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INTERNATIONAL CAPITAL FLOWS AND ECONOMIC GROWTH FOR MOZAMBIQUE (1980-1996)

Gabriel Jamo

A research report submitted to the Graduate School of Public and Development Management, University of the Witwatersrand, Johannesburg, in partial fulfillment of the requirements for the degree of Master of Management (in the field of Public and Development Management).

February 28, 1999

ABSTRACT

The purpose of this study was to assess the effect of international capital flows on economic growth and employment in Mozambique, a country that is heavily dependent on foreign assistance. The aggregate expenditure sector was employed to develop a model that is consistent with specific features of the Mozambican economy. Annual aggregate time series data from 1980 to 1996 period was primarily used to estimate of single equations which are components of the model, employing modern time series techniques. The sample size is rather small to generate anything other than tentative conclusions. Nevertheless, foreign capital flows appear to have had a far-reaching effect in fuelling economic growth in Mozambique for the period studied. The effects were largely dependent upon the magnitude of international capital flows. However, there was a significant lag between economic growth and employment generation. Due to high level of aggregation applied in the analysis, the impact of foreign resources at a sectoral impact was not captured. In particular a more desegregated analysis is required to discern the effect of international capital flows on economic growth and employment.

DECLARATION

I declare that this research report is my own, unaided work. It is being submitted in partial fulfilment for the requirements for the degree of Master of Management (in the field of Public and Development Management) at the University of Witwat srand, Johannesburg. It has not been submitted before for any other degree or examination in any other University.

_____

Gabriel Jamo

February 28, 1999

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CHAPTER 1

NATURE AND LIMITATIONS OF THE PROBLEM

1.1 RESEARCH BACKGROUND

Mozambique achieved independence from Portugal in 1975 after a 10 year protracted liberation war. The economic structure was geared towards serving the interests of the colonial power, and has undergone many transformations since independence. Severe shocks, political turbulence and natural disasters affected the macroeconomic policy stance. Nevertheless, prior knowledge of the economy will provide guidance in model specification.

Before independence, the economic structure had capitalist features, for example, residential flats, factories and businesses were privately owned. After independence in 1975, the government opted for a socialist economy, and in the process nationalised key economic sectors and abandoned factories and farms. In 1977, the state retained 1 percent ownership of industry, while the private sector ownership was 85 percent. By 1982, state ownership of industry was 62 percent, while the private sector declined to 27 percent. Thus, the state became the largest owner of factors of production (EIU, QER, 1985, pp. 27-28).

Between 1977 and 1980, economic performance was on the rise following disruptive transition to independence, and economic planners envisaged Mozambique developing in 10 years. The decade of 1980 was declared the decade of victory over underdevelopment. The economy was expected to grow at a staggering 17 percent per annum with the agricultural sector leading the way. However, it soon became clear that the plan was over ambitious, for the government had neither the financial nor the trained human resources to carry out the plan successfully. Consequently it was abandoned in the early years of the 1980's (EIU, Country Profile, 1986-87, pp. 8-9).

The country systematically faced a trade deficit even prior to independence, and current account deficit from 1984. As domestic savings were falling, the economy began to experience severe shortages of foreign exchange, partly caused by the imposition of sanctions on what was then Rhodesia, and the fact that South Africa undercut Mozambique's ports and rail facilities by offering lower tariffs. Drought also seriously affected agricultural production, a major source of export goods, during the seasons 1982/83, 1983/84 and 1984/5. Furthermore, the war had begun to affect all economic sectors by 1982, hampering performance. There were also policy mistakes made by the government, which included running small business suited to family and private sectors (EIU, Country Report, 1987, pp. 28-30).

By 1983, the government had run out of foreign exchange to pay its creditors and imports, and in the following year declared bankruptcy. In the mean time, the country remained cut-off from aid and credit pending an agreement with the IMF and the World Bank to implement a structural adjustment programme (Hanlon, 1991, p. 113). In 1984 the year in which Mozambique joined the IMF and the World Bank, the government attempted to stabilise the economy in a limited manner. In the process there were free market experiments. A variety of measures to stimulate agriculture were introduced: bigger state farms were broken into smaller parts, and some of these parts given to various stake holders, and the price of agricultural produce was allowed to rise. Exporters were permitted to retain a portion of the earned foreign exchange to import capital goods. Managers of state companies were given more freedom and tight budgets. Regarding the provision of social services, the authorities ended free medical care and education. In 1985 there was further liberalisation of regulations in business and sharp cuts in government expenditure. State owned companies were separated from the state apparatus and managers told to consider them as businesses. These reforms however, did not satisfy the IMF and the World Bank who insisted that the government implement a comprehensive structural adjustment programme as a precondition for debt relief and aid (EIU, QER, 1985 vol. 3, pp. 22-24).

In January 1987 the government introduced a stabilisation policy package, under the code name "Economic Recovery Plan" (*ERP*). The objectives of the *ERP* where to arrest the decline in economic growth, ensure a minimum level of income and consumption, reduce financial imbalances, strengthen the balance of payments, and rehabilitate the physical infrastructure. The currency was devalued by 86 percent against the US dollar. The *ERP* was also aimed at correcting financial imbalances. It sought to restore the real value of domestic currency as a store of wealth by undercutting the parallel (black) market. Measures were also taken to further reduce the state budget and restrict the volume of credit (EIU Country Profile, 1988-89). The implementation of the programme resulted in an inflow of foreign resources unprecedented since independence. The inflow of these resources has remained significantly high. For example, foreign financial resources finance about 60 percent of the government budget. These resources were used to finance social programmes, investment projects and imports.

Available data indicates that not only the decline in economic growth was arrested, but also the economy recovered and grew by 4.8 percent per annum. The second phase of structural adjustment was introduced in 1990, with emphasis on poverty alleviation and accelerated privatisation of state owned enterprises. Mozambique continues to rely heavily on foreign financing to keep its economy moving. On the political front, the government renounced its Marxist-Leninist ideology in 1987. In 1990 a new constitution providing for legal formation of opposition parties came into effect, in prelude for the end of the civil war in 1992, and the first multiparty presidential and parliamentary elections were held in 1994.

From the above summary it can be seen that the major policy shifts are associated with a change in political ideology and macroeconomic policies in the Mozambican economy at the time.

1.2 THE RESEARCH PROBLEM

The purpose of this research was to assess the effect of international capital flows on economic growth and employment in Mozambique for the 1980 - 1996 period. In order for this problem to be addressed it was broken down into two sub-problems. The first sub-problem was that of determining the effect of international capital flows on economic growth. The second problem entailed assessing the impact of economic growth on employment level.

1.3 THE RESEARCH LIMITATIONS

This research project was limited by the availability of data as in most developing countries. The time series studied correspond mostly to wartime. Furthermore this period was relatively short and previous related work which would have served as a starting point for this research report was not available and/or accessible.

1.4 RESEARCH DELIMITATIONS

It was not the objective of this paper to formulate a full-blown macroeconomic model. The model which is specified in Chapter Four is basically restricted to the aggregate expenditure sector followed by labour market function. It is intended to be descriptive in nature, that is, describe past behaviour of the economy. The use of modern time series will be restricted to Engle-Granger two step approach. Given time limitations, model simulation and multiplier analysis will not be undertaken.

