Revisiting medium term macro-economic scenarios (1985 – 1995) generated by a system dynamics model of the New Zealand economy

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Abstract

This paper revisits the macro-economic modelling and medium term scenarios undertaken at the New Zealand Planning Council (now disbanded) in the mid 1980's. The following major reports were published: "A Macro-Economic Model and Scenarios to 1995" (by E. Haywood & R.Y. Cavana) and "Towards 1995: Patterns of National and Sectoral Development" (by D. Rose, A. Stroombergen, et al). These reports discussed the development and use of a macro-economic system dynamics model (SDMACRO), used to generate trends for the main macro-economic variables, and a general equilibrium price sensitive sectoral model (JULIANNE), which generated compatible sectoral and national forecasts of a range of variables for each of 22 sectors for nominated years. The JULIANNE model used outputs from SDMACRO as constraints and inputs. This paper provides a brief overview of SDMACRO and its use at the NZ Planning Council. Also, the reforms of the New Zealand economy that have taken place since the mid 1980's will be summarised and a comparison of the SDMACRO scenarios will be provided against what actually happened over the period between 1985 to 1995. Finally, the paper discusses some of the more recent developments that have taken place with the macro-economic model.

Introduction

SDMACRO, a medium-term system dynamics model of the New Zealand (NZ) economy was developed within the framework of the National Sectoral Programme at the New Zealand Planning Council. The full documentation and a computer listing of SDMACRO, together with a discussion of a wide range of model scenarios, are provided in Haywood and Cavana (1986). SDMACRO was developed to provide likely trend movements, some 10-15 years into the future, in the key macro-economic aggregates including gross domestic product, capita1 formation, population, employment, exports, imports, and the current account balance.

The general structure of SDMACRO follows, to a degree, that of an earlier medium-term model of the New Zealand economy (Haywood, 1980). Similarities include the emphasis on the nation's external balance as a constraint on economic growth. It was also recognised that, for medium-term analysis, the degree of disaggregation that could

sensibly be modelled or examined was limited. Finally, the emphasis on model construction was to capture the key economic relationships and to examine the effects of changes in these relationships.

However, while certain similarities existed to the model outlined in Haywood (1980) a number of significant differences in approach, content and methodology were evident. In particular, these were the inclusion of relative prices, additional feedback links, more complex policy reaction functions, and different exchange rate regimes. In addition, the model was developed using the system dynamics method with the DYNAMO package (Pugh, 1976), although many of the behavioural equations have been estimated using econometric methods. An interesting feature of this model is that it demonstrated the complementary use of both the system dynamics and econometrics methods in the construction of a model within a general economics framework. This model has been discussed at an earlier International System Dynamics Conference held in San Diego, USA (Cavana & Haywood, 1988).

The main variables, linkages and feedback loops in the model are shown in Figure 1 and will be discussed briefly in this paper. The figure illustrates the interactions between the growth/decay processes (reinforcing or positive feedback loops) and the control mechanisms (balancing or negative feedback loops) within the NZ macro-economic system. SDMACRO had been designed to examine the dynamic behaviour generated by these interactions over a medium term time span (ie 5-10 years).

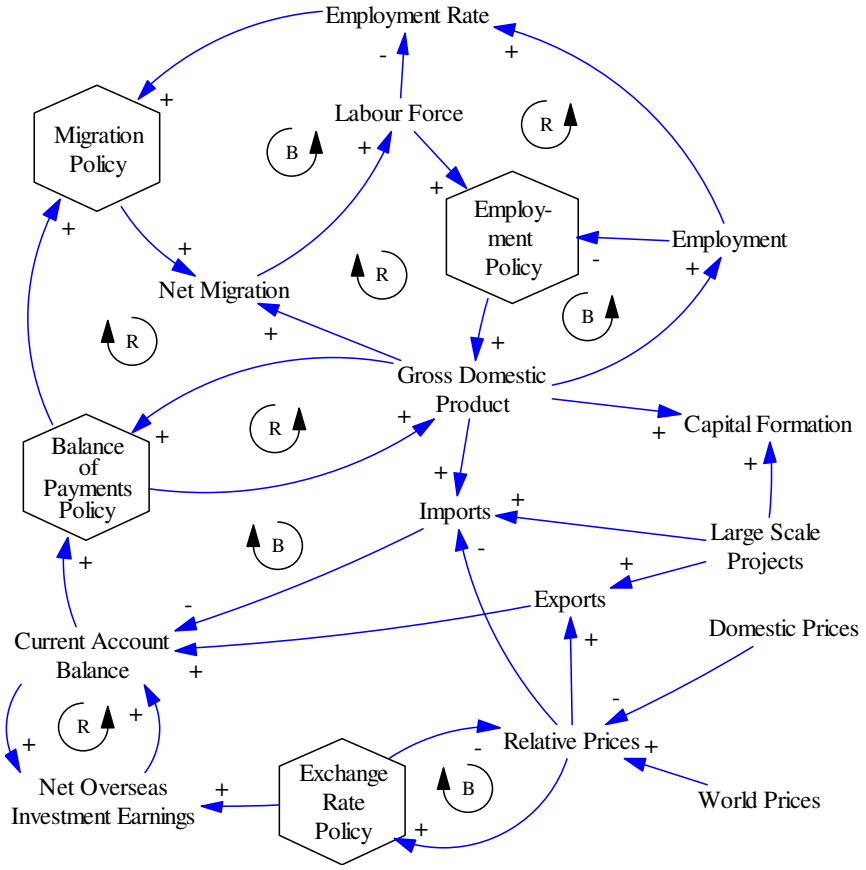


Figure 1. A simplified causal loop diagram for SDMACRO

Source: Cavana & Haywood, 1988, Fig. 1, p29. (redrawn with Vensim package (Ventana, 2002)).

Model Structure

SDMACRO contains 4 major sectors and a number of sub-sectors. These are summarised in Table 1.

Table 1: SDMACRO Model Sectors

Sector	***Sub-Sector***
OUTPUT	Gross Domestic Product Gross Fixed Capital Formation
DEMOGRAPHIC	Population Labour Force Net Migration Employment
EXTERNAL	Goods Trade [Exports & Imports] Exports & Imports of Services Net Overseas Investment Income
PRICE INDICES	Domestic Price Indices [Implicit Gross Domestic Price Deflator] [Capital expenditure price indices] Exchange Rate Indices Export & Import Price Indices

Source: See Appendix A of Haywood and Cavana (1986) for a DYNAMO computer listing of the model and variable definitions.

The model structure is fully described in section 2 of Haywood and Cavana (1986). Only a few of the sub-sectors will be described here to give an indication of the nature and rationale for the structure and equations contained within the model. The following material is generally taken direct from Haywood and Cavana (1986: 7-22).

