A SHORT-RUN MACROECONOMETRIC MODEL OF SRI LANKA

by

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DEDICATION

Dedicated in memory of

my beloved brother

Ranji Malli (Sugath Rankaduwa)

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ABSTRACT

A short-run macroeconometric model of the Sri Lankan economy which has forty-three behavioural equations and seventeen identities is formulated and estimated in this study. In view of the undersized sample problem, ordinary least squares (OLS) is used to estimate behavioural equations in the model. The estimated structure is judged by the usual criteria of goodness of fit, the expected signs and sizes of estimated coefficients, and their statistical significance.

Since the model is non-linear consisting of nineteen non-linear equations, a modified version of the Newton-Raphson algorithm by Powell is used to solve the model. Both the static and dynamic simulation experiments are conducted in order to assess the within-sample (1962-1987) and post-sample (1988-1990) tracking performance of the model. The tracking performance of the model as measured by the root mean squared percent error (RMSPE), the Theil's U-statistic and the mean absolute percent error (MAPE) is good.

The results of this study demonstrate that, without testing against empirical data, the appropriateness of primarily demand oriented approaches should not be summarily rejected in modelling the developing countries like Sri Lanka.

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CHAPTER ONE

INTRODUCTION

Keynes, in his General Theory (1936), provide the theoretical framework for building macroeconometric models. Tinbergen (1939), in his seminal work, used the Keynesian framework for formulating a simultaneous equations model of the United States economy. Klein, since the late 1940s, formulated several macroeconometric models for most developed economies and estimated them using aggregate data. In addition, Klein and his pupils at the Wharton School had been instrumental in promoting macroeconometric model building for various developing as well as planned economies. A detailed account regarding the evolution of macroeconometric model building and for Klein's own involvement in this process, reference could be made to Breit and Spencer (1986, pp. 21-42) or Marquez (1985, Chapter 8). At present there is a wide variety of models for many countries for which some reliable aggregate data are available. In view of the increasing economic interdependence and cooperation among nations, it is easy to make a case for building global macroeconmetric models. In fact, the Wharton school team is also actively involved in this endeavour. See Britton (1989, pp. 237-268). Recently, Haque, Lahiri and Montiel (1990) have developed a macroeconometric model for developing countries focussing on their general characteristics and estimated it using data from

31 developing countries. With a view to classifying the existing macreocometric models, Challen and Hagger (1983, pp. 2-24) have identified five important families of such models. They are: Keynes-Klein family, Phillps-Bergstrom family, Walras-Johansen family, Walras-Leontief family, and Muth-Sargent family. Most of the models developed so far fit into one of the five families suggested depending on the framework adopted.

The focus of early macroeconometric models was exclusively on the developed capitalist economies. As a result modelling developing economies received little attention. Since the mid 1950's, there have been some efforts to build macroeconometric models for developing economies as well. It may be mentioned here that the earliest economy-wide model of India was estimated by Narasimham (1956). The value of building macroeconometric models of developing countries became very clear in the 1960's as many developing countries resorted to economic planning as a means of alleviating poverty and restructuring their economies. The greater emphasis on the development of the third world necessitated greater understanding of the structures and workings of these economies, which, in turn, created greater interest in formulating models for these countries. In fact, the early models of developing countries were rather prototypes of models of developed countries, most often, with very little modifications. The realization that the structures and the

problems of the developing world are different from those of the developed world led researchers to modify their approach to modelling the economies of the third world.

The economies of the world today are so complex that a complete explanation of all aspects of an economy is by no means possible. Econometric models serve as modest and useful attempts for advancing our knowledge of the workings of any economy. It is needless to assert that modelling any phenomenon involves a certain degree of abstraction from the complex reality it purports to model. Accordingly, a model "by itself, is not reality, but merely a simplified picture of reality" (Klein, 1983, p.1). In spite of the limitations of models to fully explain real-world situations, yet, they serve several purposes as Haitovsky, Treyz and Su (1974, p.4) have stated succinctly as follows:

> " Econometric models may serve several purposes. On the one hand, they are of scientific value: they enhance our theoretical understanding of how complex interrelated economic systems operate and aid the economic historian in describing a historical period. On the other hand, they may assist in the governmental decision-making process as a tool in projecting the economic consequences of alternative policy measures. econometric models are also used for unconditional forecasting. In this capacity they not only help the business community to make decisions but may also help the policymaker by occasionally forecasts that imply the need for a change in government policy."

During the immediate post independence period of 1948 - 1960, the policies adopted by Sri Lanka were the same as those that existed during the colonial period with no major changes.

Though the initial efforts to economic palnning in Sri Lanka are found in the post-war development proposals in 1946, yet concerted efforts toward planned development did not take place until the five year programme of investment for 1954/55 to 1959/1960 was put in place. It is generally regarded that the ten year plan of 1959-68 is the first serious effort devoted to planned development in Sri Lanka. Unfortunately, no specific macromodel has been used to describe the various structural features of the Sri Lankan economy which would have aided in making well-informed policy decisions.

A REVIEW OF EARLIER MACROECONOMETRIC MODEL OF SRI LANKA

To the best of the author's knowledge, the only attempt to develop a macroeconometric model of Sri lanka was made by Karunasena (1983). The main purpose of his study was to examine "how the various subsectoral outputs and prices are determined by market forces, government actiivities, and international forces and subsequently how these subsectoral values determine aggregate real income, the general price level and the cost of living index" (p. 82). Karunasena divided the economy into three major sectors: agriculture, manufacturing and services. These sectors were, in turn, divided into subsectors. The agricultural sector was divided into five subsectors, i.e., tea, rubber, coconut, paddy and others, while the manufacturing sector had only two subsectors, namely, the export processing sector and the other

manufacturing sector. Three subsectors, namely, the trade and transport, the public administration and defence and other services, formed the services sector. An attempt was made to introduce explicitly the budget and balance of payments constraints into the model.

Karunasena's model is a fairly large model for a small open economy that Sri Lanka is. It consists of 89 endogeneous variables of which 35 are determined by behavioural equations, 47 are definitional identities, and the remaining 7 constitute market clearing equilibrium conditions. There are 82 exogeneous variables of which 40 are policy variables.

Karunasena acknowledged the importance of demand side forces in determining the sectoral and aggregate outputs and prices in the economy. Yet, he did not place due emphasis on the demand aspects in his model. Instead, he based the model on the premise that the major economic problems of Sri Lanka stem from the supply side. As a result, the model departed from the Keynesian demand type models and has only a few equations dealing with the demand side of the economy. Though his approach is supply oriented, the standard production functions or supply functions were not specified for key subsectors such as tea, rubber, coconut, and paddy. Instead, the outputs of these sectors were computed by multiplying the average yield by the harvested area.

The agricultural sector received detailed treatment within the model. Forty nine, equations of which twenty six were

behavioural, were devoted to explaining the various aspects of agriculture most of which are supply forces. Thus the salient feature of the model is its heavy emphasis on the explanation of the supply side of the agricultural sector.

Sri Lankan economy has always been predominantly agricultural. Nevertheless, the economic dualism and trade-dependence have been two interrelated important features of the modern Sri Lankan economy that had its roots in the colonial period and flourished since the mid 19th century. The dualism has been characterized by a modern sector specializing in the production of goods which are meant for export and a traditional sector producing for the home market. The export sector has been the mainstay of the modern Sri Lankan economy. It is the inability of exports to generate sufficient foreign exchange to meet the rapidly growing import demand that has caused the persistent chronic foreign exchange problem since the late 1950's. The main explanation for the unsatisfactory performance of the export sector and the economy can be found in the unfavorable demand conditions for its primary commodity exports. Given the fact that Sri Lanka is a small open economy, the prices of its exports and imports are exogeneously determined. The demands for exports and imports play decisive roles in determining their actual levels. Moreover, supply related problems such as the shortage of essential imported inputs (intermediate goods and capital goods) is a result of the poor performance of export sector.

Therefore, understanding the structures of exports and imports sectors is crucial for making policy decisions with the objective of improving the balance of payments position. The analysis of growing import dependence also reqires an analysis of the structure of import demand. Yet, an analysis of demand for exports and imports has not received serious attention in Karunasena's work. In his model the exports of three major traditional crops are expressed as identities by defining them as differences between their respective domestic demands and outputs.

The higher proportion of GDP spent on consumption has led directly to low levels of savings and thus of private investment, thereby limiting the GDP growth. The low levels of private investment have been one reason for increased state involvement in the economy during the past three decades. Thus an analysis of the structures of consumption and investment is crucial for a proper understanding of the growth performance of the economy. Yet, Karunasena did not pay sufficient attention to model the consumption and investment aspects of the economy. In view of the limitations of Karunasens's macroeconometric model of Sri Lanka, this study is designed to achieve the objectives stated below.

OBJECTIVES OF THE STUDY

The prime objective of the present study is to develop a short-run forecasting model of the Sri Lankan economy. The

annual time series data used here covers the period from 1960 to 1987 during which the country experienced both import substitution and export-promotion regimes. Unlike in the earlier macroeconometric model, a demand oriented approach is adopted. The supply side of the economy is incorporated into the model with a view to understanding the structural interactions among tradable and nontradable sectors of the economy.

The models based on demand oriented approaches have been criticized for neglecting the supply side of the economies. This criticism has been found to be wrong even in the case of the models which incorporate only the demand aspects as long as the demand for producer goods by business firms has been included. Klein (1985) has been very explicit on this point and observed that the critics had only the supply of commodities in their minds in making the criticism. To quote Klein:

> " Models like those of this paper have often been criticized for including only the demand side of the national market to the neglect of the supply side. ....
>
> This criticism appears wrong, immediately, to those actively engaged in the construction of econometric models because we know that it is exhaustive to say that the economy can be decomposed into three groups, say, households, business firms and government, and then to include the behaviour pattern of these three[1].

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[1] "The analysis of the supply side, however, is not a new issue for the developing economy. A deficiency of demand analyzed within the framework of the Keynesian model has not generally been thought to be the issue or approach for dealing with the problems of economic development. That is not to say

In our view whether an approach is acceptable or not should be determined by testing the model against the data. As Britten (1989, p. 6) noted "macroeconomic models can embody any view of the way the economy works which find empirical support and can be quantified". The demand disaggregated models that incorporate some supply forces have found empirical support quite often even in the case of developing countries. See, for example, Datta and Su (1967), Ghartey and Rao (1990), Marwah (1969), and Mouhammed (1990). It is hoped that this study will form a link in determining the appropriateness of a primarily demand oriented approach in modelling developing countries with particular reference to Sri Lanka.

In contrast to the Karunasena's model of Sri Lanka the external trade and balance of payments as well as the government and monetary sectors receive a more detailed treatment in this study. Furthermore, the behavioural functions of the Keynesian model (consumption, investment, and liquidity preference functions) duly modified, are explicitly incorporated into the present model. In addition, an attempt is made to draw upon the empirical findings of earlier studies of developing countries in specifying some of the equations in the model.

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that demand rrelations are non-existent or unimportant for the developing economy. It is primarily a matter of emphasis"(Klein, 1978 as quoted in Krisnamurty, Saibaba and Kazmi , 1984, p.26).

It has been argued that no matter what policy mix is preferred by the policy makers the Keynesian method of working with economic aggregates has proved to be of great service in managing the economic affairs of any nation. See Krishnamurthy, Saibaba, and Kazmi (1984, pp. 25-26). It is with this spirit that the model is developed in this study which might provide a coherent framework for the analysis of the interactions among key macro aggregates and the impact of various policies on those macro aggregates.

Chapter 2 provides an analysis of the Sri Lankan economy with special reference to the structural features and the different policy regimes which were put in place in the post-independence era. In chapter 3, a macroeconometric model of Sri Lanka is developed. Chapter 4 presents the estimated model and an analysis of the empirical results. The penultimate chapter is devoted to a historical simulation that seeks to validate the estimated model. The last chapter contains a summary and the conclusions that have emerged from this study.

CHAPTER 2

AN OVERVIEW OF SRI LANKAN ECONOMY

Sri Lanka is a relatively small open economy in South Asia. Located to the south of India in the Indian ocean, this island nation is predominantly agrarian in character and depends heavily on exports to promote its growth and development. In Table 2.1 Sri Lanka is compared with four other South Asian countries in terms of the ratios of exports and imports to Gross Domestic Product (GDP). Sri Lanka's degree of openness is remarkably high among the South Asian countries as reflected in the relatively high ratios of exports and imports to Gross Domestic Product (GDP). The exports to GDP ratios expressed as percentages for India, Bangladesh, and Nepal were less than 10 percent during the period 1956 - 87. During the same period, these percentages for Sri Lanka were, most of the time, larger than 20 percent. According to the World Bank's classification of countries, Sri Lanka is a low-income developing economy with an annual percapita Gross National Product (GNP) of less than 400 U.S. dollars. The estimated 1987 mid-year percapita GNP at current prices was 360 U.S. dollars (which is equivalent to 10,598 Sri Lanka Rupees) with a population of 16.4 million. Although the percapita GNP at current prices rose by 6.9 percent in 1987, the percapita GNP at constant (1982) prices grew only by 0.1 percent. The mid-year population recorded a growth rate of 1.5

percent in the same year. However, the most recent statistics show that Sri Lanka's population growth rate has become one of the lowest among developing countries. Sri Lanka's average annual population growth rate was only 1.9 percent for the period 1960-1988 during which India, Pakistan, Bangladesh and Nepal experienced higher average annual growth rates of 2.2, 3.0 , 2.7 and 2.4 percent respectively (UNDP, 1990 pp. 166-167).

Sri Lanka shares many common features with other developing countries. The basic structure of the economy is reflected in the sectoral composition of real GDP which is displayed in Table 2.2 for six selected years for the period 1960 - 87. Table 2.3 shows the average percentage shares of sectoral outputs with their corresponding growth rates for three selected periods of 1960-73, 1974-77, and 1978-87. The percentage share of the primary sector which includes agriculture, forestry and fishing has decreased over time from a high of 38.5% in 1960 to its lowest share of 26.5% in 1987. Nevertheless, it still accounts for more than 25% of the GDP. The agricultural products such as tea, rubber, coconut, paddy and other minor crops account for more than 90% of the primary sector's output. This confirms that the Sri Lankan economy is basically agricultural. It is clear from the figures in Table 2.3 that the primary sector posted an average growth rate of 3.3 percent as compared to 2.9 percent in the earlier two periods. The share of labour force in agriculture was

estimated to be 42.4 percent for the period 1985-1987. The percentages of labor force in industry and services were 12 and 45.6 for the same period. In 1988, the estimated labour force was 36.9 percent of population (UNDP, 1990, p. 157). The output of the manufacturing sector has shown little growth and its share in GDP remained stable around 12%. It is worth noting that the output of the secondary sector which includes mining and quarrying, and construction, in addition to manufacturing, still accounts for about 18% of the GDP and has been stable over the entire period of 1960-87. The tertiary sector, which includes all service industries, has the lion's share in the GDP and has enlarged and posted increased growth rates over the last three decades. In 1987 it accounted for about 50% of GDP. The slow growth of real GDP is closely associated with the dominance of the primary sector which has shown a declining growth trend. The growth rate of GDP at constant (1959) factor prices in 1986 and 1987 were 4.3 and 1.5 percent, respectively.

Table 2.4 shows the composition of Gross Domestic Expenditure (GDE) of Sri Lanka for six selected years. Most low-income developing economies spend a large proportion of their national income on consumption and that Sri Lanka is no exception. Though it has decreased over time, consumption expenditure still accounted for nearly 80% of GDE even in the late 1980s. As a consequence both the domestic savings and investment were relatively low. In 1987 the domestic savings

and the investment ratios, both measured as percent of GDP at current market prices, were 12.8 and 21.1, respectively. More recently, the domestic investment ratio has gone up partly due to the increased foreign direct investment. The breakdown of consumption and investment expenditures into private and public sectors for the same six selected years are also reported in Table 2.4. The average of shares of private and government consumption in the total consumption with their corresponding growth rates are reported in Table 2.5 for the three periods of 1960-73, 1974-77, and 1978-87. Similar figures are reported for investment expenditures in Table 2.6. On the basis of average shares reported in Table 2.6, it can be argued that the decline in the share of fixed investment in the period 1974-1977 was a result of the decreased share of private investment. There was no notable decline in the average proportion of public fixed investment in the second period. But, the period 1978-1987 saw a noteworthy decline in the average percentage share of public fixed investment as a direct consequence of the increased average proportion of private investment. Negative growth rates of inventory investment components in the second and third periods may be attributed to increased aggregate demand and increased capacity utilization of the economy.

The ratios of total government revenue and expenditure to GDP which are reported in Table 2.7 indicate that Sri Lanka has a relatively large public sector among the developing

countries. For instance, India's comparable government revenue and expenditure shares in 1987 were 14.6 and 18.1 percent respectively (IMF, 1990, IFS year book). It is evident from the shares of the public consumption and investment in GDE, which are presented in Table 2.4, that the public sector has enlarged over the last three decades as a result of government's direct involvement in production and exchange activities. But the economy is basically capitalistic in its structure. The private sector controls majority of the economic activities thus playing a pivotal role in the Sri Lankan economy (Lakshman, 1986, p.10).

The present day Sri Lankan economy is the result of an evolutionary process that has originated in the 19th century British colonial period. The modern economy first took the form of a 'classical export economy' until its political independence in 1948.

The 'Classical Export Economy'[1]

As the European economic and political structures had begun to change dramatically in the 19th century, the colonies

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[1] Snodgrass (1966, p. vii) writes "...the particular type of economic system referred to here as the classical export economy-"classical" because the main features of its enclave system of primary production were typical of those found in a large number of Asian, African, and Latin American economies during the Nineteenth and early Twentieth Centuries".

Sri Lanka Export Development Board (1986, p. 12) reads "Economies of the underdeveloped world which under colonial influence came to be heavily dependent on primary exports for their sustenance and growth are widely described as "export economies"".

began to experience the 'classic economic consequences of colonial domination' such as dualism and trade dependence (Shoesmith, 1986, p. 4). Sri Lanka, under the 19th century British colonial domination, was no exception. Its modern economic history began with the emergence of plantation agriculture from the hitherto traditional agro-based subsistence economy that lasted until the 1840's[2]. Depending on the country's comparative advantage in international trade, Sri Lanka began specializing in the production of primary export crops in the 1840's. The country's integration into the world economy through rapidly expanding trade could be cited as a typical example of a 'classical export economy' as noted by Snodgrass (1966). The economic dualism and the reliance on international trade constituted the two significant characteristics of this 'classical export economy'. The two sectors of the economy, namely, the export sector and the traditional sector, differed from each other in terms of their types of ownership, organizational structures, forms of management, scales of production, technologies utilized, and their market-orientations, which formed the basis for a nearly perfect dualism that was not only economic, but also technological and social as well (Karunatilake, 1971, p. 25 and Snodgrass, 1966 p. 57). The export sector, which dominated

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[2] "The rapidly expanded international trade during the 19th century created for the first time on a substantial scale the chief characteristics of a modern economy: specialized, capital-using, wage labour-hiring production for a cash market in this case a foreign market"(Snodgrass, 1966, p. 1).

the economy, depended on external markets for both the purchase of inputs and the sale of output. To the export sector, both the capital investment and enterpreneurship came from Europe, particularly from Great Britain, while the labour came from southern India. In contrast, the traditional sector found its 'forward linkages' and 'backward linkages' in the domestic market. As a result, the sectoral interdependence between these two sectors was so negligible that there was no substantial 'spread effects' of export growth on the traditional sector (EDB, 1986, p. 91 and Snodgrass, 1966, p. 5).

At the time of political independence in 1948, Sri Lanka possessed a literate well-fed population, a well developed social and economic infrastructure, a competent public administration and a prosperous export sector and enjoyed the prosperity of a classical export economy inherited from its colonial past. The Gross National Product (GNP) and its growth, foreign exchange earnings and capacity to import, investment and employment and government revenue and expenditures had a strong functional dependence on Sri Lanka's three main exports, namely, tea, rubber and coconut products. These three major export crops accounted for about one third of GDP and 95% of total foreign exchange earnings. As Rajapatirana (1988, p. 1144) ncted "the economy free of most intervention, thus conformed to the Heckscher-Ohlin-Samuelson predicted pattern of trade exporting agricultural products and

importing industrial products".

Sri Lanka has experienced three different economic policy regimes since independence. In the immediate post-independence era of 1948 to 1959, Sri Lanka continued to adopt colonial-free economic policies with slight modifications. An import substitution industrialization strategy was adopted during the period from 1960 to 1977. In 1977, an export-oriented industrialization strategy was adopted. Though slow in pace, some structural changes have taken place in the economy since independence which are worthy of attention. The degree of dualism has lessened and it still remained a central feature of the economy (UNIDO, 1987, p. 92). Although there have been diversifications within the structures of production and exports due to industrial progress, the import dependence of the economy has increased over time. Those various policy regimes have played crucial roles in determining the pace, direction and the extent of structural transformations that took place in the post-independence period. The remainder of this chapter discusses briefly the nature and the outcomes of the three policy regimes mentioned above, paying particular attention to the period covered by the present study i.e., from 1960 to 1987.

The 'Transitional Economy': 1948-1960[3]

The general pattern of policy orientation among developing countries soon after their independence had been to emphasize restructuring their economies through industrialization, mostly based on import substitution, as a means of terminating 'economic dependence' inherited from the colonial past. In its immediate post-independence era of 1948 to 1960, Sri Lanka deviated from this general pattern and continued to adopt colonial laissez-faire economic policies with slight modifications (Athukorala, 1986; Rajapatirana, 1988). As a consequence, the major structural features of the 'classical export economy', such as economic dualism, remained intact. Nevertheless, the import dependence increased due to the growth of a more consumption oriented society that necessitated increasing the levels of consumer imports. See Snodgrass (1966) for details regarding this issue.

The economy was characterised by a relatively small public sector and a low degree of state intervention. The private sector played a dominant role in production and exchange activities. Nevertheless, as a result of Sri Lanka's early commitment to the ideals of a welfare state, the government provided free food, free education and free health care services to its citizens indiscriminately. Thus, the area of state intervention had been instrumental in promoting

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[3] Snodgrass (1966) used the term 'transitional economy' to explain the country's economy during the years from 1946 to 1960.

consumption more than it did to promote the production side of the economy. Fiscal policy played a very limited role as it was designed mainly to raise revenue. There was no independent monetary policy either. Thus, the entire period of 1940-60 was characterized by a neutral trade regime with very few quantitative restrictions and very low export duties and import tariffs. As the level of imports of consumer goods rose, the balance payments position worsened as the country pursued a fixed exchage rate policy. In other words, the exchange rate could not play any useful role in correcting the balance of payments deficit. Nonetheless, the domestic currency was fully convertible with the sterling currency. Free from interventions by government, the goods and factor markets were so flexible that they permitted relatively easy adjustments that worked through changes in the money stock and prices (Rajapatirana, 1988, pp. 1143-1145). The policy environment throughout this period was not hostile to the pattern of specialization established under the colonial rule.

A heavy reliance on imports was evident throughout this period, but the favourable factors such as better terms of trade, less populaion pressure, foriegn exchange reserves that had been generated by exports during the World War II period, the Korean war boom and the tea boom in 1954-1955, helped overcome a serious foriegn exchange crisis until the late 1950's (Gunasekera, 1974). Since 1957, there has been a deficit in Sri Lanka's external trade balance except for small

surpluses in 1965 and 1977, which led to a drastic erosion of foreign exchange reserves creating a balance of payments disequilibrium that has not yet been fully corrected even to date. This crisis has been a direct consequence of unsatisfactory performance of the export sector which fell far short of expectations in generating foreign exchange. In addition, falling export prices also contributed to the dwindling foreign exchange reserves as the terms of trade became unfavourable to Sri Lanks. All the major policy formulations since the late 1950's have been governed by the need for correcting the persistent balance of payments disequilibrium.

The Import Substitution Era: 1960 - 1977

During the period from 1958 to 1977, the policy responses of both the central government and the Central Bank to the pressure of foreign exchange crisis and inflation distorted the openness of Sri Lankan economy and eventually led to creating a relatively closed and an increasingly regulated economy. After some ineffective monetary measures adopted in 1959, the Central Bank introduced some restrictive monetary methods such as restricting credits and increasing the bank rate in 1960. This was followed by the government's issue of licenses, quotas, higher tariffs and a total ban on a large number of "non-essential" imports in 1961 (Karunatilake, 1971, p.60). In line with the prevailing ideological bias in

development thinking and policy orientation in almost all LDCs, the government and monetary authorities viewed industrialization based on import substitution as the surest means for relieving balance of payments difficulties (Athukorala, 1988, p. 69). This resulted in a series of exchange rate and trade restrictions characterized by a highly differentiated tariff structure, import licenses, quotas and exchange controls that originated and grew rapidly in the first half of 1960's. In contrast to the preceding period i.e. 1940-60, both the monetary and fiscal policies were accorded critical roles in favour of the envisaged success of industrilization through import substitution. Further, an overvalued fixed exchange rate system associated with a series of exchange controls was put in effect. Unprecedentedly, the currency convertibility was also abandoned (Rajapatirana, 1988, p. 1146).

Notwithstanding the major emphasis on import substitution over the period, an unprecedented interest in export promotion had also originated in the second half of 1960's as a new political party that favoured market oriented policies more than its predecessor came to power. As early as in 1966, a bonus voucher scheme favouring export trade was implemented. Moreover, the economy was partially liberalized with the 1967 currency devaluation and the adoption of a dual exchange rate system through the Foriegn Exchange Entitlement Certificate (FEEC) scheme introduced in 1968. These measures were thougt

to bring about a free inflow of crucial inputs from abroad and a diversification of exports through the promotion of the non-traditional minor exports (EDB, 1986, p.18; Kappagoda and Paine, 1981, p.10 and Rajapatirana, 1988, p.1146).

The ideological bias of the newly elected government in 1970 that favoured institutional changes, regulation of the market forces and planning, had dire consequences to the liberalization efforts. Aborting the efforts of the late 1960's to liberalize the economy, the trade regime became increasingly stringent during the first half of the 1970's. After the mid 1970, almost all imports were subjected to licencing. The demand for those imports whose internal prices were not allowed to adjust according to the variations in international prices and the exchange rate was also affected by the gradual depreciation of the domestic currency (Kappagoda and Paine, 1981, p. 81). Nevertheless, the need for promotion of exports and diversification of the sources of foreign exchange earnings continued to influence the exchange rate policy. The Convertible Rupee Accounts Scheme (CRAS), introduced in 1972, added further exchange rates to the prevailing dual exchange rate and brought about a multiple exchange rate system. Further, in 1972, a new subsidy scheme for the cultivation of selected minor agricultural crops was introduced and subsidies for new plantation and replantation of the three major agricultural export crops (tea, rubber and coconut) were increased (EDB, 1986, p.18). Moreover, in order

to set up an effective organizational framework for export promotion, a multi-ministerial export promotion secretariat and the department of minor export crops were established in the same year. The government got actively involved in the establishment of export-oriented joint ventures with capital participation between public corporations and foriegn investors (EDB, 1986, p. 19). Various fiscal measures such as custom duty rebates on raw materials for industrial exports and tax holidays on export profits were oriented towards export promotion. It has been argued that the gradual depreciation of the rupee assisted in promoting exports by enhancing the competitiveness of Sri Lankas exports in the world market (Kappagoda and Paine, 1981, p. 83). The rapid expansion of non-traditional exports reflected the success of export promotion policies. Table 2.9 shows that the average annual share of non-traditional exports has risen from 8.5 percent to 26.9 percent between the two periods 1960-73 and 1974-1977.

Given the heavy dependence on imports, Sri Lanka has been severly affected by the oil price escalations and their consequences since the early 1970's. The government responded to the adverse external situation generated by the oil price hike in 1973 by the imposition of pervasive stringent trade restrictions, increased taxes, in particular, on external trade, widespread state intervention and the regulation of market forces. Notwithstanding, as shown in Table 2.8, Sri

Lanka's import bill grew at a faster average rate of 27 percent during the period 1974-1977. However, relative to GDP, the share of imports recorded a decline from 21.6 percent to 18.1 percent, on average, between 1960-1973 and 1974-1977. The compression of imports that were necessary for investment and production had constrained economic growth in the 1970s (Hewavitharana, 1980, pp. 21-25).

A large industrial sector was not developed during the immediate post-independence era due to the lack of a proper industrial policy under the free trade policy regime of that period (Gunasekara, 1974). But, the import substitution era saw a growth of industrial activities in the economy protected from foreign competition. The state capital took the initiative in establishing large scale heavy industries for import substitution. The rest of the industrial sector consisted of a large number of small scale light industries, most of which were financed by private capital, and a few large scale heavy industries which were state-owned. During the period of 1960-1973, on average, the manufacturing output of the economy has grown by 5.4 percent, annually. The decline in the annual growth rate of manufacturing otput during the period 1974-1977 was a reflection of insufficient imported inputs among other things.

By the end of the import substitution era, the 'classical export economy' had undergone notable transformations which was evident from the expansion of

manufacturing and other industrial activities, progress of peasant agriculture, development of a large service sector, growth of non-traditional exports and enlargement of the public sector (Athukorala, 1986; Gunasekera, 1974; Snodgrass, 1974; Kappagoda and Paine, 1981). Nevertheless, overall, the success of import substituion strategy of 1960-1977 fell far short of expectations as the critical economic problems such as balance of payment dificulties worsened. The failure of import substitution industrialisation as a development strategy in Sri Lanka may be attributed to a multiplicity of factors such as the increasing state intervention in the economy, rigidities introduced in both the labour and product markets by state regulation of market forces, bias against agriculture inherent in the strategy, domestic population pressure and a host of unfavourable developments in the world market like the oil shocks. To mark the failure, several interrelated economic problems such as high unemployment, both of labour and capital, low GNP and per capita income growth, growing reliance on imports, foreign exchange crisis, increasing external indebtedness and fiscal difficulties remained unsolved by the end of the import substituion era. These problems were passed on to next period - the period of export promotion.

Export promotion Era: post 1977

The dissatisfaction with the closed economy model based on stringent controls was politically manifest in the election of a new government which advocated the need for outward oriented development strategy based on economic liberalization. Neo-classical critics of the import substitution strategy who attribute its failure to the market distortions created by excessive government intervention that hinder the free play of market forces, formed the intellectual basis for economic liberalization in 1977. By this time, impressive success stories of the newly industrializing countries such as Hong Kong, Singapore, South Korea and Taiwan had provided the models of export-oriented development strategies in practice. In agreement with the International Monetary Fund's (IMF's) recommendations to liberalize the economy, the 1978 government budget detailed a package of new policies defining the export-led development strategy in which trade liberalization played a crucial role[4].

For the first time the exchange rate policy has been accorded an active role in promoting exports and in correcting disequiibria in the balance of payments. Since November 1977, Sri Lanka devalued its currency and launched a single managed floating exchange rate system which is in sharp contrast with the official multiple exchange rate system of the preceding

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[4] For IMF recommendations, see Kappagoda, N and Paine, S "The Balance of Payments Adjustment Process: The EXperience of Sri Lanka" Marga Institue, Colombo, 1981, pp.75-79

policy regime. A mix of fiscal and monetary measures was adopted in 1977 with a view to liberalizing foreign trade and exchange payments, thus opening up the economy to direct private foreign investment in export oriented industries. In addition, the government introduced free trade and export processing investment zones and minimized government intervention in production and exchange related activities. The basic characteristics of the post-1977 strategy included the importance placed on free market operation, trade liberalization, heavy reliance on international trade as an 'engine of growth' and the vital role assigned to the private sector in the economy. Unlike the previous policy regime, the new regime emphasized economic growth rather than social welfare. " The main elements of the post-1977 policy mix, such as trade liberalization (removal of quota restrictions on most imports) considerable relaxation of controls on foreign exchange transactions, exchange rate reform which aimed at reaching gradually a more realistic value for the Sri Lankan rupee and the elimination of various controls on the operation of the domestic economy were intended to generate an economic climate conducive to export expansion" (EDB, 1986, p. 19). In addition to providing direct tax incentives, the government had also provided a number of incentives for growth in the export industries. These included import duty concessions, export duty reductions, export financing schemes, and export credit insurance. A noteworthy growth dynamism has been

reported by industrial exports under the liberalized trade policies. But the industrial export growth has stemmed mainly from a single item, garments, indicating a high concentration of industrial exports. The high import content of industrial exports reflected weak backward linkages of industrial exports with the domestic economy that led to the inability to generate higher net foriegn exchange earnings. Some exports succeeded in achieving a considerable degree of market penetration but the rest have indicated an increasing domestic market orientation. Athukorala (1986, p.92) noted: " In most product areas Sri Lanka has not been successsful in exploiting world market opportunities and therefore the explanation for unsatisfactory performance must be found in domestic supply constraints and limitations in the incentive mix" .