1.5 STRUCTURE OF THE RESEARCH REPORT

A theoretical framework is presented in Chapter Two where theory regarding economic growth, international capital flows, debt and economic growth concepts are first reviewed. Thereafter, the theoretical underpinning describing aggregate expenditure sector, employment and the role of expectations is outlined. Chapter Three outlines the research hypotheses, while research methodology, which

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includes model specification, estimation and testing procedure and data description, is carried out in Chapter Four. Chapter Five reports on the research results, analysis and interpretation. Finally, Chapter Six presents the summary, conclusions, policy issues, and outlines further research areas.

CHAPTER 2
LITERATURE REVIEW

2.1 INTRODUCTION

The objective of this section is to outline a theoretical framework which will aid in model specification in Chapter Four. The survey is not intended to be exhaustive given that some of the theories and concomitant models may not be entirely applicable in the economy being studied.

2.2 GROWTH THEORIES

Neo-classical Analysis

In the neo-classical tradition, long term effects of capital accumulation, labour expansion and technological changes that are assumed to take place in conditions of equilibrium cause GDP to rise. Shifts in demand and the movement of resources from one sector to another are considered relatively unimportant because labour and capital produce equal marginal returns in all uses (Edgmond, 1983, p. 308). The Harrod-Domar model is the simplest and best-known growth model. Initially developed to explain growth processes in capitalist societies has since gained prominence in explaining capital requirements for growth in developing countries. The underlying assumption of this model is that the amount of capital invested in the economy is related to output, and labour is considered to be in surplus in the sense that its marginal productivity is zero. Capital investment is critical because it provides employment to labour that would otherwise be unemployed, and because labour is paid out of its marginal product. However, the model is criticised on the grounds that it does not allow for factor substitution, and because the implied savings investment equations are very simplistic (Kindleberger and Herrick, 1977, pp. 45-48).

Following the above criticism, new theories were developed to explain the growth process. One of these theories is that which relates to aggregate production

function containing factors other than just physical capital, associated with the Cobb-Douglas production function. This theoretical framework suggests that increments of any factor cause increment to the product according to marginal productivity of that factor. When factor earnings are used as measures of the contribution of productive factors to the process of economic growth a substantial amount of economic growth (the residual) remained unexplained. However, this theoretical approach has been criticised for measuring input and output in aggregate at different times and costs. The fundamental assumptions of the neo-classical approach are that factor returns equal marginal productivity in all uses, and that there are no economies of scales in addition to perfect foresight and continuous equilibrium in all markets. The empirical implications are that the elasticities of substitution in demand and trade are relatively high, and limited need for sector desegregation. The sources of growth are capital accumulation, increase in labour quantity an' quality, increase in intermediate inputs, and total factor productivity within sectors (Thirlwall, 1994, pp. 69-71).

Structuralist Analysis

Structuralists regard economic growth as one aspect of transformation of the structure of production that is required to meet changing demands and to make more productive use of technology. Given the perfect foresight and limits to factor mobility, structural changes are most likely to occur under conditions of disequilibrium, especially in factor markets. Thus a shift of labour and capital from less productive to more productive sectors can accelerate growth. The structural approach assumes that income is related to changes in internal demand, constrained external markets, lags in adjustment, and transformation of productive structure producing disequilibria in factor markets. The empirical implications are low price elasticity and lags in adjustment, segmented factor markets, and lags in adoption of new technology. The sources of growth include all the neo-classical ones plus reallocation of resources to higher productivity sectors, economies of scale and learning by doing, and a reduction of internal bottlenecks (Chenery,

1986, pp. 13-32). There are other growth models such as putty clay and clay-clay, Kole, but they will not be considered in this research paper.

2.3 INTERNATIONAL CAPITAL FLOWS DEBT AND ECONOMIC GROWTH

Countries with deficient domestic savings (S_D) have relied on foreign savings (S_F) from other countries to fuel economic growth. The notion of foreign savings can be approached in two ways: foreign savings finance the amount by which investment exceeds domestic savings: $S_F = I - S_D$ and the trade deficit: the excess of imports over exports $S_D = M - E$. Foreign savings consist of both private and official savings. Foreign private savings largely embody foreign direct investment by multinational corporations. Aid can be bilateral (directly given by one government to another) or multilateral (funds flow to an international agency, which in turn grants or loans the funds to recipient developing countries). A large proportion of official savings is on concessional terms, made available either as grants or soft loan aid. Governments also obtain loans on commercial terms including export credits, equity investment, and hard loans from the World Bank and other regional development banks. Finally, aid can be in the form of technical and capital assistance. The former entails the provision of skilled individuals to enhance national expertise, while the latter entails the provision of finance or commodities for a variety of purposes (Gillis, Perkins, Roemer, and Snodgrass, 1992, p.374).

2.3.1 Resources Gap and Foreign Exchange Gap

An understanding of the necessity of external financing requires recognition of the relationship between national income analysis and balance of payments analysis. An external microimbalance between national expenditure and national savings leads to an external imbalance in the balance of payments. It is known from national income analysis that the use of national income $(C+I+G+X-M)$ must be equal to disposable national income $(C+S+T)$, where (C) is

consumption, (I) gross domestic investment, (G) government expenditure, (X) exports, (M) imports, (S) gross savings, and (T) taxes. Rearranging the previous identities a fundamental relationship emerges: $(I+G)-(S+T)=(M-X)$. This relationship implies that an excess of investment and government expenditure over earnings from resources released through private savings and taxation creates a resource gap within the economy, resulting in an excess of imports over exports. The resource gap thus spills over into the balance of payments and creates a foreign exchange gap. Under these circumstances, required investment and government expenditure can be achieved by importing goods and services. In such case, foreign resources are then feeling the domestic resource gap (Thirwall, 1994, p. 304-305).

However, when imports exceed exports, the country faces the foreign exchange gap that has to be filled. This can only be done by running down the foreign exchange reserves or through external financing. The financial inflow to fill the foreign exchange gap allows real capital transfer in the form of imports greater than exports. High levels of domestic investment will necessitate high levels of inflows of foreign capital, depending on the targeted level of GDP. To support the targeted GDP, gross capital inflows must cover the balance of trade deficit $(X-M)$ generated at that level of GDP, plus any servicing of external debt. The net capital inflows, will equal the gross capital inflows minus debt service outflows on foreign direct investment, capital flight, and build up of reserves. External financing fills the resource gap and foreign exchange gap, thereby allowing national expenditure $(C+I+G)$ to be greater than the value of products produced domestically (Meier, 1995, pp. 215-217).

2.3.2 Theoretical Determinants and Effects of Capital Flows

In analysing theoretical determinants of capital flows using the two gap model, structuralists assume that capital output ratios are fixed for each country, and that at certain times developed countries have a savings surplus. On the other hand

developing countries face a chronic shortage of capital and that their development would be enhanced by the availability of international capital inflows.