Gross Domestic Product

In the early 1980s, most textbooks suggested that the purpose of macro-economic policy should be to achieve certain objectives. In particular: economic growth, full employment, price stability and external balance.

However, in practice trade-offs exist between the various objectives. Accordingly, depending upon the particular conditions that prevail and objective functions of the nation, different emphasis upon achieving the various objectives will exist.

SDMACRO does not directly include a price stability objective, due to equation formulation difficulties. However, in its simplest form the model can be operated to achieve a single objective, eg – balance of payments or a particular employment objective. Alternatively, the two objectives, balance of payments and employment, can be combined with specific weights given to each. These two effects, which are discussed briefly below, are combined as follows in determining the growth rate of gross domestic product in the model:

QRP = WTBP*QRPBP+(l-WTPB)*QRPE

QRP = percentage change in real gross domestic product
WTBP = weight given to balance of payments effect on GDP
QRTBP = balance of payments effect on GDP
QRPE = employment policy effect on GDP

It is assumed appropriate policies are adopted to maximise domestic growth consistent with the desired external and employment objectives. No view on what specific set of policies should be adopted to achieve this goal is given. In the Base Case WTBP is given a weighting of 70 percent.

Employment policy effect on GDP: The employment response objective function is incorporated in the model as the graphical relationship in Figure 2 below which specifies the desired employment rate in the next year given the existing employment rate. The desired increase in employment that, via an employment-domestic growth equation, provides an estimate of the increase in domestic activity that would need to occur to meet the desired increase in the employment rate in the next period. Full employment, which is assumed desirable, is specified as 2 percent unemployed.

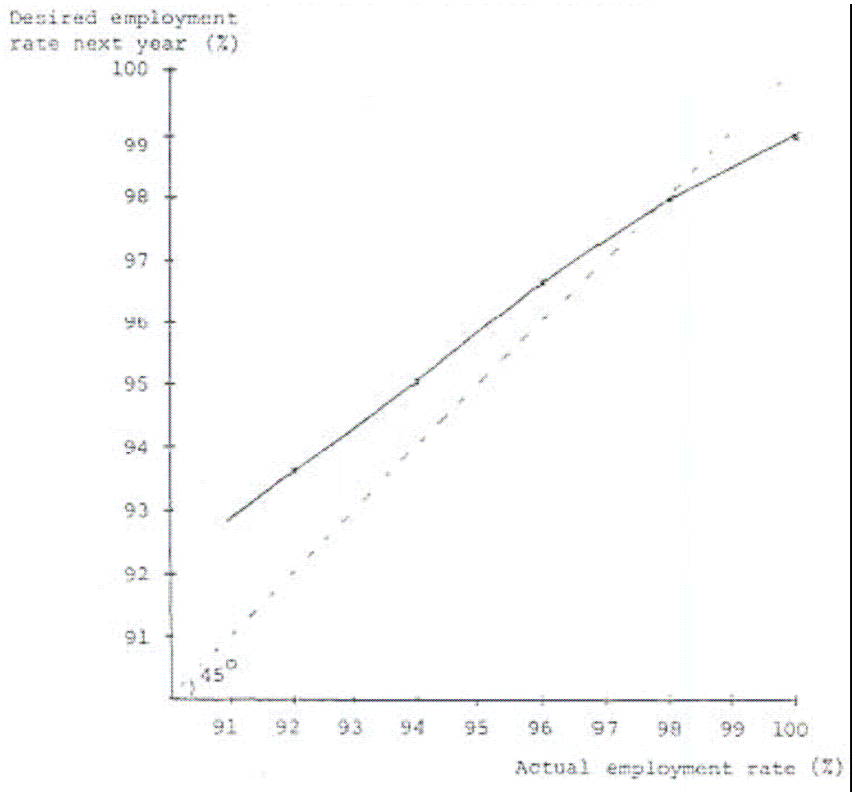


Figure 2: Employment objective function

Source: Haywood & Cavana, 1986, Fig. 2.1, p8.

Balance of payments effect on GDP: The model assumes that GDP growth is dependent on the relationship between the current account balance and the level of GDP. This is modelled as the graphical relationship in Figure 3. For example, if the current account balance as a ratio of GDP was –3 (minus 3) percent, then it is assumed that the desired rate of growth in the economy is 3 percent. Whether this growth rate is maintained or even achieved depends upon the relative weight given to the external balance objective, and secondly, to the various factors determining the current account in following periods:

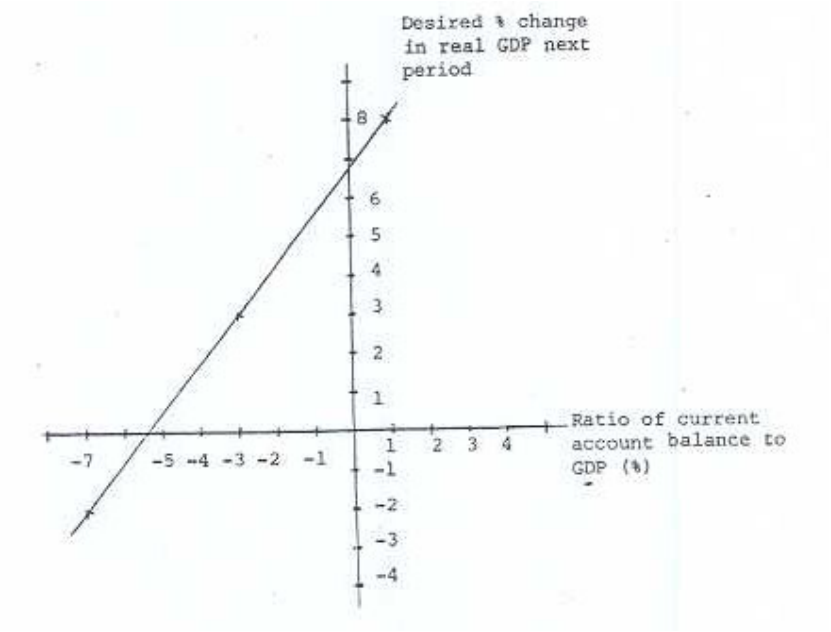


Figure 3. GDP – Current Account Balance Objective Function

Source: Haywood & Cavana, 1986, Fig. 2.2, p9.