Overall, the impact of the post-1977 regime on the economic performance has been both favourable and unfavourable. To the credit of the regime, the economy realized a relatively faster growth, increases in savings and investment, reduction in unemployment, a better performance of the industrial sector, some favourable changes in the structures of exports and imports and greater availability of imported goods. Notwithstanding, the rapid growth in the rate of inflation, increasing socio-economic disparities, enlargement of trade deficit that precipitated severe balance of payments and foriegn exchange problems, increasing external indebtedness and fiscal difficulties recorded the adverse

effects. The reasons for the failure of the regime have, in fact, been controversial in the recent debates on Sri Lanka's economic performance.

Table 2.1

Ratios of Exports and Imports to GDP in South Asia*

	1956	1960	1965	1970	1975	1980	1985	1987
Bangladesh								
Exports/GDP	-	-	-	-	3.1	5.9	6.7	5.1
Imports/GDP	-	-	-	-	12.6	17.2	18.6	15.5
India								
Exports/GDP	5.1	4.2	3.3	3.8	4.9	5.0	4.4	4.1**
Imports/GDP	6.7	7.3	5.6	4.0	7.2	8.6	7.6	6.6**
Nepal								
Exports/GDP	-	-	7.8	4.9	6.6	4.1	7.0	6.1
Imports/GDP	-	-	14.6	8.7	11.4	17.6	19.8	20.8
Sri Lanka								
Exports/GDP	32.2	27.4	24.1	14.9	15.0	26.4	22.3	20.8
Imports/GDP	30.3	29.4	18.2	16.8	21.5	50.6	30.8	30.8
Maldives								
Exports/GDP	-	-	-	-	-	18.3	27.4	-
Imports/GDP	-	-	-	-	-	67.4	62.7	-

Source: International Financial Statistics,
Supplement on Trade Statististics, IMF, 1988, pp. 50-55

Notes: * Bhutan, for which the data are not available, is ommited from the table.
** Figures are for 1986.

Table 2.2

Sectoral Composition of GDP*

	1960	1965	1970	1977	1980	1987
1) Agriculture Forestry and Fishing	38.5	36.7	34.9	32.0	30.0	26.5
2) Mining and Quarrying	00.5	00.4	00.7	02.6	03.2	03.6
3) Manufacturing	11.5	12.4	13.6	12.6	11.2	12.5
4) Construction	04.4	03.5	05.9	04.0	05.7	04.2
5) Services	45.1	47.0	44.9	48.8	49.9	53.2
6) Gross Domestic Product	100.0	100.0	100.0	100.0	100.0	100.0

Notes: * All the shares in the table are percentages computed using the corresponding values at constant (1959) factor cost prices.

Source: Review of the Economy and Annual Report, Central Bank of Ceylon, Various Issues.

Table 2.3

Sectoral Composition and Growth of GDP*

	1960-1973		1974-1977		1978-1987	
	Share %	Growth %	Share %	Growth %	Share %	Growth %
1) Agriculture, Forestry and Fishing	36.9	02.9	32.1	02.9	29.5	03.3
2) Mining and Quarrying	00.7	27.3	02.4	08.1	03.2	09.0
3) Manufacturing	12.8	05.4	12.9	1.5	11.5	05.2
4) Construction	04.6	04.9	04.6	-01.5	04.7	05.8
5) Services	45.1	04.5	48.0	04.9	51.2	06.0
6) Gross Domestic Product	100.0	04.2	100.0	03.4	100.0	05.1

Notes: * All the shares and growth rates are calculated using the corresponding values at constant (1959) factor cost prices.

Source: Review of the Economy and Annual Report, Central Bank of Sri Lanka, Various Issues.

Table 2.4

Composition of Gross Domestic Expenditure

	1960	1965	1970	1977	1980	1987
1) Consumption	85.5	87.1	81.6	85.0	72.5	78.9
i) Private	72.6	73.0	70.1	76.1	65.5	69.9
ii) Public	12.9	14.1	11.5	08.9	07.0	09.0
2) Investment	14.2	12.6	18.4	15.0	27.5	21.1
a) Fixed	14.8	12.9	16.7	14.4	25.6	21.0
i) Private	10.2	08.2	12.7	10.0	19.8	15.9
ii) Public	04.6	04.7	04.0	04.4	05.8	05.6
b) Inventory	-00.6	-00.4	01.7	00.6	02.0	00.1
i) Private	-00.4	-00.7	01.4	-00.3	00.8	00.1
ii) Public	-00.2	00.3	00.3	00.9	01.2	00.0
3) Gross Domestic Expenditure	100.0	100.0	100.0	100.0	100.0	100.0

Notes: * All the percentages are calculated using the corresponding values at current market prices.

Source: Review of the Economy and Annual Report, Central Bank of Ceylon, Various Issues.

Table 2.5

Composition and Growth of Consumption*

	1960-1973		1974-1977		1978-1987	
	Share %	Growth %	Share %	Growth %	Share %	Growth %
1) Private Consumption	85.1	08.6	88.8	17.8	89.7	19.2
i) Imported	22.9	01.8	16.0	21.1	20.8	22.2
ii) Locally produced	62.2	11.5	72.8	17.3	68.9	18.7
2) Government Consumption	14.9	06.3	11.2	12.9	10.3	20.5
i) Central Government	13.7	06.6	10.6	13.6	09.4	20.0
ii) Local Governments	01.2	03.4	00.6	04.0	00.9	31.7
3) Total Consumption	100.0	08.2	100.0	17.1	100.0	19.3

Notes: * All the shares and growth rates are period means calculated using the corresponding values at current market prices.

Source: Review of the Economy, Central Bank Of Ceylon, Various issues

Table 2.6

Composition and Growth of Investment*

	1960-1973		1974-1977		1978-1987	
	Share %	Growth %	Share %	Growth %	Share %	Growth %
1) Fixed Investment	96.3	06.7	89.6	19.4	98.7	26.8
i) Private	67.7	07.7	61.9	16.4	76.7	28.4
ii) public	28.5	04.5	27.7	29.0	22.1	24.4
2) Inventory Investment	03.7	84.8	10.4	495.1	01.3	70.1
i) private	00.9	192.9	00.3	-148.2	01.4	-99.2
ii) public	02.8	13.7	10.1	218.2	-00.1	-282.8
3) Total investment	100.0	26.5	100.0	10.1	100.0	06.9

Notes: * All the shares and growth rates are period means calculated using the corresponding values at current market prices.

Source: Review of the Economy, Central Bank of Ceylon, Various issues.

Table 2.7

Composition and Growth of Government Revenue*

	1960-1973		1974-1977		1978-1987	
	Share %	Growth %	Share %	Growth %	Share %	Growth %
1) Tax Revenue	83.5	09.1	82.0	13.8	83.6	23.1
i) Direct Tax	16.0	10.1	14.5	08.9	12.8	20.4
ii) Indirect Tax	67.6	09.1	67.5	15.7	70.7	24.3
a) BTT	04.7	117.3	12.6	06.1	19.1	33.2
b) SST	10.0	17.1	17.3	39.7	13.0	16.7
c) Import Duties	21.0	-02.1	07.1	24.1	20.1	43.3
d) Export Levies	12.2	03.1	09.7	20.3	16.2	51.4
e) other	19.7	21.1	20.8	06.2	02.3	17.7
2) Non-Tax Revenue	16.5	12.1	18.0	12.9	16.4	24.4
3) Total Revenue	100.0	08.8	100.0	13.6	100.0	22.9
4) Govt. Revenue/GDP	21.4	-	18.5	-	20.1	-
5) Govt.Expenditure/GDP	27.8	-	25.3	-	32.3	-
6) Budget Deficit/GDP	06.4	-	06.7	-	12.3	-

Notes: * All the shares and growth rates are period means calculated using the corresponding values at current market prices.

Source: Review of the Economy, Central Bank of Ceylon, Various issues.

Table 2.8

Composition and Growth of Imports*

	1960-1973		1974-1977		1978-1987	
	Share %	Growth %	Share %	Growth %	Share %	Growth %
1) Consumer Goods of which	50.7	04.2	41.8	22.0	25.9	23.1
i) Food and Drink	40.5	06.1	37.8	22.7	14.6	17.5
ii) Other	10.2		04.0		11.3	
2) Intermediate Goods	23.0	06.2	40.1	42.7	48.5	33.3
3) Capital Goods	21.6	00.4	11.4	14.6	22.7	50.5
4) Unclassified	04.7	150.0	06.7	02.0	03.0	-53.0
5) Total Imports	100.0	02.6	100.0	27.1	100.0	30.5
6) Total Imports/GDP	21.6	-	18.1	-	33.5	-
7) Total Exports/GDP	19.1	-	15.3	-	21.2	-
8) Trade Balance/GDP	-02.5	-	-02.8	-	-12.4	-

Notes: * All the shares and growth rates are period means

Source: Review of the Economy and Annual Report, Central Bank of Sri Lanka, Various Issues.

Table 2.9

Composition and Growth of Exports

	1960-1973		1974-1977		1978-1987	
	Share %	Growth %	Share %	Growth %	Share %	Growth %
1) Traditional Exports	91.5	02.1	73.1	24.7	52.3	17.2
a) Tea	61.1	01.6	46.7	31.4	34.5	17.2
b) Rubber	18.1	09.8	17.8	13.5	11.4	16.6
c) Coconut	12.3	01.7	08.6	40.2	06.4	33.3
2) Non-traditional Exports	08.5	08.1	26.9	61.1	47.7	31.8
3) Total Exports	100.0	02.4	100.0	30.3	100.0	22.6

Notes: * All the shares and growth rates are period means

Source: Review of the Economy and Annual Report, Central Bank of Sri Lanka, Various Issues.

Table 2.10

Composition and Growth of National Debt

	1960-1973		1974-1977		1978-1987	
	Share %	Growth %	Share %	Growth %	Share %	Growth %
1) Domestic debt	84.1	13.1	70.1	13.8	51.3	19.1
2) External debt	15.9	18.5	29.9	44.6	48.7	26.7
3) Total debt	100.0		100.0		100.0	
4) Average Change						
a) Domestic debt	+ 501.79		+ 1452.00		+ 6460.50	
b) External debt	+ 179.84		+ 1949.60		+ 9945.20	
c) Total debt	+ 681.84		+ 3401.50		+ 16406.00	
5) As percentage of GDP						
a) Domestic debt	43.17		39.27		35.43	
b) External debt	08.54		17.69		34.25	
c) Total debt	51.71		56.96		69.68	

Notes: * All the shares and growth rates are period means

Source: Review of the Economy and Annual Report, Central Bank of Sri Lanka, Various Issues.

Table 2.11

Composition and Growth of Monetary Aggregates

	1960-1973		1974-1977		1978-1987	
	Share %	Growth %	Share %	Growth %	Share %	Growth %
1) Currency and notes	37.5	07.3	33.1	18.8	21.8	17.2
2) Demand deposits	33.7	06.2	31.1	18.6	21.6	16.8
3) Narrow Money (M1)	71.2	06.4	64.2	18.6	43.4	16.9
4) Time and Savings deposits	28.8	11.9	35.8	26.3	56.6	26.8
5) Broad Money (M2)	100.0	07.7	100.0	21.2	100.0	21.3
5) As percentage of GDP						
a) Currency and notes	09.33		06.59		05.60	
b) Demand deposits	08.37		06.19		05.53	
c) Narrow money	17.70		12.78		11.13	
d) Time and savings deposits	07.10		07.18		14.58	
e) Broad money	24.80		19.96		25.71	

Notes: * All the shares and growth rates are period means

Source: Review of the Economy and Annual Report, Central Bank of Sri Lanka, Various Issues.

CHAPTER 3

THE MODEL

A macroeconometric model of Sri Lankan economy is developed in this chapter. The list of variables used in the model is presented lexiographically below. Unless otherwise specified, all the variables are measured in millions of Sri Lankan rupees.

LIST OF VARIABLES

ENDOGENEOUS VARIABLES

BS: Budget surplus (net-cash surplus) of Central Government

BTT: Business turn over tax revenue of Central Government

C: Total consumption at current market prices

CA: Surplus of the current account of the balance of payments

CDDEB: Change in Central Government domestic debt

CGE: Central Government total expenditure

CGOCE: Central Government other recurrent expenditure

CGOKE: Central Government other capital expenditure

CGR: Central Government total revenue

CONCG: Consumption of Central Government at current market prices

COND: Consumption of domestically produced goods and services at current market prices

CONLG: Consumption of local governments at current market prices

CONM: Consumption of imported goods and services at current market prices

CPI: Consumer price index (1980=100)

CPID: Consumer price index of domestic goods and services (1980=100)

CPIM: Consumer price index of imports (1980=100)

CPIX: Consumer price index of exports (1980=100)

CXDEB: Change in Central Government external debt

DDEB: Domestic debt of Central Government

FICG: Fixed investment of Central Government at current market prices

FIP: Fixed investment of private sector at current market prices

GDP: Gross Domestic Product at current market prices

GDPF: Gross Domestic Product at constant (1980=100) factor cost

GNP: Gross National Product at current market prices

I: Total investment at current market prices

IICG: Inventory investment of Central Government at current market prices

IIP: Inventory investment of private sector at current market prices

MS1: Narrow money supply

MS2: Broad money supply

MT: Import tax revenue of Central Government

NT: Current value of net private and official international transfer receipts

NTR: Non-tax revenue of Central Government

P: General Price level-GDP deflator (1980=100)

PM: Import price index (1980=100)

PX: Export price index (1980=100)

RI: Rate of inflation

SEX: Current value of services exports

SIM: Current value of services imports

SST: Selective sales tax revenue of Central Government

TD: Direct tax revenue of Central Government

TID: Indirect tax revenue of Central Government

TIDO: Other indirect tax revenue of Central Government

TSB: Trade and services balance of the balance of payments

TSD: Time and savings deposits held by public

VAC: Value added in construction at constant (1980) factor cost prices

VAFF: Value added in agriculture, fishing and forestry at constant (1980) factor cost prices

VAM: Value added in manufacturing at constant (1980) factor cost prices

VAMQ: Value added in mining and quarrying at constant (1980) factor cost prices

VAS: Value added in services at constant (1980) factor cost prices

VM: Current value of aggregate imports

VMC: Current value of consumer goods imports

VMI: Current value of intermediate goods imports

VMK: Current value of capital goods imports

VX: Current value of aggregate exports

VXC: Current value of coconut exports

VXO: Current value of non-traditional exports

VXR: Current value of rubber exports

VXT: Current value of tea exports

XDEB: External debt of Central Government

XT: Export tax revenue of Central Government

PRE-DETERMINED VARIABLES

Exogeneous Variables

CGOE: Other expenditure of Central Government

D67: Devaluation dummy variable

= 0 for the period 1960-1967

= 1 otherwise

D73: Oil price escalation dummy variable

= 0 for the period 1960-1973

= 1 otherwise

D77: Economic liberalization dummy variable

= 0 for the period 1960-1977

= 1 otherwise

ER: Exchange rate in rupees per US dollar

FC: Factor cost index (1980=100)

IRT: Nominal interest rate

NFIA: Net factor income from abroad

NRIGT: Net receipts of international gifts and transfers

PMC: Import price index of consumer goods (1980=100)

PMI: Import price index of intermediate goods (1980=100)

PMK: Import price index of capital goods (1980=100)

PXC: Export price index of coconut exports (1980=100)

PXO: Export price index of non-traditional exports (1980=100)

PXR: Export price index of rubber exports (1980=100)

PXT: Export price index of tea exports (1980=100)

SDgdp: Statistical discrepancy

VMO: Value of other imports

WPDC: Wholesale price index of developed countries (1980=100)

WPLC: Wholesale price index of developing countries (1980=100)

WPW: World wholesale price index (1980=100)

YIDC: GDP index of developed countries (1980=100)

YILC: GDP index of developing countries (1980=100)

YIW: GDP index of World (1980=100)

Lagged Endogeneous Variables

The lagged endogeneous variables with the subscript -1 and -2 denote one and two period lagged values of the corresponding endogeneous variables, respectively.

BTT_{-1}, $CDDEB_{-1}$, CGR_{-1}, $COND_{-1}$, $CONLG_{-1}$, $CONM_{-1}$, CPI_{-1}, $CPID_{-1}$, $CPIM_{-1}$, $CXDEB_{-1}$, $DDEB_{-1}$, $FICG_{-1}$, FIP_{-1}, GDP_{-1}, GNP_{-1}, $IICG_{-1}$, ICG_{-2}, IIP_{-1}, $MS1_{-1}$, $MS2_{-1}$, NT_{-1}, NTR_{-1},

P_{-1}, P_{-2}, PM_{-1} SEX_{-1}, SIM_{-1}, TD_{-1}, $TIDO_{-1}$, TSD_{-1}, VMC_{-1}, VMI_{-1}, VMK_{-1}, VX_{-1}, $XDEB_{-1}$.

Lagged exogeneous variables

The lagged exogeneous variables with the subscript -1 denote one period lagged values of the corresponding exogeneous variables.

PMC_{-1}, PMI_{-1}, PMK_{-1}.

1.0 PRODUCTION

Estimating standard production functions for various sub-sectors of the economy becomes a difficult task in the case of many developing countries due to unavailability of reliable and continuous time series data on the sectoral distribution of employment and capital stock. In our model the production sector is disaggregated into five sub-sectors: (1)

agriculture, forestry and fishing, (2) mining and quarrying, (3) manufacturing, (4) construction and (5) services. Reliable time series data on the labour and capital inputs utilized in these sectors are not readily available. However, disaggregated data on the final demand of the Sri Lankan economy are available. Therefore, as some other reseachers such as Marzouk (1975) and El-Sheikh (1992) have done, the value added in each production sub-sector of our model is determined by a transformation of an input-output type production process where the value added in each sector results from a production decision response to various components of the final demand.

The transformation of the input-output type production process adopted in this study has been explained in detail in Klein (1983, pp. 21-36). In the following section the transformation process is explained following Marzouk (1975).

Consider the standard input-output relationship given by the matrix representation

$$(I - A)X = F \qquad \text{(i)}$$

where X denotes the vector of gross outputs of various sectors of the economy. The value added in jth sector, X_j^*, which is defined as the difference between gross output, X_j, and total intermediate inputs delivered by all sectors to the jth sector, ΣX_{ij}, can be written as:

$$X_j^* = X_j - \Sigma a_{ij} X_j = [\ 1 - \Sigma a_{ij}\ ] X_j \qquad \text{(ii)}$$

In matrix form, the system can be represented by

$$X^* = BX \qquad \text{(iii)}$$

Where the diagonal elements of B are $(1-\Sigma a_{i1})$, $(1-\Sigma a_{i2})$, ..., $(1-\Sigma a_{in})$, and its off diagonal elements are zeros. Thus, this sytem transforms gross output into value added by sector.

For simplicity, suppose the economy has only three final demand categories, say, consumption, C, investment, I, and government expenditure, G. Then, the final demand deliveries by the ith sector can be wriitten as

$$F_i = h_{ic}C + h_{ii}I + h_{ig}G \qquad \text{(iv)}$$

where h_{ic} is the ith sector final demand deliveries to C, h_{ii} is the ith sector final demand deliveries to I, and h_{ig} is the ith sector final demand deliveries to G. The system of final demand deliveries can be written as:

$$F = HR(v)$$

where F is an Nx1 vector of final demand deliveries by sector, H is an Nx3 matrix of input-output coefficients and R is a 3x1 vector of GNP components. The elements of H show the proportion of each type of final demand delivered by each sector and that elements in each of its columns sum to unity. Using the equations (iii) and (v) a set of linear equations connecting value added by sector (X^*) with GNP components (R) can be obtained as follows:

$$(I - A)B^{-1}X^* = HR \qquad \text{(vi)}$$

$$\text{or} \quad X^* = B\,(I - A)^{-1}\,HR \qquad \text{(vii)}$$

The equations of the system are dynamic linear empirical approximations and the coefficients of the equations can be

estimated by regression analysis.

Based on the transformation process described above we estimate the set of linear approximations given by equations (1) through (5) to account for the value added of the above mentioned five sub-sectors of the production sector in the Sri Lankan economy. Value added in agriculture includes the value added by tea, rubber, coconut, paddy as well as all the other minor crops produced in the economy. Value added in the sub-sector of agriculture, fishing and forestry in our model is related to two aggregate demand components, namely, private consumption of domestically produced goods and services, and consumption of the Central Government. This is because the main role of this sub-sector is to satisfy the demand for food and other consumption goods. Three dummy variables, D67, D73 and D77 are also included in the equation to account for the effects of the partial liberalization of the economy associated with the devaluation in 1967, escalation of oil prices in 1973 and the liberalization of the economy in 1977, respectively. Value added in mining and quarrying is explained by the private consumption of domestically produced goods and services and the fixed investment of Central Government. The manufacturing subsector includes all the industries of which the majority is classified into the export processing industries of the three main export crops, factory industries and small industries. Since production of the manufacturing sector is directed to satisfy domestic consumption demand and

the demand for exports, the value added in this sector is explained by the private consumption of domestically produced goods and services, Central Government's consumption and the level of exports along with the three dummy variables D67, D73 and D77. Value added in construction is explained by the fixed investments of the Central government and private sector and D67. A wide variety of services account for the services sector in our model, which include services such as elctricity, gas, water, sanitation, transport, storage, communication, wholesale and retail trade, public administration and defense, banking, insurance and real estate, ownership of dwellings and other services. Value added in services is explained by the private consumption of domestically produced goods and services, consumption of the Central Government, level of exports, D67 and D77.

1.1 Value added in agriculture, fishing and forestry

$$VAFF = a_0 + a_1 (COND/CPID) + a_2 (CONCG/CPI) + a_3 (FIP/P) + U_1 \quad (1)$$

1.2 Value added in mining and quarrying

$$VMQ = a_4 + a_5 (COND/CPID) + a_6 (FICG/P) + U_2 \quad (2)$$

1.3 Value added in manufacturing

$$VAM = a_7 + a_8 (COND/CPID) + a_9 (CONCG/CPI) + a_{10} D67 + a_{11} D77 + U_3 \quad (3)$$

1.4 Value added in construction

$$VAC = a_{12} + a_{13}\,(COND/CPID) + a_{14}\,(FIP/P) + a_{15}\,(IIP/P) + a_{16}\,(IICG/P) + U_4 \quad (4)$$

1.5 Value added in services

$$VAS = a_{17} + a_{18}\,(COND/CPID) + a_{19}\,(CONCG/CPI) + a_{20}\,(CONLG/CPI) + a_{21}\,(FIP/P) + a_{22}\,(VX/PX) + a_{23}\,D67 + U_5 \quad (5)$$

1.6 Gross Domestic Product at current factor cost prices

$$GDPF = (VAFF + VAMQ + VAM + VAC + VAS)(FC)$$

2.0 CONSUMPTION

Wallis (1980,p.1) observed that the aggregate consumption function is the most researched behavioural relation in economics since this concept was introduced by Keynes' in his General Theory. Because of its crucial importance to policy formulation and economic planning, the emphasis of empirical research on the subject has mostly been on the verification of the applicability of various consumption hypotheses such as the absolute income hypothesis, the relative income hypothesis, the permanent income hypothesis and the habit persistence hypothesis, in the context of developing countries (see Khan,1987). Recently, there has been a growing concern over the applicability of the traditional models that have been formulated to explain the experiences of developed countries to the developing countries. The empirical findings

have proved that models based on the simple Keynesian absolute income hypothesis and the dynamic specifications incorporating habit persistence hypothesis to be good approximations of the consumption behaviour in developing countries as well (See for example Khan, (1987) and Song, (1981)). In our model we incorporate these hypotheses with some modifications appropriate to the Sri Lankan economy.

Since the public sector plays an important role in the economy as a consumer, treating the public consumption as exogeneous is in fact a gross oversimplification in the case of Sri Lanka (See Ghartey (1987), p.195). Therefore, total consumption is disaggregated into private and public consumption components.

It is customary to distinguish between durable goods consumption and non-durable goods consumption in macroeconometric modelling, especially of developed countries. But in our model, in view of the country's heavy reliance on imports for consumption and low percapita income which is mostly spent on non-durable consumption, the private consumption is divided into two components: the consumption of imported goods and services and the consumption of domestically produced goods and services. The government consumption is further divided into the central government consumption and local government consumption. Thus equations (2.1) to (2.5) account for the consumption sector of the economy.

Haque, Lahiri and Montiel (1990) specified consumption function to be a function of real interest rate, lagged real private consumption, and current and lagged real disposable income. In our model a similar function is specified for the private consumption of domestically produced goods and services with an additional variable employed to capture wealth effects on consumption. Thus, the private real consumption of domestically produced goods and services in our model is a function of lagged private real consumption of domestically produced goods and services, current and lagged real disposable national income, real interest rate, and the wealth variable proxied by the real value of broad money supply and the dummy variable D73.

The private real consumption of imported goods and services is explained by the income terms of trade index (value of exports deflated by the import price index) of the previous year, current real disposable national income, the private real consumption of imported goods and services in the previous year and the two dummy variables D73 and D77.

Consumption of the Central Government is dependent both on the current and lagged revenue of the Central Government, additional domestic and foriegn resources available to the Central Government through borrowing and the liberalization dummy variable D77. It should be noted here that the Central Government consumption includes both the domestically produced and imported consumer goods and services. The change in the

Central Government's debt variable is employed to capture the effect of the additional resources available to the Central Government. Since,the revenue of the Central Government lagged behind an ever-increasing expenditure, additional resources for financing the budget deficits were generated mainly through the borrowings throughout the period under study. The dummy variable D77 is expected to account for the effect of new economic policies introduced in 1977 which emphasized reduction in government's consumption expenditures. The consumption of local governments accounts only for one per cent of total consumption of the economy. The real consumption of local governments is related to its own lag, lagged real revenue of the Central Government and real national wealth proxied by the real broad money supply.

The lagged dependent variables entered into the equations account for both the adjustment lags and the effect of past behaviour on consumption of the respective goods and services.

2.1 Consumption of domestically produced goods and services

$$\begin{aligned} COND/CPID = {} & b_0 + b_1\ (COND/CPID)_{-1} + b_2\ ((GNP-TD)/P) \\ & + b_3\ ((GNP-TD)/P)_{-1} + b_4\ (IRT-RI) \\ & + b_5\ (MS2/P) + b_6\ D73 + U_6 \end{aligned} \tag{6}$$

2.2 Consumption of imported goods and services

$$\begin{aligned} CONM/CPIM = {} & b_7 + b_8\ (CONM/CPIM)_{-1} + b_9\ ((GNP-TD)/P) \\ & + b_{10}\ (VX/PM)_{-1} + b_{11}\ D73 \\ & + b_{12}\ D77 + U_7 \end{aligned} \tag{7}$$

2.3 Consumption of Central Government

$$CONCG/CPI = b_{13} + b_{14}\ (CONCG/CPI)_{-1} + b_{15}\ (CGR/P) + b_{16}\ (CGR/P)_{-1} + b_{17}\ (CDDEB+CXDEB) + b_{18}\ D73 + b_{19}\ D77 + U_8 \quad (8)$$

2.4 Consumption of local governments

$$CONLG/CPI = b_{20} + b_{21}\ (CONLG/CPI)_{-1} + b_{22}\ (CGR/P)_{-1} + b_{23}\ (MS2/P) + U_9 \quad (9)$$

2.5 Total consumption

$$C = COND + CONM + CONCG + CONLG$$

3.0 INVESTMENT

Evans (1969) noted that the accelerator principle that formed the basis for investment functions in early macro models had been well embedded in the pre-Keynesian literature. In its most simple form, this principle is known as the naive accelerator. The naive accelerator states that the investment is proportional to the change in output and does not take into account either the lags in planning and delivery or replacement investment. Thus, it is deficient as a theory of investment and has subsequently been modified to take the lags in planning and delivery, and replacement investment into account. However, those modified versions received only a little empirical support.

Chenery (1952) and Goodwin (1951) suggested independently

a model known as the stock adjustment model that assumes investment to be a fraction of the difference between the desired and actual capital stock. Chenery's version of the stock adjustment model is generally referred to as the capacity model. Koyck (1954) made an attempt to verify the similarities among the naive accelarator, the stock adjustment model and the capacity model. Chenery's version is now regarded as the capacity version of the accelerator while the naive accelerator itself is referred to as the 'change in sales version' of the accelerator.

Koyck (1954) argued that capital stock at any point of time is proportional to some weighted average of previous output levels over a certain number of years in the past. The investment function based on this idea is generally referred to as the flexible accelerator. The capacity principle and stock adjustment principle can be shown to be special cases of the investment function based on the flexible accelarator.

Wallis (1980, p.95) noted that the accelarator models are based on little economic theory compared to "neoclassical" models of investment behaviour. The neoclassical models of investment are based on the neoclassical theory of demand for factors of production by firms. Within the neoclassical framework the optimal level of capital accumulation is determined by the firm's networth maximization behaviour. The net worth of the firm is defined as the present value of all expected future net cash flows.

Neither of those traditions, i.e., accelarator models or neoclassical models, was the result of attempts to explain the investment behaviour in developing countries. The behaviour of private investment in developed market economies was the subject of those theories. The application of those theories to verify investment behaviour in developing countries may not be appropriate due to structural differences between markets in developed and developing countries. Furthermore, lack of reliable data precludes adoption of those models in the context of developing countries. It is this difficulty which led researchers to adopt more or less ad hoc specifications or the simplest accelarator formulations of investment behavior in the case of developing economies. These attempts to adopt the naive accelarator with some modifications in the case of developing countries have been quite successful in lending empirical support.

Following Marwah (1969) and Haque, Lahiri and Montiel (1990), the present study adopts investment functions based on the naive accelarator with some modifications. Equations (3.1) to (3.5) account for the investment sector of the economy. The real fixed investment of the Central government is explained by the changes in real GDP, real private fixed investment, real national wealth, external debt and domestic debt position of the Central Government, lagged real fixed investment of the Central Government and the dummy variables D73 and D77. The private fixed investment is defined to

include the investments of public corporations which operate like private enterprises. The real private fixed investment variable is included in this function on the assumption that a degree of complimentarity between the private and the Central Government fixed investments. This is a reasonable assumption because the Central government has taken over the responsibility of investing in the infrastructure of the economy. Since Sri lanka is a low income, capital deficient economy, it can be conceived that changes in national wealth are directly related to the demand for Central Government's fixed investment.

In addition to the changes in real GDP and real national wealth, the real fixed investment of private sector is explained by the real fixed investment of the Central Government, real imports of capital goods, and the lagged real private investment. The government investment variable is introduced into the equation in order to account for the 'crowding out effect ' generated by such public investments on the private investment. Given the low level of indigeneous technological progress and the heavy import dependence of the country's production structure, the availability of imported capital goods is assumed to be positively related to the private fixed investment demand. Encouragement of private investment in the economy was declared as a major objective of the new economic policies adopted in 1977. In order to assess the extent to which the new policies succeeded in

promoting private investment the policy dummy variable D77 is also included as an explanatory variable. Real inventory investment of the Central government is explained by the real budget surplus of the central government and one and two periods lagged real inventory investment of the Central government. The real budget surplus is assumed to impact positively on the real inventory investment of the Central Government. From the figures in Table 2.6 in Chapter 2, it is very clear that the inventory investment of Central government (public sector), in real terms, has reported a remarkably high average annual growth rate during the period 1974 to 1977. As a result, its share in total investment during the same period had unprecedentedly increased to 10.1 percent whereas its share was only 2.8 percent for the period 1960 to 1973. During the period from 1978 to 1987 the inventory investment of the Central government had decreased at a faster average annual rate of 283 percent in nominal terms. The dummy variables D73 and D77 are introduced into the equation to discover possible structural shifts that might have occurred during the sub-periods. The real inventory investment of the private sector which also includes the real inventory investment of public corporations is specified as a function of the change in real GDP and the lagged private real inventory investment.