Sructuralists criticise the neo-classical argument that chronic balance of payments constraint is caused by overvalued exchange rates, which has the effect of reducing the level of exports and increasing imports. The criticism is based on the notion that a rise in the price of foreign exchange may not lead to a rise in the level of exports because of inadequate domestic substitutes for necessary imports. Furthermore, there might be fixed coefficients between imports, domestic output, and exports might face highly elastic demand (Krueger and Rultan, 1989, p. 42). Hirschman (1961) argues that devaluing domestic currency to deal with foreign exchange constraints may lead to a fall in real ' ome. This takes place as long as increases in spending on imports exceeds ex .. receipts in a situation where a trade deficit is prevailing. Therefore, the economy transfers real income to the rest of the world.

However, two-gap model is criticised on the grounds that the assumptions required to generate foreign exchange are not plausible, because imports can be diversified into lines where foreign demand is inelastic. Furthermore, import intensity of domestic production is fixed in the short run, but in the long run import substitutes can be developed. The model is further criticised for concentrating excessively on the volume of resource flows, without paying adequate attention on efficiency in resource use. The final criticism is based on the argument that the responsiveness of exports to changes in real exchange rates is not incorporated in the model (Michlopoulos 1989, pp. 343-356).

The neo-classical view has formulated a number of theories, which in their view are the determinants of international capital flows. The urbanisation theory and the foreign financing of public sector theory are briefly outlined here. The thrust of the former is that the demand for capital and foreign borrowing are caused by urbanisation. Urbanisation induces population growth in developing countries leading to excess demand for capital and foreign borrowing. The latter purports to

demonstrate that if a significant proportion of non-traded goods in the form of infrastructure and services are publicly provided will cause demand for capital in the public sector to increase. Eventually, public sector deficit becomes so large to an extent that domestic resources can no longer finance them, thus leading to reliance on foreign borrowing. It is therefore expected that there will be a positive measure association between urbanisation and public sector expenditure and between government deficits and growth rate of the debt to GDP ratio in developing countries (Scott and Lal 1990, pp. 242-246).

2.3.3 Empirical Effects of International Capital Flows in Economic Growth

While there is no doubt that the inflow of foreign resources augments real resources directly, questions have been raised about its contribution to the broader aspects of economic development. Foreign aid has been criticised on both the right and the left of the political spectrum. On the one hand, supporters of private enterprise and critics of government activism claim that the receipt of concessional resources from aid donors delays self-reliance on the part of the recipient country, substitutes for domestic savings and allows the postponement of the needed policy reform. On the other hand, leftists argue that aid perpetuates dependency and perverts domestic development. (Todaro, 1994 pp. 547-548). Despite these extreme views, this question is considered to be an empirical one that can be answered only with empirical evidence.

Nixon (1996, p. 85) quotes "The Economist" on a study conducted by Boone who surveyed 96 countries between 1971 and 1990, where he assessed the impact of foreign aid on investment and growth. He concluded that in most cases aid is spent on consumption, and that only in small countries where aid makes up more than 15 percent of GDP, there a significant correlation between investment and aid. On the other hand, Cassen (1994, pp. 7-9) provides evidence based on a large sample of aid activities for a number of countries case studies all written to the same reference and various other reports on aid. The basic finding is that most of the aid works and "succeeds in achieving its developmental objectives contributing

positively to the recipient countries' economic performance and does not substitute for activities, which would have occurred anyway". Nevertheless, he acknowledges that aid does not work on all accounts and that performance varies from country to country. He further acknowledges that bilateral donors political and commercial motives can interfere with development.

2.3.4 Debt Service and Sustainable Debt

The accumulation of debt is an accepted phenomenon in developing countries at the stage of economic development. These countries are characterised by low domestic savings, high current account payments deficits, and the need to import capital to augment domestic resources. Nevertheless, the benefits of foreign savings come at a cost which recently has been greater than the benefits for many developing countries. The main cost of accumulation of external debt is debt servicing: the payment of the principal and accumulated interest rates. As the size of the debt increases or interest rate rises, debt servicing charges also increase. Debt service payments must be made in foreign exchange through export earnings, curtailed imports, or more external borrowing (Kindleberger et al., 1977 pp. 299). The problem occurs when accumulated debt becomes so large that its rate of increase begins to decline as amortisation rises relative to the growth of new foreign inflow. This takes place when the economy begins to experience severe balance of payments problems because of falling commodity prices and deteriorating terms of trade. A global recession or external shock such as a rise in oil prices, a sudden change in the value of the US dollar, in which most of the debts are denominated, has the same effect. All these combine to lower the rate of increase of debt and increase the volume of debt servicing (Todaro, 1994, pp. 457-458).

2.4 THE AGGREGATE EXPENDITURE SECTOR

Aggregate expenditure is an accounting identity consisting of a number of equations that determine various components of national expenditure given as:

$$Y = C + I + G + M - X \tag{2.4.1}$$

Where (Y) is national income, (C) is private consumption, (G) is government consumption, (M) is imports, and (X) is exports (Chrystal & Price, 1994, pp. 9-10).

Consumption Function

The absolute income theory of consumption as presented in Thomas 1985, (pp. 160-162) postulates that consumption (C) is a function of real income, i.e.:

$$C = f(Y) \tag{2.4.2}$$

It is postulated that as income rises, consumption increases as well. But not by as much as the increase in income, thus implying that the marginal propensity to consume lies between zero and unity, i.e.: $0 < \partial c / \partial y < 1$. It is further postulated that the proportion of income spent on consumption falls as income increases, i.e.: $d(c/y)\partial y < 0$ which implies that income elasticity of consumption is less than one. It is also postulated that marginal propensity to consume (MPC) is less than the average propensity to consume (APC), i.e.: $\partial c / dy < c / y$, and that marginal propensity to consume falls as real income rises. C/Y is the share of consumption in income or average propensity to consume (APC), and is expected to decrease as income rises.

However, it is stated in the relative income hypothesis that in addition to current income, consumers are also influenced by past consumption levels. Thus changes in income do not necessarily result in fluctuation of consumption level. Equation (2.4.2) can be specified in the following way:

$$C = f(Y_t, Y_{t-1}) \tag{2.4.3}$$

The above equation implies that consumers draw from their past savings to finance current period consumption in addition to current period income. The relative income hypothesis formulated by Brown (1952) in Mayes (1981, pp. 35-37). further postulates that consumers adjust their consumption habits slowly, and therefore the previous consumption level in addition to disposable income affects current consumption. Consequently, consumption changes slowly to a new equilibrium value in response to a change in either a rise or a fall in income level. The consumption function becomes a function of disposable income and previous consumption level:

$$C_t = f(Y_t, C_{t-1}) \tag{2.4.4}$$

There are other theories such as the permanent income hypothesis, which will not be considered in this research report.

Investment Theories

In this subsection, the accelerator model is outlined, followed by a brief description of the Jorgenson's neo-classical theory, the relationship between credit availability and investment and finally, the complementarity relationships between public sector real investment expenditure and private sector real investment expenditure. There are other theories such as the Tobin q model and the vector autoregressive models. But these will not be considered in this paper.