Population, Labour Force and Net Migration

The NZ Department of Statistics estimates of population and labour force, assuming zero migration, are input into the model as exogenous projections. The effects of net migration modify the population and labour force projections. Migration is calculated in the model as the sum of normal net migration flows plus the net inward migration resulting from an active immigration policy. Normal net migration is assumed to depend on economic conditions within New Zealand. The result of estimating the relationship between the five yearly moving average data of net migration and the annual percentage change of real gross domestic product is:

MIGN = -18262 + 7357*QRP $R^2 = 0.77$
(5.1) (6.6) 1965-80

MIGN = normal net migration (persons/year)
QRP = percentage change in real GDP
(t values in brackets)

At high levels of employment (ie over 97 percent), it was assumed that an active immigration policy (see Figure 4) will be introduced by Government to reduce labour shortages, providing that the balance of payments is at the same time in a satisfactory position. For example, at an employment rate of 98 percent, it is assumed that an additional net 5,000 persons are attracted to New Zealand above that associated with the normal net migration which is related to the growth in domestic economy.

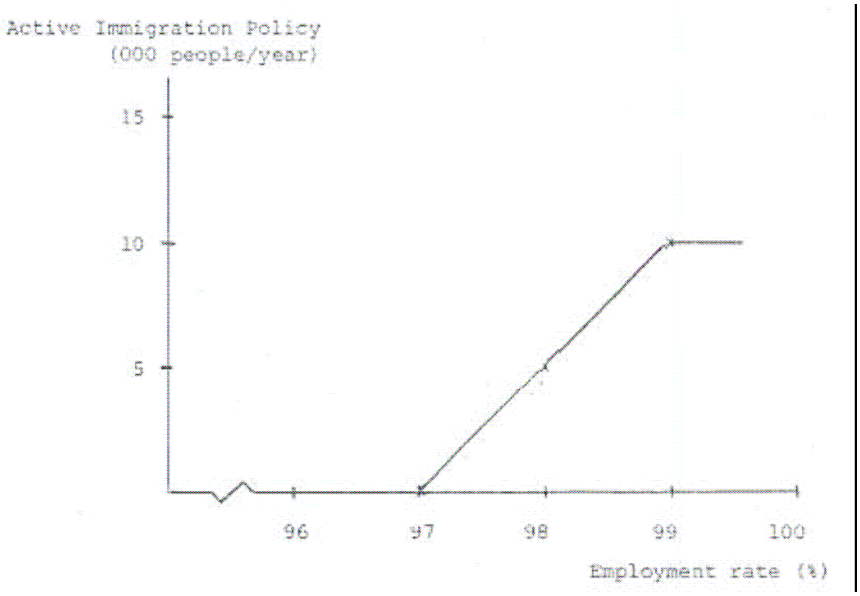


Figure 4. Active Immigration Policy Response Function

Source: Haywood & Cavana, 1986, Fig. 2.3, p15.

Employment

The percentage change in employment in the model is directly related to movements in domestic output. The estimated relationship is:

$$EP = \underset{(3.1)}{0.522} + \underset{(8.0)}{0.435}*QRP \qquad R^2 = 0.82$$

1965-80

Exports and Imports of Goods

Three categories of export goods are assumed: traditional (meat, wool and dairy products), non-traditional (forest products, manufacturing and other primary products), and those exports associated with the "additional" large-scale projects[1]. In the base case, traditional and non-traditional exports are assumed to increase at annual real rates of 1 and 6 percent respectively. The assumed growth rates are modified if relative price movements between domestic and export prices occur. The price elasticity for

[1] The large scale projects in New Zealand in the early 1980's were those capital projects supported by the Government, and including ammonia-urea, synthetic gasoline, refinery expansion and methanol. These projects could not readily be explained by movements in domestic activity.

traditional exports was assumed to be 0.3 and for non-traditional exports 0.7, giving on aggregate an overall price elasticity of 0.5.

Various categories of imports of goods are assumed. These are traditional (consumer, capital and intermediate goods imported), and those imports/import savings associated with the large-scale projects. In the model the percentage change in traditional imports is related to the percentage change in real GDP and the difference between the percentage changes in import prices and domestic prices:

$$MGTRP = \underset{}{-5.4} + \underset{(3.9)}{2.878}*QRP - \underset{(6.9)}{0.567}*(PMP-PDP)_{(3.8)} \qquad R^2 = 0.92 \text{ (1965-80)}$$

MGTRP = percentage change in traditional imports of goods
QRP = percentage change in real GDP
PMP = percentage change in import price index
PDP = percentage change in domestic price index

Exports and Imports of Services

Exports of services are assumed to be exogenous to the model with a growth rate of 6% p.a. in the base case. This rate is modified by the relative price movements and a price elasticity of 0.5. Imports of services are estimated at the historical ratio of 18 percent of total goods trade.

Net Overseas Investment Income

It is assumed "investment income" credits move 3.5% above world inflation. "Direct private investment income" debits, i.e. foreign investment in NZ, is assumed to move directly with the movement in domestic activity as represented by money GDP. "Other investment income" debits, primarily interest paid on overseas loans by Now Zealanders, is broken into two categories. Past payments are assumed to represent interest and will remain at that level adjusted for movements in the exchange rate. The interest rate on new loans required to cover the current account balance are borrowed at 3 5% above the estimated world inflation rate.

Domestic Price Index

The percentage change in the domestic price index (PDP) consists of two elements - internally generated inflation (PIP), assumed to be 10% in the base case, and imported inflation (PMP) These elements are weighted according to their approximate importance in total domestic economic activity:

$$PDP = 0\ 7\ PIP + 0\ 3\ PMP$$

Exchange Rate Index

The model can be set to operate in either a “fixed” or "flexible" exchange rate mode. In the base case the exchange rate, in its "flexible" mode, adjusts according to relative differences that emerge between domestic and external prices so that NZ's competitive position can be retained internationally Also an option exists in the model which

introduces a constant "under" or "over" shooting of the assumed exchange rate adjustment, which causes a gradual depreciation or appreciation of the nation's real exchange rate over time

Export and Import Price Indices

The external price indices are made up of two components: overseas prices in foreign currency and the exchange rate In the base case export and import prices, in foreign currency, are assumed to grow at 6 and 6 5 percent per annum respectively

Model Behaviour

A large number of simulation runs with SDMACRO are reported in Haywood and Cavana (1986). However, only the base case and the optimistic and pessimistic scenarios will be presented here. The model commences simulation from a base position of 31 March 1983. The values for that year are the average of the 1982-4 actual values. This procedure being adopted to ensure that the model commences its projections from values that are close to the series medium-term trend values, at that time.

The optimistic scenario assumes that the nation's terms of trade will improve by 0.5% p.a. (compared with -0.5% p.a. for the base case) and the real annual growth in traditional exports will be 1.8% (1%), non-traditional exports 8% (6%) and services 8%(6%).