3.1 Fixed investment of Central Government

$$FICG/P = c_0 + c_1 ((GDP/P)-(GDP/P)_{-1}) + c_2 ((FIP/P)-(FIP/P)_{-1}) + c_3 ((MS2/P)-(MS2/P)_{-1}) + c_4 CXDEB + c_5 CDDEB + c_6 (FICG/P)_{-1} + c_7 D73 + c_8 D77 + U_{10} \quad (10)$$

3.2 Fixed investment of private sector

$$FIP/P = c_9 + c_{10} ((GDP/P)-(GDP/P)_{-1}) + c_{11} ((FICG/P)-(FICG/P)_{-1}) + c_{12} ((VMK/PMK)-(VMK/PMK)_{-1}) + c_{13} ((MS2/P)-(MS2/P)_{-1}) + c_{14} (FIP/P)_{-1} + c_{15} D77 + U_{11} \quad (11)$$

3.3 Inventory investment of Central Government

$$IICG/P = c_{16} + c_{17} ((CGR-CGE)/P) + c_{18} (IICG/P)_{-1} + c_{19} (IICG/P)_{-2} + c_{20} D73 + c_{21} D77 + U_{12} \quad (12)$$

3.4 Inventory investment of private sector

$$IIP/P = c_{22} + c_{23} ((GDP/P)-(GDP/P)_{-1}) + c_{24} (IIP/P)_{-1} + U_{13} \quad (13)$$

3.5 Total investment

$$I = FICG + FIP + IICG + IIP$$

4.0 GOVERNMENT REVENUE, OTHER EXPENDITURE AND DEBT

In simple Keynesian macroeconomic models the government expenditure variable is generally treated as exogeneous. But, in view of the intended applications of the macroeconomic models, it can be argued that government expenditure should be appropriately endogenized to the system. Challen and Hagger (1983, pp. 55-57) have argued that the endogeneous treatment of government expenditure is appropriate if the variable is expressed in current prices and if the government expenditure plans are formulated in current prices. The exogeneous treatment may be appropriate when the government expenditure plans are formulated in constant prices, because the govenment expenditures are externally determined by political decisions in that case. In the case of many developing countries such as Sri Lanka, the government expenditure plans are always formulated in current prices. In addition, the important role played by the government in the economies of developing countries makes it appropriate to endogenize not only government expenditures but also government revenues into the macroeconomic models of those countries.

In the consumption and investment sectors of the present model the government consumption and investment expenditures have already been endogenized. In this section the government revenue, and other recurrent and capital expenditures are endogenized along with the budget surplus and national debt.

In common with many low income developing economies the

main source of government revenue in Sri Lanka is the various indirect taxes imposed on production and expenditure. As shown in Table 2.7 the average annual share of indirect tax revenue has been 68 percent for the two sub-periods of 1960-1973 and 1974-1977. The share has amounted to 71 percent of total revenue during the period from 1978 to 1987. In our model, the indirect tax revenue is disaggregated into five components,namely, the business turnover tax revenue, selective sales tax revenue, import tax revenue, export tax revenue, and other indirect tax revenue. The relative significance of these components in the total revenue has changed noticeably during the period under study. During the period from 1960 to 1973 the business turn over tax revenue grew at an average annual rate of 117 percent, with an average share of only 5 percent of the total revenue. Nevertheless, its share has been growing over the three sub-periods and stayed at 20 percent for the third sub-period, viz. 1978-1987. The enlargement of its share in the total revenue during the post-1977 period has stemmed from the Central government's measures adopted which included increases in existing tax rates, introduction of new taxes and by the elimination of tax-related administrative costs. In our model the business turn over tax revenue is explained by GDP representing the overall economic activity of the country and by the lagged business turn over tax revenue. Selective sales tax revenue is generated from ad-valorem tea tax, excise on liquor and

tobacco, the administrative levy imposed on coconut kernel products and the sales taxes imposed on a selected number of other goods. On average, the selective sales tax revenue accounted for 17.3 percent of total revenue annually during the period of 1974- 1977 and the highest average annual growth rate of 40 percent was recorded during the same time. During the third sub-period the revenue from this category acounted for an average annual share of 13 percent while growing at an average annual rate of 17 percent. The selective sales tax revenue in our model is specified as a simple function of the current value of GDP that represents the aggregate economic activity. Both the business turn over tax and selective sales tax revenues are expected to be related positively to the GDP. The combined share of indirect taxes on external trade, imports and exports, has accounted for more than one third of the total revenue of the Central Government during the periods from 1960 to 1973 and from 1978 to 1987. Relatively, the import tax share has been greater than the export tax share during both periods. During the intervening sub-period of 1974-1977, mainly as a consequence of pervasive policy measures to compress imports, the average annual import tax share remained below that of the export tax share. However, both the shares were noticeably low compared to their respective shares in the other two sub-periods. In the present model the import tax revenue is explained by the current value of aggregate imports while the export tax revenue is

explained by the current value of aggregate exports, the exchange rate and the two dummy variables D73 and D77. The rationale for these specifications is that the current values of aggregate imports and exports are more or less proportional to their respective tax revenues. Since the foreign price in domestic currency is negatively related to the demand for exports, the exchange rate expressed as the number of Sri Lankan rupees per United States dollar is expected to impact negatively on the export tax revenue. Also, it is expected that the exchange rate variable will capture the effects of the major devaluations that took place in 1967 and 1977 (It may be pointed out that there was a slight appreciation of currency in 1976). The dummy variable D77 is expected to show an upward structural shift of export tax revenue function mainly because the post-1977 period was characterized by a remarkable increase in exports.

In view of the low percapita income and unequal distribution of income in Sri Lanka, the personal and corporate income taxes generate only a small proportion of the total revenue. Over the three sub-periods reported in Table 2.7 the average annual contribution of direct taxes to the total revenue of the Central Government has decreased from 16 percent to 13 percent. In view of the relative constancy of the revenue yield from direct taxes, the direct tax revenue is specified as a function of national income (GNP) and a positive association is expected between the two variables.

The other indirect tax revenue includes all revenues from taxes on production and expenditure except the rvenues from business turnover tax, selective sales tax, import tax and export tax. Among the main components of this category is the net receipts from the Foreign Exchange Entitlement Certificates (FEEC) scheme that was introduced in May 1968 with a view to liberalizing imports of essential inputs and promoting exports of minor export products. A dual exchange rate was introduced initially to accommadate the FEEC scheme. This led eventually to the establishment of a multiple exchange rate system which was subsequently abolished in 1977. This category also comprises the revenues from licence taxes and property transfer taxes. In the present model the other indirect tax revenue is specified as a function of its own lag, the dummy variables D67 and D77 in addition to the current value of GDP reflecting the level of economic activity.

The total tax revenue is the sum of direct and indirect tax revenues. The non-tax revenue also constitutes an important share of the government revenue as the government is involved directly in production and exchange activities of the economy. Gross receipts from government trading enterprises, interest, profits and dividend receipts, social security contributions and other current and capital transfer receipts, sales and charges, repayments of loans and advances account for most of the non-tax revenue. In our model the non-

tax revenue of the Central Government is treated as a function of Central Government total expenditure, lagged non-tax revenue and the dummy variable D77. The Central Government total expenditure is included here because, the revenues such as gross receipts from government trading partners, interest, profits and dividends receipts are directly related to it. As the government has taken active steps, such as privatization of state owned ventures, to limit state intervention in the production and exchange activities in order to allow market forces to play a major role in resource allocation in the economy, the coefficient of D77 is expected to bear a negative sign.

The total expenditure of the Central Government is made up of two components, the current and capital expenditures. Generally, these two components are treated as consumption and investment expenditures of the Central Government. The current expenditure is divided into two parts as the expenditure on goods and services and the other recurrent expenditure. The first part has already been discussed earlier as the consumption of the Central government. The other recurrent expenditure is mainly composed of a variety of transfer payments made to households and others and the interest payments for both domestic and foriegn borrowings. The other recurrent expenditure, in the present model, is assumed to depend on the level of economic activity, i.e., GDP, the current level of Central government domestic and foreign debt.

In addition, the dummy variable D77 is introduced to account for possible structural shifts due to the liberalization programs. Since most of those transfer and other payments included in the other recurrent expenditure are necessary for the maintenance of the overall economic activity, a positive association between GDP and the other recurrent expenditure is expected. However, given the reluctance of governments to increase current expenditure, mainly in the forms of transfer payments in the face of increasing debt burden, the possibility of a negtive association between the total debt level and the other recurrent expenditure cannot be ruled out although the interest payments are a part of that expenditure category. Considering the various efforts made by the Sri Lankan government to cut transfer payments such as consumer subsidies as means to reducing the growing budget deficits, a negative sign for the total debt variable is expected. The capital expenditure also includes a component of transfer payments and a component of net outpayment of loans in addition to the expenditure for the acquisition of fixed capital assets, which is treated as fixed investment of Central Government in our model. The capital expenditure, other than the fixed investment is called "other capital expenditure" in our model and is explained by the level of economic activity (GDP) and D73. It is expected that GDP is positively related to the other capital expenditure. Since the difficulties created by the unfavourable external

situation in 1973 forced government to curtail even capital transfers, the sign of D73 is expected to be negative.

The total Central Government expenditue variable considered in this study excludes the payments such as contributions to sinking funds, direct repayment of public debt and subscriptions to international financial organizations. This was done in order to focus on the net-cash surplus (or deficit) of the Central Government. Thus the budget surplus given by the revenue minus expenditure in our study is the net-cash surplus. Throughout the period of this study the net cash surplus has been negative.

The Central government finances the negative net-cash surplus through domestic market and non-market borrowings, use of cash balances and by foreign loans and grants. The ever increasing total debt burden has been the direct and immediate consequence of growing budget deficits during the past.

Generally known as the national or public debt, the Central Government's debt has been of great concern to the policy makers of the country with growing external deficits. Over time, both the domestic and external debt of the Central Government has risen continuously. Growth rates reported in Table 2.10 show clearly that the growth of domestic debt has been faster in the third sub-period 1978-1987 compared to the two sub-periods of 1960-1973 and 1974-1977. The average annual growth rate for the post-1977 period was 19.1 percent whereas in the previous two sub-periods the growth rates were 13.1 and

13.8 percent respectively. However, the average annual growth rate of external debt has always been greater than that of the demestic debt in all the three sub-periods. In the-sub period from 1973 to 1977 the external component of total debt posted dramatic increases as a direct consequence of unfavourable foreign exchange situation created by the oil price hike in 1973. On average, the external debt has grown annually by an unprecedented rate of 44.6 percent during the second sub-period. Though sharply decreased, the growth rate of external debt remained at 26.7 percent even in the post-1977 period. The faster growth of external debt brought about a significant change in the composition of total debt by increasing its share from 15.9 percent to 48.7 percent between the first and the last sub-periods.

The change in the Central Government domestic debt is specified as a function of the Central government budget surplus, the lagged change in the domestic debt and D77. The budget surplus variable is expected to have a negative effect on borowings while the expenditure is expected to have a positive effect on borrowings. Although the Central government can borrow domestically from both the market and non-market sources, in practice government relied mainly on the domestic market borrowings as non-market sources have not sufficiently developed. Nevertheless, the government became more and more reluctant to finance budget deficits by increasing its market borrowings because of their inflationary consequences.

Therefore, a one-period lagged change in domestic debt may have a negative effect on the current change in domestic debt. The change in external debt is assumed to be a negative function of the surplus of trade and services balance of the current account. The rationale behind this assumption is that While higher export earnings can reduce the need for external borrowings, the higher import payments increase the need for such borrowings. In the case of Sri Lanka the past levels of external borrowings have forced authorities to borrow more and more from external sources as the debt service burden has grown over the years. Export earnings have fallen far short of the amounts of foreign exchange necessary for debt servicing while maintaining satisfactory levels of capital and other essential imports. Therefore, the lagged change in external debt is expected to impact negatively on the current change in the external debt. Since the oil price hike in 1973 aggravated the country's external situation the dummy variable D73 is expected to account for a positive structural shift in the external debt position of the country.

4.1 Business turnover tax revenue

$$BTT = d_0 + d_1\ GDP + d_2\ BTT_{-1} + U_{14} \qquad (14)$$

4.2 Selective sales tax revenue

$$SST = d_3 + d_4\ GDP + U_{15} \qquad (15)$$

4.3 Import tax revenue

$$MT = d_5 + d_6\ VM + U_{16} \qquad (16)$$

4.4 Export tax revenue

$$XT = d_7 + d_8\ VX + d_9\ ER + d_{10}\ D73 + d_{11}\ D77 + U_{17} \qquad (17)$$

4.5 Other indirect tax revenue

$$TIDO = d_{12} + d_{13}\ GDP + d_{14}\ TIDO_{-1} + d_{15}\ D67 + d_{16}\ D77 + U_{18} \qquad (18)$$

4.6 Direct tax revenue

$$TD = d_{17} + d_{18}\ GNP + U_{19} \qquad (19)$$

4.7 Non-tax revenue

$$NTR = d_{19} + d_{20}\ CGE + d_{21}\ NTR_{-1} + d_{22}\ D77 + U_{20} \qquad (20)$$

4.8 Other recurrent expenditure

$$CGOCE = d_{23} + d_{24}\ GDP + d_{25}\ (DDEB+XDEB) + d_{26}\ D77 + U_{21} \qquad (21)$$

4.9 Other capital expenditure

$$CGOKE = d_{27} + d_{28}\ GDP + d_{29}\ D73 + U_{22} \qquad (22)$$

4.10 Change in Central Government's domestic debt

$$CDDEB = d_{30} + d_{31}\ BS + d_{32}\ CDDEB_{-1} + d_{33}\ D77 + U_{23} \qquad (23)$$

4.11 Change in Central Government's external debt

$$CXDEB = d_{34} + d_{35}\ CXDEB_{-1} + d_{36}\ TSB + d_{37}\ d73 + d_{38}\ D77 + U_{24} \quad (24)$$

4.12 Central Government's total indirect tax revenue

$$TID = BTT + SST + XT + MT + TIDO$$

4.13 Central Government's total revenue

$$CGR = TID+TD+NTR$$

4.14 Total recurrent expenditure

$$CGE = CONCG +CGOCE + FICG + CGOKE + CGOE$$

4.15 Central Government's budget surplus(net-cash surplus)

$$BS = CGR - CGE$$

4.16 Central government's domestic debt

$$DDEB = CDDEB + DDEB_{-1}$$

4.17 Central government's external debt

$$XDEB = CXDEB + XDEB_{-1}$$

5.0 BALANCE OF PAYMENTS

One salient feature of modern macroeconometric models, particularly of advanced capitalist economies, is the important role played by the open economy relationships in

them. This has been a consequence of the explicit recognition that those economies cannot be treated as if they were closed. It should be pointed out that many developing countries like Sri Lanka also cannot be treated as closed economies because of their heavy dependence on external trade and foriegn capital. Thus, incorporating open economy aspects into the macroeconometric models of such developing countries becomes imperative.

It was shown in Chapter 1 that Sri Lanka's degree of openness measured in terms of the proportions of exports and imports to GDP is remarkably high among developing countries. Therefore, open economy relationships should form an essential part of any macroeconometric model of the Sri Lankan economy. It was also mentioned in Chapter 2 that the balance of payments difficulties that stemmed mainly from the adverse trade balance have been the major concern of the policy makers throughout the period of this study. The trade, services and transfer accounts that constitute the current account have not followed the same pattern over the last three decades. Except for a few years the trade balance has always been in deficit and growing. The services account posted a surplus in the aftermath of the land reform which nationalized foriegn owned plantation industries in the early 1970's. However, mainly due to increasing debt service payment difficulties the service balance turned to a deficit since 1982. Nevertheless, in common with many developing countries, the balance on

transfers account has always been a surplus. The present study incorporates equations explaining the current account of the balance of payments with a view to identifying the determinants of basic components of current account and the impact of those components on output and expenditure.

In modelling balance of payments two competing hypotheses have been adopted in general. They are the monetary approach and components approach. It has been argued that, although the monetary approach is straightforward it lacks in detail which is of interest to the economic planner. In contrast, the components approach is more detailed in that it can be used to determine important sub-totals of the balance of payments such as trade balance, services balance and the balance on current account (Watson, 1990, p.52). The present study adopts the components approach with a view to identifying the determinants of various basic components of current account and their impact on output, expenditure and national debt. Thus, the present study goes beyond modelling the visible trade flows.

The pioneering work of Houthakker and Magee (1969) in estimating price and income elasticities of export and import demands of developing countries initiated the econometric analysis of the trade flows of developing countries. They estimated only equilibrium formulations that assume instantaneous adjustments to changes in explanatory variables. Khan (1974) in his econometric study of trade elasticities

estimated relative price and income elasticities of export and import demands for 15 developing countries, including Sri Lanka, using annual data for the period 1951-1969. Having specified the log-linear demand and supply equations for both exports and imports, a Two Stage Least Squares (2SLS) procedure was applied to estimate both the equilibrium and disequilibrium forms of export and import demand functions. He concluded that a simple equilibrium formulation appears to be adequate.

Nguyen and Bhuyan (1977) estimated the relative price and income elasticities of demand for both aggregated and disggregated exports and imports of four South Asian countries including Sri Lanka. In the case of Sri Lanka disaggregated export demand functions for three major traditional exports, tea, rubber and coconut products have been estimated along with the aggregate export demand function. The export demand for tea was explained by its own price, the price of a closely related good and income. The export demand for rubber was explained by the lagged own price, income, and the time trend variable. The demand for coconut products was related to their own price, current income, lagged exports of coconut products and the change in their own price. The aggregate export demand was explained only by the own price and income variables.The import demand functions for food and drink, consumer goods other than food and drink, intermediate goods, investment goods and total imports have also been estimated for Sri

Lanka. While the aggregate import demand was estimated to be function of income and time trend, the import demands for each disaggregated component was explained by own price of the good, income and the time trend variable in some cases.

O'Neill (1982) and Rittenberg (1986) included Sri Lanka in their sample of developing countries which did not produce satisfactory results for Sri Lanka. However, Rittenberg (1986) made an attempt to estimate cross-price elasticity along with the price and income elasticities of export demand by including the price of competing goods as a seperate explanatory variable. Follwing Khan (1974), Rittenberg (1986) casts doubts on the argument that less developed countries (LDCs) trade is controlled by non-market forces and concluded that "behaviour of LDCs exports seems to conform to theory on the magnitudes of various elasticites as well"(p.177).

There are several characteristics of the above mentioned econometric studies of Sri Lanka's trade flows that can be discussed in the light of some recent developments in the literature related to the estimation of international trade flows. First, all of these studies except Rittenberg (1986) relied upon the traditional specifications of export and import demand functions. Generally, those traditional specifications relate the quantities demanded to relative prices and real incomes of purchasing countries. Until recently almost all studies of export and import demands used these traditional specifications with limited number of

explanatory variables, including a single relative price variable in each equation. The argument for using a single price variable has been the assumption of a degree of substitutability between imports and domestic goods in the case of import demand and between the country's exports and the exports of the rest of the world in the case of export demand. Statistically, the inclusion of a single relative price variable constrains the influence of the two price variables to be equal in magnitudes but opposite in sign and also, it restricts the cross-price elasticity to be zero in the demand function. The traditional specifications may be appropriate when the homogeneity assumption is satisfied. The appropriateness of such a single price variable has been questioned by many researchers recently and it has been argued that the two price variables be separately included (Arize, 1987 and 1988; Gafar, 1983; Ginman and Murray, 1975 and Rittenberg, 1986). Also, attempts have been made to decompose the income variable (Arize, 1787 and 1988). Further, other explanatory variables such as exchange rate have been introduced into the export and import demand functions in recent studies as modifications of traditional specifications. See Aggarwal, 1984; Bahmani-Oskooee, 1986 and Kolluri and Torrisi, 1987.

Second, economic theory is of little help in choosing an appropriate functional form for estimation. The simple linear and log-linear formulations are the most common functional

forms specified. Using a Box-Cox procedure Khan and Ross (1977) argued that the log-linear formulation of import demand function could not be rejected in favour of the simple linear formulation. Boylan, Cuddy and O'Muircheartaigh (1980) supported the results of Khan and Ross. Salas (1981) also selected the log-linear formulation as the appropriate functional form. The advantage of using log-linear formulations is not only that it restricts the elasticities to be constant but also produces the elasticities directly as the estimated coefficients of the explanatory variables.

Finally, almost all of the studies estimated sigle equation models. The underlying assumption of estimating single equation models for exports and imports is that the price elasticities of the supply of exports and imports are, at least, very large if not infinite so that the prices of exports and imports can be treated as exogeneous. Recently, questioning the assumptions regarding the infinite elasticities of supplies, Khan (1978), Arize (1987 and 19888), Ghartey (1987) and Culem (1987) employed simultaneous equation models in their studies. Ghartey (1987) concluded that the simultaneous equation model yielded poor results when the two-stage least squares (2SLS) method was used to estimate the equations and that the ordinary least squares (OLS) could be relied upon to yield good estimates. On the other hand, Arize (1987) argued strongly in favour of simultaneous model estimators.

The present study estimates the aggregate and disaggregated import and export demands of Sri lanka using non traditional specifications that include separate price variables and standard income variables. However, the services export and import functions are estimated in nominal terms because the reliable data for the prices of services exports and imports are not available.

The total exports of goods is disaggregated into four categories: tea exports, rubber exports, and exports of coconut products, which make up the traditional exports and the remaining which make up the non-traditional exports. The non-traditional exports comprise a group of minor agricultural exports, industrial exports, mineral exports and unclassified exports. In 1986 and 1987, while the three traditional exports contributed only 42 and 38 percent of total exports, the industrial exports has become the largest contributor by accounting for nearly 47 and 49 percent respectively.

The demand for tea exports is assumed to be a function of its own price, prices of the related goods in developed and developing countries, income of developed countries given by their real GDP, exchange rate and the devaluation dummy variable D67 and the liberalization dummy variable D73. The exports of rubber is explained by its own price, prices of the related goods in the world as a whole, world income given by world GDP and the dummy variables D73 and D77. The own price, the prices of related goods in both the developed and

developing countries, income of developing countries, exchange rate and D73 are used to explain the demand for exports of coconut products. The demand for non-traditional exports is assumed to depend on their own price, the prices of related goods in both developed and developing country trade partners and the incomes of developed and developing countries. In the cases of tea, coconut products and non-traditional exports, the prices of related goods and incomes of trading partners are disaggregated by developed and developing country groups assuming different elasticities with respect to those diaggregated price and income variables. The own price is expected to be negatively related to the demand for respective exports. The signs of the variables representing the prices of related goods can either be positive or negative depending on whether the related goods are substitutes or complementary goods to the exports in question. The sign of the income variables can also be either positive or negative depending on whether the goods in question are considered as normal or inferior goods by those trading partners. However, the exchange rate variable, expressed in Sri Lankan rupees per United States dollar, is expected to carry a positive sign.

The aggregate imports is decomposed into four categories: consumer goods, intermediate goods, capital goods, and other imports. All the categories except other imports are endogenized to the model by behavioural equations in the form of import demand functions. The real imports of consumer goods

is explained by their own price, price of the consumer goods exports, current and lagged real GDP, lagged real imports of consumer goods and the dummy variables D73 and D77. The real imports of intermediate goods is explained by its own price, price of consumer goods, lagged real GDP, lagged real imports of intermediate goods and the dummy variables D67 and D73. The demand function for capital goods imports relate the current level of real imports of capital goods to import price of capital goods, general price level, lagged real imports of capital goods and the dummy variables D67 and D77.

All the disaggregated export and import demand functions discussed in the preceding paragraphs are in log-linear formulations. The equations explaining services exports and inmports are specified in linear form. Faced with difficulties in getting appropriate price variables the functions are formulated for nominal exports and imports of services. The exports of services is explained by its one-period lagged values, the current level of real exports of goods, and the dummy variable D77. It is hypothesized that services exports vary directly with the level of real exports of goods.

Services imports are described by the current levels of real GDP and real imports of goods and by its one-period lagged values. The services imports are expected to vary directly with the real GDP and real goods imports. The net outcome of exports and imports of both the goods and services is the trade and services balance which is defined by the

identity in equation 5.11.

The net private and official transfer receipts, the dfference between receipts and paymer.ts of private and official gifts and grants, has always been a positive magnitude in Sri Lanka. This is not uncommon among the developing countries as they receive grants and other donations from various governments in the developed world and international organisations. These receipts do not affect the country's external debt situation. In fact , they ease the problem of debt servicing to a certain extent. In our model net private and official transfer receipts is explained by a simple distributed lag function which also includes the liberalization dummy variable D77 that accounts for any noticeable increase in the average level of such receipts after 1977. The surplus of the current account is defined by the identity in equation 5.12.

5.1 Exports of tea

$$\text{Ln } VXT/PXT = e_0 + e_1 \text{ Ln } PXT + e_2 \text{ Ln } WPDC + e_3 \text{ Ln } WPLC + e_4 \text{ Ln } YIDC + e_5 \text{ Ln } ER + e_6 \text{ D73} + e_7 \text{ D77} + U_{25} \quad (25)$$

5.2 Exports of rubber

$$\text{Ln } VXR/PXR = e_8 + e_9 \text{ Ln } PXR + e_{10} \text{ Ln } WPW + e_{11} \text{ Ln } YIW + e_{12} \text{ D73} + e_{13} \text{ D77} + U_{26} \quad (26)$$

5.3 Exports of coconut products

$$\text{Ln PXC/PXC} = e_{14} + e_{15} \text{ Ln PXC} + e_{16} \text{ Ln WPDC} + e_{17} \text{ Ln WPLC} + e_{18} \text{ Ln YILC} + e_{19} \text{ Ln ER} + e_{20} \text{ D73} + U_{27} \quad (27)$$

5.4 Other exports

$$\text{Ln VXO/PXO} = e_{21} + e_{22} \text{ Ln PXO} + e_{23} \text{ Ln WPLC} + e_{24} \text{ Ln WPDC} + e_{25} \text{ Ln YILC} + e_{26} \text{ Ln YIDC} + U_{28} \quad (28)$$

5.5 Imports of consumer goods

$$\text{Ln VMC/PMC} = e_{27} + e_{28} \text{ Ln PMC} + e_{29} \text{ Ln CPIX} + e_{30} \text{ Ln (GDP/P)} + e_{31} \text{ Ln (GDP/P)}_{-1} + e_{32} \text{ Ln (VMC/PMC)}_{-1} + e_{33} \text{ d73} + e_{34} \text{ d77} + U_{29} \quad (29)$$

5.6 Imports of intermediate goods

$$\text{Ln VMI/PMI} = e_{35} + e_{36} \text{ Ln PMI} + e_{37} \text{ Ln P} + e_{38} \text{ Ln (GDP/P)} + e_{39} \text{ Ln (GDP/P)}_{-1} + e_{40} \text{ D73} + U_{30} \quad (30)$$

5.7 Imports of capital goods

$$\text{Ln VMK/PMK} = e_{41} + e_{42} \text{ Ln PMK} + e_{43} \text{ Ln P} + e_{44} \text{ Ln (GDP/P)} + e_{45} \text{ Ln (GDP/P)}_{-1} + e_{46} \text{ D73} + e_{47} \text{ D77} + U_{31} \quad (31)$$

5.8 Services exports

$$SEX = e_{48} + e_{49}\ SEX_{-1} + e_{50}\ (VX/PX) + e_{51}\ D77 + U_{32} \quad (32)$$

5.9 Services imports

$$SIM = e_{52} + e_{53}\ (GDP/P) + e_{54}\ (VM/PM) + e_{55}\ SIM_{-1} + U_{33} \quad (33)$$

5.10 Net private and official transfer receipts

$$NT = e_{56} + e_{57}\ NT_{-1} + e_{58}\ D77 + U_{34} \quad (34)$$

5.11 Current value of aggregate exports

$$VX = VXT + VXR + VXC + VXO$$

5.12 Current value of aggregate imports

$$VM = VMC + VMI + VMK + VMO$$

5.13 Trade and services balance

$$TSB = (VX - VM) + (SEX - SIM)$$

5.14 Surplus of the current account

$$CA = TSB + NT$$

6.0 MONETARY SECTOR

Various imperfections and rigidities are common features of the money and capital markets of developing countries. Thus, they define some important aspects of a typical developing economy. The degree of diversification in the set of financial assets is remakably high in developed economies as a large number of assets such as money, bonds, equities and securities are transacted in their financial markets. The relatively high ratio of currency to the total money supply is a salient feature of developing countries. The low level of savings may partly explain the low degree of diversification in the set of financial assets in developing countries. It has been argued quite often that unlike in the smoothly functioning financial markets of developed market economies, the equilibria in the financial markets of developing countries do not result from interest rate adjustments because money and capital markets are imperfect and the interest rates are generally administered. In this view money stock is always determined by supply forces and the interest rate plays only a passive role in the demand for money (Pandit, 1989, p. 134). However, these arguments may not be equally true of all the developing countries as they differ in their states of the development of financial markets.

Perera (1988, p.19) observed that most of the models of demand for money reported in the literature are broadly based on three theories, namely, the modern quantity theory, the

portfolio theory, and the inventory theory. He argued that the portfolio model has only little relevance to developing countries because "the financial markets in those countries are "underdeveloped or virtually non-existent" (p.19). He estimated demand for money functions derived within the framework of the modern quantity theory for both the narrow and broad monies of Sri Lanka and concluded that the demand for money is a function of current real income and expected rate of inflation.

The demand for money functions for the two disaggregated components of broad money, that is the narrow money (currency and notes in circulation and demand deposits held by public) plus the time and savings deposits held by public, are estimated in the present study. However, supply of money is postulated to be exogeneously determined by monetary authorities.

The demand for real narrow money balances is explained by the current real national income (real GNP), the cost of holding money given by the current rate of inlation and the lagged real narrow money balances. The demand for real quasi-money, real time and savings deposits by public is assumed to be functions of real national income, current interest rate, rate of inflation, lagged real quasi-money and the liberalization dummy variable D77. In both the specifications, it is expected that real national income has a positive impact while rate of inflation has a negative impact on the

respective components of money demand. The rate of interest is expected to be positively related to the real quasi-money demand. Due to the developments of money market in the post-1977 period , the dummy variable D77 is expected to carry a positive sign. The demand for nominal broad money is defined by the identity expressed in equation 6.3.

6.1 Demand for narrow money

$$MS1/P = f_0 + f_1 (GNP/P) + f_2 RI + f_3 (MS1/P)_{-1} + U_{36} \quad (35)$$

6.2 Demand for time and savings deposits

$$TSD/P = f_4 + f_5 (GNP/P) + f_6 IRT + f_7 RI + f_8 (TSD/P)_{-1} + f_9 D77 + U_{36} \quad (36)$$

6.3 Demand for broad money

$$MS2 = MS1 + TSD$$

7.0 PRICES

Due to serious data deficiencies, the input markets such as labour and capital markets are not incorporated into our model. Therefore, prices of those inputs are assumed to be exogeneous. But, we have derived the implicit factor cost price index of GDP (FC), a measure to represent average factor cost of aggregate production from the GDP data at current and constant factor cost prices. This price index is not

endogenized as factor markets are not incorporated into the model. But the price indices which represent the general price level, aggregate and sectoral consumer prices, aggregate export prices and aggregate import prices are treated endogenously in the model.

The general price level (GDP deflator) of the economy is determined by the average factor cost index FC, and the one-period lagged general price level. The consumer price index for domestic goods and services is specified in a similar manner. The factor cost price index is used to explain the consumer price index for domestic goods and services to capture the cost effects on the determination of their prices. It is very clear that the inclusion of FC is based on the assumption that the production cost of domestically produced consumer goods and services is proportional to the total average production cost of the economy given by the FC. The past level of the respective price index represents expectations. The consumer price index of imports is explained by the current price (level) index of consumer imports and the lagged consumer price index for imports. Tea and coconut products are the main exports in this category of consumer goods. Accordingly, the consumer price index of exports is explained by the prices of these two exports of consumer goods. The consumer price index is a Divisia index based on price indices of the three categories of the goods and services included in the total basket of goods. Exports and

imports price indices are also modelled as Divisia indices based on the price indices of their sub categories of goods. Thus, the export price index is specified as a function of the price indices of tea, rubber, coconut, and nontraditional exports. The import price index is described by the price indices of consumer goods, intermediate goods and capital goods imports.

Based on the "small country" assumption in the international trade theory it could be argued that Sri Lanka is a price taker in the world market. Therefore, the export and import prices of all the the dissaggregated categories of exports and imports are assumed to be determined in the world market and hence are not endogenized in our model.