The naive accelerator model postulates a constant proportionality between optimal capital stock (K_t^*) and output:

$$K_t^* = \mu Y_t \tag{2.4.5}$$

where (Y_t) output and (μ) fixed capital-output ratio. Given that capital stock is always optimally adjusted in each period, suggesting that desired capital stock is equal to actual capital stock, net investment is given by the difference between present and past capital stock. It is further assumed that capital stock is always optimally adjusted in each period, so $K_t = K_t^*$, then net investment equation (I_{nt}) is written as:

$$I_{nt} = K_t - K_{t-} = \mu(Y_t - Y_{t-1}) \qquad (2.4.6)$$

The instantaneous adjustment of K_t to K_t^* suggests that there is an infinitely elastic supply of capital goods and that firms always seek to maintain a constant capital output ratio. Although a symmetrical reaction for both increases and decreases in output is assumed, in practice decreases in capital stock are likely to be limited to the rate of physical depreciation. Therefore, simple regression estimates for equation (2.4.6) yield poor estimates for μ. These estimates are generally less than suggested by observed capital output ratios (Thomas, 1985, pp. 251-252).

The flexible accelerator model on the other hand assumes a partial adjustment process between desired and actual capital stock. In this model, firms seek to close a fraction λ of the gap between desired and actual capital stock (K_t) in each period so that capital stock at the end of the current period is given by:

$$I_{nt} = \mathrm{K}_t - \mathrm{K}_{t-1} = \lambda(K_t^* - K_{t-1}) \qquad 0 < \lambda < 0 \qquad (2.4.7)$$

hence net investment equation $I_{nt} = K_t - \mathrm{K}_{t-1}$ is only a proportion, λ, of that which is necessary to attain the optimal capital stock K_t^*(Berndt, 1991,pp.233-235).

Thomas (1985, pp. 223-259) also suggests that investment decisions are dependent on the streams of returns, interest rates and the price of capital goods, in addition to the availability of funds. Early attempts to incorporate financial factors rendered capital stock a function of the level of profits (PF):

$$K_t^* = f(PF_t) \tag{2.4.8}$$

The Jorgenson's neo-classical theory of investment provides a theoretical underpinning that combines output effects with interest rate and other cost of capital effects. The main argument of this theory is that net investment spending is determined by the discrepancy between actual and desired capital over time. In turn, the rental (user) cost of capital and the expected level of output and investment tax policy determine desired capital stock. A rise in interest rate leads to a fall in desired capital stock. The level of capital stock is also affected by monetary and fiscal policies, but with long lags (Berndit, 1991, pp. 243-248).

Returning to the concept of credit availability in the context of developing countries, it is argued that credit availability constraints for the private sector in these countries often arise because of attempts to fight inflation. In many countries credit ceilings are normally employed as a supplementary instrument of inflation control. However, such measures often result in government taking a large proportion of available credit from the banking system. In such instances, the government would be "crowding out" the private sector from credit sources. This leads to serious disruptions in the private sector including increasing unemployment and low real income growth (Gillis et al., 1992, pp. 369-37). "Crowding out" of private sector investment is caused by raising interest rates. High interest rates result in low profits, which makes it less attractive for the private sector to borrow funds for investment purposes (Glahe, 1985, pp.178-181).

Other theories of investment in relation to developing countries suggest that real private sector investment expenditure and real public sector investment

complement each other. The complementarity relationship between government investment in infrastructure and private sector investment "crowding-in" arises in instances where public sector investment generates positive externalities. This happens when the government invests in infrastructure, which reduces the cost of private sector projects. "Crowding-in" is also likely to result in multiplier effects in instances where there is surplus capacity that can be vitalised by additional expenditure, so that with higher incomes more private savings are influenced to finance additional investment (Weiss, 1995, pp. 330-31).

The Government Sector

As presented in standard macroeconomic textbooks, the government sector is exogenous and influences the level of equilibrium income:

$$G = G^0 \tag{2.4.9}$$

Firstly, government expenditure on goods and services is a component of aggregate demand. Secondly, taxes and transfers affect the relationship between income (Y) and disposable income (Y_D) available for consumption (C) or savings (S) (Rudiger et al., 1991, pp. 113). The government sector is a policy instrument in that it can be used to stabilise the economy. For example, when the economy is experiencing a recession, the government may want to increase its expenditure to nurse it back to growth. Conversely, the government can reduce its expenditure to cause the economy to contract if there are fears that it may overheat (Mork, 1992, pp. 156-158).

Net Foreign Demand

In an open economy, part of the domestic output is sold to foreigners (exports), and part of the spending by domestic residents is on foreign goods (imports). The difference between exports and imports is referred to as the trade balance (net

export). Exports (X) are assumed to be fixed and imports (M) to depend on the level of income. Net foreign demand is therefore written as:

$$NX = \overline{X} - \overline{M} = \overline{X} - mY \qquad (2.4.10)$$

where (m) is marginal propensity to import out of national income. The above equation implies that that at low levels of income, given a fixed level of exports, there is a trade surplus, $NX > 0$. As income rises, import spending increases until the level of income matches the level of imports so that there is a trade balance. A further increase in income results in a trade deficit. A rise in autonomous spending on domestic goods, an autonomous increase in exports and a shift in demand from imports to domestic goods, in a fixed exchange rate regime results in a rise in the level of equilibrium income (Case and Fair, 1996, pp. 511-512).

The exchange rate affects income and trade balance via real exchange, which is defined as the relative price of foreign goods and domestic goods. Assuming that foreign price and domestic price are fixed, a devaluation of domestic currency increases the real exchange rate thus increases the relative price of imports in domestic market and lowers the relative price of exports in the foreign market. This in turn leads to a fall in the demand for imports and a rise in exports, which results in an improvement in the trade balance. Given a fixed exchange rate a rise in domestic producer price relative to world prices will cause the exchange rate to fall, leading to a rise in the level of imports and a fall in the level of exports. Conversely, a rise in world prices relative to domestic prices will have the same effect as devaluation of domestic currency. Therefore, all else equal, an appreciation of domestic currency raises the relative price of its exports and lowers the relative price of imports. Conversely, currency depreciation lowers the relative price of country's exports and raises the relative price of imports (Krugaman and Obstfeld, 1988, pp. 310-312).

Despite the above theoretical underpinning regarding international trade, other theoretical considerations that bear relevance to developing countries are raised. With respect to exports, it is believed that these countries have little influence over

the growth of real world income or the relative prices of synthetic substitutes from primary commodities, which they export. This implies that they do not have control over the demand determinants of their terms of trade. On the supply side, the influence which any individual developing country has over the price of its exports and thus its terms of trade depends on its supply of a particular commodity as a proportion of the world supply of these commodities. The terms of trade are compounded by the fact that developing countries often experience fluctuations in the prices of their primary exports, caused by inelastic and unstable demand supply (Bird, 1982, pp. 63- 70). In relation to imports, Moran (1988), explores the role of foreign exchange constraint on imports, and demonstrates that previous models which simply regarded imports as dependent on the level of relative prices are inadequate for developing countries. He demonstrates that foreign exchange constraint also plays an important role in determining import behaviour of imports in these countries. Hence import models that neglect these effects are likely to yield biased estimates.