The pessimistic scenario assumes that the nation's terms of trade will decline by 1.5% p.a. and the annual real growth in traditional exports will be 1%, non-traditional exports 4% and services 4%. In addition, it is assumed that there will be no further "additional" benefits from the large scale projects (compared with 50% additionality for the base case) and the level of import substitution will be less than the historical rate (i.e. the constant coefficient in the import equation above will be -4% rather than -5.4% for the base case).

Figure 5 displays the model results for the Base Case and optimistic/pessimistic scenarios for the change in real gross domestic product. Figure 6 illustrates the Base Case output for the labour force, employment and unemployment levels. Historical data from 1960 to 1983 are also shown for comparative purposes.

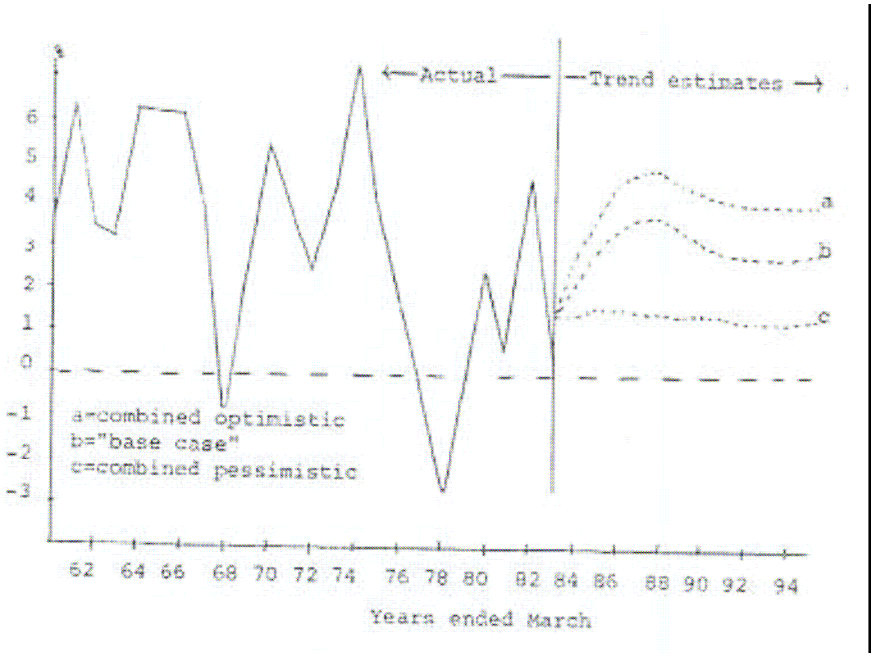


Figure 5. Combined pessimistic & optimistic scenarios: Real GDP

Source: Haywood & Cavana, 1986, Fig. 3.17, p42.

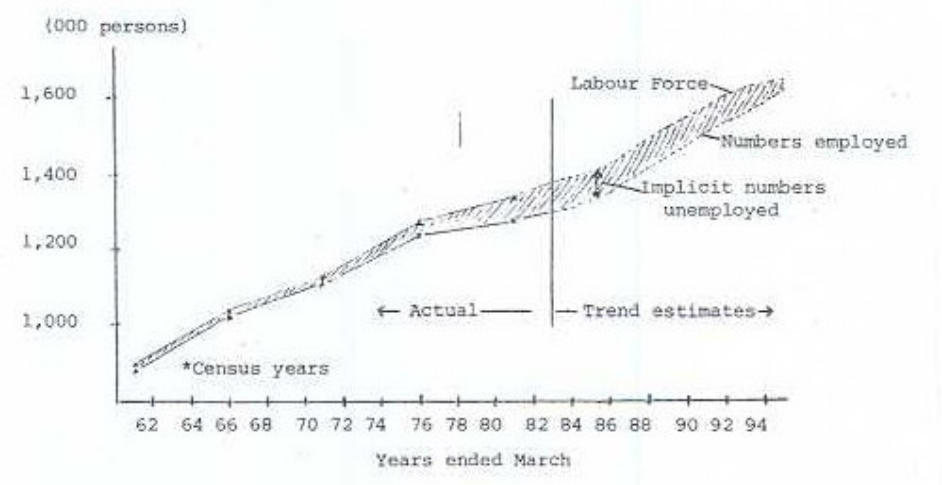


Figure 6. Base Case: Labour force, employment & unemployment

Source: Haywood & Cavana, 1986, Fig. 3.3, p28.

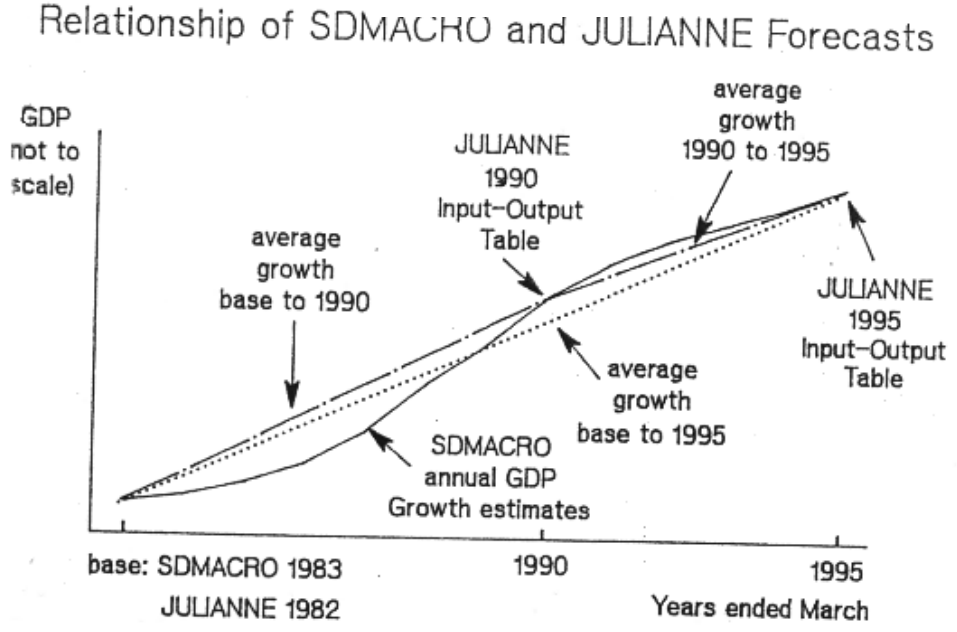
Role of SDMACRO in the National Sectoral Programme

The purpose of the NZ Planning Council's National Sectoral Programme was to provide a general indication of the likely sectoral and national development path of the New Zealand economy some five to ten years in the future. The programme, which is discussed fully in the report of the National Sectoral Working Group (1986), comprised three major elements:

- a programme of research and consultations with a range of sectoral organisations in both the private and public sectors to provide qualitative and quantitative information for the model runs.
- a system dynamics model, SDMACRO, designed to produce medium term trend values of the major macro-economic variables.
- a non-linear general equilibrium model, JULIANNE, which generates compatible sectoral and national projections of a range of variables including output, exports and employment for each of 22 sectors for nominated future years.