7.1 General Price level (GDP deflator)

$$P = g_0 + g_1 FC + g_2 P_{-1} + U_{37} \qquad (37)$$

7.2 Consumer price index

$$\text{Ln CPI} = g_3 + g_4 \text{ Ln CPID} + g_5 \text{ Ln CPIM} + g_6 \text{ Ln CPIX} + U_{38} \qquad (38)$$

7.3 Consumer price index for domestic goods and services

$$CPID = g_7 + g_8 FC + g_9 CPID_{-1} + U_{39} \qquad (39)$$

7.4 Consumer price index for imports

$$CPIM = g_{10} + g_{11}\ PMC + g_{12}\ CPIM_{-1} + U_{40} \qquad (40)$$

7.5 Consumer price index for exports

$$CPIX = g_{13} + g_{14}\ PXT + g_{15}\ PXC + U_{41} \qquad (41)$$

7.6 Export price index

$$Ln\ PX = g_{16} + g_{17}\ Ln\ PXT + g_{18}\ Ln\ PXR + g_{19}\ Ln\ PXC + g_{20}\ Ln\ PXO + U_{42} \qquad (42)$$

7.7 Import price index

$$Ln\ PM = g_{21} + g_{22}\ Ln\ PMC + g_{23}\ Ln\ PMI + g_{24}\ Ln\ PMK + U_{43} \qquad (43)$$

8.0 National Income (GNP), GDP and the rate of inflation

The definitional equations or identities which are directly related to the variables explained have been appropriately included among the equations describing each sector. Three identities, which define important macroeconomic variable which close the model, are presented below.

8.1 National income (GNP)

$$GNP = C + I + CA + NRIGT$$

8.2 Gross Domestic Product

$$GDP = GNP - NFIA$$

8.3 Rate of inflation

$$RI = ((P-P_{-1})/P_{-1})*100$$

CHAPTER 4

ESTIMATION OF THE MODEL

A macroeconometric model of the Sri Lankan economy consisting of 60 endogeneous variables of which 43 are behavioural equations and 17 are identities was developed in the preceding chapter. The model consists of 61 predetermined variables of which 23 are exogeneous variables, 35 are lagged endogeneous and 3 are lagged exogeneous variables. Compared to the Karunasena's (1983) model which contained 89 endogeneous variables, our model is small and relative to the size of most existing models for developing countries, it is clearly a medium-size macroeconometric model. Nevertheless, the number of behavioural stochastic equations estimated in our model exceeds that of Karunasena's model. Noticeably, non-linearities are present in our model as many stochastic equations include explanatory variables defined as the ratios of endogeneous variables.

Before any attempt is made to estimate the structural equations of a model, it is imperative that the researcher ensure that the equations are identified. It is clear that all the behavioural equations are over-identified according to the order condition for identifiability. This is because the model contains a large number of predetermined variables. Ghartey (1987, p.54) observed that the rank condition, which is both necessary and sufficient for identifiability, is not generally

applied to identify equations in large macroeconomic systems of the size comparable to that of our model. Moreover, Ghartey (1987, pp.54-55) noted that comprehensive criteria for idenfying non-linear equations in econometric models have not yet been developed.

The equations in the model were estimated using annual time series data covering the period from 1959 to 1987 obtained from different secondary sources such as the Internatinal Financial Statistics (IFS) published by the IMF, and the Annual Report and the Review of the Economy published by the Central Bank of Sri Lanka. In cases where one year lagged variables were present in the equations, the data for 1959 were used as the first observation of those lagged variables.

In the estimation of economy-wide macroeconometric models, model builders quite often encounter the undersized sample problem. As Challen and Hagger (1983, p.128) have described, this problem arises when the sample size is smaller than the number of predetermined variables or when the sample size is smaller than the number of stochastic equations estimated in the system. In the first case the simultaneous structural estimators such as the two-stage least squares (2SLS) and three-stage least squares (3SLS) estimators break down. This is because these estimators require a first stage ordinary least squares (OLS) estimation of the unrestricted reduced form which cannot be achieved as the rank of the matrix of

data on all the predetermined variables is smaller than the number of predetermined variables. In other words, if W represents the TxK matrix of predetermined variables, with rank T<K, then (W'W) is singular and hence the OLS estimator of the equations of the unrestricted reduced form cannot be obtained. If the unrestricted reduced form equations cannot be estimated, the 2SLS or the 3SLS estimates of the structural equations of the model cannot be obtained either. When the undersized sample problem arises through the larger number of stochastic eqations than the number of sample points, full-information system estimators break down because it is impossible to form a non-singular estimate of the contemporaneous covariance matrix of the disturbances (Challen and Hagger (1983, p.129).

It is generally accepted that devising methods for circumventing the undersized sample problem in the case of full-information estimators is not possible. Nevertheless such methods have been proposed in the case of limited-information estimators. For instance, deleting unimportant predetermined variables or replacing the predetermined variables with a subset of their principal components at the first-stage regressions of 2SLS have been devised to cope with the undersized sample problem. Swamy and Holmes (1971) and Fisher and Wadyascki (1971) have shown that the 2SLS estimator specializes to the OLS estmator in the presence of undersized samples and therefore the OLS estmator is valid when the

sample is undersized. Moreover, Swamy has provided a justification for using OLS estimator in the estimation of simultaneous equations models (SEMs) based on the principal of non-contradiction which states that the identifying restrictions imposed on the structure should not be violated by any estimation procedure.

Considering the validity of OLS in the presence of undersized sample problem and the ease with which it can be applied, the OLS estimator was used to estimate the stochastic equations in our model. In order to correct for serial correlation the maximum likelihood procedure (MLE) proposed by Beach and Mackinon (1978) was employed whenever necessary.

THE ESTIMATED MACROECONOMETRIC MODEL OF SRI LANKA

The estimated equations of the 43 behavioural equations of the model developed in the preceding chapter are presented below. The standard errors and t-ratios of the estimated coefficients are given in the square brackets and parentheses, respectively, below the estimated coefficients. The superscripts "a", "b", 'c", "d" and "e" on the estimated coefficients denote the statistical significance of the coefficients at the levels of 1 Percent, 2 percent, 5 percent, 10 percent and 20 percent, respectively. Those estimated coefficients which are not statitically significant at the 20 percent level do not carry any superscript. The F statistic calculated for testing the overall significance of the

regression, the coefficient of determination (R^2), the adjusted coefficient of determination (R^{-2}) and the Durbin-Watson statistic (DW) are listed below each estimated equation along with the estimator used (OLS or MLE), the sample size, and the degrees of freedom. When the estimated equations include lagged dependent variables, the Durbin-h statistic (DH) is also reported.

PRODUCTION

The production sector consists of five value added equations. Each of these equations describes a subsector. The adjusted coefficients of determination of the five estimated equations varied between 0.97 and 0.99. The components of aggregate demand employed to explain value added in the production subsectors are significant at the 1 percent level except (COND/CPID) (real consumption of domestically produced goods and services) which is significant at the 2 percent level in the case of manufacturing sector.

All the explanatory variables except D77 are significant at the 1 percent level in the case of the value added in the agriculture, forestry and fishing subsector. The dummy variable D77 is significant at the 5 percent level. The real consumption demand for domestically produced goods and services variable (COND/CPID) is found to be a highly significant determinant in all the subsectors except construction. An increase of one million rupees in real

consumption demand for domestically produced goods and services will increase the value added in agriculture, forestry and fishing subsector by 0.18 million rupees, the value added in mining and quarrying by 0.03 million rupees, the value added in manufacturing by 0.09 million rupees and the value added in services by 0.46 milion rupees. In terms of elasticities at means, one percent increase in the real consumption of domestically produced goods and services will increase the value added in agriculture, forestry and fishing by 0.32 percent, in mining and quarrying by 1.0 percent, in manufacturing by 0.23 percent and in services by 0.57 percent.

The variable representing real consumption demand of the Central Government is found to be a significant determinant at the 1 percent level in the cases of agriculture, forestry and fishing, manufacturing, and services. An increase of one million rupees in the real consumption demand of the Central Government increases the value added in these three sectors by 0.43, 0.55 and 0.67 million rupees respectively.

CONSUMPTION

The marginal propensity to consume varied considerably between domestically produced goods and services and imported goods and services. The estimated marginal propensity to consume for the domestically produced goods and services is 0.24 while the estimated marginal propensity to consume for imported goods and services category is 0.09. The lagged real

income has a negative impact on the real consumption of domestically produced goods and services. Haque, Lahiri and Montiel (1990) also verified a negative relationship between lagged real disposable income and real consumption. The real interest rate exerts a negative effect on the real consumption of domestically produced goods and services as expected. The existence of a positive wealth effect on the real consumption of domestically produced goods and services is evident from the positive coefficient estimated for the real broad money variable. The estimated coefficient of 0.84 for the lagged real consumption of domestically produced goods and services is a clear indication of a strong habit persistence in this case. On average, the consumption demand for the domestic category has increased in the post-1973 period as indicated by the positive coefficient of the dummy variable D73.

All the estimated coefficients are significant at the 1 percent level in the case of private real consumption of imported goods and services. The lagged export earnings deflated by the lagged import price index is a measure of the income terms of trade of the previous period. This variable is verified to influence positively on the current private real consumption of imported goods and services. Though relatively small compared to the case of domestiaclly produced goods and sevices, the habit persistence is an important factor even in the case of the demand for imported consumption goods and services. Even though there had been tremendous efforts to

discourage imports in the face of a worsened foreign exchange shortage after 1973, the demand for imported consumption goods and services has increased on average. This could have resulted from the inability of the country to produce sufficient levels of domestic substitutes for imported consumer goods. As such it is not surprising that the consumption of imported goods and services has further shifted upward in the liberalised economy after 1977.

The Central government's marginal propensity to consume is estimated to be 0.19. Both the lagged real revenue of the Central government and the curent change in the Central Government's total debt have significant and positive impacts on the real consumption of the Central Government. Those measures adopted to reduce Central Government's consumption under the new economic strategy of the post-1977 era seem to have been somewhat successful as reflected by the significant negative coefficient of the dummy variable D77.

The lagged real consumption of local governments is verified to be the most important determinant of the real consumption of local governments. The real broad money representing the level of national wealth has a positive infuence on the real consumption of local governments while the lagged real revenue of the Central Government has a negative impact.

INVESTMENT

All the estimated coefficeients are statistically significant at the 1 percent level in the case of the Central Government real fixed investment. In the case of private real fixed investment also the changes in real GDP, Central Government's fixed investment and real imports of capital goods, and the lagged private real investment have statistically significant estimated coefficients at the 1 percent level. The estimated coefficients of the change in real money supply and the liberalization dummy variable D77 are statistically significant at the 2 percent and the 5 percent levels respectively. Except for the change in Central governments real fixed investment, all the variables have positive sign in the equation estimated for the private real fixed investment. It is interesting to note that the real private fixed investment impacts positively while the Central Government real fixed investment exerts a negative effect on the private real fixed investment. The latter confirms the existence of a 'crowding out effect' of the Central Government fixed investment on its private counterpart. The positive impact of private real fixed investment on the Central government real fixed investment can be thought of as (a sort of complementarity) a reflection of higher demand for fixed investments in infrastructure of the economy generated by the higher levels of private fixed investment. The change in real national wealth, $((FIP/P)-(FIP/P)_{-1})$, in both the fixed

investment equations are positively related to the respective real fixed investments. The change in real capital goods imports, $((VMK/PMK)-(VMK/PMK)_{-1})$, included in the private real fixed investment equation to account for the impact of the availability of capital goods has a positive sign as expected. Both the own lag variables and the liberalization dummy variable D77 included in both the fixed investment functions are found to have positive impacts on the respective real fixed investment variables. The current changes in Central Government external and domestic debt components are verified to have opposing effects on the real fixed investment of the Central Government. The external debt variable has a positive effect whereas the domestic debt variable has a negative effect even though both the estimated coeffients of the two debt variables are very small. The dummy variable D73 showed an upward shift of the Central governments real fixed investment on average after 1973.

Except for the intercept parameters, the estimated coefficients of all the explanatory variables in both the Central Government and the private sector real inventory investment eqations are statistically significant at the 1 percent level. The real budget surplus is negatively related to the real inventory investment of the Central government. Both the one-period and two-period lagged dependent variables have negative influences on the Central Government real fixed investment. Although there has been a statistically

significant upward shift in the level of real inventory investment after 1973, the post-1977 period is marked by a significant downward shift. Both the explanatory variables, the change in real GDP and the one-period lagged dependent variable, in the private inventory investment equation indicate postive influences on the current level of real private inventory investment.

The adjusted coefficients of determination for the Central Government and private inventory investment equations are 0.66 and 0.50 respectively. These are relatively low compared to those of other estimated equations of the model but not unsatisfactory as they explain at least 50 percent of the total variation. In addition, the F-statistics of the overall regressions are significant. Also, the inventory investment equations with even lower adjusted coefficients of determination are commonly encountered in empirical studies of both the developed and developing countries. For an example, see Ghartey and Rao (1990).

GOVERNMENT REVENUE, OTHER EXPENDITURE AND DEBT

All the explanatory variables bear coefficients that are significant at the 1 percent level in the business turn over tax (BTT) revenue equation. The marginal tax rate for business turn over tax is estimated to be 0.026. The BTT revenue of the previous period is positively related to the current BTT revenue.

The estimated marginal tax revenue for the selective sales tax revenue variable (SST) is 0.024 which is very close to that of BTT revenue. With respect to the total value of imports the marginal import tax rate is 0.16. This is considerably higher than the estimated marginal export tax rate with respect to the total value of exports. There is a negative relationship between the exchange rate and export tax revenue. Since the exchange rate is expressed in terms of rupees per U.S dollar, this negative relationship indicates that the export tax revenue goes up as the foriegn price of the Sri Lankan rupee goes up. The export tax revenue has experienced two upward shifts, one after 1973 and the other after 1977, as is evident from the significant coefficients of corresponding dummy variables in the export tax revenue equation. The size of the shift is relatively greater due to the adoption of liberalized trade policies. Among all the indirect tax revenue equations the other indirect tax revenue reported the lowest marginal tax rate of 0.006. The one-period lagged variable has a positive effect on the current level of other indirect tax revenue. As expected the partial liberalization dummy variable D67, which accounts also for the adoption of Foreign Exchange Entitlement Certificate scheme, has a positive coefficient while the liberalization dummy variable D77 has a negative coefficient. Those coefficients are significant at the 10 percent and the 1 percent levels, respectively.

In the case of direct taxes, the marginal tax rate (the coefficient of GNP) is 0.03. The current level of total Central Government expenditure and the non-tax revenue of the previous period are positively related to the current level of non-tax revenue. On average, the non-tax revenue is negatively influenced by the new liberal economic policies adopted in 1977.

The other recurrent and the other capital expenditure equations are verified to be influenced positively by the GDP. An increase of one million rupees in GDP leads to 0.13 and 0.09 million increases in the other recurrent and the other capital expenditure components, respectively. Though relatively smaller, the total debt of the Central government impacts negatively on the other recurrent expenditure as reflected by the negative coefficient of total debt variable which is significant at the 2 percent level. In the consumption sector of our model it was noted that the new economic policy in 1977 has led to a decrease in the Central Government consumption expenditure which is part of total recurrent expenditure. In contrast, the new policies are found to have generated an upward structural shift in the average level of other recurrent expenditure after 1977. As a consequence of the oil-price escalation in 1973, there has been a decrease in the average level of other capital expenditure as indicated by the negative estimated coefficient of the oil-price dummy variable D73 in the equation.

The budget surplus is an important determinant of the current change in the Central governments domestic debt. A budget deficit (negative surplus) of one million rupees will increase the domestic debt by 0.85 million rupees according to our estimates. The estimated coefficient of the one-period lagged dependent variable (CDDEB), is negative indicating that an increase in the change in the domestic debt in the last period will cause a decrease in the change in domestic debt in the current period. According to our estimates an increase in the trade and services deficit of balance of payments will result in a net addition of 0.26 million rupees to the total external debt of the Central Government. The estimated coefficient of the lagged change in external debt variable turned out to be larger than unity and significant at the 5 percent level implies an ever increasing trend in the total external debt of the central Government during a period when the country experienced increasing deficits of trade and services balance. The estimated coefficients of D77, which are significant at the 5 percent level, indicate a negative impact of the new economic policies introduced in 1977 both on the changes in domestic and the external debt components of the Central government. In addition, the oil price hike in 1973 has resulted in an upward structural shift in the external debt situation.

BALANCE OF PAYMENTS

The estimated own price elasticities of all the categories of exports , that is tea, rubber, coconut and non-traditional exports, are less than unity confirming that the exports of sri lanka are price inelastic. Nevertheless, the cross price elasticities of tea, coconut and non-traditional exports with respect to the prices of related goods in developed countries are greater than unity in absolute magnitude. The cross-price elasticity of rubber exports with respect to the related goods prices of the world is also greater than unity. However, with respect to the prices of related goods of the developing world, Sri Lanka's tea, coconut and non-traditional exports are found to be cross-price inelastic. The negative sign of both the cross-price elasticities of tea exports indicate that the goods of both the developing and the developed countries are complementary, not substitutes, for tea exports. The cross-price elasticity of rubber exports is also negative indicating a complementary relationship with the goods of the rest of the world. Sri Lanka's coconut exports are complementary to goods of the developed world but are substitutes to the goods of developing world. Nevertheless, the degree of substitutability of coconut products is not high as indicated by the cross-price elasticity of 0.39. Only Sri Lankan non-traditional exports are substitutes for the goods of both the developed and the developing countries. The income elasticity of tea and rubber

exports are 1.63 and 1.49 respectively. A 1 percent increase in the GDP of developed countries will lead to a 1.63 percent increase in Sri lanka's tea exports according to our estimates. In the case of rubber, an increase in world income (YIW) by 1 percent will bring about 1.49 percent increase in rubber exports. In contrast, the income elasticity of coconut products turned out to be negative in our study. As the income elasticity is measured here with respect to the income of the developing countries, this result indicates that the purchasers of developing countries treat Sri Lanka's coconut exports as inferior goods. However, the absence of income variable of the developed countries in the equation for coconut exports indicates that the coconut exports are highly inelastic with respect to the income of developed countries. Interestingly, the income elasticities of non-traditional exports with respect to the incomes of both the developed and the developing countries are gerater than unity in absolute value but opposite in sign. These elasticities are a clear indication that the two groups of countries treat Sri Lanka's non-traditional exports to be different in nature. While the developing countries treat them as non-essential luxury goods, the developed counties treat them as inferior goods. Based on these elasticities, we can infer that a 1 percent increase in the income of developed countries will result in a 2.88 percent decrease in the non-traditional exports while the same percentage increase in income of developing countries will

increase the non-traditional exports by 1.89 percent.

Among the three main categories of Sri Lanka's imports both the imports of consumer and intermediate goods are found to be price inelastic while the imports of capital goods is found to be price elastic. The estimated own price elasticities of the imports of consumer, intermediate and capital goods are 0.57, 0.21 and 1.15 respectively. The estimated cross-price elasticities of the three categories are positive indicating that all of these imports posses a degree of substitutability with the domestic products. However, only the imports of intermediate goods have a cross price elasticity larger than unity. Thus the imports of consumer goods and capital goods are both price and cross-price inelastic. Although, current real domestic income measured by real GDP is not found to be a statistically significant determinant of intermediate or capital imports both the current and one-period lagged real GDP are statistically significant at the 1 and 5 percent levels respectively in the case of consumer goods. Furthermore, the income elasticities with respect to current and lagged real GDP are greater than unity in absolute value and opposite in sign. The positive income elasticity with respect to current real GDP shows that consumer imports are not inferior goods. The income elasticity of intermediate goods imports with respect to lagged GDP is also greater than unity in absolute value and negative in sign. In the case of imported capital goods the one-period

lagged dependent variable is significant at the 1 percent level. The lagged dependent variables in the imports of consumer and intermediate goods equations are also statistically significant at the 5 percent and the 10 percent levels. The estimated coefficients of the own-lagged variables are positive and less than unity in all cases. The dummy variable D67 indicates a positive impact of partial liberalization policies introduced in 1967 on the real imports of intermediate and capital goods, thus marking a certain degree of success in achieving their objectives. The oil price hike of 1973 has positively affected the real imports of both consumer and intermediate goods. The liberalization policies introduced in 1977 have also generated positive effects on the real imports of consumer and capital goods.

Although we estimated export and import demand equations for merchandise exports and imports in real terms the equations for services and transfer accounts of the balance of payments are estimated only in nominal terms due to absence of appropriate price indices to deflate nominal values. However, the real total merchndise exports is verified to influence current nominal services exports positively. Both the real GDP and real total merchandise imports are found to impact positively on the current nominal services imports. The one-period lagged dependent variables in both equations have positive and significant (at the 1 percent level) coefficients close to unity. There has been a positive impact of economic

liberalization in 1977 on the level of services exports on average. The net private and official transfer payments have also been affected favourably by the liberalization policies of 1977. According to our estimates an increase of one million rupees in the last period's net receipt of transfer payments will generate an increase of 0.96 million rupees in the current year in nominal terms.

MONETARY SECTOR

The estimated equations of the linear disequilibrium formulations of both the demands for real narrow money and the real time and svings deposits performed quite satisfactorily. All the explanatory variables have expected a' priori signs. The adjusted coefficients of determination are 0.93 and 0.99 respectively. All the explanatory variables of the demand for real narrow money equation are statistically significant at the 2 percent level or better. According to our estimates an increase of one million rupees in real national income brings about only a 0.04 million increase in the demand for real narrow money. A unit change in the rate of inflation generates an increase of 0.41 million rupees in the demand for real narrow money. If the demand for real narrow money has increased by one million rupees in the previous period, the current year's demand would increase by 0.72 million.

Except the real national income variable which has an estimated coefficient which is significant at the 5 percent

level, the estimated coefficients of all the variables in the equation of the demand for quasi money (the time and savings deposits held by public in commercial banks) are statistically significant at the 1 percent level. The estimated coefficient of real national income variable is even smaller in the case of time and savings deposits compared to that of the narrow money equation. Rate of interest has a positive influence on the demand for quasi money while the rate of inflation has a negative influence; these signs are as expected. The one-period lagged level of demand has a positive effect on the current demand for real quasi money. The package of new economic policies adopted in 1977 has been responsible for an upward shift of the demand for real quasi money as verified by the positive coefficient of D77.

PRICES

Seven price equations were estimated. The estimated coefficients of the explanatory variables in all of these equations are significant at the 1 percent level. The adjusted R^{-2} are all greater than 0.97. the F statistics of the regressions are also significant at the 5 percent level. The one-period lagged dependent variables which are included in the equations for P (general price level), CPID (consumer price index for domestic goods and services), and CPIM (consumer price index for imports), have positive estimated coefficients which are smaller than unity. This implies that these prices tend to stabilize in the long-run.

THE ESTIMATED MODEL

PRODUCTION SECTOR

1.1 Value added in agriculture, forestry and fishing

$$VAFF = \underset{(37.753)}{\underset{[2.1271]}{80.305^{a}}} + \underset{(9.2169)}{\underset{[0.019185]}{0.17682^{a}}}\,(COND/CPID) + \underset{(4.3179)}{\underset{[0.10016]}{0.43248^{a}}}\,(CONCG/CPI)$$

$$+ \underset{(4.6025)}{\underset{[1.8553]}{8.5392^{a}}}\,D67 - \underset{(-5.2221)}{\underset{[2.6282]}{13.725^{a}}}\,D73 + \underset{(2.4233)}{\underset{[2.9673]}{7.1904^{a}}}\,D77 \qquad (1)$$

Estimator Used=MLE

R^2=0.9888 R^{-2}=0.9863 $F_{(5,22)}$= 388.5265
D.W.=1.7704 N=28 DF=22

1.2 value added in mining and quarrying

$$VAMQ = \underset{(-8.3351)}{\underset{[43.535]}{-\,362.87^{a}}} + \underset{(8.7375)}{\underset{[0.30194]}{2.6382^{a}}}\,(COND/CPID) + \underset{(3.8316)}{\underset{[3.6272]}{13.898^{a}}}\,(FICG/P) \qquad (2)$$

Estimator Used=OLS
R^2=0.9721 R^{-2}=0.9698 $F_{(2,25)}$=435.191
D.W.=1.6417 N=28 DF=25

1.3 Value added in manufacturing

$$VAM = \underset{(1.1066)}{\underset{[7.5235]}{8.3251}} + \underset{(2.6891)}{\underset{[0.031752]}{0.085386^{b}}}\,(COND/CPID) + \underset{(3.3572)}{\underset{[0.16285]}{0.54674^{a}}}\,(CONCG/CPI)$$

$$+ \underset{(2.4913)}{\underset{[0.085734]}{0.21359^{c}}}\,(VX/PX) + \underset{(5.9847)}{\underset{[3.1791]}{19.026^{a}}}\,D67 \qquad (3)$$

$$- \underset{(-1.7240)}{\underset{[4.3624]}{7.5207^{d}}}\,D73 - \underset{(-2.1195)}{\underset{[4.0441]}{8.5715^{c}}}\,D77$$

Estimator Used=MLE
R^2=0.9823 R^{-2}=0.9772 $F_{(6,21)}$= 194.2532
D.W.=1.7347 N=28 DF=21

1.4 Value added in construction

$$VAC = \underset{[0.92359]\ (14.648)}{13.529^{a}} + \underset{[0.013846]\ (8.3763)}{0.11598^{a}}\ (FIP/P) + \underset{[0.061992]\ (3.1955)}{0.19810^{a}}\ (FICG/P) + \underset{[1.0773]\ (11.145)}{12.006^{a}}\ D67 \qquad (4)$$

Estimator Used=OLS
R^2=0.9792 R^{-2}=0.9766 $F_{(3,24)}$=376.078
D.W.=1.6389 N=28 DF=24

1.5 Value added in services

$$VAS = \underset{[9.7044]\ (1.5647)}{15.184^{e}} + \underset{[0.034269]\ (13.463)}{0.46138^{a}}\ (COND/CPID) + \underset{[0.20985]\ (3.2103)}{0.67369^{a}}\ (CONCG/CPI) + \underset{[0.11272]\ (2.8635)}{0.32277^{a}}\ (VX/PX) + \underset{[3.6507]\ (2.6578)}{9.7028^{b}}\ D67 - \underset{[5.1946]\ (-5.1512)}{26.758^{a}}\ D73 \qquad (5)$$

Estimator Used=OLS
R^2=0.9971 R^{-2}=0.9964 $F_{(5,22)}$=1513.009
D.W.=2.1885 N=28 DF=22

CONSUMPTION SECTOR

2.1 Consumption of domestically produced goods and services

$$COND/CPID = \underset{[8.5528]\ (0.56732)}{4.8521} + \underset{[0.081971]\ (10.196)}{0.83581^{a}}\ (COND/CPID)_{-1} + \underset{[0.083271]\ (2.8999)}{0.24148^{a}}\ ((GNP-TD)/P) - \underset{[0.091605]\ (-2.7600)}{0.25283^{b}}\ ((GNP-TD)/P)_{-1} - \underset{[0.26394]\ (-7.8947)}{2.0837^{a}}\ (IRT-RI) + \underset{[0.094842]\ (3.5868)}{0.34018^{a}}\ (MS2/P) + \underset{[6.7411]\ (1.8405)}{12.407^{d}}\ D73 \qquad (6)$$

Estimator Used = MLE
R^2=0.9981 R^{-2}=0.9975 $F_{(6,21)}$= 1840.1548
D.W.=2.0838 D.H.= - 0.246066 N=28 DF=21

2.2 Consumption of imported goods and services

$$CONM/CPIM = -30.257^{a} + 0.33889^{a}\ (CONM/CPIM)_{-1} + 0.085362^{a}\ ((GNP-TD)/P) + 0.17995^{a}\ (VX/PM)_{-1} + 21.982^{a}\ D73 + 21.064^{a}\ D77 \quad (7)$$

	[9.4241]	[0.10798]		
(-3.2107)	(3.1384)			
	[0.020366]		[0.032814]	
	(4.1914)		(5.4839)	
[4.2839]		[6.3513]		
(5.1312)		(3.3164)		

Estimator Used = MLE
R^2=0.9775 R^{-2}=0.9723 $F_{(5,22)}$= 191.16065
D.W.=1.9589 D.H.= 0.1324988 N=28 DF=22

2.3 Consumption of Central Government

$$CONCG/CPI = 9.5392^{a} + 0.18541^{a}\ (CGR/P) + 0.11140^{c}\ (CGR/P)_{-1} + 0.00073792^{a}\ (CDDEB+CXDEB) - 5.8442^{d}\ D77 \quad (8)$$

[2.7106]	[0.046125]		[0.048108]	
(3.5192)	(4.0197)		(2.3156)	
	[0.00015526]		[2.9605]	
	(4.7527)		(-1.9741)	

Estimator Used=OLS
R^2=0.9700 R^{-2}=0.9647 $F_{(4,23)}$ = 185.645
D.W.=2.1049 N=28 DF=23

2.4 Consumption of Local Governments

$$CONLG/CPI = -0.021169 + 0.83181^{a}\ (CONLG/CPI)_{-1} - 0.018612^{a}\ (CGR/P)_{-1} + 0.020889^{a}\ (MS2/P) \quad (9)$$

[0.25112]	[0.099339]		
(-0.084298)	(8.3735)		
	[0.0065221]		[0.004515]
	(-2.8537)		(4.6266)

Estimator Used = OLS
R^2=0.9472 R^{-2}=0.9406 $F_{(3,24)}$ = 143.473
D.W.=2.1265 D.H.= ? N=28 DF=24

INVESTMENT SECTOR

3.1 Fixed investment of Central Government

$$FICG/P = 8.1028^{a} + 0.056829^{a}\ ((GDP/P)-(GDP/P)_{-1})$$
$$[1.1389] \quad [0.013264]$$
$$(7.1148) \quad (4.2844)$$

$$+ 0.13736^{a}\ ((FIP/P)-(FIP/P)_{-1})$$
$$[0.036712]$$
$$(3.7417)$$

$$+ 0.11248^{a}\ ((MS2/P)-(MS2/P)_{-1})$$
$$[0.030980]$$
$$(3.6308)$$

$$+ 0.0010334^{a}\ CXDEB - 0.0013017^{a}\ CDDEB \qquad (10)$$
$$[0.00009366] \quad [0.0001793]$$
$$(11.033) \quad (-7.2600)$$

$$+ 0.35684^{a}\ (FICG/P)_{-1} + 6.0309^{a}\ D73 + 6.2685^{a}\ D77$$
$$[0.075907] \quad [0.68803] \quad [1.4443]$$
$$(4.7010) \quad (8.7655) \quad (4.3403)$$

Estimator Used = MLE

R^2=0.9855 R^{-2}=0.9795 $F_{(8,19)}$ = 161.43034

D.W.=2.6057 D.H.= - 1.7498915 N=28 DF=19

3.2 Fixed investment of private sector

$$FIP/P = 4.2332^{e} + 0.22390^{a}\ ((GDP/P)-(GDP/P)_{-1})$$
$$[2.8163] \quad [0.048764]$$
$$(1.5031) \quad (4.5914)$$

$$- 0.87410^{a}\ ((FICG/P)-(FICG/P)_{-1})$$
$$[0.27483]$$
$$(-3.1805)$$

$$+ 0.28814^{a}\ ((VMK/PMK)-(VMK/PMK)_{-1})$$
$$[0.074389]$$
$$(3.8735)$$

$$+ 0.33784^{b}\ ((MS2/P)-(MS2/P)_{-1})$$
$$[0.12934]$$
$$(2.6120)$$

$$+ 0.83592^{a}\ (FIP/P)_{-1} + 16.158^{c}\ D77 \qquad (11)$$
$$[0.049695] \quad [7.1145]$$
$$(16.821) \quad (2.2711)$$

Estimator Used = MLE

R^2=0.9868 R^{-2}=0.9831 $F_{(6,21)}$ = 261.68114

D.W.=2.0934 D.H.= - 0.2561268 N=28 DF=21

3.3 Inventory investment of Central Government

$$
\begin{aligned}
IICG/P = &- 0.11311 - 0.10728^{a}\ ((CGR-CGE)/P) \\
&\quad [1.6193] \quad [0.026946] \\
&\quad (-0.069854) \quad (-3.9815) \\
&- 0.42087^{a}\ (IICG/P)_{-1} - 0.35689^{a}\ (IICG/P)_{-2} \\
&\quad [0.10424] \quad [0.10551] \\
&\quad (-4.0376) \quad (-3.3827) \\
&+ 8.9794^{a}\ D73 - 18.092^{a}\ D77 \qquad (12) \\
&\quad [1.9231] \quad [2.5401] \\
&\quad (4.6692) \quad (-7.1227)
\end{aligned}
$$

Estimator Used = MLE
R^2=0.7233 R^{-2}=0.6604 $F_{(5,22)}$ = 11.501765
D.W.=1.9071 D.H.=0.2946704 N=28 DF=22