2.5 LABOUR MARKET

The neo-classical model as presented in Elliott (1991, pp. 7-11) presupposes an interaction of labour supply and labour demand. The labour supply curve shows the relationship between labour supply and wage rate, and is expressed as:

$$L_s = L_s(W/P, Y, \tau) \qquad (2.4.12)$$

where (L_s) labour supply, *(W/P)* wage rate, (Y) non labour income and (τ) tastes. Changes in non-labour income and in individuals' tastes for leisure will shift the position of the supply curve, while changes in wage rate result in movements along the curve. The labour demand curve represents the demand for labour by firms, and is a derived demand from the demand for the final commodity that labour produces. Since output can be generated by either employing capital or hiring labour, the price of labour is also affected by the price of substitute factors of production such as capital. The above argument can be expressed as:

$$L_d = L_d(W/P, K/P) \tag{2.4.12}$$

where (L_d) is labour demand and (K/P) is the real price of capital. The downward slop of the demand curve reflects the argument of marginal productivity theory, which postulates that as more of a variable factor is used in connection with a fixed factor of production, capital, the output of each successive unit of the variable factor will eventually diminish. In this model, equilibrium is reached at the point where both demand and supply for labour intersect. This is the point where the equilibrium wage rate and employment level is achieved.

In labour demand analysis, it is often useful to quantify the magnitude of the proportional change in labour demand resulting from a proportional change in the wage rate. The elasticity of demand provides such a measure. Own demand elasticity of labour is defined as:

$$\varepsilon = (dL_{d_i} / L_{di}) / dW_i / W_i = (dL_{di} * W_i) / L_{di} * W_i \tag{2.4.13}$$

With respect to developing countries, a number of theories have been put forward to explain labour market in these countries, with the efficiency wage being one of the most recent theories. The efficiency wage model of wage determination asserts that employers can lower their costs by raising the wages of their work force, thus leading to a cost minimising wage which is higher than the wage at which workers are willing to supply their labour. Higher wages motivate workers to be more productive, by inducing them to make greater effort at work. This model can be illustrated by letting $\phi(w)$ be the efficiency wage of a worker earning wage (w). If $\phi(w)$ initially rises at an increasing rate up to the point where $\phi(w) = w$, then there is a scope for increasing the rate paid which will also increases the worker's efficiency. Under these circumstances, labour input in the firm is a function of the number of workers (L) and the efficiency with which they work. The firm's production function can now be written as:

$$X = X[\phi(w)L, K] \tag{2.4.14}$$

where (X) is firms output and (K) is capital stock. In the short run, when the level of capital stock does not vary, the firm will try to minimise its employment costs and is able to set its own wage rate. Minimising costs therefore, implies choosing the wage which will maximise the efficiency of the workers employed. The cost of employment in efficiency units is the wage bill divided by the efficiency factor $\phi(w)$:

$$C = wL / \phi(w) \tag{2.4.15}$$

where (C) is the cost in efficiency units. To minimise (C) with respect to (w), the first order condition is taken:

$$\frac{dC}{dw} = \frac{\phi(w)L - wL\phi'(w)}{[\phi(w)]^2} = 0$$

the above equation implies that

$$w^* = \frac{\phi(w^*)}{\phi'(w^*)} \tag{2.4.16}$$

where (w^*) is the cost minimising level of (w). The wage rate is therefore determined with reference to the wage efficiency relationship. The level of employment is determined by the optimal wage rate (w^*). The fact that workers may avail themselves and willing to work for wages lower than (w^*) is no longer relevant consideration (Dinwiddy & Teal, 1996, pp.145-147).

Other models suggest that employment is related to the level of output. For a given aggregate capital output ratio, the ratio of national output and hence employment growth can be maximised by maximising the rate of growth of savings. As such, a 4 percent increase in real income for example would cause employment level to rise by the same amount (Harrod, 1939).

2.6 The Role of Expectations

Expectations play a crucial role in almost every economic activity, for example, production depends on expected sales, investment depends on expected output. There are several kinds of expectations: naive model of expectations, the adaptive expectations, and rational expectations. The adaptive expectations will be described here briefly.

The simplest assumption of the adaptive expectations model asserts that changes in prices over the next period are the same as those in the previous periods. In this model, the entire past history is used in forming expectations, with the past values receiving declining weights (Turnovsky, 1972). In the regressive expectations, the expected rate of change of prices from t to $t+1$ is believed to be the same as the actual change from $t-2$ to $t-1$. Current expectations is therefore a weighted average of the previous expectations and the current rate of inflation. A modified version of the adaptive expectations defines the change in expectations as an adjustment which depends on the error between the actual rate of inflation from $t-1$, and the expectation for that period. Only a fraction of the error is corrected in anyone period (Holden, Peel and Thompson, 1985, p. 11-18).

CHAPTER 3
THE RESEARCH HYPOTHESES

3.1 INTRODUCTION

Now that the theoretical framework underlying capital flows and the channels through which they affect economic growth, and in turn how economic growth affects employment level have been outlined, attention can now be focused on the specific details of the problem.

3.2 INTERNATIONAL CAPITAL FLOWS AND ECONOMIC GROWTH

Structuralists and the neo-classical schools of thought present different views regarding the causes of the resource gap and the foreign exchange gap. The theoretical debate is reflected in prescriptions that each theoretical underpinning suggests for addressing these gaps. On the one hand, the structuralists emphasise the need for the transfer of capital from richer to poor nations to close both savings gap and trade gap, in order to stimulate growth. On the other hand, the orthodox view emphasises the need to increase the price of foreign exchange in order to boost exports and reduce imports, and increasing the level of domestic savings to relieve foreign exchange constraint. Yet, empirical findings of the effects of international capital inflows are contradicting. There are those who argue and demonstrate that international capital flows into countries facing resource gap and foreign exchange gap have been a success, because they augment domestic resources of developing countries and thus help their economies to grow. Others insist that the whole concept of aid has been a failure because it is not development oriented. Yet others argue that, provided that capital outflows do not exceed capital inflows, the effect of international capital flows on economic growth should be positive. The first two hypotheses to be tested are whether the parameters to be estimated in relation to the Mozambican economy for the period under study, provide support for the argument that international capital inflows stimulated economic growth by easing the resource gap and the foreign exchange gap. The

third hypothesis to be tested is whether economic growth resulting from foreign capital flows led adequate level of employment growth

HYPOTHESIS 1:

> *The inflow of foreign resources eased the resource gap and the foreign exchange gap, thus stimulated economic growth in Mozambique.*

The overall impact of international capital flows will depend on the size of the net transfer on debt. If net transfer on debt is significantly positive, the overall effect will be an increase in the level of economic growth. On the other hand, if net transfer on debt is low to negative as a result of principal and interest payments, economic growth in the recipient country will be adversely affected.