The relationship between the projections generated by SDMACRO and JULIANNE is illustrated in Figure 7. SDMACRO provided a continuous growth path for selected macro-economic variables, e.g. GDP, employment and investment up to 1995 from a base year of 1983, whereas JULIANNE provided "snap shots" of two future time periods, 1990 and 1995, from a base year of 1982.

Figure 7



Source: National Sectoral Working Group, 1986, Fig. 3.3, p22.

The SDMACRO base run was used with information from the sectoral consultations to constrain the JULIANNE calibration run. In this run JULIANNE was required to replicate in 1990 and 1995 SDMACRO figures for employment, the real exchange rate, the terms of trade, the balance of trade and total exports; to work within a total capital stock which was compatible with the SDMACRO time profile of capital formation; and to approximate the investment to GDP ratio in SDMACRO in the nominated years. In addition, JULIANNE was required to replicate sectoral export growth rates and sectoral rates of depreciation and technical change as derived from the consultations. The major results of this calibration run indicated that to secure the level of exports foreseen in the sectoral consultations the model required substantial increases in export subsidies above

the level prevailing in 1981/82 and to secure a level of imports compatible with the SDMACRO trade balance required the removal of all tariff protection.

However, to produce results more consistent with the policy settings in New Zealand in the early to mid 1980's, the JULIANNE current policy run required four major changes from the calibration run: the model was instructed that no subsidies were to be paid on exports; for competing imports tariff equivalents were to be reduced to a maximum of 25 percent and tariffs on non-competing imports were to be reduced to zero; and to enable the model to determine its own export prices, the SDMACRO constraints on terms of trade and the real exchange rates were removed. This run resulted in lower export growth rates and a lower ratio of imports to GDP. In the rerun SDMACRO was required to replicate JULIANNE'S projections in 1990 and 1995 for the terms of trade, real exchange rate, and real exports of goods and services. The lower levels of employment and investment generated by the rerun of SDMACRO were used to constrain a further rerun of JULIANNE. At this stage the sectoral implications of the runs outlined above were examined and some further policy experiments with JULIANNE undertaken.

Comparison of SDMACRO Scenarios with Actual Performance of NZ Economy

The policy environment changed dramatically with the election of the Labour Government in New Zealand in July 1984. Previously, New Zealand had been a very tightly regulated economy. This change of Government marked the beginning of a systematic and comprehensive programme of economic reforms in NZ. These economic reforms included major changes to international trade policy, monetary and fiscal policies, industry policy and labour policy. They have been fully discussed in Dalziel & Lattimore (2001), and Evans et al. (1996). Some of the reforms included:

- *'Financial market* - removal of interest rate and foreign exchange controls; and floating of the NZ dollar (exchange rate).
- *Goods market* – removal of price and rent freezes, consumer and producer subsidies, export assistance, import licensing and tariffs; and introduction of light handed regulation.
- *Monetary Policy* - introduction of the primary objective of monetary policy to be price stability, setting the Reserve Bank a target for increases in the Consumer Price Index of between 0-2 percent (Reserve Bank Act).
- *Public Sector Reforms* - corporatising and privatising government trading organizations (e.g. sale of NZ Railways Corporation); reforming Government Departments; introduction of the Fiscal Responsibility Act.
- *Taxation Reforms* - introduction of a 12.5% Goods and Services Tax; Fringe Benefit Taxes; and company and personal income tax cuts.
- *Industry Reform* – incl. deregulation of the road transport industry; opening up of domestic air routes to competitors.
- *International Trade* - establishment of a Trans-Tasman free market under the terms of the Australia and New Zealand Closer Economic Relations Trading Agreement.
- *Labour Policy* – reform of laws governing labour relations; ending compulsory union membership; and introduction of the Employment Contracts Act.'

(Cavana, 2004, p181)

> "The decade of radical economic reform between 1984 and 1994 was a very important period in New Zealand's economic history. It saw the country's transition from being one of the most tightly regulated and controlled economies in the world to being one of the most liberal market-based economies anywhere" (Dalziel & Lattimore, 2001, p31)

These reforms, which started with the election of the Labour Government in New Zealand in July 1984, continued with the election of the National Government in October 1990. A chronology of the major economic reforms in New Zealand between 1984 to 1995 is provided in Appendix 1.

The economic environment over the period from 1984 to 1995 has been considerably different to the environment that existed in the early to mid 1980's when the modelling work was being carried out at the New Zealand Planning Council. Nevertheless, some of the policy changes were examined within the National Sectoral Programme and reported in Haywood & Cavana (1986) and the National Sectoral Working Group (1986).

Although the policy environment was quite different to that expected, it is useful to compare some of the SDMACRO generated scenarios with the actual outcomes over this period. Table 2 summarises a range of comparative figures, including final value (1995) values and average growth rates over the modelling period (1983 to 1995). By and large the economy performed at slightly worse than the Base Case on average over the 10 year period.

However, the policy changes in New Zealand were much more dramatic than envisaged in the early 1980's, and together with the share market crash in 1987, the NZ economy went through a longer than expected 'adjustment' period, showing signs of considerable improvement from about 1993 onwards (see Figures 8-10). This is also indicated by the real investment to GDP ratio of about 33 percent in 1995, much higher than even the most positive scenario generated by SDMACRO (see Table 2).

Hence it can be concluded that the SDMACRO macro-economic modelling and scenarios did provide some useful insights into the emerging nature of the New Zealand economy over the period from 1985 to 1995.