3.4 Inventory investment of private sector

$$
\begin{aligned}
IIP/P = &- 0.25658 + 0.041984^{a}\ ((GDP/P)-(GDP/P)_{-1}) \\
&\quad [0.28044] \quad [0.0082892] \\
&\quad (-0.91490) \quad (5.0649) \\
&+ 0.33392^{a}\ (IIP/P)_{-1} \qquad (13) \\
&\quad [0.11975] \\
&\quad (2.7884)
\end{aligned}
$$

Estimator Used = MLE
R^2=0.5393 R^{-2}=0.5025 $F_{(2,25)}$ = 14.632624
D.W.=2.1353 D.H.= - 0.4627239 N=28 DF=21

GOVERNMENT REVENUE, OTHER EXPENDITURES AND DEBT

4.1 Business turnover tax revenue

$$
\begin{aligned}
BTT = &- 287.59^{e} + 0.025856^{a}\ GDP + 0.55891^{a}\ BTT_{-1} \qquad (14) \\
&\quad [176.45] \quad [0.0055521] \quad [0.11666] \\
&\quad (-1.6299) \quad (4.6570) \quad (4.7909)
\end{aligned}
$$

Estimator Used = MLE
R^2=0.9890 R^{-2}=0.9881 $F_{(2,25)}$ = 1123.8636
D.W.=1.8608 D.H.= 0.4681295 N=28 DF=25

4.2 Selective sales tax revenue

$$SST = 71.530 + 0.023919^{a}\ GDP \qquad (15)$$
[114.27] [0.0013267]
(0.62599) (18.029)

Estimator Used = OLS
R^2=0.9259 R^{-2}=0.9231 $F_{(1,26)}$ = 325.051
D.W.=1.8332 N=28 DF=26

4.3 Import tax revenue

$$MT = -6.7916 + 0.15794^{a}\ VM \qquad (16)$$
[779.73] [0.021704]
(-0.00871) (7.2767)

Estimator Used = MLE
R^2=0.9554 R^{-2}=0.9537 $F_{(1,26)}$ = 556.98711
D.W.=1.5688 N=28 DF=26

4.4 Export tax revenue

$$XT = 1625.3^{a} + 0.062322^{d}\ VX - 278.94^{a}\ ER$$
[258.36] [0.030818] [56.967]
(6.2906) (2.0223) (-4.8965)

$$+ 774.34^{a}\ D73 + 5051.3^{a}\ D77 \qquad (17)$$
[163.99] [314.05]
(4.7218) (16.085)

Estimator Used = OLS
R^2=0.9683 R^{-2}=0.9627 $F_{(4,23)}$ =175.425
D.W.=1.7305 N=28 DF=23

4.5 Other indirect tax revenue

$$TIDO = 88.731 + 0.0057689^{a}\ GDP + 0.56134^{a}\ TIDO_{-1}$$
[76.566] [0.0010737] [0.15530]
(1.1589) (5.3731) (3.6145)

$$+ 253.77^{d}\ D67 - 800.20^{a}\ D77 \qquad (18)$$
[137.03] [157.24]
(1.8519) (-5.0890)

Estimator Used=OLS
R^2=0.8152 R^{-2}=0.7831 $F_{(4,23)}$ =25.369
D.W.=1.9095 D.H.=0.310311 N=28 DF=23

4.6 Direct tax revenue

$$TD = 36.067 + 0.029096^{a}\ GNP \qquad (19)$$
$$[111.21] \quad [0.0014212]$$
$$(0.32431) \quad (20.472)$$

Estimator Used = MLE
R^2=0.9648 R^{-2}=0.9635 $F_{(1,26)}$ = 712.66065
D.W=1.6126 N=28 DF=26

4.7 Non-tax revenue

$$NTR = -151.42^{e} + 0.11737^{a}\ CGE + 0.42687^{a}\ NTR_{-1}$$
$$[104.88] \quad [0.021968] \quad [0.12021]$$
$$(-1.4437) \quad (5.3429) \quad (3.5509)$$

$$-1574.6^{a}\ D77 \qquad (20)$$
$$[470.16]$$
$$(-3.3491)$$

Estimator Used = OLS
R^2=0.9822 R^{-2}=0.9800 $F_{(3,24)}$ = 441.216
D.W.= 1.7143 D.H.= 0.9796228 N=28 DF=24

4.8 Other recurrent expenditure

$$CGOCE = -96.645 + 0.13141^{a}\ GDP - 0.053092^{b}\ (DDEB+XDEB)$$
$$[184.36] \quad [0.01773] \quad [0.020498]$$
$$(-0.52421) \quad (7.4117) \quad (-2.5902)$$

$$+1434.4^{b}\ D77 \qquad (21)$$
$$[542.77]$$
$$(2.6428)$$

Estimator Used = OLS
R^2=0.9916 R^{-2}=0.9905 $F_{(3,24)}$ = 940.501
D.W.=1.6846 N=28 DF=24

4.9 Other capital expenditure

$$CGOKE = -787.91^{a} + 0.093734^{a}\ GDP - 871.87^{b}\ D73 \qquad (22)$$
$$[177.06] \quad [0.0026422] \quad [345.10]$$
$$(-4.4501) \quad (35.475) \quad (-2.5264)$$

Estimator Used = OLS
R^2=0.9889 R^{-2}=0.9880 $F_{(2,25)}$ = 1110.310
D.W=2.0129 N=28 DF=25

4.10 Change in government domestic debt

$$CDDEB = \underset{[564.16]\ (0.32412)}{182.86} - \underset{[0.096755]\ (-8.8199)}{0.85337^{a}}\ BS - \underset{[0.095174]\ (-5.1260)}{0.48786^{a}}\ CDDEB_{-1} - \underset{[1420.0]\ (-2.5989)}{3690.6^{b}}\ D77 \qquad (23)$$

Estimator Used = MLE

$R^2=0.8762$ $R^{-2}=0.8607$ $F_{(3,24)} = 56.620708$

D.W.=2.0228 D.H.= -0.6982404 N=28 DF=24

4.11 Change in government external debt

$$CXDEB = \underset{[299.41]\ (-0.29073)}{-\ 87.048} + \underset{[0.11465]\ (9.0617)}{1.0389^{a}}\ CXDEB_{-1} - \underset{[0.071839]\ (-3.5626)}{0.25593^{a}}\ TSB + \underset{[666.14]\ (1.6793)}{1118.7^{e}}\ D73 - \underset{[1150.0]\ (-3.3207)}{3818.9^{a}}\ D77 \qquad (24)$$

Estimator Used = MLE

$R^2=0.9293$ $R^{-2}=0.9171$ $F_{(4,23)} =75.579882$

D.W.= 2.2490 D.H.= -0.8287176 N=28 DF= 23

5.0 BALANCE OF PAYMENTS

5.1 Exports of tea

$$\ln VXT/PXT = \underset{[1.2771]\ (0.81058)}{1.0352} - \underset{[0.083201]\ (-4.5295)}{0.37686^{a}}\ \ln PXT - \underset{[0.31649]\ (-3.7856)}{1.1981^{a}}\ \ln WPDC - \underset{[0.064712]\ (-5.5172)}{0.35703^{a}}\ \ln WPLC + \underset{[0.32877]\ (4.9583)}{1.6302^{a}}\ \ln YIDC + \underset{[0.14545]\ (10.914)}{1.5875^{a}}\ \ln ER - \underset{[0.075466]\ (-5.3227)}{0.40169^{a}}\ D67 + \underset{[0.10138]\ (3.7261)}{0.37776^{a}}\ D73 \qquad (25)$$

Estimator Used=MLE

$R^2=0.7919$ $R^{-2}=0.7191$ $F_{(7,20)}=10.8725$

D.W.=2.1000 N=28 DF=20

5.2 Exports of rubber

$$\begin{aligned}\text{Ln VXR/PXR} = {} & 0.34076 - 0.042984\ \text{Ln PXR} - 1.0165^{b}\ \text{Ln WPW} \\ & [1.0455] \quad [0.23357] \quad [0.36626] \\ & (0.32595) \quad (-0.18403) \quad (-2.7754) \\ & + 1.4945^{a}\ \text{Ln YIW} + 0.49670^{a}\ \text{D73} + 0.45008^{b}\ \text{D77} \\ & [0.38212] \quad [0.11450] \quad [0.17211] \\ & (3.911) \quad (4.3380) \quad (2.6151)\end{aligned} \tag{26}$$

Estimator Used=OLS

R^2=0.7783 R^{-2}=0.7279 $F_{(5,22)}$ = 15.444

D.W.=1.7434 N=28 DF=22

5.3 Exports of coconut products

$$\begin{aligned}\text{Ln VXC/PXC} = {} & 12.078^{a} - 0.70871^{a}\ \text{Ln PXC} - 2.0917^{c}\ \text{Ln WPDC} \\ & [2.3830] \quad [0.20664] \quad [0.89194] \\ & (5.0684) \quad (-3.4296) \quad (-2.3451) \\ & + 0.39002^{c}\ \text{Ln WPLC} - 0.72806^{e}\ \text{Ln YILC} \\ & [0.16611] \quad [0.43755] \\ & (2.3479) \quad (-1.6640) \\ & + 1.4230^{b}\ \text{Ln ER} + 0.65688^{d}\ \text{D73} \\ & [0.53772] \quad [0.32828] \\ & (2.6464) \quad (2.0010)\end{aligned} \tag{27}$$

Estimator Used=OLS

R^2=0.8185 R^{-2}=0.7666 $F_{(6,21)}$ = 15.783

D.W.=1.9590 N=28 DF=21

5.4 Other exports

$$\begin{aligned}\text{Ln (VXO/PXO)} = {} & 2.2028 - 0.57907^{a}\ \text{Ln PXO} + 0.35426^{a}\ \text{Ln WPLC} \\ & [2.7799] \quad [0.071756] \quad [0.087786] \\ & (0.79241) \quad (-8.0699) \quad (4.0354) \\ & + 1.6587^{a}\ \text{Ln WPDC} + 1.8903^{d}\ \text{Ln YILC} \\ & [0.54166] \quad [1.0639] \\ & (3.0622) \quad (1.7767) \\ & - 2.8799^{c}\ \text{Ln YIDC} \\ & [1.2842] \\ & (-2.2426)\end{aligned} \tag{28}$$

Esimator Used=OLS

R^2=0.9590 R^{-2}=0.9497 $F_{(5,22)}$=103.028

D.W.= 1.8706 N=28 DF=22

5.5 Consumer goods imports

$$\begin{aligned}\text{Ln VMC/PMC} = {} & 3.9038^{a} - 0.56776^{a}\ \text{Ln PMC} + 0.31722^{a}\ \text{Ln CPIX} \\ & [1.1327] \quad [0.11794] \quad [0.079722] \\ & (3.4463) \quad (-4.8138) \quad (3.9791) \\ & + 1.0325^{a}\ \text{Ln (GDP/P)} - 1.0501^{c}\ \text{Ln (GDP/P)}_{-1} \\ & [0.34672] \quad [0.41909] \\ & (2.9779) \quad (-2.5057) \\ & + 0.22459^{c}\ \text{Ln (VMC/PMC)}_{-1} + 0.14423^{e}\ \text{D73} \\ & [0.092962] \quad [0.088878] \\ & (2.4159) \quad (1.6228) \\ & + 0.57014^{a}\ \text{D77} \\ & [0.10989] \\ & (5.1883)\end{aligned} \tag{29}$$

Estimator Used=MLE

R^2=0.9092 R^{-2}=0.8774 $F_{(7,20)}$= 28.6092

D.W.=2.2145 N=28 DF=

5.6 Imports of intermediate goods

$$\begin{aligned}\text{Ln VMI/PMI} = {} & 6.8603^{a} - 0.21168^{b}\ \text{Ln PMI} + 1.2135^{a}\ \text{Ln CPI} \\ & [1.5523] \quad [0.083094] \quad [0.28443] \\ & (4.4194) \quad (-2.5475) \quad (4.2664) \\ & - 1.2662^{a}\ \text{Ln (GDP/P)\_1} + 0.24827^{d}\ \text{Ln (VMI/PMI)}_{-1} \\ & [0.33530] \quad [0.14116] \\ & (-3.7762) \quad (1.7589) \\ & + 0.18075^{d}\ \text{D67} + 0.33458^{a}\ \text{D73} \\ & [0.10512] \quad [0.11767] \\ & (1.7195) \quad (2.8433)\end{aligned} \tag{30}$$

Estimator Used=MLE

R^2=0.7331 R^{-2}=0.6568 $F_{(5,22)}$ = 12.0855

D.W.=1.4088 N=28 DF=22

5.7 Imports of capital goods

$$\begin{aligned}\text{Ln VMK/PMK} = {} & 2.5189^{a} - 1.1461^{a}\ \text{Ln PMK} + 0.76686^{a}\ \text{Ln P} \\ & [0.53292]\quad [0.21995]\qquad [0.24645] \\ & (4.7266)\quad (-5.2106)\qquad (3.1116) \\ & + 0.31726^{a}\ \text{Ln (VMK/PMK)}_{-1} + 0.32517^{c}\ \text{D67} \\ & [0.10868]\qquad\qquad [0.15557] \\ & (2.9193)\qquad\qquad (2.0902) \\ & + 1.7909^{a}\ \text{D77} \\ & [0.27185] \\ & (6.5879)\end{aligned} \tag{31}$$

Estimator Used=OLS

R^2=0.9140 R^{-2}=0.8944 $F_{(5,22)}$ = 46.756

D.W.=1.8127 N=28 DF=22

5.8 Services exports

$$\begin{aligned}\text{SEX} = {} & -927.91^{d} + 0.87399^{a}\ \text{SEX}_{-1} + 7.2321^{d}\ \text{(VX/PX)} \\ & [505.34]\quad [0.044940]\qquad [3.7404] \\ & (-1.8362)\quad (19.448)\qquad (1.9335) \\ & + 1236.8^{a}\ \text{D77} \\ & [132.61] \\ & (9.3270)\end{aligned} \tag{32}$$

Estimator Used=MLE

R^2=0.9963 R^{-2}=0.9959 $F_{(3,24)}$= 2155.094

D.W.=2.355 N=28 DF=24

5.9 Services imports

$$\begin{aligned}\text{SIM} = {} & -2971.0^{a} + 3.7821^{a}\ \text{(GDP/P)} + 5.5309^{a}\ \text{(VM/PM)} \\ & [282.38]\quad [0.28123]\qquad [0.68956] \\ & (-10.521)\quad (13.448)\qquad (8.0209) \\ & + 0.89135^{a}\ \text{SIM}_{-1} \\ & [0.022010] \\ & (40.497)\end{aligned} \tag{33}$$

Estimator Used=MLE

R^2=0.9976 R^{-2}=0.9973 $F_{(3,24)}$=3325.333

D.W.=2.2221 N=28 DF=19

5.10 Net private and official transfer receipts

$$NT = 39.328 + 0.95644^{a}\ NT_{-1} + 1664.1^{a}\ D77 \qquad (34)$$
$$[100.01]\ [0.029145]\ [272.89]$$
$$(0.39326)\ (31.940)\ (6.0982)$$

Estimator Used=OLS
R^2=0.9932 R^{-2}=0.9926 $F_{(2,25)}$=1816.992
D.W.=1.9711 N=28 DF=25

6.0 MONETARY SECTOR

6.1 Demand for narrow money

$$MS1/P = 7.3212 + 0.036626^{b}\ (GNP/P) - 0.40638^{b}\ RI$$
$$[5.9000]\ [0.013874]\ [0.14881]$$
$$(1.2409)\ (2.6398)\ (-2.7309)$$

$$+ 0.71573^{a}\ (MS1/P)_{-1} \qquad (35)$$
$$[0.17544]$$
$$(4.0796)$$

Estimator Used=OLS
R^2=0.9407 R^{-2}=0.9333 $F_{(3,24)}$=126.932
D.W=1.8002 D.H.= 1.4220462 N=28 DF=24

6.2 Demand for time and savings deposits (quasi-money)

$$TSD/P = -11.532^{a} + 0.013231^{c}\ (GNP/P) + 3.4203^{a}\ IRT$$
$$[1.9384]\ [0.0060711]\ [0.35577]$$
$$(-5.9492)\ (2.1793)\ (9.6138)$$

$$- 0.46348^{a}\ RI + 0.68208^{a}\ (TSD/P)_{-1} + 14.150^{a}\ D77 \qquad (36)$$
$$[0.071869]\ [0.025111]\ [1.9485]$$
$$(-6.4490)\ (27.163)\ (7.2619$$

Estimator Used=MLE
R^2=0.9972 R^{-2}=0.9965 $F_{(5,22)}$=1567.9245
D.W.=2.6252 D.H.= -1.6689208 N=28 DF=22

7.0 PRICES

8.1 General price level

$$P = \underset{[0.74494]\ (5.2439)}{3.9064^{a}} + \underset{[0.054959]\ (14.003)}{0.76961\ FC^{a}} + \underset{[0.061566]\ (3.9929)}{0.24583^{a}\ P_{-1}} \qquad (37)$$

Estimator Used=OLS
R^2=0.9988 R^{-2}=0.9987 $F_{(2,25)}$=10202.300
D.W.=1.9632 D.H.= 0.1029815 N=28 DF=25

8.2 Consumer price index

$$\text{Ln CPI} = \underset{[0.030862]\ (2.8176)}{0.12458^{a}} + \underset{[0.024397]\ (19.324)}{0.59637^{a}\ \text{Ln CPID}} + \underset{[0.0094112]\ (12.932)}{0.31550^{a}\ \text{Ln CPIM}}$$

$$+ \underset{[0.0094112]\ (6.8171)}{0.064157^{a}\ \text{Ln CPIX}} \qquad (38)$$

Estimator Used=MLE
R^2=0.9998 R^{-2}=0.9998 $F_{(3,24)}$=40152.602
D.W.=1.4739 N=28 DF=24

8.3 Consumer price index for domestic goods and services

$$\text{CPID} = \underset{[1.3518]\ (3.3522)}{4.5314^{a}} + \underset{[0.041621]\ (7.0544)}{0.29361^{a}\ FC} + \underset{[0.053333]\ (14.142)}{0.75424^{a}\ \text{CPID}_{-1}} \qquad (39)$$

Estimator Used=OLS
R^2=0.9984 R^{-2}=0.9983 $F_{(2,25)}$=7864.142
D.W.=2.2601 D.H.= -0.7173173 N=28 DF=25

8.4 Consumer price index for imports

$$\text{CPIM} = \underset{[1.5929]\ (4.9492)}{7.8836^{a}} + \underset{[0.055042]\ (6.8762)}{0.37848^{a}\ PMC} + \underset{[0.066827]\ (9.3971)}{0.62798^{a}\ \text{CPIM}_{-1}} \qquad (40)$$

EStimator Used=OLS
R^2=0.9946 R^{-2}=0.9941 $F_{(2,25)}$=2289.276
D.W.=2.1996 D.H.= -0.5645677 N=28 DF=25

8.5 Consumer price index for exports

$$CPIX = \underset{[3.4433]\ (3.6958)}{12.725^{a}} + \underset{[0.056809]\ (11.058)}{0.62822^{a}}\ PXT + \underset{[0.071495]\ (3.7875)}{0.27079^{a}}\ PXC \qquad (41)$$

Estimator Used=MLE
R^2=0.9800 R^{-2}=0.9784 $F_{(2,25)}$=612.5
D.W.= 1.4650 N=28 DF=25

8.6 Export price index

$$\begin{aligned} Ln\ PX = {} & \underset{[0.10821]\ (3.9410)}{0.42646^{a}} + \underset{[0.034395]\ (8.9500)}{0.30783^{a}}\ Ln\ PXT + \underset{[0.045824]\ (4.2841)}{0.19631^{a}}\ Ln\ PXR \\ & + \underset{[0.032708]\ (4.1085)}{0.13438^{a}}\ Ln\ PXC + \underset{[0.025519]\ (10.314}{0.26320^{a}}\ Ln\ PXO \end{aligned} \qquad (42)$$

Estimator Used=MLE
R^2=0.9987 R^{-2}=0.9984 $F_{(4,23)}$=3591.3669
D.W.= 2.0452 N=28 DF=23

8.7 Import price index

$$\begin{aligned} Ln\ PM = {} & 0.11138 + \underset{[0.072551]\ (6.1882)}{0.44896^{a}}\ Ln\ PMC + \underset{[0.060702]\ (4.4832)}{0.27214^{a}}\ Ln\ PMI \\ & + \underset{[0.057773]\ (4.1968)}{0.24246^{a}}\ Ln\ PMK \end{aligned} \qquad (43)$$

Estimator used=MLE
R^2=0.9981 R^{-2}=0.9978 $F_{(3,24)}$=302.3636
D.W.= 1.7842 N=28 DF=24

Identities

$$GDPF=(VAFF + VAMQ + VAM + VAC + VAS)(FC) \qquad (44)$$

$$RI=((P-P_{-1})/P_{-1})*100 \qquad (45)$$

$$C= COND+CONM+CONCG+CONLG \qquad (46)$$

$$I= FICG+FIP+IICG+IIP \qquad (47)$$

$$TID=BTT+SST+XT+MT+TIDO \qquad (48)$$

CGR=TID+TD+NTR (49)

CGE=CONCG+FICG+CGOCE+CGOKE+CGEO* (50)

BS=CGR-CGE (51)

DDEB=DDEB$_{-1}$+CDDEB (52)

XDEB=XDEB$_{-1}$+CXDEB (53)

VX=VXT+VXR+VXC+VXO (54)

VM= VMC+VMI+VMK+VMO* (55)

TSB = (VX-VM)+(SEX-SIM) (56)

CA=TSB+NT (57)

MS2= MS1+TSD (58)

GNP=C+I+CA-NRIGT (59)

GDP=GNP-NFI+SDgdp (60)

CHAPTER 5

VALIDATION OF THE MODEL

An econometric model of Sri Lanka was developed in Chapter 3. In chapter 4, the estimated equations of the model were reported. The estimated structure was judged by the usual criteria of goodness of fit, the expected signs and sizes of the estimated coefficients, and their statistical significance. In some equations the presence of serially correlated disturbances was detected when the D-W test or the Durbin H-test was used. In such cases, the equations were reestimated using the maximum likelihood estimator proposed by Beach and McKinnon (1978). In this chapter we examine the reliability of the estimated structure of the model. This is achieved by performing simulation experiments and test how well the estimated structure tracked the historical time-paths of the endogenous variables in the model.

One of the important purposes of an economy-wide macroeconometric model is to explain the behavior of the endogenous variables. This is achieved by solving the estimated structure of the model for the values of the endogenous variables given the values of the predetermined variables. Such an exercise is called simulation, which is simply the mathematical solution of a system of algebraic difference equations. It is quite possible that individual estimated equations satisfy all the statistical criteria of

goodness of fit, and yet could perform badly when combined with the rest of the equations in the model in tracking the behavior of the endogenous variables. The overall simultaneous solution of the structure provides a means of testing the reliability of the model in duplicating the economy. Thus, the acid test of a structural model is: How well does it track the time-paths of the endogenous variables conditional on the values of the predetermined variables? The simulation experiments which are conducted in this study are aimed at assessing the ability of our model to track the historical time-paths of the endogenous variables (within-sample tracking performance) and its ability to forecast the values of the endogenous variabes beyond the sample period used for estimation (post-sample tracking performnce).

A number of methods have been developed for solving simultaneous equations. Among them, the Gauss, the Gauss-Seidle, the Newton, and the Newton-Raphson algorithms have gained popularity. The Newton and the Newton-Raphson algorithms were devised primarily for solving nonlinear systems of eqautions while the Gauss and the Gauss-Seidle algorithms were meant primarily for solving large linear systems of equations. In our study, we chose a modified version of the Newton-Raphson algorithm by Powell; this is called the hybrid method. This algorithm is chosen because it does not require the computation of the nonlinear Jacobian matrix of the system of equations in order for the solutions

to converge. In addition, this method does not require that the initial values of the endogenous variables to be specified to start the iterative process be close to the solution values to ensure rapid convergence to the final solution. The specific subroutine of the hybrid method used in this study is the sub-routine CO5NBF found in the Numerical Algorithm Groupings Library (NAGLIB). For a detailed information on this programme, the reader may refer to the CO5NBF-NAG Fortran Library Routine Document ((1983), pp. 1-18).

Using the hybrid method mentioned above, we performed both the static and dynamic simulation experiments in order to assess the within-sample and post-sample tracking performance of the model. The experiments were carried out for the entire sample period from 1962 to 1987. Note that for purposes of estimating the model, we used the annual time series data covering the period 1962 to 1987. As discussed in Chapter 3, three over-lapping subperiods were distinguished. The first subperiod started in 1968, the year in which the Sri Lankan currency was devalued for the time after attaining independence in 1948. Thus this subperiod spans from 1968 to 1990. The second subperiod was the post-oil-price-escalation period which started in 1974. Thus this subperiod spans from 1974 to 1990. The third subperiod was marked by the beginning of the post-liberalization era which started in 1978 and spans the period from 1978 to 1990. The results of simulation experiments carried out in this study covered the entire sample period

from 1962 to 1987, and the three subperiods mentioned above. It is clear that the static simulations do not differ between the main period and the subperiods as the actual observed values of the predetermined variables were used in simulating the current values of the endogenous variables. The dynamic simulations differ between the main period and the subperiods as they depended on the starting values of the predetermined variables which were determined by the year in which the period commenced.

For purposes of measuring the accuracy of the static and dynamic simulations in tracking the historical path, three measures were used: mean absolute percent error (MAPE), the root mean squared percent error (RMSPE), and the Theil's U-statistic. These statistics are defined below.

$$MAPE = (1/T) \sum [Abs(Y^s - Y^a)/Y^a)] \times 100$$

$$RMSPE = SQRT\{(1/T) \sum ([(Y^s - Y^a)/Y^a)]^2)\} \times 100$$

$$U = SQRT[\sum (Y^s - Y^a)^2 / \sum (Y^a)^2]$$

where

T= the number of observations

Y^s= the simulated value of the endogeneous variable

Y^a= the actual value of the endogeneous variable. These are three of the most widely used measures for the evaluation of forecast accuracy of the estimated macromodels.

The model developed and estimated in this study consists of 60 endogenous variabels, 35 lagged endogenous variables and 26 exogenous variables. There are 10 nonlinear equations

in the model which make the reduced form of the model difficult to obtain in explicit form, which in turn, makes forecasting difficult. In addition, as Goldberger (1959) pointed out, reduced form estimates of a model are valid in a small neighbourhood around the point where the partial derivatives are computed if the model contains nonlinear equations. Since our model contains nonlinear equations we have resorted to the simultaneous solution of the estimated structure of the model using the hybrid method mentioned above for purposes of generating the within-sample and post-sample prdictions.

Results of both the static and dynamic simulations are displayed in Table 5.1 covering the post-liberalization period for all the 60 endogenous variables, the behaviour of which were explained in the model. The three summary statistics, namely, the MAPE, RMSPE, and the Theils' U-statistic are displayed in Table 5.2. The post-liberalization era was chosen for purposes of displaying the simulation results because it is this period that is of paramount importance as Sri Lanka had entered a new era of modernization in 1978. In additon, the earlier period is of little relevance, if any, as the structural evolution of the Sri Lankan economy is mostly dependent on the measures taken during the liberalization period. However, the complete simulation results for the three over-lapping subperiods and also for the main period are available from the author.

The simulation results for the period 1978 through 1987 are historical forecasts. The simulation results for the years 1988, 1989, and 1990 are post-sample predictions.

An inspection of the entries in the tables indicates that the simulated values were close to the actual values in the case of many variables. The key macroeconomic aggregates that economists use to assess the strength or weekness of an economy are the GDP and its components. The components of GDP are: the aggregate consumption and its components including the consumption of the government sector; investment and its components including the investment of the government sector; the imports and exports which form the external sector. For these key macroeconomic aggregates the simulated values are very close to the actual values indicating that the model tracked extremely accurately the historical trends in these variables. It is important that we highlight the performance of the model in tracking the time-paths of varaibles in both the static and dynamic simulations.

There are instances when the actual and the simulated values differed markedly. This is particularly true of change in Government domestic debt (CDDEB), change in Government external debt (CXDEB), Government inventory investment (IICG), and private inventory investment (IIP). The actual values of all of these variable have displayed large fluctuations over the study period. Although the simulated values of changes in Government debt components have differed markedly from their

actual values, the simulated values of the levels of both the government domestic and external debts track the actual values very closely.

In the case of dynamic simulation 27 out of 60 endogeneous variables have MAPE less than 10 percent. Another 19 variables have MAPE between 10 and 20 percent. The MAPE for another 3 variables falls between 2 and 3 percent. Also, in the case of dynamic simulation 29 endogeneous variables have Theil's U-statistic less than 0.1 while another 17 variables have U-statistic between 0.1 and 0.2. Another 6 variables have their U-statistics ranging between 0.2 and 0.3. Thus only 8 variables have U-statistics greater than 0.3.

Figures 5.1 to 5.10 show graphically the static and dynamic solutions and the actual values of 10 variables for the period 1978-1990. These variables are : the gross domestic product (GDP) at current market prices, consumption, investment, the Central Government expenditure, the Central Government revenue, imports, exports, GDP deflator, Consumer price index and the broad money M2. A high standard of the within-sample (1978-1987) and post-sample (1988-1990) tracking perfomance of the model is clear from those graphs as both the dynamic and static simulated results track the actual time paths of the variables very closely. In the case of dynamic simulation it could be expected that the solutions at the end of the period covered may deviate sharply from the actual values because of the accumulation of forecast errors as we

move away from the initial conditions. However, we did not find such sharp deviations in any of the values of the endogeneous variables reported in the Figures 5.1 t0 5.10. The slight differences between actual and dynamic simulated solutions in the post-sample period in the case of some variables may be attributed to structural shifts in the equations explaining those variables immediately after the end of the estimation period, i.e.,1987.