HYPOTHESIS 2:

> *The magnitude of the net transfer on debt ultimately determined the level of economic growth, in Mozambique, a country facing both resource gap and foreign exchange gap.*

3.3 ECONOMIC GROWTH AND EMPLOYMENT

Theories of economic growth and employment growth are conflicting. The free market classical theoretical underpinning draws an inverse relationship between employment and wages. In this model, the equilibrium wage determines employment level at that point. A rise in wage rate leads to a fall in employment level, while a fall in wage rate cause employment level to rise. The price of substitutes such as capital play an important role in labour demand. The lower the cost of capital, the lower the demand for labour. In the Harrod-Domar model, the economic problem is one of securing investment resources to generate targeted

levels of national income growth. The underlying assumption with regard to employment generation is that a fast growing economy will improve the employment situation.

HYPOTHESIS 3:

> *Economic growth stimulated by an inflow of international capital is likely to be channelled to capital intensive methods of production, thus weakening the economy's ability to create adequate level of employment growth*

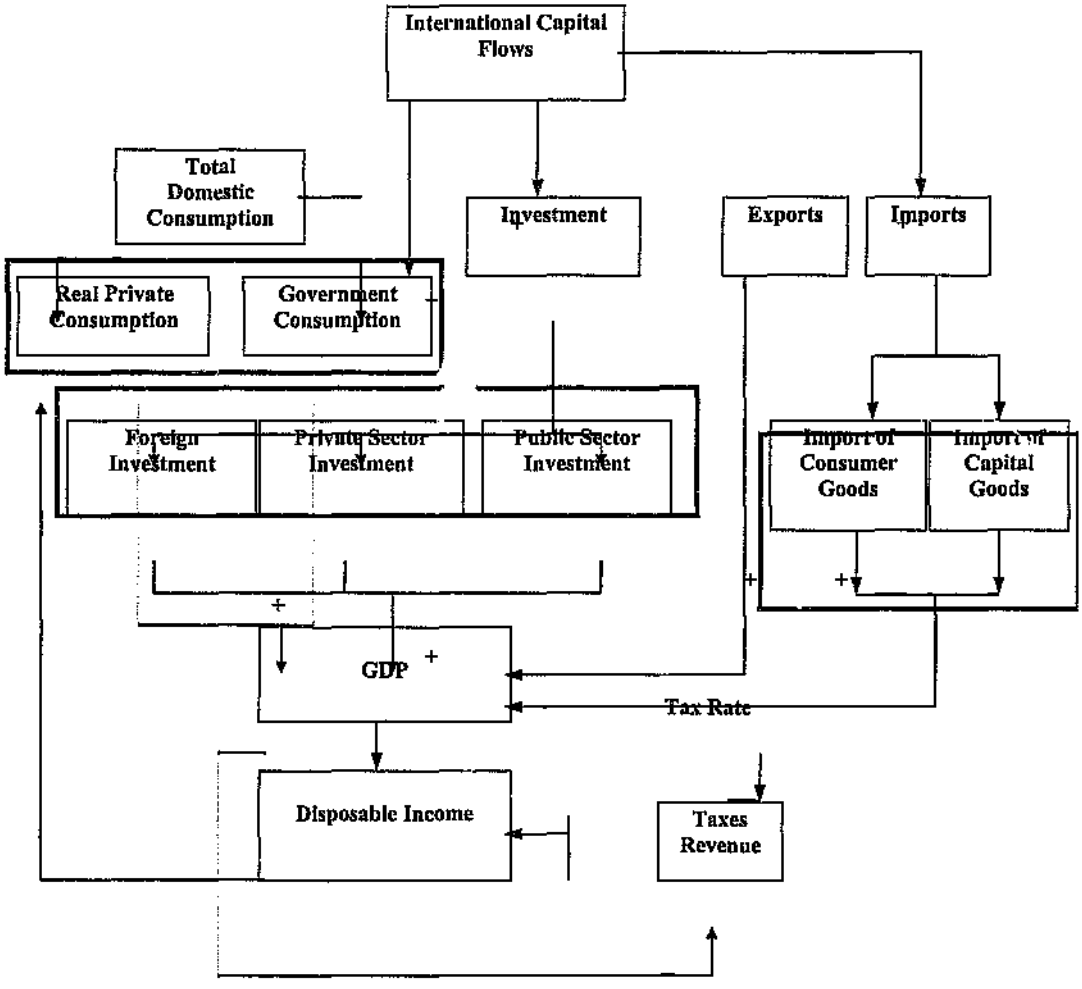
CHAPTER 4
RESEARCH METHODOLOGY

4.1 INTRODUCTION

The methodology adopted here calls upon the theoretical framework outlined in Chapter Two and prior knowledge of the economy to model the impact of international capital flows on economic growth and the effect of the latter on employment level. To do this, it is necessary, in the first instance, to construct a small macroeconomic model that is relevant to the economy being studied using the aggregate expenditure sector followed by a labour market function. The model is then used to perform a theoretical assessment of the impact of a change in international capital flows on economic growth, followed by a theoretical assessment of a change in *GDP*, wage rate and capital stock on labour demand. The second stage involved formulating an econometric model, in an empirically testable form to perform the above-mentioned exercise. The modelling approach adopted in this research paper is easily manageable and it incorporates institutional aspects that are more relevant to the Mozambican economy than the underlying Keynesian models for developing countries.

For the purpose of this research paper foreign capital inflows are divided into three parts: net transfer on debt (*NTD*), grants (*GT*) and foreign direct investment (see data description section).

The flow chart below describes the channels through which international capital flows affect real income.


International Capital Flows
Total Domestic Consumption
Investment
Exports
Imports
Real Private Consumption
Government Consumption
Foreign Investment
Private Sector Investment
Public Sector Investment
Import of Consumer Goods
Import of Capital Goods
+
+
+
+
GDP
Tax Rate
Disposable Income
Taxes Revenue

International capital flows (inflows minus outflows) as depicted in the above diagram affect real income through total investment which is composed of foreign direct investment, real investment expenditure in the private sector and real investment expenditure in public sector. International capital flows also affect real income through government expenditure. Although not shown on the diagram import of capital goods positively effects real income via real investment expenditure block. Import of capital goods increases investment level which in turn increases real income. Therefore, an increase in total consumption, total investment, imported investment goods and export, increase *GDP*. In turn a rise in real income increases disposable income and tax revenue which allows a further increase in private domestic consumption and government expenditure. In addition, real investment expenditure in both sectors including imports will increase. As it can be seen from the above diagram, an increase in the level of capital flows sets in motion a chain reaction on various variables in the flow chart. Conversely, low to negative capital flows will have low to negative impact in the variables mentioned in the flow chart.

4.2 COUNTRY SPECIFIC MODEL

4.2.1 Aggregate Expenditure Sector

This section outlines the theoretical model which will serve as the basis for formulating the empirically testable model where the rational for variable selection/exclusion is provided[1].

Equilibrium output in the expenditure sector is traced by drawing from the identities of the accounting structure:

$$Y = C + I + G + X - M \qquad (4.2.1)$$

[1] The model is a modified version of that contained in Murinde, 1993.

Equation (4.2.1) indicates that aggregate demand consists of private domestic consumption (C), gross domestic investment (I), government consumption (G), and net foreign demand (X-M).