Table 2
Comparisons of SDMACRO Scenarios with the Actual Major Macro-Economic Indicators

	Initial Values (1983)	SDMACRO Final Values (1995)			Actual Final Values (1995)
		Base Case	Pessimistic Scenario	Optimistic Scenario	
Real GDP					
Value (1983 $000m)	32.0	46.0	37.5	51.8	40.4
Growth Rate, 83-95 (% p.a.)		3.1	1.3	4.1	2.0
Real GDP per capita					
Value (1983 $000m)	9.9	12.9	10.9	14.1	11.4
Growth Rate, 83-95 (% p.a.)	-	2.2	0.8	3.0	1.2
Real Investment/GDP ratio (%)	22.5	18.7	14.0	25.0	32.7
Population					
Number (000)	3,230	3,579	3,426	3,680	3,539
Growth Rate, 83-95 (% p.a.)	-	0.9	0.5	1.1	0.8
Total net migration between 1983-95 (000)	-	53	(100)	154	(21)
Employment no. (000)	1,300	1,622	1,483	1,707	1,608
Unemployment rate (%)	5.5	1.8	4.9	0.3	6.9
Real Exchange Rate	100	99	99	99	na
Terms of Trade	100	94	84	106	118
Real Exports of Goods & Services					
Value (1983 $000m)	9.4	15.1	11.8	19.3	16.4
Growth Rate, 83-95 (% p.a.)	-	4.0	1.9	6.2	4.7
Current account balance/GDP ratio (%)	(5.3)	(2.1)	(4.7)	(0.1)	(3.8)

Sources: Haywood & Cavana (1986); actual final values derived from Statistics New Zealand statistics summarised in Appendix 2.

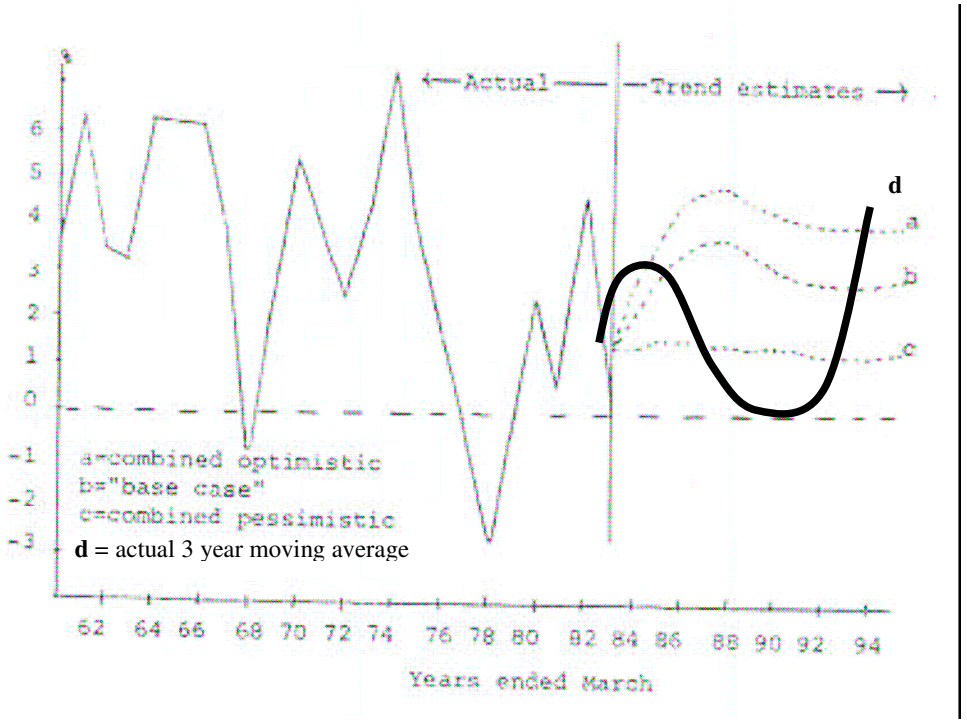


Figure 8. Comparison of SDMACRO scenarios and actual outcomes: Real GDP growth rates

Source: Haywood & Cavana, 1986, Fig 3.17, p42; and NZ Department of Statistics

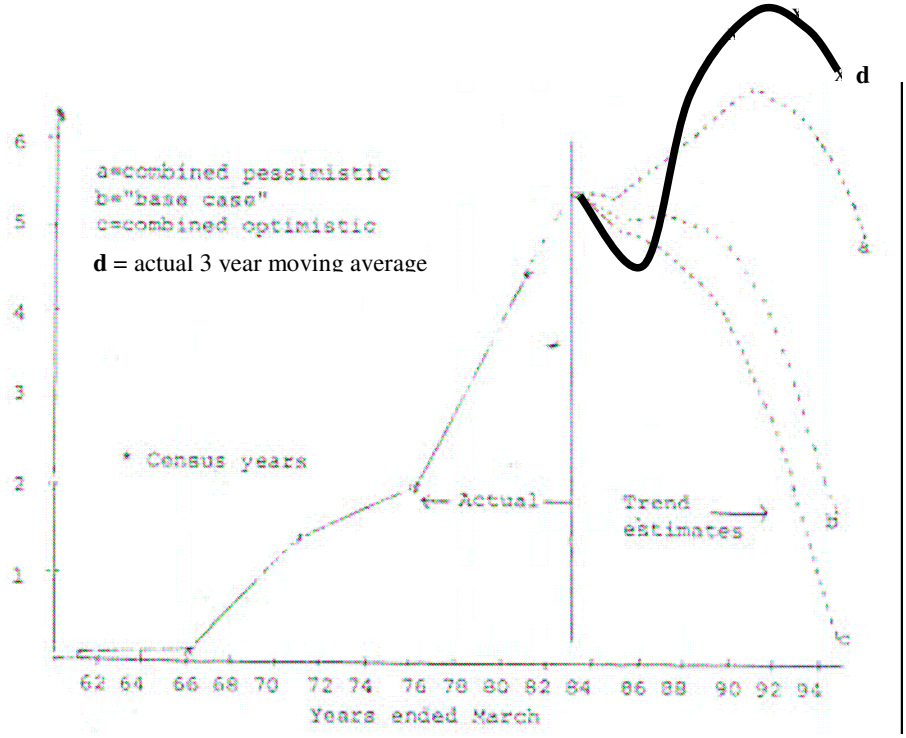


Figure 9. Comparison of SDMACRO scenarios and actual outcomes: Unemployment rates