Table 5.1

Actual, Static and Dynamic Simulated Solutions
(1978-1990)

VARIBLE	YEAR	ACTUAL	STATIC	DYNAMIC
BS	1978	-6000.0000	-5944.5847	-5944.5847
	1979	-7609.0000	-6240.6366	-7731.4556
	1980	-14464.0000	-11265.9563	-12773.2248
	1981	-13258.0000	-12966.0139	-13118.7549
	1982	-17478.0000	-11798.4881	-12473.0281
	1983	-16303.0000	-16670.2197	-17177.6512
	1984	-13632.0000	-16794.6402	-16388.8640
	1985	-18779.0000	-16667.9001	-15277.6885
	1986	-20521.0000	-21622.9619	-22425.3961
	1987	-20904.0000	-24668.6780	-26431.2428
	1988	-33562.0000	-15850.4789	-17529.7536
	1989	-28185.0000	-13763.5488	-17977.5051
	1990	-31850.0000	-22695.4828	-25194.1685
BTT	1978	1143.0000	1410.6439	1410.6439
	1979	1215.0000	1811.3937	2185.6360
	1980	1640.0000	2462.8101	3217.1416
	1981	2829.0000	3245.1538	4239.4131
	1982	4051.0000	4337.6132	5261.1018
	1983	6224.0000	5850.2602	6529.9615
	1984	8144.0000	7228.6515	7377.4886
	1985	10189.0000	8830.3969	8119.4573
	1986	10088.0000	10790.7464	9446.5185
	1987	10611.0000	11379.0816	11087.2586
	1988	12320.0000	11301.3879	11898.3682
	1989	14658.0000	12826.3616	12924.7526
	1990	20291.0000	15523.4767	14755.6925
C	1978	36148.0000	40057.2643	40057.2643
	1979	45169.0000	45417.2709	51029.4849
	1980	59084.0000	57997.6801	63903.5725
	1981	75061.0000	77228.5024	79364.3232
	1982	87468.0000	88848.1976	90605.5465
	1983	104834.0000	108024.2213	109069.3083
	1984	123170.0000	126021.2168	125390.1116
	1985	143102.0000	140762.2143	137009.1974
	1986	157850.0000	160965.1661	158421.2115
	1987	171487.0000	180342.6535	181660.0899
	1988	195306.0000	193207.0021	198820.9439
	1989	221090.0000	214401.0572	223280.7062
	1990	273640.0000	263356.0880	271180.1887

CA	1978	-1032.0000	-1423.4233	-1423.4233
	1979	-3556.0000	-4770.6656	-4880.3763
	1980	-10912.0000	-8484.8335	-8705.9064
	1981	-8498.0000	-10628.7813	-8238.4284
	1982	-11844.0000	-10067.9542	-8400.3247
	1983	-11122.0000	-7653.4888	-6466.4647
	1984	-1400.0000	-9000.4867	-6836.7814
	1985	-11408.0000	-18119.9977	-20046.2077
	1986	-11908.0000	-9031.8332	-15296.4834
	1987	-10537.0000	-8217.9762	-8980.0512
	1988	-12377.0000	-4943.5956	36.4726
	1989	-11069.0000	-13277.1778	-6833.8579
	1990	-9653.0000	-16337.8260	-14854.0029
CDDEB	1978	1975.1000	735.3404	735.3404
	1979	3266.6000	854.2598	2731.3092
	1980	9436.3000	4512.6457	6060.0504
	1981	6448.4000	2953.4740	4730.9557
	1982	9748.2000	3414.8193	4828.3239
	1983	6503.0000	5962.3686	8795.6061
	1984	-118.5000	7651.7486	6187.0004
	1985	10959.7000	10773.9573	6511.3910
	1986	6887.8000	9597.8478	12452.7730
	1987	9498.4000	14183.4876	12972.6798
	1988	20582.8200	5384.6938	5122.7743
	1989	19910.0000	-1803.8749	9334.5268
	1990	17219.0000	6146.6115	13438.2653
CGE	1978	17688.0000	18445.6615	18445.6615
	1979	20339.0000	19881.8743	22548.5741
	1980	28532.0000	28672.9144	31662.4303
	1981	29486.0000	33396.9417	34850.2005
	1982	35287.0000	34809.7888	37096.8636
	1983	41513.0000	44963.5687	46707.8456
	1984	51363.0000	49752.9884	49380.7645
	1985	57789.0000	54814.0948	51821.0410
	1986	62185.0000	63192.3752	62935.2051
	1987	65804.0000	70868.6718	72536.2331
	1988	79237.0000	61866.6873	64823.7681
	1989	84932.0000	66298.5771	71352.5467
	1990	102699.0000	90154.0228	91411.1468

CGOCE	1978	6630.0000	6370.8233	6370.8233
	1979	7024.0000	6894.1071	7984.9658
	1980	7945.0000	9643.2464	10460.5198
	1981	10044.0000	11317.3906	12163.9446
	1982	12636.0000	12709.1544	13794.4817
	1983	15238.0000	16074.9648	16385.7738
	1984	18367.0000	15496.2416	16159.7566
	1985	18703.0000	17678.7178	16264.0023
	1986	17919.0000	20346.4940	19049.8719
	1987	20288.0000	21777.0819	21523.7311
	1988	25959.0000	18328.1435	19189.6865
	1989	32978.0000	20269.5251	19853.7724
	1990	42894.0000	23335.8347	23417.2860
CGOKE	1978	2372.0000	3056.0993	3056.0993
	1979	4000.0000	3633.6010	4448.0219
	1980	7335.0000	5849.2519	6617.1969
	1981	7639.0000	7824.3035	8233.1536
	1982	11191.0000	9375.5962	9865.7081
	1983	10468.0000	12383.3023	12395.4950
	1984	12446.0000	12977.4049	12897.0416
	1985	15865.0000	14893.8411	13869.6090
	1986	17949.0000	17857.0281	17177.1527
	1987	17798.0000	20194.5236	20436.3536
	1988	26767.0000	18853.1748	20052.3820
	1989	22671.0000	20918.8193	22129.8107
	1990	27356.0000	25959.2820	26687.7548
CGR	1978	11688.0000	12501.0769	12501.0769
	1979	12730.0000	13641.2377	14817.1185
	1980	14068.0000	17406.9581	18889.2055
	1981	16228.0000	20430.9278	21731.4455
	1982	17809.0000	23011.3007	24623.8356
	1983	25210.0000	28293.3490	29530.1944
	1984	37731.0000	32958.3482	32991.9005
	1985	39010.0000	38146.1947	36543.3525
	1986	41664.0000	41569.4133	40509.8090
	1987	44900.0000	46199.9938	46104.9904
	1988	45675.0000	46016.2083	47294.0144
	1989	56747.0000	52535.0283	53375.0416
	1990	70849.0000	67458.5400	66216.9783

CONCG	1978	3778.0000	3591.9440	3591.9440
	1979	4478.0000	4533.3302	4848.1382
	1980	5304.0000	5616.8616	6412.6990
	1981	5961.0000	7031.1698	7667.0259
	1982	7474.0000	7840.4337	8687.7706
	1983	8725.0000	9203.6516	10700.6354
	1984	10559.0000	12001.1560	11872.4158
	1985	15139.0000	14368.9440	13503.1502
	1986	16853.0000	15680.1909	16314.1007
	1987	17683.0000	19211.4695	19287.0535
	1988	20654.0000	19290.8755	20023.2074
	1989	25508.0000	19103.5614	23772.8296
	1990	29880.0000	29638.6740	31209.5582
COND	1978	24508.0000	28009.4997	28009.4997
	1979	30540.0000	30441.6898	34227.2595
	1980	39797.0000	38926.3986	42144.8549
	1981	51844.0000	50953.8532	52008.8481
	1982	59969.0000	60354.5180	60504.4799
	1983	72986.0000	75339.9463	74731.7563
	1984	89524.0000	88129.9317	87050.4967
	1985	98382.0000	96422.8142	93972.1837
	1986	108368.0000	111358.5817	109147.8227
	1987	118754.0000	122224.7556	124222.2067
	1988	132598.0000	131677.9166	135226.4470
	1989	144952.0000	144907.9303	147618.6213
	1990	180338.0000	167331.9811	171590.9132
CONLG	1978	265.0000	251.3003	251.3003
	1979	320.0000	286.3542	283.3861
	1980	381.0000	438.1800	364.7105
	1981	349.0000	595.6113	475.2293
	1982	768.0000	608.7595	641.1918
	1983	1164.0000	1100.7003	858.7023
	1984	1376.0000	1445.9737	1090.6758
	1985	1460.0000	1432.5624	1295.9464
	1986	1627.0000	1593.3726	1492.5648
	1987	1855.0000	1798.9634	1744.4358
	1988	1195.0000	2067.7502	1968.3773
	1989	902.0000	1698.2533	2386.9407
	1990	1237.0000	1486.6836	3013.7784

CONM	1978	7597.0000	8204.5203	8204.5203
	1979	9831.0000	10155.8967	11670.7011
	1980	13602.0000	13016.2399	14981.3082
	1981	16907.0000	18647.8680	19213.2199
	1982	19257.0000	20044.4864	20772.1041
	1983	21959.0000	22379.9231	22778.2143
	1984	21711.0000	24444.1554	25376.5232
	1985	28121.0000	28537.8937	28237.9170
	1986	31002.0000	32333.0209	31466.7234
	1987	33195.0000	37107.4649	36406.3939
	1988	40859.0000	40170.4598	41602.9121
	1989	49728.0000	48691.3122	49502.3146
	1990	62585.0000	64898.7493	65365.9390
CPI	1978	71.5900	73.5728	73.5728
	1979	79.2900	83.9471	83.6789
	1980	100.0000	98.0798	99.3025
	1981	117.9800	119.7030	117.8813
	1982	130.7700	132.3964	131.4490
	1983	149.0300	150.1085	150.0028
	1984	173.8200	169.2337	169.3020
	1985	176.3700	180.0174	177.7237
	1986	190.4500	185.9648	186.7643
	1987	205.1500	206.4331	204.0734
	1988	233.8400	223.4844	224.3549
	1989	260.8900	249.3865	249.9077
	1990	316.9600	293.9150	294.2161
CPID	1978	79.2000	78.3951	78.3951
	1979	86.2900	89.0567	88.4496
	1980	100.0000	98.9758	100.6047
	1981	118.1700	115.4587	115.9148
	1982	132.8800	132.8187	131.1177
	1983	149.8800	151.3948	150.0656
	1984	173.3500	171.9946	172.1345
	1985	185.1200	190.2163	189.2995
	1986	207.6200	202.1736	205.3260
	1987	221.2500	223.0637	221.3335
	1988	240.4200	240.4230	240.4860
	1989	261.3100	261.3059	261.3557
	1990	292.1400	292.1389	292.1733

CPIM	1978	58.3700	58.6760	58.6760
	1979	67.9200	68.9167	69.1089
	1980	100.0000	88.3840	89.1306
	1981	118.0500	125.2092	118.3834
	1982	127.5800	130.5567	130.7661
	1983	139.6700	137.6087	139.6095
	1984	154.1300	146.2720	146.2340
	1985	158.9900	159.8414	154.8829
	1986	169.7900	166.1029	163.5237
	1987	175.4400	183.1495	179.2144
	1988	199.2300	199.2290	201.5992
	1989	237.0500	237.0478	238.5356
	1990	308.1900	308.1912	309.1242
CPIX	1978	81.7600	88.6792	88.6792
	1979	87.9300	96.0372	96.0372
	1980	100.0000	119.6850	119.6850
	1981	119.2000	115.0769	115.0769
	1982	122.4600	122.5894	122.5894
	1983	176.2600	198.4150	198.4150
	1984	285.3700	291.0440	291.0440
	1985	194.7500	193.2539	193.2539
	1986	147.7500	150.6527	150.6527
	1987	226.5000	190.1983	190.1983
	1988	192.6300	215.8678	215.8678
	1989	214.3900	233.9227	233.9227
	1990	280.2500	295.3664	295.3664
CXDEB	1978	3988.8000	4007.1454	4007.1454
	1979	1258.3000	3317.6499	3621.0172
	1980	6436.2000	1860.1132	4591.5001
	1981	6895.3000	8167.0561	5855.5566
	1982	5425.3000	9111.2130	7569.3273
	1983	11427.6000	7415.7598	9198.2964
	1984	7655.8000	14384.0207	11313.9117
	1985	13992.4000	13222.4368	17206.7075
	1986	18535.1000	17444.1033	22413.6443
	1987	23837.4000	22213.9581	26493.9846
	1988	15611.3000	27218.8772	28700.3492
	1989	30641.0000	21371.5308	33013.7888
	1990	20585.0000	38213.7214	39799.0875

DDEB	1978	16367.5000	15127.74 4	15127.7404
	1979	19634.1000	17221.7598	17859.0495
	1980	29070.4000	24146.7457	23919.0999
	1981	35518.8000	32023.8740	28650.0556
	1982	45267.0000	38933.6193	33478.3795
	1983	51770.0000	51229.3686	42273.9856
	1984	51651.5000	59421.7486	48460.9861
	1985	62611.2000	62425.4573	54972.3770
	1986	69499.0000	72209.0478	67425.1501
	1987	78997.4000	83682.4876	80397.8299
	1988	94401.0000	84382.0938	85520.6042
	1989	114311.0000	92597.1251	94855.1310
	1990	131530.0000	120457.6115	108293.3963
FICG	1978	3077.0000	3595.7950	3595.7950
	1979	3809.0000	3792.8360	4239.4482
	1980	4709.0000	4324.5544	4933.0147
	1981	4126.0000	5508.0778	5070.0763
	1982	4866.0000	5764.6044	5628.9033
	1983	5963.0000	6182.6500	6106.9414
	1984	7075.0000	6362.1860	5535.5505
	1985	7767.0000	7557.5918	7869.2794
	1986	9634.0000	9478.6622	10564.0799
	1987	11216.0000	10866.5967	12470.0949
	1988	12805.0000	12342.4934	12506.4922
	1989	14306.0000	16537.6713	16127.1341
	1990	13480.0000	21731.2321	20607.5478
FIP	1978	5444.0000	7082.4855	7082.4855
	1979	9437.0000	8322.9521	10735.1161
	1980	16136.0000	14396.5835	16028.7544
	1981	19153.0000	20457.9538	20650.2545
	1982	25413.0000	21347.2787	23199.7805
	1983	29379.0000	31363.8839	29321.8735
	1984	32483.0000	31777.4368	30639.1847
	1985	30690.0000	34507.3886	29882.7718
	1986	32692.0000	33772.0052	33639.4200
	1987	34536.0000	38118.0536	38157.8716
	1988	37156.0000	30949.6154	33459.7905
	1989	39943.0000	37074.1557	34731.8045
	1990	58120.0000	41062.0235	39903.4580

GDP	1978	44702.0000	50311.2986	50311.2986
	1979	58696.0000	56472.3685	65161.0073
	1980	81549.0000	80110.0123	88302.8235
	1981	98671.0000	101180.8258	105542.6378
	1982	117995.0000	117730.7722	122959.5247
	1983	139966.0000	149818.4469	149948.5245
	1984	162878.0000	156156.6227	155299.2677
	1985	181784.0000	176602.0989	165675.0917
	1986	200313.0000	208214.8212	200961.5795
	1987	217387.0000	233152.3634	235732.3229
	1988	221982.0000	218842.2004	231635.9275
	1989	251891.0000	240879.5025	253798.9490
	1990	321751.0000	294653.6151	302425.3181
GDPF	1978	40470.0000	42496.5023	42496.5023
	1979	49782.0000	48202.9439	51999.1280
	1980	62246.0000	62516.1646	65998.6510
	1981	79337.0000	82273.4626	84056.3295
	1982	91643.0000	93571.8974	95945.7294
	1983	113878.0000	117314.8520	119707.0143
	1984	140039.0000	140712.5409	139107.4482
	1985	148321.0000	147625.7369	144584.5229
	1986	163713.0000	166801.0625	165264.8917
	1987	177731.0000	180872.6830	184008.0633
	1988	203516.0000	199122.2036	203201.2829
	1989	228138.0000	223344.7712	232811.5855
	1990	290495.0000	296446.7757	302020.9066
GNP	1978	42428.0000	48037.2986	48037.2986
	1979	52147.0000	49923.3685	58612.0073
	1980	66096.0000	64657.0123	72849.8235
	1981	83137.0000	85646.8258	90008.6378
	1982	97278.0000	97013.7722	102242.5247
	1983	118387.0000	128239.4469	128369.5245
	1984	149293.0000	142571.6227	141714.2677
	1985	158337.0000	153155.0989	142228.0917
	1986	175612.0000	183513.8212	176260.5795
	1987	192386.0000	208151.3634	210731.3229
	1988	216717.0000	213577.2004	226370.9275
	1989	246152.0000	235140.5025	248059.9490
	1990	315114.0000	288016.6151	295788.3181

I	1978	8554.0000	10645.4577	10645.4577
	1979	13527.0000	12269.7632	15455.8987
	1980	22465.0000	19685.1657	22193.1574
	1981	23610.0000	26083.1047	25918.7430
	1982	30527.0000	27106.5288	28910.3029
	1983	35132.0000	38325.7144	36223.6808
	1984	39708.0000	37735.8927	35345.9375
	1985	38682.0000	42551.8823	37304.1019
	1986	42463.0000	44373.4883	45928.8514
	1987	45900.0000	50490.6861	52515.2841
	1988	50562.0000	42087.7940	44287.5110
	1989	54722.0000	52607.6231	50204.1007
	1990	72638.0000	62509.3531	60973.1322
IICG	1978	-354.0000	-383.0238	-383.0238
	1979	-65.0000	-97.8396	56.8645
	1980	980.0000	484.2530	580.6244
	1981	-120.0000	-197.8857	-39.2042
	1982	78.0000	-410.7800	-179.7822
	1983	-65.0000	337.6073	475.9548
	1984	-60.0000	88.5183	-101.7885
	1985	25.0000	46.6577	-308.2149
	1986	-50.0000	458.2709	703.9195
	1987	-42.0000	664.8021	648.1498
	1988	320.0000	-461.4671	-908.8020
	1989	85.0000	-1058.0766	-331.5731
	1990	158.0000	-582.9758	467.3700
IIP	1978	387.0000	350.2011	350.2011
	1979	346.0000	251.8148	424.4699
	1980	640.0000	479.7747	650.7640
	1981	451.0000	314.9588	237.6164
	1982	170.0000	405.4257	261.4013
	1983	-145.0000	441.5732	318.9110
	1984	210.0000	-492.2484	-727.0093
	1985	200.0000	440.2441	-139.7343
	1986	187.0000	664.5500	1021.4320
	1987	190.0000	841.2337	1239.1678
	1988	281.0000	-742.8478	-769.9696
	1989	388.0000	53.8727	-323.2648
	1990	880.0000	299.0733	-5.2435

MS1	1978	5936.3000	6276.9368	6276.9368
	1979	7669.3000	6857.1121	7417.9115
	1980	9428.1000	8896.1714	8920.1842
	1981	10024.4000	11164.4928	10848.9643
	1982	11759.8000	11934.9089	12771.2235
	1983	14747.9000	14641.3070	15461.0857
	1984	16823.8000	17683.4534	18190.6408
	1985	18761.0000	19171.3720	19861.6760
	1986	21179.2000	21950.2867	22468.2012
	1987	25083.3000	24780.5467	25838.8796
	1988	32379.0000	28256.9378	29411.5184
	1989	35338.0000	34741.2222	33016.9344
	1990	39878.0000	39987.0329	38640.0887
MS2	1978	10892.0000	11811.6330	11811.6330
	1979	15057.6000	13960.8001	15154.3578
	1980	19860.1000	19290.0919	19721.8972
	1981	24446.8000	25871.0631	25904.7672
	1982	30509.9000	30386.8201	31756.0556
	1983	37256.9000	37626.4693	38569.5986
	1984	43427.4000	44865.7412	45743.3009
	1985	48408.9000	47388.5330	48737.6360
	1986	50860.3000	53428.0691	53217.1571
	1987	58335.0000	56404.8787	58249.2343
	1988	67946.0000	63585.4524	64386.3153
	1989	76433.0000	76296.3866	74392.0135
	1990	91017.0000	90420.8175	89661.4797
MT	1978	1469.0000	2884.4247	2884.4247
	1979	2271.0000	3560.9206	3681.9657
	1980	2925.0000	4726.0415	4727.8701
	1981	3226.0000	5724.5480	5264.1169
	1982	3222.0000	6279.8263	5860.8797
	1983	4836.0000	7125.2224	6771.9062
	1984	7945.0000	8415.5727	7936.6424
	1985	8396.0000	10054.3997	10125.9393
	1986	10014.0000	8251.6352	9333.4836
	1987	11683.0000	9182.5382	9316.2113
	1988	11599.0000	10252.1712	9421.7131
	1989	15708.0000	13885.7956	12754.0221
	1990	17512.0000	18186.4766	17851.6167

NT	1978	1242.0000	2288.7693	2288.7693
	1979	2993.0000	2891.3265	3892.4985
	1980	4541.0000	4566.0529	5426.3693
	1981	7036.0000	6046.6220	6893.4246
	1982	8873.0000	8432.9398	8296.5750
	1983	10457.0000	10189.9201	9638.6042
	1984	12185.0000	11704.9211	10922.1746
	1985	12040.0000	13357.6494	12149.8327
	1986	13097.0000	13218.9656	13324.0140
	1987	14463.0000	14229.9227	14447.0479
	1988	16775.0000	15536.4197	15521.1625
	1989	18591.0000	17747.7090	16548.4887
	1990	21511.0000	19484.6040	17531.0645
NTR	1978	1369.0000	970.4004	970.4004
	1979	1628.0000	1191.9006	1334.7410
	1980	1610.0000	2334.2643	2559.9603
	1981	2093.0000	2881.0397	3457.1183
	1982	2453.0000	3253.0438	4103.7790
	1983	4571.0000	4598.4662	5507.8600
	1984	6599.0000	6064.7110	6420.9405
	1985	8376.0000	7524.4254	7097.1225
	1986	9935.0000	9266.3322	8690.2337
	1987	9250.0000	10832.7895	10497.1577
	1988	8901.0000	9483.8206	10363.2674
	1989	8780.0000	9855.0139	11072.3964
	1990	9103.0000	12603.2763	13729.3801
P	1978	72.2000	76.4344	76.4344
	1979	83.3000	86.6335	87.6744
	1980	100.0000	101.3450	102.4204
	1981	120.8000	121.5506	122.1456
	1982	134.2000	136.2455	136.5764
	1983	156.6000	159.1493	159.7335
	1984	190.3000	185.0429	185.8132
	1985	191.4000	194.6896	193.5866
	1986	202.9000	203.0332	203.5707
	1987	219.2000	216.1345	216.2994
	1988	240.8500	238.6969	237.9838
	1989	267.2900	260.8581	260.1536
	1990	321.5200	306.8774	305.1230

PM	1978	55.6000	48.5747	48.5747
	1979	84.4000	67.7086	67.7086
	1980	100.0000	94.5130	94.5130
	1981	111.1000	118.3023	118.3023
	1982	118.9000	128.9079	128.9079
	1983	121.1000	121.3952	121.3952
	1984	126.7000	125.4961	125.4961
	1985	136.7000	136.2383	136.2383
	1986	126.7000	138.5721	138.5721
	1987	143.3000	157.0967	157.0967
	1988	174.4000	190.7890	190.7890
	1989	206.6200	230.4510	230.4510
	1990	292.1500	309.5857	309.5857
PX	1978	84.0000	84.1309	84.1309
	1979	91.6000	92.0708	92.0708
	1980	100.0000	97.4202	97.4202
	1981	105.3000	98.5177	98.5177
	1982	103.2000	98.4546	98.4546
	1983	131.6000	133.6488	133.6488
	1984	168.4000	165.5791	165.5791
	1985	149.5000	144.4405	144.4405
	1986	132.6000	128.2366	128.2366
	1987	153.7000	151.7606	151.7606
	1988	174.7500	176.3969	176.3969
	1989	193.7000	188.1233	188.1233
	1990	247.3900	212.6039	212.6039
RI	1978	9.5600	15.9854	15.9854
	1979	15.3700	19.9910	14.7055
	1980	20.0500	21.6627	16.8190
	1981	20.8000	21.5506	19.2591
	1982	11.0900	12.7861	11.8143
	1983	16.6900	18.5912	16.9555
	1984	21.5200	18.1628	16.3270
	1985	0.5800	2.3067	4.1834
	1986	6.0100	6.0780	5.1575
	1987	8.0300	6.5227	6.2527
	1988	9.8800	8.8946	10.0252
	1989	10.9800	8.3073	9.3157
	1990	20.2900	14.8106	17.2857

SEX	1978	1942.0000	2353.0275	2353.0275
	1979	2992.0000	3163.0912	3522.3251
	1980	4605.0000	4151.9994	4615.4982
	1981	6019.0000	5735.0292	5744.2046
	1982	6962.0000	7145.3972	6905.2287
	1983	8033.0000	7936.3055	7886.6879
	1984	8567.0000	8847.9637	8720.0884
	1985	8926.0000	9544.2610	9678.0587
	1986	10601.0000	10038.9010	10696.1928
	1987	11332.0000	11484.0610	11567.2586
	1988	13097.0000	12203.2946	12408.9082
	1989	14597.0000	14118.9314	13517.5460
	1990	21729.0000	15929.6744	14986.2424
SIM	1978	1823.0000	2154.6009	2154.6009
	1979	2253.0000	2964.5346	3668.2517
	1980	3746.0000	3780.4512	5313.7613
	1981	5937.0000	5212.8319	6593.6848
	1982	7276.0000	7296.9016	7905.3069
	1983	9444.0000	9132.1977	9581.2679
	1984	10302.0000	10988.8154	10946.8439
	1985	12573.0000	12228.5655	12627.8020
	1986	14217.0000	14201.5802	14378.8274
	1987	15589.0000	15829.6421	16045.6862
	1988	17981.0000	16274.7772	16743.1259
	1989	20207.0000	18659.8970	17581.8165
	1990	24769.0000	20729.9019	18469.2790
SST	1978	1884.0000	1274.9260	1274.9260
	1979	1907.0000	1422.2926	1630.1161
	1980	1878.0000	1987.6814	2183.6452
	1981	2028.0000	2491.6742	2596.0044
	1982	2273.0000	2887.5323	3012.5989
	1983	3230.0000	3655.0374	3658.1488
	1984	5787.0000	3806.6403	3786.1332
	1985	4014.0000	4295.6756	4034.3125
	1986	4476.0000	5051.8203	4878.3300
	1987	4978.0000	5648.3014	5710.0114
	1988	4685.0000	5306.0166	5612.0298
	1989	6167.0000	5833.1268	6142.1471
	1990	9481.0000	7119.3498	7305.2412

TD	1978	1102.0000	1433.7602	1433.7602
	1979	1357.0000	1488.6373	1741.4420
	1980	2086.0000	1917.3274	2155.7055
	1981	2029.0000	2528.0470	2654.9583
	1982	2923.0000	2858.7797	3010.9155
	1983	3366.0000	3767.3219	3771.1067
	1984	5480.0000	4184.3309	4159.3853
	1985	5586.0000	4492.2678	4174.3356
	1986	4787.0000	5375.5851	5164.5448
	1987	4909.0000	6092.4391	6167.5056
	1988	4647.0000	6250.3092	6622.5555
	1989	5148.0000	6877.7151	7253.6193
	1990	7336.0000	8416.1984	8642.3239
TID	1978	9217.0000	10096.9162	10096.9162
	1979	9745.0000	10960.6998	11740.9355
	1980	10372.0000	13155.3663	14173.5397
	1981	12106.0000	15021.8410	15619.3689
	1982	12433.0000	16899.4772	17509.1411
	1983	17273.0000	19927.5608	20251.2278
	1984	25652.0000	22709.3062	22411.5747
	1985	25048.0000	26129.5015	25271.8945
	1986	26942.0000	26927.4959	26655.0305
	1987	30741.0000	29274.7653	29440.3271
	1988	32127.0000	30282.0785	30308.1916
	1989	42819.0000	35802.2994	35049.0260
	1990	54410.0000	46439.0653	43845.2743
TIDO	1978	485.0000	533.0992	533.0992
	1979	184.0000	140.3400	217.4648
	1980	291.0000	107.7422	173.7917
	1981	338.0000	289.3631	248.7327
	1982	403.0000	411.2227	391.2781
	1983	524.0000	632.8236	626.9941
	1984	601.0000	737.3107	790.1793
	1985	576.0000	898.4838	941.6399
	1986	790.0000	1066.8241	1230.2285
	1987	1807.0000	1330.8156	1592.8172
	1988	1957.0000	1819.1430	1772.7207
	1989	5069.0000	2030.4772	2001.5662
	1990	5888.0000	4087.5902	2410.5518

TSB	1978	-2274.0000	-3712.1926	-3712.1926
	1979	-6549.0000	-7661.9921	-8772.8748
	1980	-15453.0000	-13050.8864	-14132.2757
	1981	-15534.0000	-16675.4033	-15131.8530
	1982	-20717.0000	-18500.8940	-16696.8997
	1983	-21579.0000	-17843.4089	-16105.0689
	1984	-13585.0000	-20705.4078	-17758.9560
	1985	-23448.0000	-31477.6471	-32196.0404
	1986	-25005.0000	-22250.7988	-28620.4974
	1987	-25000.0000	-22447.8989	-23427.0991
	1988	-29152.0000	-20480.0153	-15484.6899
	1989	-29660.0000	-31024.8868	-23382.3466
	1990	-31164.0000	-35822.4301	-32385.0674
TSD	1978	4955.7000	5534.6962	5534.6962
	1979	7388.3000	7103.6881	7736.4462
	1980	10432.0000	10393.9205	10801.7130
	1981	14422.4000	14706.5703	5055.8029
	1982	18750.1000	18451.9113	18984.8320
	1983	22509.0000	22985.1624	23108.5128
	1984	26603.6000	27182.2878	27552.6601
	1985	29647.9000	28217.1610	28875.9600
	1986	29681.1000	31477.7823	30748.9559
	1987	33251.7000	31624.3320	32410.3547
	1988	35566.5000	35328.5146	34974.7969
	1989	41095.6000	41555.1643	41375.0791
	1990	51139.2000	50433.7846	51021.3911
VAC	1978	41.3500	45.6013	45.6013
	1979	50.0200	45.3502	49.3149
	1980	55.5200	50.4638	53.2272
	1981	53.8400	54.0323	53.3657
	1982	52.1000	52.0887	53.4007
	1983	52.3600	56.0872	54.3989
	1984	52.3000	52.2634	50.5608
	1985	52.5700	53.7816	51.4909
	1986	53.3700	54.0752	54.9805
	1987	54.3100	55.9494	57.4162
	1988	55.1200	50.8164	52.2520
	1989	55.4600	54.5775	53.2993
	1990	56.5600	55.0821	54.0820

VAFF	1978	163.1800	166.5993	166.5993
	1979	166.4200	166.1057	175.7902
	1980	171.5800	176.6189	184.3107
	1981	183.5300	185.7464	189.7741
	1982	188.3400	188.2701	192.4871
	1983	197.4100	196.8189	201.2164
	1984	196.7000	203.5813	202.0575
	1985	213.6600	206.4621	202.9458
	1986	219.2200	216.1691	214.0818
	1987	206.4500	219.4440	222.4227
	1988	210.7800	216.4837	220.3343
	1989	208.3900	213.4945	223.3212
	1990	226.7200	227.2007	232.0307
VAM	1978	104.7000	105.0051	105.0051
	1979	109.5300	104.1388	110.1451
	1980	110.4800	112.4226	118.6066
	1981	116.1900	122.4447	126.5190
	1982	121.7700	128.9808	133.3396
	1983	123.0600	132.8342	138.3444
	1984	138.0800	138.6238	137.6214
	1985	145.2900	149.8045	146.8084
	1986	157.6000	161.3538	161.3708
	1987	168.2700	165.3361	167.2632
	1988	176.1100	164.0003	166.8495
	1989	183.8900	170.2910	181.2955
	1990	201.2900	199.8595	203.9611
VAMQ	1978	11.2900	12.3354	12.3354
	1979	11.9000	11.4739	13.3006
	1980	12.4900	12.6776	14.1170
	1981	13.0200	14.3120	13.9773
	1982	13.5600	14.2399	14.2733
	1983	14.6300	14.8991	14.8229
	1984	14.8400	14.6679	13.8533
	1985	15.0500	15.1397	15.1174
	1986	15.8500	17.3910	17.6077
	1987	18.8400	17.8145	19.1905
	1988	20.5400	18.0069	18.5097
	1989	21.6500	19.8125	19.8878
	1990	23.6200	21.3242	21.2517

VAS	1978	232.5600	251.0915	251.0915
	1979	251.7600	243.8534	267.3336
	1980	272.3600	272.9788	289.7250
	1981	289.5200	303.8604	311.5040
	1982	311.3600	318.0167	325.8945
	1983	329.4300	337.8865	344.8026
	1984	353.6400	350.0767	346.4597
	1985	366.1400	363.7904	356.3622
	1986	382.4400	395.1458	388.3199
	1987	394.6400	398.8758	405.9903
	1988	403.2600	397.8050	406.5202
	1989	418.5300	411.0732	428.2894
	1990	434.0900	458.1177	468.3394
VM	1978	15600.0000	18305.7889	18305.7889
	1979	22570.0000	22589.0349	23355.4343
	1980	33915.0000	29[illegible].0194	29977.5973
	1981	36123.0000	362[illegible].0813	33372.8535
	1982	41501.0000	398[illegible].8360	37151.2680
	1983	45206.0000	45156.4770	42919.4492
	1984	49048.0000	53326.3534	50293.9978
	1985	55529.0000	63702.6169	64155.5714
	1986	55282.0000	52288.3804	59138.1237
	1987	61018.0000	58182.4100	59028.7636
	1988	71030.0000	64954.8107	59696.7503
	1989	80225.0000	87961.1701	80795.3251
	1990	107729.0000	115191.0107	113070.8389
VMC	1978	5618.0000	7172.0890	7172.0890
	1979	7824.0000	6902.3162	7829.1137
	1980	10158.0000	9974.5414	10317.5034
	1981	9219.0000	10026.1589	9863.0144
	1982	8601.0000	9098.1272	9084.1702
	1983	11893.0000	10933.5276	10765.8192
	1984	10694.0000	11709.7302	10767.6239
	1985	10462.0000	11688.3216	11302.5705
	1986	12256.0000	10995.4163	11999.4878
	1987	13804.0000	13142.5695	13220.2824
	1988	17438.0000	12257.7532	11694.7656
	1989	20962.0000	15458.1041	14123.9052
	1990	28004.0000	19626.2499	17897.2629