Total consumption expenditure comprises of both domestically produced goods (C_d) and imported consumption goods (C_z), and this identity can be written as:

$$C = C_d + C_z \tag{4.2.2}$$

Private domestic consumption is postulated to depend on real income net of taxes, ($Y - T$), domestic price (P_d) and price subsidy (P_s):

$$C_d = C_d(Y, T, P_d, P_s) \quad c_{d1}, c_{d4} > 0,\ c_{d2} < 0,\ c_{d3} > 0 \text{ or } c_{d3} < 0 \tag{4.2.3}$$

Import of consumption goods (C_z) is postulated to be a function of real income (Y), taxes (T) and capital flows (CF):

$$C_z = C_z(Y, T, CF) \qquad c_{z1}, c_{z3} > 0,\ c_{z2} < 0 \tag{4.2.4}$$

Combining equations (4.2.3) and (4.2.4) the following expression emerges:

$$C = c(Y, T, CF, P_d, P_s) \quad c_1, c_3, c_5 > 0,\ c_2 < 0\ \ c_4 > 0 \text{ or } c_4 < 0 \tag{4.2.5}$$

Given that the tax level (T) depends on the level of real income, the tax function is specified in the following way:

$$T = T(Y) \qquad 0 < t < 1 \tag{4.2.6}$$

where t_1 is the rate for PAYE, including personal income tax, corporate taxes, import duty rates for exercise duty on sales tax, but does not include export tax.

Substituting equation (4.2.6) into the consumption function in (4.2.5) and linearising the following expression emerges:

$$C = c_1(1-t_1)Y + c_3CF + c_4P_d + c_5P_x \qquad (4.2.7)$$

Total investment comprises of foreign, private and government sectors. The latter two constitute domestic investment. Separating real investment expenditure on domestically produced goods (I_d) and imported goods (I_z), total investment can be written as:

$$I = I_d + I_z$$

Real investment expenditure on domestically produced goods (I_d) is postulated to be a function of real income (Y), domestic credit (DC), profits (PF) and real interest rate ($R - P_d^e$), which is adjusted for expected changes in real domestic price level (P_d^e). This is written as:

$$I_d = I_d(Y, DC, PF, R - P_d^e)\ 0 < id_1 < 1, id_2, id_3 > 0; id_4 < 0 \qquad (4.2.8)$$

Real investment expenditure on imported investment goods is postulated to be a function of real income (Y), foreign exchange, proxied by capital flows (CF) and adjusted interest rate ($R - P_d^e$). This can be written as:

$$I_z = I_z(Y, CF, R - P_d^e)\ 0 < I_{z1} < 1\ iz_2, > 0,\ iz_3 < 0 \qquad (4.2.9)$$

Considering the above, the investment function can be written in linear form as:

$$I = i_1Y + i_2DC + i_3CF + i_4PF - i_5(R - P_d^e) \qquad (4.2.10)$$

$$Z = C_z + I_Z$$

Real government expenditure is specified as a function of government revenue (GR) and capital flows (CF):

$$G = f(GR, CF)$$

Government revenue is a function of national income (gY), where g is tax rate. Replacing GR by (gY) and linearising, government consumption function becomes:

$$G = g_1 Y + g_2 CF \qquad 0 < g_1 < 1 \qquad g_2 > 0 \qquad (4.2.11)$$

Exports are postulated to be a function of the supply capacity of export goods and export tax:

$$X = x(X_s, T)$$

where $T = T(X_s)$ $\qquad 0 < t_x < 1$

Substituting for T in X the above expression and linearise becomes:

$$X = x_1(1 - tx)X$$

or

$$X = x_1 X - x_2 X \qquad (4.2.12)$$

where $x_2 = x_1 tx$

The level of total imports which incorporates import of consumption goods (4.2.4) and investment goods (4.2.9) is defined Z as:

$$Z = z_1 Y - z_2 t_1 Y + z_3 CF - z_4 (R - P_d^e)$$

Letting $Z_1 = Z_2$ in $(Z_1 + Z_2)$ the above expression can be written as:

$$Z = z_1(1-t_1) + z_3 CF - z_4(R - P_d^e) \tag{4.2.13}$$

Reverting to equation (4.2.1) and substituting equations (4.2.7) for consumption, (4.2.10) for investment, (4.2.11) for government sector, (4.2.12) for export and equation (4.2.13) for imports, the aggregate demand equation yields:

$$\begin{aligned} Y = [&c_1(1-t)Y + c_3 CF + c_4 P_d + c_5 P_x + i_1 Y \\ &i_2 DC + i_3 CF + i_4 PF - i_5(R - P_d^e) + g_1 + g_2 CF \\ &+ x_1 X - x_2 X - z_1(1-t)Y + z_3 CF - z_4(R - P_d^e)] \end{aligned}$$

and simplifying then rearranging the following expression emerges:

$$\begin{aligned} Y = [&(c_3 + i_3 + g_2 + z_3)CF + i_2 DC + x_1 X - x_2 X \\ &+ i_4 PF + (-i_5 - z_4)R + (i_5 + z_4)P_d]^{-\theta} \end{aligned} \tag{2.2.14}$$

where $\theta = [1 - c_1(1-t_1) - i_1 + z_1(1-t_1) - g_1]$

c_1 = marginal propensity to consume out of national income

$c_1 t_1$ = marginal propensity to consume out of disposable income

i_1 = marginal propensity to invest out of national income

z_1 = marginal propensity to import out of national income

At this stage, it is appropriate to write the above equation in a reduced form by setting coefficients $a_i : i = 1,...,5$, and predicting signs in the steps that follow:

Letting $Z_1 = Z_2$ in $(Z_1 + Z_{2t})$ the above expression can be written as:

$$Z = z_1(1-t_1) + z_3CF - z_4(R - P_d^e) \qquad (4.2.13)$$

Reverting to equation (4.2.1) and substituting equations (4.2.7) for consumption, (4.2.10) for investment, (4.2.11) for government sector, (4.2.12) for export and equation (4.2.13) for imports, the aggregate demand equation yields:

$$\begin{aligned} Y = [&c_1(1-t)Y + c_3CF + c_4P_d + c_5P_x + i_1Y \\ &i_2DC + i_3CF + i_4PF - i_5(R - P_d^e) + g_1 + g_2CF \\ &+ x_1X - x_2X - z_1(1-t)Y + z_3CF - z_4(R - P_d^e)] \end{aligned}$$

and simplifying then rearranging the following expression emerges:

$$\begin{aligned} Y = [&(c_3 + i_3 + g_2 + z_3)CF + i_2DC + x_1X - x_2X \\ &+ i_4PF + (-i_5 - z_4)R + (i_5 + z_4)P_d]^{-\theta} \end{aligned} \qquad (2.2.14)$$

where $\theta = [1 - c_1(1-t_1) - i_1 + z_1(1-t_1) - g_1]$

c_1 = marginal propensity to consume out of national income

c_1t_1 = marginal propensity to consume out of disposable income

i_1 = marginal propensity to invest out of national income

z_1 = marginal propensity to import out of national income

At this stage, it is appropriate to write the above equation in a reduced form by setting coefficients $a_i : i = 1,...,5$, and predicting signs in the steps that follow:

The following is assumed to hold:

$z_1 \geq z_1 t$, $0 < i_1 < 1$, $0 < g_1 < 1$ and $c_1 \geq ct$. Therefore, $\theta^{-1} > 0$.