Source: Haywood & Cavana, 1986, Fig 3.18, p43; and NZ Department of Statistics

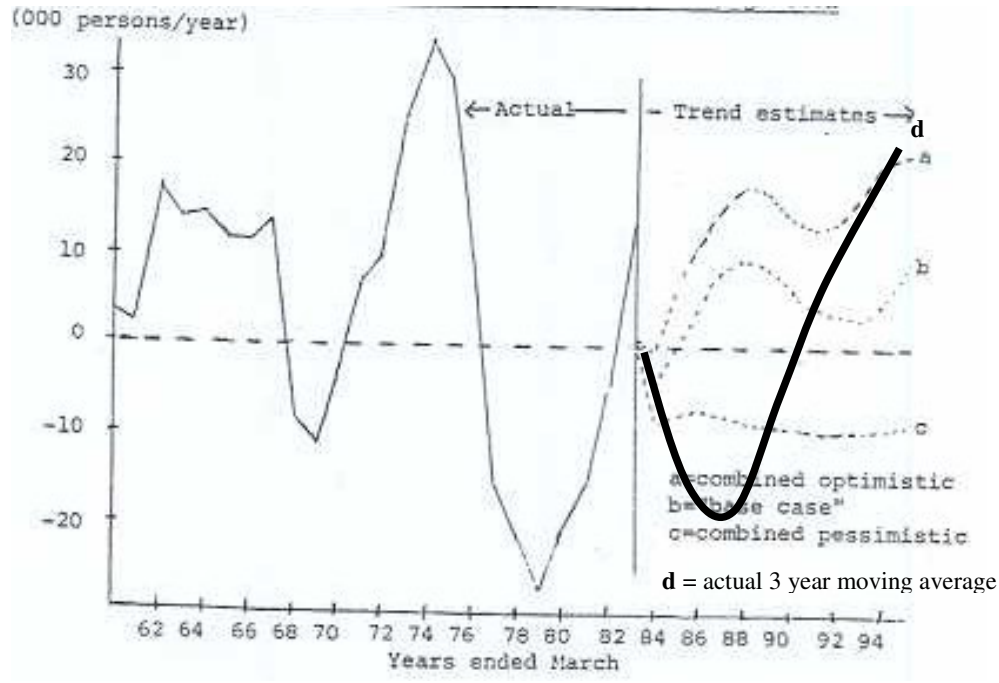


Figure 10. Comparison of SDMACRO scenarios and actual outcomes: Net migration

Source: Haywood & Cavana, 1986, Fig 3.19, p43; and NZ Department of Statistics

Development of the Three Sector Macro Model

Although the NZ Planning Council was disbanded in the late 1980's, some work still continued on both the macro-economic trend model (SDMACRO) and the general equilibrium model (JULIANNE). The development work was mostly carried out at Business and Economic Research Ltd (BERL) in Wellington, with funding assistance from the Foundation for Research Science and Technology, and continuing input from a number of economists at other institutions, including Victoria University of Wellington.

The development of the macro-economic trend model was principally carried out by Eric Haywood (reported in Haywood *et al.* 1993). The macro control model (now called TRI model), followed the standard approach of modelling the nation's main national accounting series, but with the difference that output is now divided into three sectors (Production module) (SDMACRO only had one sector), while growth is achieved via a set of reaction functions (Control module) contained in the model.

The Production Module

In the TRI model (Haywood, *et al.* 1993), the economy is divided into three sectors: primary, secondary and tertiary, with each sector having its own stock of capital and employment. The overall increase in GDP as estimated elsewhere in the model is split between the three sectors by a simple routine. The output of the primary sector is assumed to change at the same rate as do exports of the additional commodities. The remaining part of the absolute increase in GDP is split between the other two sectors in fixed proportion.

For each sector changes in future demand for labour and capital per unit of output are driven by exogenously forecast rates of change in capital and labour productivity. These underlying rates of change are modified in accordance with changes in a capacity utilisation as proxied by the current and trend values for the rate of growth in sectoral output. Model requirements of labour and capital per unit of output are also sensitive to changes in the costs of labour and capital. Differences between sectoral rates of change in the cost of labour and capital per unit of output are applied through exogenous elasticities of labour capital substitution. These routines are sufficient to generate forecasts of total employment and the required stock of capital in each sector.

The Control Module

Growth in the TRI model is determined via various "reaction-functions." The reaction functions fall into two distinct categories - direct and indirect.

The model contains two direct reaction functions relating to employment and the balance of payments. It is assumed, for example, that increasing unemployment beyond a specified level will cause a reaction which will see policies or actions implemented that will increase domestic activity to increase employment. Exactly what policies or changes would occur to cause an increase in activity are not specified, merely that activity will be increased. Offsetting or reinforcing this is the assumption that the nation's balance of payments position, and thereby the level of net overseas liabilities, is a direct major determinant of growth. Not an unreasonable assumption in a small open economy such as New Zealand's. An improvement/deterioration in the current account balance is assumed to lead to an increase/decrease in domestic economic activity.

Complementing the above direct reaction functions on the determination of growth is a set of indirect functions. For example, there is a set of reaction functions dealing with interest rates, inflation, and the exchange rate, which indirectly impact on the growth rate. A fuller description of this module is provided in Haywood *et al*. (1993).

Use of the TRI Model

The new three sector macro-economic trend model (TRI) has been used successfully for a number of different purposes; including forecasting macro and sectoral trends in the economy (Haywood *et al*. 1993) and forecasting medium term trends in occupational patterns of employment in New Zealand (Andrews & Rose, 1995). Both of these studies also involved the use of the general equilibrium model, JULIANNE. The macro trend model has been used to examine the macro-economic implications of variations in the net flow of foreign direct investment in New Zealand (Rose, 1996).

Concluding Comments

The macro-economic trend model discussed in this presentation has evolved quite significantly since its initial development as a FORTRAN model at the New Zealand Planning Council by Eric Haywood over 20 years ago. It developed into a system dynamics model in the early to mid 1980's (also at the New Zealand Planning Council) and more recently it has been further enhanced and disaggregated into a three sector model. However, it has been used successfully for a variety of forecasting and scenario

modelling projects, which require medium term trend values of the major macro-economic variables for the New Zealand economy.

In addition, it is still extremely valuable in modelling work to reflect back on the scenarios and forecasts generated by a model. This is a form of validation, as well as helping to build improved understanding of the system that is being modelled. In this way better and more robust models can be built for the future.

The model discussed in this paper (SDMACRO) was used to create macro economic scenarios and forecasts of the New Zealand economy over the period from 1985 to 1995. This was a period during which considerable economic reform and restructuring took place. This "revisiting the New Zealand Planning Council's medium term macro-economic scenarios" is another step in the process of model development and refinement. Also it is hoped that it will lead to more insight into the medium to long term effects of some of the policy changes that have occurred in the New Zealand economy.

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Appendix 1
Chronology of Major Economic Events/Reforms in New Zealand: 1984 - 1995

1984 Feb-84 Price freeze, imposed in June 1982, lifted. Wage freeze extended until an agreement on long-term wage fixing procedure is reached.
Jun-84 Supplementary Minimum Payments (SMPs) to farmers removed from end of the 1983/84 season.
Jul-84 Price freeze re-introduced for 3 months.
Jul-84 Labour Government elected.
Jul-84 NZ dollar devalued 20 percent.
Jul/Aug-84 Controls on interest rates and credit growth abolished.
Oct-84 New wage-fixing rules introduce greater flexibility in bargaining and wage freeze, imposed in June 1982, lifted.
Nov-84 Budget announces intention to eliminate numerous consumer and producer subsidies/incentives.
Nov-84 Price freeze, re-introduced in July, lifted.
Dec-84 All controls on both outward and inward foreign exchange transactions removed.
Dec-84 Controls on overseas borrowing removed.
Dec-84 New motor vehicle industry plan allows for greater access for imported vehicles and components.