VMI	1978	5591.0000	5903.5748	5903.5748
	1979	9143.0000	9758.9557	9118.3751
	1980	15522.0000	13238.7946	12553.7211
	1981	19275.0000	18073.4794	15684.5563
	1982	21640.0000	22168.8858	19444.8071
	1983	20624.0000	23155.9779	21864.9132
	1984	24672.0000	27317.0974	26058.9745
	1985	29331.0000	33893.8422	34861.0656
	1986	28618.0000	25681.2213	30744.8610
	1987	34619.0000	32504.6100	32632.6827
	1988	40325.0000	39977.9685	35125.4034
	1989	45255.0000	59375.3755	53682.0432
	1990	58672.0000	81872.7223	81857.7970
VMK	1978	3367.0000	4206.1251	4206.1251
	1979	5459.0000	5783.7630	6263.9455
	1980	8144.0000	6661.6834	7015.3728
	1981	7956.0000	8515.4429	8152.2827
	1982	11591.0000	8867.8230	8953.2907
	1983	11854.0000	10231.9715	9453.7169
	1984	11934.0000	12551.5258	11719.3994
	1985	10387.0000	12771.4532	12642.9352
	1986	10556.0000	11759.7428	12541.7748
	1987	11332.0000	11272.2304	11912.7985
	1988	12081.0000	11533.0891	11690.5813
	1989	12018.0000	11137.6905	10999.3768
	1990	19129.0000	11768.0385	11391.7791
VX	1978	13207.0000	14395.1697	14395.1697
	1979	15282.0000	14728.4862	14728.4862
	1980	17603.0000	16543.5847	16543.5847
	1981	20507.0000	19090.4807	19090.4807
	1982	21098.0000	21454.4465	21454.4465
	1983	25038.0000	28508.9603	28508.9603
	1984	37198.0000	34761.7973	34761.7973
	1985	35728.0000	34909.2744	34909.2744
	1986	33893.0000	34200.2608	34200.2608
	1987	40275.0000	40080.0921	40080.0921
	1988	46928.0000	48546.2781	48546.2781
	1989	56175.0000	61477.2490	61477.2490
	1990	79481.0000	84168.8081	84168.8081

	1978	972.0000	1075.7155	1075.7155
	1979	1298.0000	1050.3703	1050.3703
	1980	754.0000	971.3827	971.3827
	1981	1011.0000	1074.1380	1074.1380
	1982	1003.0000	1091.2811	1091.2811
	1983	1921.0000	1506.2421	1506.2421
	1984	2118.0000	2013.9695	2013.9695
	1985	3093.0000	2180.8952	2180.8952
	1986	2389.0000	2376.7399	2376.7399
	1987	2140.0000	3000.6285	3000.6285
	1988	1538.0000	4106.6499	4106.6499
	1989	2865.0000	5367.9421	5367.9421
	1990	2783.0000	6967.7052	6967.7052
VXO	1978	3813.0000	4284.9429	4284.9429
	1979	5771.0000	5775.0090	5775.0090
	1980	8089.0000	7002.3511	7002.3511
	1981	10163.0000	9473.6207	9473.6207
	1982	11430.0000	11330.6048	11330.6048
	1983	11970.0000	13687.4271	13687.4271
	1984	16015.0000	16248.8077	16248.8077
	1985	18066.0000	19359.8067	19359.8067
	1986	19629.0000	19321.3570	19321.3570
	1987	24552.0000	22501.1641	22501.1641
	1988	29385.0000	28842.1304	28842.1304
	1989	36534.0000	40219.9298	40219.9298
	1990	53795.0000	60223.5215	60223.5215
VXR	1978	2021.0000	2203.8616	2203.8616
	1979	2491.0000	2645.2469	2645.2469
	1980	2590.0000	2686.6031	2686.6031
	1981	2889.0000	2305.0391	2305.0391
	1982	2323.0000	2107.5372	2107.5372
	1983	2852.0000	2644.2128	2644.2128
	1984	3301.0000	2646.7183	2646.7183
	1985	2566.0000	2846.8653	2846.8653
	1986	2622.0000	3033.9609	3033.9609
	1987	2929.0000	3532.4093	3532.4093
	1988	3706.0000	4461.3732	4461.3732
	1989	3112.0000	3889.1915	3889.1915
	1990	3080.0000	3046.9051	3046.9051

VXT	1978	6401.0000	6830.6498	6830.6498
	1979	5722.0000	5257.8601	5257.8601
	1980	6170.0000	5883.2477	5883.2477
	1981	6444.0000	6237.6830	6237.6830
	1982	6342.0000	6925.0235	6925.0235
	1983	8295.0000	10671.0783	10671.0783
	1984	15764.0000	13852.3018	13852.3018
	1985	12003.0000	10521.7072	10521.7072
	1986	925_ 0000	9468.2030	9468.2030
	1987	10654.0000	11045.8902	11045.8902
	1988	12299.0000	11136.1245	11136.1245
	1989	13664.0000	12000.1856	12000.1856
	1990	19823.0000	13930.6763	13930.6763
XDEB	1978	14582.3000	14600.6454	14600.6454
	1979	15840.6000	17899.9499	18221.6626
	1980	22276.8000	17700.7132	22813.1627
	1981	29172.1000	30443.8561	28668.7192
	1982	34597.4000	38283.3130	36238.0465
	1983	46025.0000	42013.1598	45436.3429
	1984	53680.8000	60409.0207	56750.2546
	1985	67673.2000	66903.2368	73956.9621
	1986	86208.3000	85117.3033	96370.6064
	1987	110045.7000	108422.2581	122864.5910
	1988	125657.0000	137264.5772	151564.9402
	1989	156298.0000	147028.5308	184578.7290
	1990	176833.0000	194511.7214	224377.8165
XT	1978	4236.0000	3993.8224	3993.8224
	1979	4168.0000	4025.7529	4025.7529
	1980	3638.0000	3871.0911	3871.0911
	1981	3685.0000	3271.1019	3271.1019
	1982	2484.0000	2983.2826	2983.2826
	1983	2459.0000	2664.2172	2664.2172
	1984	3175.0000	2521.1311	2521.1311
	1985	1873.0000	2050.5454	2050.5454
	1986	1574.0000	1766.4699	1766.4699
	1987	1662.0000	1734.0285	1734.0285
	1988	1566.0000	1603.3597	1603.3597
	1989	1217.0000	1226.5381	1226.5381
	1990	1238.0000	1522.1721	1522.1721

Table 5.2

Mean Percent Error (MAPE), Root Mean Square Percent Error (RMSPE) and Theil's U statitic (U) for Static (^{s}) and Dynamic (^{d}) Simulation Experiments

VARIABLE	$MAPE^s$	$MAPE^d$	$RMSPE^s$	$RMSPE^d$	U^s	U^d
BS	20.6516	17.5958	74.4604	63.4426	0.2572	0.2246
BTT	17.9616	28.2470	64.7616	101.8460	0.1366	0.1681
C	3.0506	4.7193	10.9990	17.0155	0.0285	0.0316
CA	74.0564	66.8544	267.0142	241.0469	0.4097	0.4609
CDDEB	554.6936	450.5027	1999.9763	1624.3107	0.6714	0.5197
CGE	7.9714	10.2113	28.7414	36.8175	0.1011	0.1081
CGOCE	15.4927	18.1384	55.8597	65.3990	0.2197	0.2305
CGOKE	12.4592	11.7770	44.9222	42.4627	0.1170	0.1059
CGR	10.4716	14.4078	37.7560	51.9479	0.0749	0.1003
CONCG	8.2510	11.6474	29.7494	41.9952	0.0895	0.0892
COND	3.0422	4.3927	10.9689	15.8381	0.0277	0.0340
CONLG	24.6980	39.9210	89.0498	143.9371	0.2077	0.4151
CONM	5.3484	7.4831	19.2838	26.9806	0.0474	0.0552
CPI	2.9067	2.4251	10.4801	8.7438	0.0326	0.0284
CPID	1.1984	0.8954	4.3208	3.2284	0.0101	0.0070
CPIM	2.7448	2.4334	9.8967	8.7738	0.0225	0.0212
CPIX	7.7553	7.7553	27.9620	27.9620	0.0742	0.0742
CXDEB	50.2337	44.5192	181.1201	160.5162	0.3869	0.3471
DDEB	9.6054	12.7143	34.6328	45.8422	0.0963	0.1276

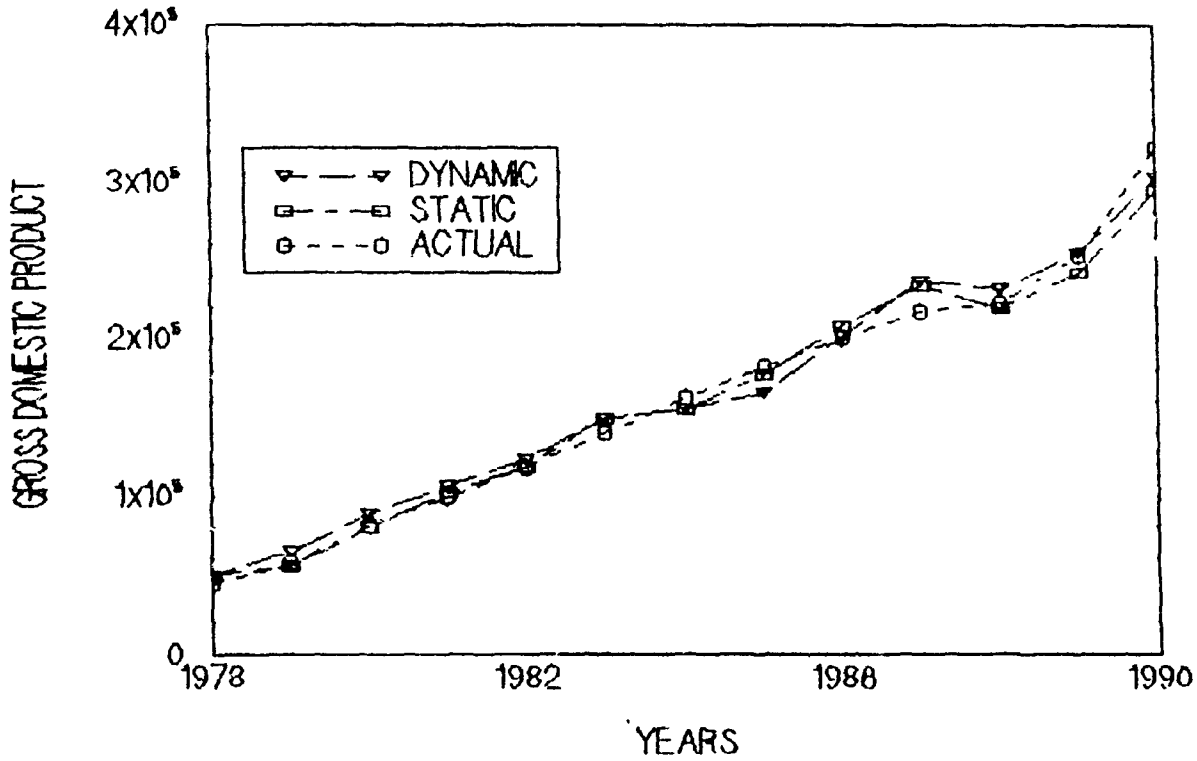
table 5.2 continued.

FICG	13.7706	14.2876	49.6505	51.5147	0.1536	0.1565
FIP	12.5978	10.5590	45.4221	38.0711	0.1273	0.1111
GDP	4.6377	6.4260	16.7214	23.1694	0.0470	0.0544
GDPF	2.1790	3.4664	7.8564	12.4984	0.0195	0.0290
GNP	5.0973	7.2427	18.3787	26.1140	0.0516	0.0597
I	10.8406	10.1499	39.0864	36.5958	0.1009	0.0995
IICG	500.9070	545.3803	1806.0458	1966.3965	2.3221	2.1664
IIP	169.5455	209.7912	611.3051	756.4129	1.1753	1.4978
MS1	4.7995	5.9994	17.3047	21.6312	0.0413	0.0590
MS2	3.6036	3.3496	12.9931	12.0772	0.0288	0.0300
MT	40.4738	37.8854	145.9303	136.5977	0.2241	0.2133
NT	11.4286	15.4049	41.2063	55.5430	0.0635	0.0922
NTR	20.8542	30.4953	75.1909	109.9524	0.1603	0.2400
P	2.2142	2.5028	7.9835	9.0239	0.0214	0.0237
PM	7.7098	7.7098	27.7982	27.7982	0.0733	0.0733
PX	3.3339	3.3339	12.0204	12.0204	0.0397	0.0397
RI	40.7797	62.7958	147.0332	226.4134	0.1920	0.1703
SEX	7.6088	7.9374	27.4341	28.6188	0.0870	0.0936
SIM	8.5376	15.3918	30.7826	55.4961	0.0733	0.1110
SST	18.2917	18.3722	65.9516	66.2419	0.1806	0.1745
TD	19.1585	22.4451	69.0769	80.9268	0.2004	0.2297

table 5.2 continued.

TID	13.9714	16.6014	50.3745	59.8573	0.1206	0.1407
TIDO	28.5727	31.4524	103.0202	113.4033	0.3505	0.4410
TSB	22.1784	24.1431	79.9654	87.0491	0.1821	0.2090
TSD	3.2840	3.3169	11.8406	11.9593	0.0270	0.0227
VAC	4.2268	3.8990	15.2399	14.0582	0.0411	0.0381
VAFF	2.0527	4.1952	7.4013	15.1259	0.0208	0.0418
VAM	3.7560	3.9526	13.5424	14.2515	0.0376	0.0364
VAMQ	6.0447	7.3911	21.7945	26.6490	0.0646	0.0736
VAS	2.7468	4.4310	9.9039	15.9761	0.0262	0.0416
VM	7.1043	8.1171	25.6150	29.2668	0.0713	0.0730
VMC	14.3098	12.9285	51.5949	46.6144	0.1686	0.1702
VMI	12.4803	12.9577	44.9984	46.7196	0.1625	0.1647
VMK	14.1295	15.2775	50.9447	55.0838	0.1517	0.1634
VX	5.3933	5.3933	19.4459	19.4459	0.0529	0.0529
VXC	44.2376	44.2376	159.5009	159.5009	0.5141	0.5141
VXO	6.9469	6.9469	25.0473	25.0473	0.0747	0.0747
VXR	13.0196	13.0196	46.9427	46.9427	0.1359	0.1359
VXT	10.9492	10.9492	39.4778	39.4778	0.1285	0.1285
XDEB	7.6135	9.9501	27.4510	35.8754	0.0686	0.1488
XT	9.8441	9.8441	35.4935	35.4935	0.0959	0.0959

FIGURE 51


4x10⁵
3x10⁵
2x10⁵
1x10⁵
0
GROSS DOMESTIC PRODUCT
DYNAMIC
STATIC
ACTUAL
1978
1982
1988
1990
YEARS

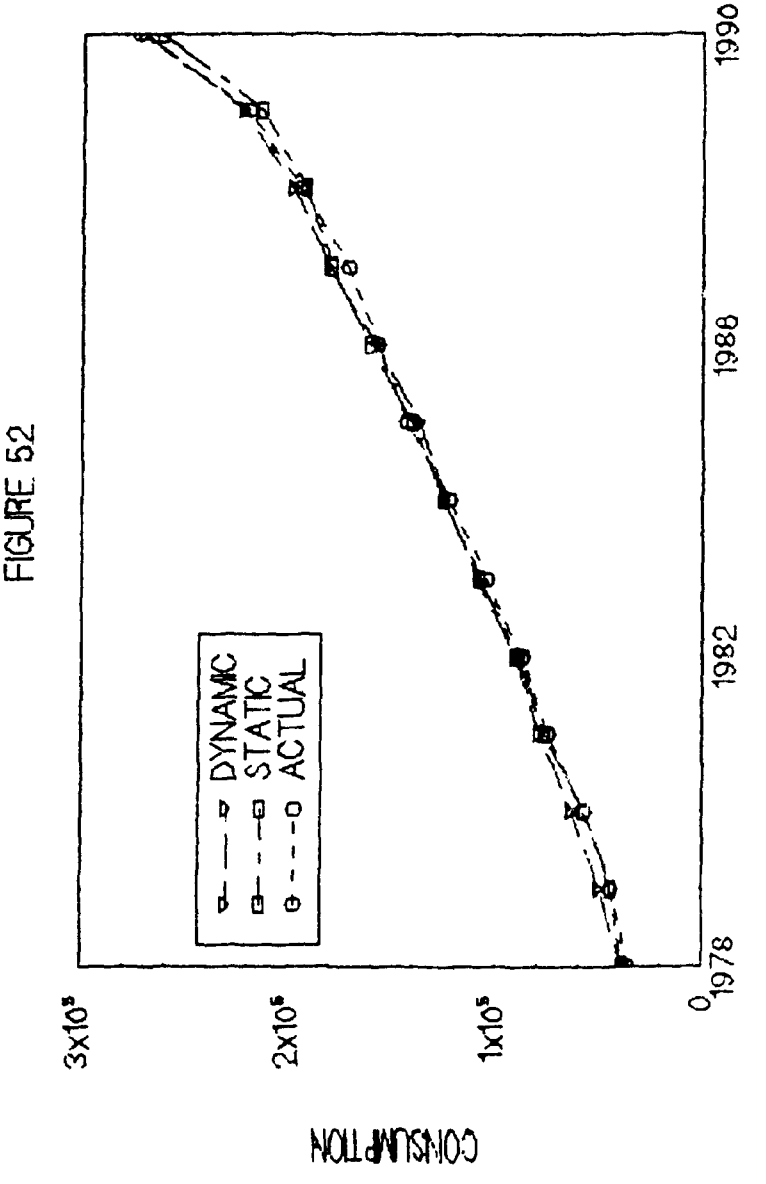

DYNAMIC
STATIC
ACTUAL
CONSUMPTION
3x10⁵
2x10⁵
1x10⁵
0
1978
1982
1988
1990
YEARS

FIGURE 52

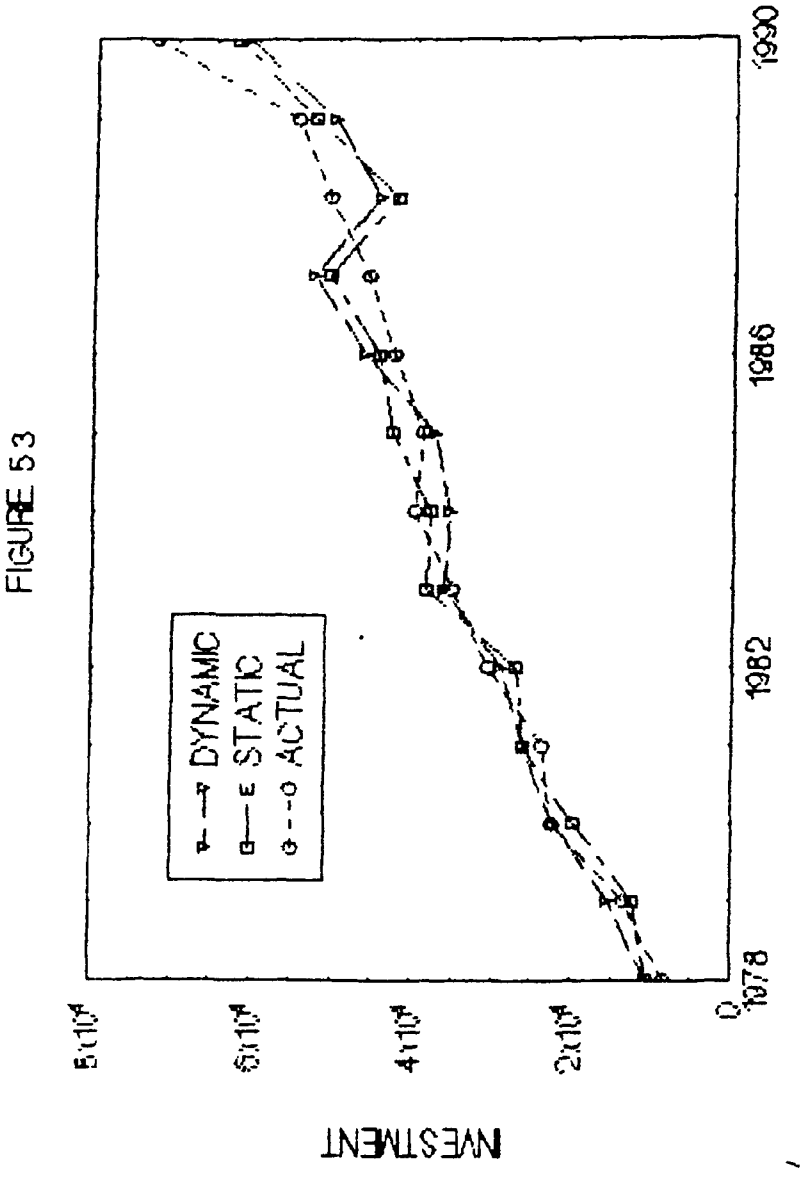

DYNAMIC
STATIC
ACTUAL
INVESTMENT
YEARS
1978
1982
1986
1990

FIGURE 5.3

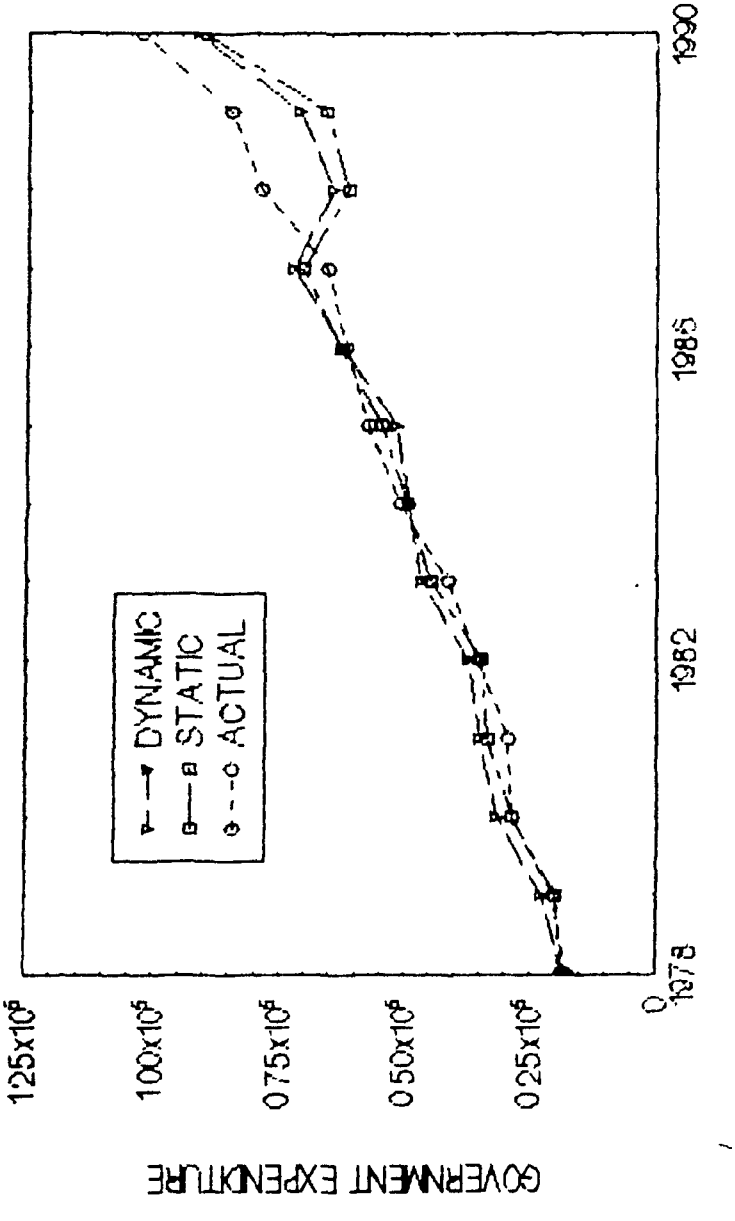

GOVERNMENT EXPENDITURE
125x10⁶
100x10⁶
0 75x10⁶
0 50x10⁶
0 25x10⁶
0
1978
1982
1986
1990
YEARS
DYNAMIC
STATIC
ACTUAL

FIGURE 5.4

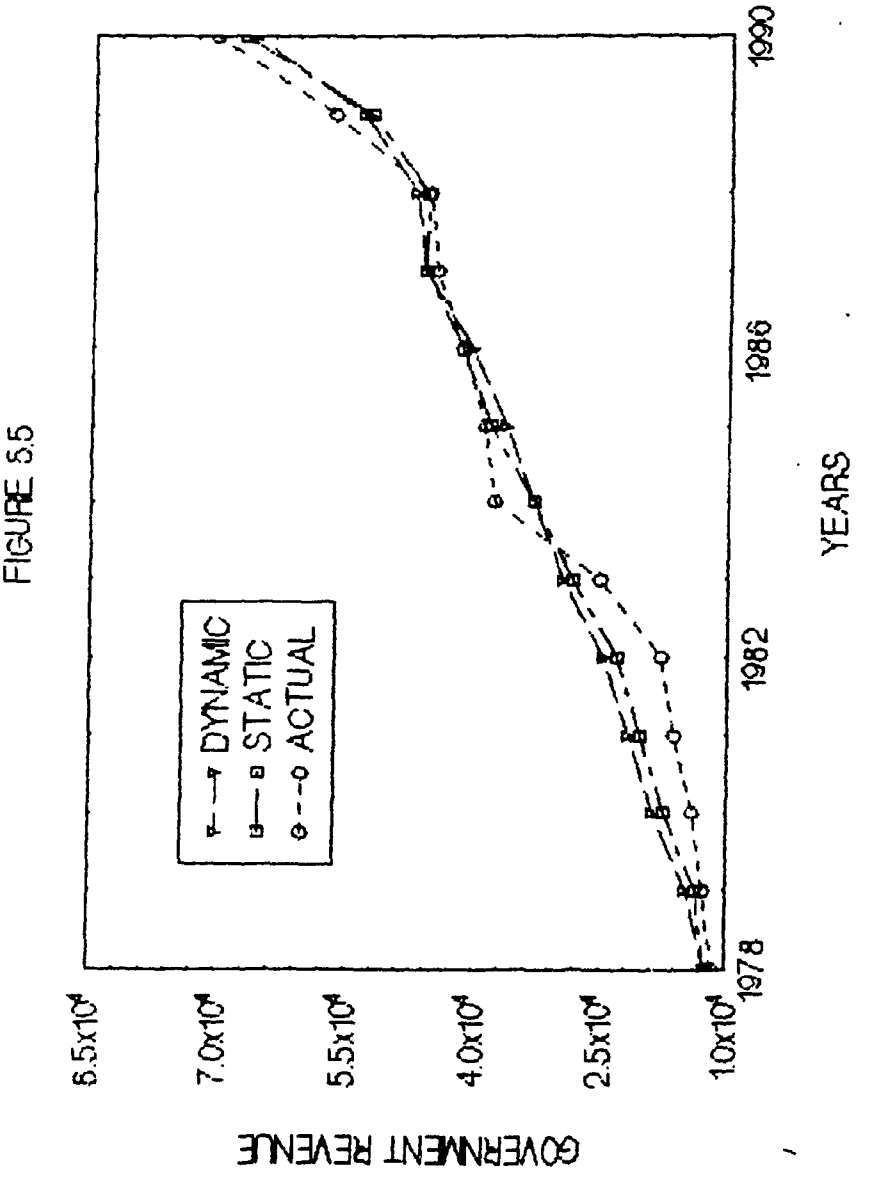

DYNAMIC
STATIC
ACTUAL
GOVERNMENT REVENUE
YEARS
1978
1982
1986
1990
10x10⁴
2.5x10⁴
4.0x10⁴
5.5x10⁴
7.0x10⁴
8.5x10⁴

FIGURE 5.5

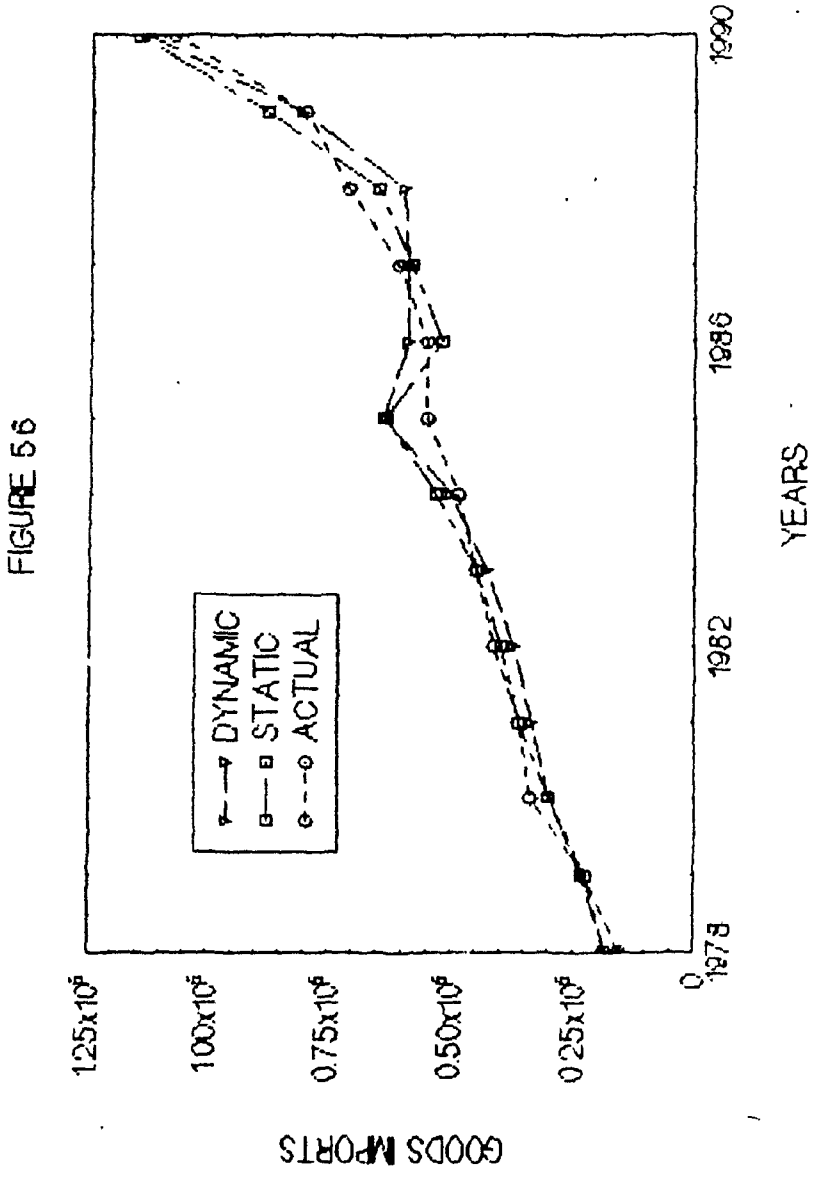

GOODS IMPORTS
125x10⁶
100x10⁶
0.75x10⁶
0.50x10⁶
0.25x10⁶
0
1978
1982
1986
1990
YEARS
DYNAMIC
STATIC
ACTUAL

FIGURE 5.6

FIGURE 57

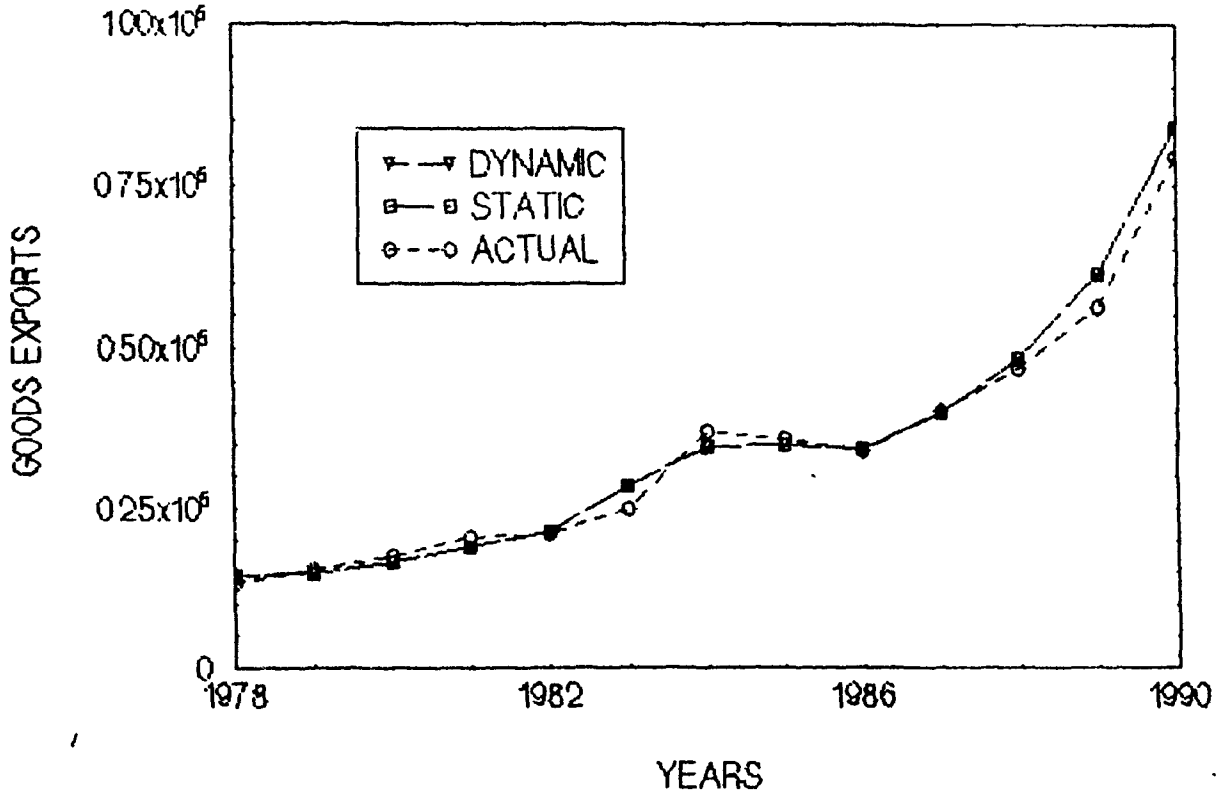
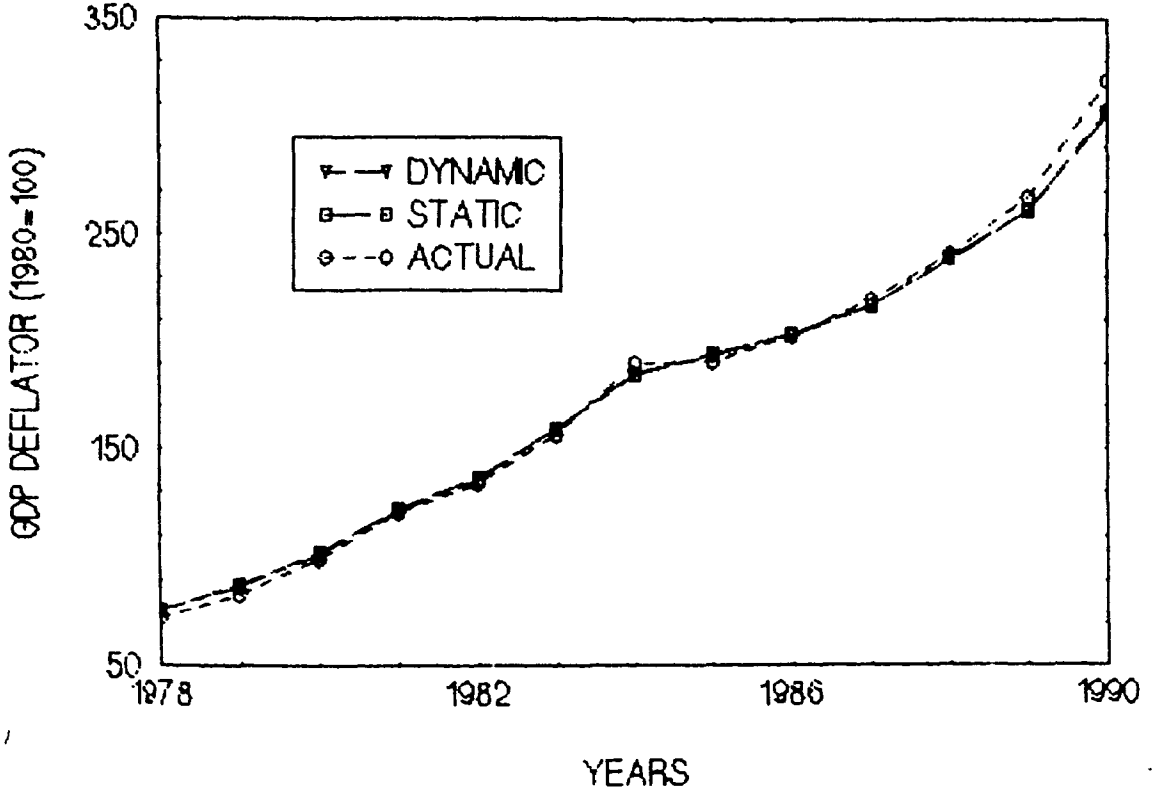

