent higher in annual terms (B12).

The level of primary liquidity, expressed as a daily average (non-seasonally adjusted), fell over January to $2,298 million compared with $2,397 million in December.

In the year to December:
- Savings bank lending rose 19.6 per cent and deposits 7.2 per cent.
- Trustee savings bank lending and deposits increased by 7.4 per cent and 10.3 per cent respectively (C2).
- Post Office Savings Bank lending rose 96.1 per cent and deposits 9 per cent (C1).
- Private savings bank lending and deposits fell 16.8 per cent and 15.9 per cent respectively (C4).
- Large finance companies’ lending rose 25.6 per cent and deposits 25.5 per cent (F4).
- Building societies’ lending and deposits were up 8.2 per cent and 10.1 per cent respectively (F5).
Trading bank deposit interest rates on terms of less than twelve months fell sharply over December while longer term rates were virtually unchanged (I2).

External Sector

(Figures not seasonally adjusted.)

A $22 million net inflow of private capital was recorded over November after eight successive months of net outflows (G4).

The OET current account deficit for the year ended November was $2,548 million compared with $2,390 million for the year ended October and $2,012 million for the November 1984 year (G4).

Merchandise trade figures for December show an excess of exports over imports of $176.2 million. A year earlier imports for the month exceeded exports by $29.8 million (G4).

New Zealand’s official overseas reserves rose by $360.3 million during December to an end-of-month level of $3,254.9 million. At the end of December 1984 reserves stood at $3,698.4 million (G1).

National Income

After rising 1.7 per cent in the June quarter, real GDP fell by 0.3 per cent in the September quarter. The increase for the year ended September was 3.2 per cent, down from the 4.7 per cent growth rate recorded for the year ended June. The largest falls in the quarter were recorded in the trade, restaurants and hotels industry and the agricultural sector while the strongest increases were in the electricity, gas and water group, and the construction sector.

Consumption

Retail turnover (in real terms) fell 1.3 per cent over the December quarter, having fallen 2 per cent the previous quarter. Automotive stores’ sales again accounted for most of the movement and sales excluding this group rose by 0.1 per cent over the quarter (J1).

Labour Market

The number of registered unemployed rose by 0.2 per cent in December to 53,883, having risen 5.7 per cent the previous month. This latest figure is 5.1 per cent down on December 1984. The total of registered unemployed and assisted employed rose 6.1 per cent in December to 86,319, 11.5 per cent less than a year earlier (J4).

A net outflow of 1,540 permanent and long-term migrants was recorded over December, bringing the net outflow over the last year to 19,284.

Prices

The Food Price Index rose 1.9 per cent in January, the highest monthly increase since March 1985. This brought the annual rate of increase to 11.6 per cent (J3).

Government Sector

(Figures not seasonally adjusted.)

Government net expenditure for the nine months ended December was 20.7 per cent higher than for the corresponding period in 1984 while government revenue was up 19.5 per cent. The government deficit before borrowing for the nine months was $3,646.1 million, 24.1 per cent higher than for the nine months to December 1984 (E2).

Note

All quarterly and monthly data are seasonally adjusted unless otherwise stated. The figures in brackets refer to the Bulletin tables in which the relevant statistics appear. However, the statistics in the Bulletin tables have not been seasonally adjusted and therefore may differ from the statistics given here.