1985 Feb-85 Compulsory ratio system requiring financial institutions to invest fixed proportions of their total funds in government and public securities abolished.
Mar-85 NZ dollar floated.

1986 1986 Complete phasing-out of permits for long-distance road haulage.
Progressive removal of imposts on road transport, including excise taxes on fuel and reduced import tariffs on tyres and trucks.
Jul-86 Government assumes responsibility for major project and producer board debts totalling $7.2 billion.
Oct-86 Goods and Services Tax (GST) of 10 percent introduced. Compensating reductions in personal tax and benefit increases accompany the new tax. Some sales duties/taxes also removed or reduced.

1987 1987 Domestic air routes opened to competitors.
Apr-87 Institutions, including overseas organisations, able to apply for banking licenses.
Apr-87 Ten new state corporations (SOEs) established.
Jun-87 Government announces intention to sell assets to pay off public debt.
Aug-87 Labour Relations Act 1987. Rationalises existing legislation under one statute and reforms laws governing labour organisations to improve negotiating environment.
Oct-87 World sharemarket crash. NZ sharemarket suffers its biggest ever one day fall.

1988 1988 Remaining price controls on petrol abolished.

Mar-88 Sale of NZ Steel to Equiticorp begins the government's programme of stateowned asset sales.

Apr-88 State Sector Act 1988 comes into force. The Act restructures public sector management, introducing increased management flexibility for senior public servants along with increased accountability for performance, and aligns public sector with private sector employment regulation.

Jul-88 Import licensing ends for most goods.

Aug-88 Australian and New Zealand Prime Ministers sign an agreement to bring forward the date for establishing a Trans-Tasman free-market to July 1990 under the terms of the Australia-New Zealand Closer Economic Relations Trading Agreement. Protocols signed to remove most trade barriers between Australia and New Zealand.

1989 Jul-89 GST increased to 12.5 percent.

Dec-89 Reserve Bank of New Zealand Act passed. As from February 1990 the Act defines the objective of monetary policy to be the achievement and maintenance of stability in the general level of prices.

1990 Mar-90 First Reserve Bank policy targets agreement signed. The Minster of Finance and the Governor of the Reserve Bank reaffirm the objective of price stability and set an annual CPI increase of 0 - 2 percent by December 1992 as a target.

Oct-90 National Government elected.

Dec-90 New Reserve Bank target agreement signed extending the achievement of the price stability target to December 1993.

Economic package introduces across-the-board benefit cuts from April1991.

Dec-90 Compulsory union membership ends.

1991 May-91 Employment Contracts Act introduced.

1992 Jul-92 ACC reforms introduced. The scheme's source of funds are realigned reducing the share incurred by business and increasing personal contributions. Entitlement redefined, including the abolition of lump sum payments.

Dec-92 The Government and Reserve Bank sign a new Policy Targets Agreement requiring the Bank to keep 12-monthly increases in the CPI within the range of 0 - 2 percent.

1993 Jan-93 Sealord Products bought by a Maori/Brierley Investments venture. The Government's financing of the Maori half share is in exchange for the ending of all Maori claims to commercial fishing under the Treaty of Waitangi.

Dec-93 Agreement reached in the Uruguay Round of the General Agreement on Tariffs and Trade (GATT). The agreement will lead to a more open world trading environment through the agreed process of progressive liberalisation.

1994 Jun-94 The Government records a financial surplus of $755 million for the 1993/94 financial year.

1995 Nov-95 The Royal Assent to the $170 million Tainui Maori land settlement in compensation for lands confiscated in 1884 is signed.

Source: Statistics New Zealand, 1995, New Zealand System of National Accounts 1995, Wellington, pp. 147-149.

Appendix 2
Actual Macro-Economic Variables for the New Zealand Economy, 1983 - 1995

Year	Real Gross Domestic Product (1982-83$m)	Real Gross Fixed Capital Formation (1982-83$m)	Real Exports of Goods & Services (1982-83$m)	Net Overseas Investment Earnings ($m)	Current Account Balance ($m)	Gross Domestic Product ($m)	Ratio CAB to GDP (%)
1983	31,561	7,827	9,116	(867)	(1,945)	31,561	(6.2)
1984	32,422	8,272	9,756	(1,362)	(1,992)	35,049	(5.7)
1985	34,022	8,650	10,454	(1,262)	(2,700)	39,677	(6.8)
1986	34,284	9,351	10,944	(1,460)	(2,845)	45,777	(6.2)
1987	35,005	8,819	11,447	(2,705)	(2,878)	55,024	(5.2)
1988	35,471	9,353	12,227	(3,198)	(2,506)	62,536	(4.0)
1989	35,212	9,111	12,392	(2,627)	(707)	67,228	(1.1)
1990	35,800	9,956	12,126	(2,071)	(2,576)	71,406	(3.6)
1991	35,589	9,550	13,053	(2,076)	(1,958)	72,962	(2.7)
1992	35,129	8,031	13,879	(4,035)	(1,881)	73,030	(2.6)
1993	36,169	8,777	14,031	(2,957)	(1,251)	75,220	(1.7)
1994	38,107	10,555	15,285	(3,277)	(1,054)	79,999	(1.3)
1995	40,421	13,207	16,365	(4,835)	(3,310)	86,304	(3.8)

Year	Terms of Trade	Consumer Price Index	Population (000)	Net Migration (000)	Number Employed (000)	Labour Force (000)	Unemployment Rate (%)
1983	954	488	3,190	3	1,279	1,355	5.6
1984	962	505	3,231	7	1,293	1,371	5.7
1985	942	572	3,259	(8)	na	na	na
1986	919	647	3,273	(22)	1,545	1,613	4.2
1987	985	765	3,284	(14)	1,558	1,625	4.1
1988	1074	834	3,316	(16)	1,529	1,609	5.0
1989	1139	867	3,318	(25)	1,466	1,582	7.4
1990	1172	928	3,336	(4)	1,471	1,587	7.3
1991	1095	970	3,373	12	1,464	1,624	9.9
1992	1081	978	3,416	4	1,450	1,630	11.1
1993	1125	987	3,452	7	1,475	1,643	10.2
1994	1118	1000	3,491	16	1,532	1,693	9.5
1995	1125	1040	3,539	22	1,608	1,787	6.9

Sources: Statistics New Zealand, Key Statistics & Monthly Abstracts, Various Issues, Welington.
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