100x10⁶
075x10⁶
050x10⁶
025x10⁶
0
1978
1982
1986
1990
GOODS EXPORTS
YEARS
DYNAMIC
STATIC
ACTUAL

FIGURE 5.8


350
250
150
50
GDP DEFLATOR (1980=100)
DYNAMIC
STATIC
ACTUAL
1978
1982
1986
1990
YEARS

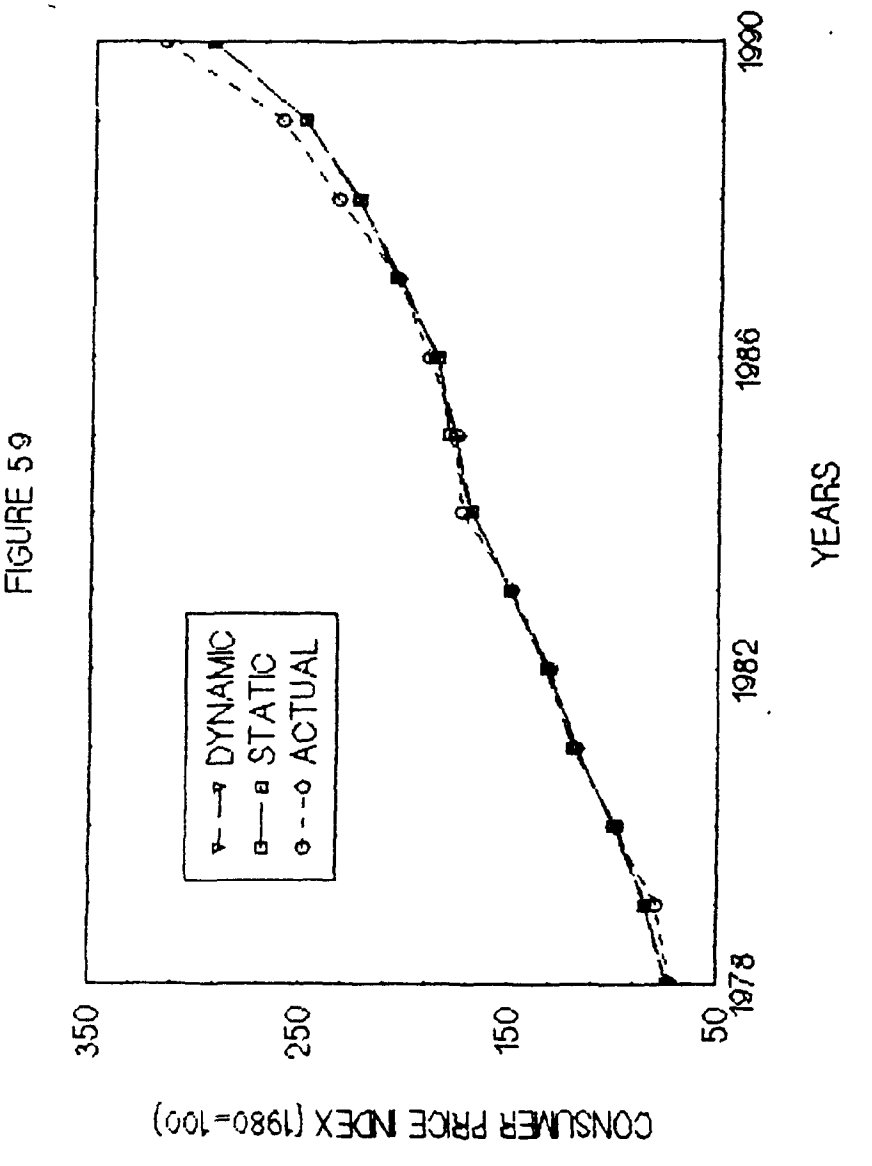
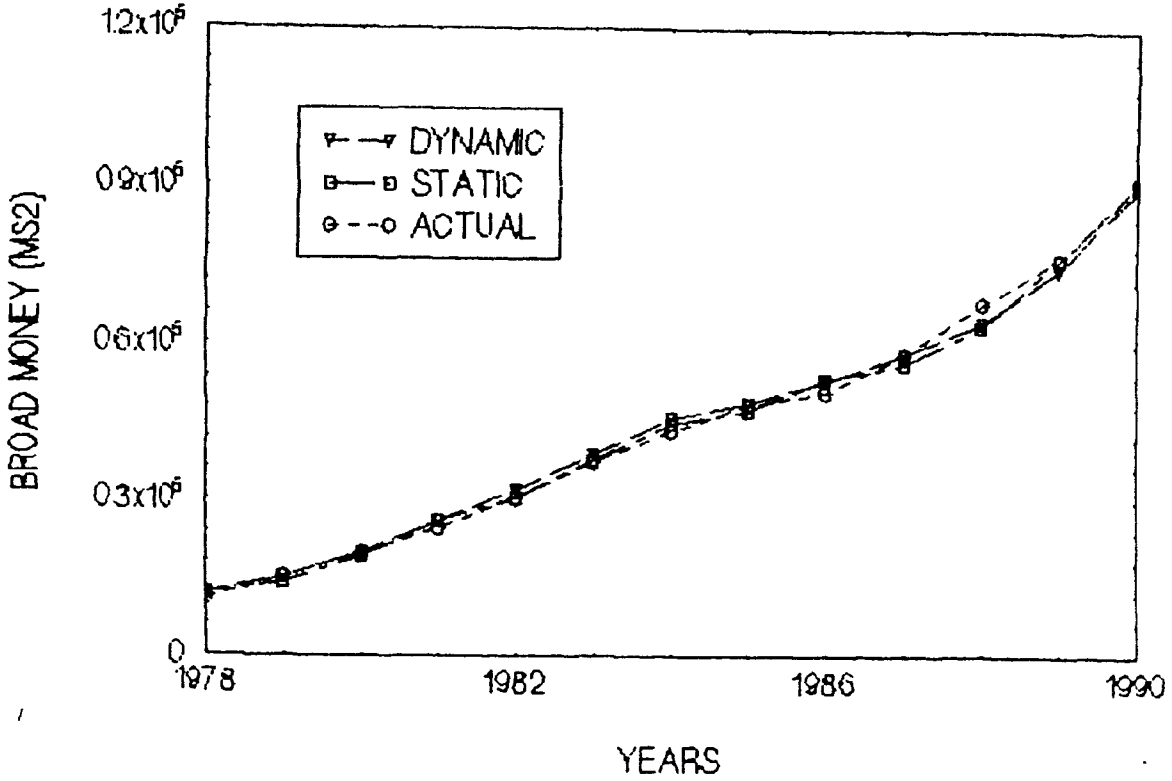

CONSUMER PRICE INDEX (1980=100)
350
250
150
50
1978
1982
1986
1990
YEARS
DYNAMIC
STATIC
ACTUAL

FIGURE 5 9

FIGURE 5.10


1.2x10^6
0.9x10^6
0.6x10^6
0.3x10^6
0
1978
1982
1986
1990
DYNAMIC
STATIC
ACTUAL
BROAD MONEY (MS2)
YEARS

CHAPTER 6

SUMMARY AND CONCLUSIONS

In this study, we formulated and estimated a short-run macroeconometric model of Sri Lanka. The model consists of 60 endogeneous variables of which 43 are behavioural equations and 17 are identities. The model also consists of 61 predetermined variables of which 23 are exogeneous variables, 35 are lagged endogeneous and 3 are lagged exogeneous variables. To the best of our knowledge Karunasena's (1983) model of Sri Lanka, which contained 89 endogeneous variables, is the only other economy-wide macroeconometric model of Sri Lanka. Compared to the size of Karunasena's (1983) model our model is small and relative to the most existing models for developing countries, our model is clearly a medium-size macroeconometric model. Nevertheless, the number of behavioural stochastic equations estimated in our model exceeds that of Karunasena's model. Many stochastic equations in our model include the ratios of endogeneous variables as explanatory variables thus introducing non-linearities into some of the equations.

In estimating the model we used annual data covering the period from 1960 to 1987. Since the number of predetermined variables exceeds the number of available observations, we encountered the undersized sample problem. Therefore, we used ordinary least squares (OLS) to esimate the behavioural

equations. As noted by Swamy and Holmes (1971) and Fisher and Wadyascki (1971), the 2SLS estimator specializes to OLS in the presence of undersized samples. Whenever, the problem of serial correlation was signalled by the Durbin-Watson or Durbin-H statistic, the maximum likelihood estimator (MLE) proposed by Beach and Mackinon (1978) was used to estimate those equations. The estimated structure was judged by the usual criteria of goodness of fit, the expected signs and sizes of the estimated coefficients, and their statistical significance.

In order to assess the ability of our model to track the historical time-paths of the endogeneous variables (i.e. within-sample tracking performance) and its ability to forecast the values of the endogeneous variables beyond the sample period used for estimation (i.e. post-sample tracking performance) we used the hybrid method which is the Newton-Raphson algorithm as modified by Powell. Using this method we performed both the static and dynamic simulation experiments. The results of these simulation experiments showed that the simulated values of most of the endogeneous variables were close to their actual values. The three forecast accuracy statistics namely, the MAPE, RMSPE and Theil's U-statistic, also indicated a good performance of the model in forecasting the values of the endogenous variables.

In contrast to the supply oriented approach adopted by Karunasena (1983), our model is formulated in terms of the

demand oriented approach. The results of our study convincingly demonstrate that, without testing against empirical data, the appropriateness of primarily demand oriented approaches should not be summarily rejected in the case of developing countries like Sri Lanka.

Though we adopted a primarily demand oriented approach in building our macroeconometric model of Sri Lanka, the supply side of the economy also received adequate treatment thereby maintaining a fairly balanced synthesis between demand and supply aspects of the Sri Lankan economy. The components of aggregate demand which were purported to explain the value added in five subsectors of the production sector explained almost all of the total variation in the value added in all the subsectors. This was evident from the statistical significance of those demand variables and the high values of the adjusted coefficients of determination (R^{-2}) of those equations which ranged from 0.97 to 0.99. The general conclusion that could be derived from these results is that the aggregate output of the economy is highly responsive to the demand forces in the economy. Thus the economy of Sri Lanka provides a notable example suggesting that demand creates supply even in the case of developing countries. The major policy conclusion emerging from this fact of Sri Lankan economy is that not only the direct measures to boost the total output but also the policies stimulating aggregate demand can be relied upon to generate higher economic growth.

Our study sheds light on the components of aggregate demand that should be stimulated in attempts to promote output growth in each of the five subsectors. The policies of increasing the real consumption demand for domestically produced goods would contribute to higher output growth in all the five subsectors except construction. The policies increasing the Central Government's real consumption would increase the production of three subsectors namely, services, manufacturing, and agriculture, forestry and fishing. Although the subsector of agriculture, forestry and fishing is not significantly responsive to export demand, both the manufacturing and services subsectors are quite responsive to the changes in export demand. This result is interesting because it suggests that the growth of agricultural sector of the economy is no longer dependent on foreign demand. This is in sharp contrast to the traditional view that Sri Lanka's agricultural growth, and thereby its overall economic growth, depends mainly on the foreign demand for its exports. Furthermore, it shows that the foreign demand is an important determinant of growth in the manufacturing subsector. The success of those efforts made to restructure the economy through promoting export oriented industries in manufacturing is indicated by this fact. The main determinnats of value added in construction are the real fixed investment demands of both the private sector and the Central Government. The oil-price-escalation which started in 1973 has negatively affected the value added of all the

subsectors save the construction and the minning and quarrying subsectors.

The marginal propensities to consume estimated for two components of private consumption, namely the consumption of domestically produced goods and sevices and the consumption of imported goods and services, are 0.24 and 0.09 respectively. In the case of domestically produced goods and services we verified a negative real interest rate effect, a positive wealth effect and a strong habit persistance in addition to the opposing effects of current and lagged real disposable income. Though relatively small in its effect when compared to the case of domestically produced goods and services, the habit persistence is an important factor even in the case of the demand for imported consumption goods and services. The current demand for imported consumption goods and services is positively affected by the capacity to import which is measured by export earnings of the previous year. The oil-price-escalation which started in 1973 impacted positively upon both the components of private consumption demand. The economic liberalization program which was launched in 1977 has further shifted upward the private real consumption demand for [illegible]rted goods and services. The current and past real revenues of the Central Government are the major determinants of the Central Government real consumption demand. The attempts made to reduce the Central Government consumption has been somewhat successful under the economic liberalization

program launched in 1977.

The major determinants of the fixed investment of the Central Government are the changes in real GDP, private real fixed investment, real national wealth, Central government external debt, and Central government domestic debt and the one-period lagged fixed investment of the Central Government. The increases in domestic debt of the Central Government discourage its fixed investment demand while the increases in external debt and all the other determinants mentioned above encourage the fixed investment demand of the Central Government. The changes in real GDP, real fixed investment of the Central Government, real imports of capital goods and real national wealth, and the one period lagged private real fixed investment are the major determinants of Sri Lanka's private real investment demand. The Central Government real fixed investment exerted 'a crowding out effect' on the private real fixed investment according to our results. However, based on this result, it cannot be concluded that the Central Government should not increase its investment in the economy. Because, our results show that there exists a sort of complementarity between the real fixed investments of the Central Government and the private sector. Therefore, in making investment decisions the Central Government must identify the spheres in which the private investment would not be crowded out but promoted by its investments. The infrastructure of the economy may be an appropriate area for

the Central Government fixed investment.

In estimating export demand functions we adopted non-traditional specifications incorporating separate price variables and disaggregated income variables with a view to assessing the seperate effects of the incomes of both the developed and the developing countries. In all cases of exports except rubber, the cross-price elasticities and income elasticities varied noticeably with respect to the prices and incomes of the two different groups of countries. The estimated own price elasticities of all the categories of exports, that is tea, rubber, coconut and non-traditional exports are less than unity, confirming that the exports of Sri Lanka are price inelastic. The cross-price elasticities of tea, coconut and non-traditional exports are greater than unity with respect to the prices of related goods in developed countries and less than unity with respect to the prices of related goods in developing countries. The cross-price elasticity of rubber exports is also larger than unity. Both the tea and rubber exports of Sri Lanka are treated as complementary goods by the rest of the world. Therefore, the inflation in the developed countries will encourage only the demand for coconut and non-traditional exports of Sri Lanka. The demand for tea and rubber exports will be discouraged by the persistant high inflation in the developed countries. While the purchasers in developing countries treat Sri Lanka's coconut exports as substitutes, the purchasers in developed

countries treat them as complementary goods. Nevertheless, the non-traditional exports are treated as substitutes for the goods of both the developed and the developing countries. Both the tea and rubber exports of Sri Lanka have income elasticities larger than unity. With respect to the incomes of both the developed and developing countries the non-traditional exports are income elastic but opposite in sign. While the income growth of developed countries decreases the demand for non-traditional exports, the income growth in developing countries increases the demand for non-traditional exports. Thus, in the short-run, the non-traditional exports may be encouraged by the recession in the developed countries, but, in the long-run, it may not be advisable to rely on the markets in the developed countries to promote non-traditional exports unless changes in its composition are realized. However, securing markets in developing countries may be a safer strategy if such compositional changes in non traditional exports cannot be realized within the near future.

The import demands for both the consumer and intermediate goods imports are price-inelastic. Only the demand for capital goods imports is price-elastic. Since all the export categories and majority of imports have price-inelastic demand the Marshall-Lerner condition for a successful devaluation may not be easily satisfied in the case of Sri Lanka. Therefore, the devaluation of Sri Lankan rupee may not be of much help in ameliorating the balance of

payments difficulties arising mainly from an adverse trade balance. The estimated cross-price elasticities of all the categories of import demand are positive indicating a degree of substitutability with domestic products. The promotion of the production of these domestic substitutes may be necessary in an attempt to reduce imports; otherwise, the increases in the prices of these substitutes may encourage imports, which, in turn, worsen the balance of payments difficulties. An interesting conclusion arrived at in this study is that the growth of real GDP decreases the demand for imports more than proportionately, indicating that the economy's dependence on imported intermediate goods diminishes in the long-run. However, growth of the real GDP increases consumer goods imports more than proportinately contributing to an increased reliance on imported consumer goods in the long-run. The oil-price-escalation which started in 1973 has shifted upward the imports of all categories even though the imports became prohibitively expensive. Interestingly, the demand for intermediate goods imports was not affected by the liberalization efforts in 1977, though both the capital and consumer goods imports were positively affected.

The services exports of Sri Lanka can be encouraged by the promotion of goods exports. The growth of real GDP and goods imports increases Sri Lanka's demand for imports. The promotion of goods exports will help achieve favourable balances in both the trade and services accounts of the

balance of payments. But, the increasing reliance on the services imports cannot be arrested without taking steps to limit the volume of goods imports.

The demand for narrow money in Sri Lanka depends on the current real national income, the rate of inflation and the past level of narrow money demand. The demand for time and savings deposits is determined mainly by the real national income, the rate of interest, the rate of inflation and the demand for time and savings deposits in the previous year. In order to generate higher savings for investment, the policy makers must contain inflation thereby bringing about a favourable real interest rate.

According to our estimates, the major determinant of the general price level is the costs of production. However, this does not negate the existence of imported inflation. The main argument here is that the imported inflation impacts upon the general price level through the production costs. However, there is a tendency to stabilize the general price level in the long-run. The increases in the prices of domestically produced and imported consumer goods and services are mainly responsible for the ever increasing cost of living in Sri Lanka. Compared to these two factors the contribution of the prices of exported consumer goods and services is relatively of less significance. However, the tea and coconut prices are the major determinants of the rising prices of the consumer exports. Again, in the case of the prices of domestically

produced consumer goods and services the production costs are the major determinant.

REFERENCES

Agarwal, M.R., (1984), "Devaluation Determinants of International Trade Flows and Payments Imbalances", Indian Economic Journal, Vol. 31, No. 3, pp. 24-33.

Arize, A., (1987), "The Elasticities and Structural Stability of Import Demand Functions for Nigeria: 1960-1977", Social and Economic Studies, Vol. 36, No. 2, pp. 171-186.

---------, (1987), "The Supply and Demand for Imports and Exports in a Simultaneous Model", Applied Economics, Vol. 19, pp. 1233-1247.

---------, (1988), "Modelling Export Prices and Quantities in Selected Developing Economies", Atlantic Economic Journal, Vol. XVI, No. 1, pp. 19-24.

Athukorala, P., (1986), "The Impact of 1977 Policy Reforms on Domestic Industry", Upanathi, Vol. 1, No. 1, pp.69-106.

Athukorala, P. and J.S. Bandara, (1989), "Growth of Manufactured Exports Primary Commodity Dependence and Net Export Earnings: Sri Lanka, World Development, Vol. 17, No. 6, pp. 897-903.

Bahmani-Oskooee, M., (1986), "Determinants of International Trade Flows: The Case of Developing Countries", Journal of Development Economics, Vol. 20, pp.107-123.

Balakrishnan, N., (1980), "Economic Policies and Trends in Sri Lanka", Asian Survey, Vol. XX, No.9, pp.891-903.

Beach, C. and J. MacKinnon, (1978), "A Maximum Likelihood Procedure for Regression with Autocorrelated Errors", Econometrica, Vol.46, No.1, pp.51-58.

Boylan, T.A. and M.P. Cuddy and I. O'Muircheartaigh, (1980), " The Functional Form of the Aggregate Import Demand equation: A Comparison of Three European Economies", Journal of International Economics, Vol.10, pp.561-66.

Breit, W. and R.W. Spencer, (1986), Lives of the Laureates: Seven Nobel Economists. The MIT press, Cambridge, Massachusetts.

Britton, A., (1989), Policymaking with Macroeconomic Models. GOWER, Aldershot.

Challen, D.W. and A.J. Hagger, (1983), Macroeconometric Systems: Construction, Validation, and Applications. (St. Martin's Press, New York).

Chenery, H.B., (1952), " Overcapacity and the Accelaration Principle", Econometrica, Vol.20, No. 1, pp.1-28.

Culem, C.G., (1987), "Foreign Trade Behaviour in a Small Open Economy: Belgium 1970-1980", Scandinavian Journal of Economics, Vol.89, No.1, pp.55-70.

Datta, M. and V. Su, (1969), " An Econometric Model of Puerto Rico", The Review of Economic Studies., Vol. XXXVI (3), No. 107, pp.319-333.

El-Sheikh, S., (1992), "Towards a Macrometric Policy Model of a Semi-Industrial Economy: The Case of Egypt", Economic Modelling, January, pp.75-95.

Evans, M.K., (1969), Macroeconomic Activity: Theory, Forecasting, and Control., (Harper & Row, Publishers, New York).

Fry, Maxwell J.(1978) "The Permanent Income Hypothesis in Underdeveloped Economies:Additional Evidens", Journal of Development Economics, Vol.5, pp.399-402.

----,(1981), "The Permanent Income Hypothesis in Underdeveloped Countries:Mea Culpa", Journal of Development Economics, Vol.8,pp 263-268.

Fisher, W.D and W.J. Wadycki, (1971), "Estimating a Structural Equations in a Large System", Econometrica, Vol.39, No.3, pp.461-465.

Gafar, J., (1984), " Devaluation and Its impact on the Demand for Imports in an Open Economy: The Case of Jamaica", The Indian Economic Journal, Vol.31, No.3, pp.34-44.

Ghartey, E.E., (1987), A Macroeconometric Model of Ghana. Unpublished Ph.D. Dissertation, Dalhousie University, Canada.

------(1987b), "Devaluation as a Balance of Payments Corrective Measure in Developing Countries: A Study Relating to Ghana", Applied Economics, Vol.19, No.7, pp.937-47.

Ghartey, E.E. and U.L.G. Rao, (1990), " A Short-Run Forecasting Model of Ghana", Economic Modelling, July, pp.291-308.

Ginman, P.J., and T. Murray, (1976), " An Empirical Examination of the Traditional Aggregate Import Demand Model", The Review of Economics and Statistics, Vol. LVIII, No.1, pp.75-80.

Goldberger, A.S., (1959), Impact Multipliers and Dynamic Properties of the Klein-Goldberger Model. (North-Holland Publishing company, Amsterdam).

Goodwin, R.M., (1951), " The Non-linear Accelarator and the Persistence of Business Cycles", Econometrica, Vol. 19, No.1, pp.1-17.

Gunasekera, H.M., (1974), "The Economy of Sri Lanka: 1948-73", The Ceylon Journa of Historical and Social Studies, Vol. IV, Nos. 1 and 2, pp.73-92.

Haitovsky, Y., G. Treyz and V. Su, (1974), Forecasts with Quarterly Macroeconometric Models., (Natonal Bureau of Economic Research, New York).

Haque, N.U., K. Lahiri and P.J. Montiel, (1990), " A Macroeconometric Model for Developing Countries", IMF Staff Papers. Vol. 37, No. 3, pp.537-559.

Hewavitharana, B., (1980), " New Patterns and Strategies of Development for Sri Lanka", Economic Bulletin for Asia and the Pacific, June, pp.20-44.

Houthakker, H.S. and S.P. Magee, (1969), " Income and Price Elasticities in World Trade", The Review of Economics and Statistics, Vol. LI, No.2, pp.111-125.

IMF, (1990), International Financial Statistics Year Book.

Kappagoda, N. and S. Paine, (1981), The Balance of Payments Adjustment Process: The Experience of Sri Lanka., (Marga Institute, Colombo).

Karunasena, A, (1983), A Macroeconometric Model for Sri Lanka., Unpublished Ph.D. Dissertation, McMaster University, Canada.

Karunatilake, H.N.S., (1971), Economic Development in Ceylon., (Praeger Publishers, New York).

Keynes, J.M. (1936), The General Theory of Employment, Interest and Money. Macmillan, London.

Khan, Asfaque H.,(1987), " Aggregate Consumption Function and Income Distribution Effect: Some Evidence from Developing Countries", World Development, Vol.15, No.10/11, pp 1369-1374.

Khan, M.S., (1974), " Import and Export Demand in Developing Countries", IMF Staff Papers, Vol.21, pp.678-693.

----- and K.Z. Ross, (1977), " The Functional Form of the Aggregate Import Demand Equation", Journal of International Economics, Vol.7, pp.149-160.

Kolluri, B.R. and C.R. Torrisi, (1987), " Aggregate Import Demand and Elasticities of the Major Oil-Exporting Countries", Journal of International Economic Integration, Vol.2, No.2, pp.89-103.

Koyck, L.M., (1954) Distributed Lags and Investment Analysis., (North-Holland, Amsterdam).

Lakshman, W.D., (1986), " State Policy in Sri Lanka and Its Economic Impact 1970-85: Selected Themes with Special Reference to Distributive Implications of Policy", Upanathi, Vol. 1, No. 1, pp. 5-36

Klein, L.R., (1983), Lectures in Econometrics., (North-Holland, Amsterdam).

----- (1985), Economic Theory and Econometrics., (University of Pennsylvania Press, Philadelphia).

Krishnamurty, K., P. Saibaba and N.A. Kazmi, (1984), " Inflation and Growth: A Model for India", Indian Economic Review., Vol. XIX, No. 1, pp. 17-111.

Marwah, K., (1969), An Econometric Model of India: Estimating Prices, Their Role and Sources of Change., Carleton University, Ottawa.

Marzouk, M.S., (1975), "An Econometric Model of Sudan: Simulation Experiments of Growth Prospects", Journal of Development Economics, Vol.1, pp.337-358.

Mouhammed, A, (1990), " An Econometric Identification of Development Strategies in Iraq: 1951-1980", Canadian Journal of Development Studies., Vol. XI, No. 1, pp.99-118.

Narasimham, N.V.A., (1956), Short-Term Planning Model for India., (North-Holland, Amsterdam).

Nguyen, D.T. and A.R. Bhuyan, (1977), " Elasticities of Export and Import Demand in Some South Asian Countries: Some Estimates", The Bangladesh Development Studies, Vol.5, No.2, pp 133-50.

O'Neill, T.H., (1982), An Estimation of International Trade Elasticities for Ten Developing Countries, Unpublished M.A. Dissertation, Dalhousie University, Canada.

Pandit, V., (1984), "Macroeconomic Adjustments in a Developing Economy: A Medium Term Model of Outputs and Prices in India", Indian Economic Review, Vol.XIX, No.1, pp. 112-157.

Perera, N., (1988), "Demand for Money in Sri Lanka 1960-1984", The Indian Economic Journal, Vol.36, No.1, pp.18-32.

Rajapatirana, S, (1988), " Foreign Trade and Economic Development: Sri Lanka's Experience", World Development, Vol.16, No.10, pp.1143-57.

Rittenberg, L., (1986), "Export Growth Performance of Less-Developed Countries", Journal of Development economics, Vol.24, pp.167-77.

Salas, J., (1982), "Estimation of the Structure and Elasticities of Mexican Imports in the Period 1961 to 1979", Journal of Development Economics, Vol.10, pp.297-311.

Snodgrass, D.R., (1966), Ceylon: An Export Economy in Transition. (Richard D. Irwin, Inc., Homewood, Illinois).

-----,(1974), " Sri Lanka's Economic Development during Twenty-Five Years of Independence", The Ceylon Journal of Historical and Social studies, Vol. IV, Nos. 1 and 2, pp.119-26.

Song, Byung-Nak., (1981), " Empirical Research on Consumption Behaviour: Evidence from Rich and Poor LDC's", Economic Development and Cultural Change, Vol.29, No.3, pp. 597-611.

Sri Lanka Export Development Board (EDB), (1985), Annual Review of Export Performance in Sri Lanka., Colombo.

Swamy, P.A.V.B., and J. Holmes, (1971), "The Use of Undersized Samples in the Estimation of Simultaneous Equations Systems", Econometrica, Vol.28, No.1, pp.45-61.

Tinbergen, J. (1939), Statistical Testing of Business Cycle Theories, II: Business Cycles in the U.S.A., 1919-1932. (League of Nations, Geneva)

UNDP, (1990), Human Development Report 1990.

UNIDO, (1987), Industry and Development Global Report.

Wallis, K.F., (1980), Topics in Applied Econometrics., (University of Minnesota Press, Minneapolis).

Watson, P.K. (1990), "Modelling the Balance of Payments of Trinidad and Tobago 1965-1985: A Policy Making Perspective", Social and Economic Studies, Vol.39, No.1, pp.51-70.