CF: Let $a_1 = (c_3 + i_3 + z_3 + g_2)\theta^{-1}$

All the above coefficients are preceded by a positive sign, therefore $a_1 > 0$.

DC: Let $a_2 = (i_2)^{\theta-1}$

The sign preceding the coefficient (i_2) is positive, hence $a_2 > 0$.

X: Let $a_3 = (x_1 - x_2)^{\theta-1}$

Assuming that marginal propensity to export will have larger effects than the tax rate on export gods, it follows that $x_1 > x_2$, therefore, $a_3 > 0$

R: Let $a_4 = (-i_5 - z_4)\theta^{-1}$

Since both coefficients in question are preceded by a negative sign it follows that $a_4 < 0$.

P_d^e :Let $a = (i_5 + z_4)\theta^{-1}$

The coefficients in the parenthesis are preceded by a positive sign, henceforth, $a_5 > 0$

Thus in line with algebraically derived coefficients, the *IS* curve may be written as follows:

$$Y = a_1 CF + a_2 DC + a_3 X - a_4 R + a_5 P_d^e \qquad (4.2.15)$$

In accordance with conventional economic theory, equation (4.2.15) represents the *IS* curve in the (*Y,R*) space, and shows a negative relationship between income (*Y*) and interest rate (*R*). Given prices, the IS curve shows the combination of *Y* and *R* which keeps goods market in equilibrium.

To asses the theoretical impact of a change in capital flows on economic growth, the first order condition is taken with respect to *CF*: $\partial Y / \partial CI = a_1, > 0$. Therefore, the impact of an increase in international capital inflows is expected to be positive. Note that if capital flows were negative, then $a_1 < 0$, indicating that negative capital flows have a negative impact on economic growth. Similarly, the first order condition with respect to *DC* is positive (see data description) indicating that foreign resources have a positive effect on economic growth.

4.2,2 Labour Market

It is presupposed that wage package is determined at the time when a new period commences. The money wage and 'other fringe benefits agreed for the job at the time of the wage contract constitutes the wage package. However, neither the price level nor the price of inputs is known workers and managers. Therefore, output prices are determined together with other prices and the level of output, and these parameters determine the level of labour and capital inputs. On the supply side wage bargaining time is assumed to be the time when labour accepts employment. Wage bargaining refers to the decision by labour to accept employment under the stipulated wage package or to shop for employment in non-government sectors. This is the case because in the government sector minimum wage and entire wage and salary structure is simultaneously set or revised by the government. It is assumed that workers do not suffer from money illusion and therefore consider the wage package in relation to domestic prices, particularly in an inflationary environment as in the economy being studied. Hence, the supply of labour is a linear function of wage package and domestic prices:

$$L_s = b_1(W - P) \tag{4.2.16}$$

where (Ls) is labour supply, (W) is wage rate, (P) is retail price. On the demand side it assumed that demand for labour is determined by wage rate and capital intensity. Noting that the decision to increase factor inputs is determined by economic growth, labour demand is also expressed as a function to GDP:

$$L_d = b_2(GDP - W^* - K) \tag{4.2.17}$$

Considering the following first order condition:

$$\partial L_d / GDP > 0,\ \partial L_d / W^* < 0\ \partial L_d / K < 0$$

It is clearly seen that economic growth will lead to employment expansion while higher wages and increased used of capital stock will cause employment to contract.

It should be noted that with regard to the economy being studied, the concept of wage efficiency might apply in certain modern sector and for highly skilled work force. M reover, for the general working population wage rate is low and in many case. t compensated for inflation.

4.2.3 Country Specific Macroecc ometric Model Specification

The model which shall be fitted is basically an aggregate expenditure sector model that is relevant and specific to the economy being studied. Model specification will take into account data availability and is presented in empirically testable form in equations (4.2.18) to (4.2.26).

Domestic Consumption

Domestic consumption consists of private domestic consumption (C_P) and government consumption (C_G):

$$C_D = C_P + C_G$$

Private domestic consumption function (C_P) is specified as a function of disposable income (Y_D), domestic price level (P_G), and lagged consumption (C_{P-1}). Furthermore, price subsidy (Ps) is a feature of the economy hence it is incorporated in the model as an explanatory variable. A rise in the level of disposable income is expected to increase the level of private domestic consumption. An increase in price subsidy is also expected to have the same effect since it increases purchasing power, hence increase demand. A rise in the domestic price level can on the one hand have a price expectations effect, thus increasing the demand as consumers rush to purchase goods in anticipation of a price rise. On the other hand it can have the effect of reducing consumer's purchasing power in which case the demand for consumer goods falls. Disposable income is expected to be the most influential variable in determining the level of private domestic consumption. C_{P-1} accounts for non fluctuating behaviour of private domestic consumption. The independent variable in question can be expressed in the following way:

$$C_P = c_{0P} + c_{1P}Y_D + c_{2P}C_{-1} + c_{3P}P_G + c_{4P}P_S \qquad (4.2.18)$$

Private domestic consumption can also be divided in to durable and non-durable goods, and disposable income could further be broken into wages (agricultural, industrial and service sectors) and profits, but this level of desegregation is beyond the scope of this paper.

Disposable income by definition is written as:

$$Y_D = Y - T$$

where T is indirect tax

Government Consumption

In developed economies, government consumption is taken as exogenous, i.e., a policy instrument variable. However, the brief introduction presented in Chapter One, emphasises that the economy of interest was financed by foreign resources, and its behaviour is consistent with the behaviour of an endogenous variables. Government consumption is therefore specified as a function of government revenue (*GR*), grants (*GT*), and net transfer on debt (*NTD*). Lagged government consumption (C_{G-1}) accounts for non-fluctuating behaviour in government consumption. Domestic savings variable is not included in the model because it was largely negative, therefore, not considered to be a significant explanatory variable. It is expected that an increase in government revenue, net transfer on debt and grants will increase government expenditure. The above arguments can be expressed as follows:

$$C_G = g_0 + c_{1g} GR + c_{2g} NTD + c_{3g} GT + c_{4g} C_{G-1} \qquad (4.2.19)$$

Net transfer on debt (NTD) is given by:

$$NTD = D - P - r$$

Where (*D*) is disbursement, (*P*) payment on the principal amount (*r*) is interest payment, and Grants (*GT*) is an exogenous variable.

It is noted that government revenue can further be divided into tax revenue and non-tax revenue. The former can still be divided into various tax categories, but this level of desegregation will not be undertaken in this research report. Hence, government revenue is considered exogenous.

Investment

Total investment is composed of foreign direct investment (I_F) and gross domestic investment (I_D). The latter is further broken into real investment expenditure in the private sector (I_P) and real investment expenditure in the public sector (I_G). Following the above, total investment equation is specified in the following manner:

$$I = I_F + I_D$$

where,

$$I_D = I_P + I_G$$

Foreign direct investment is attracted by the prospects for profit maximisation offered by growing economies. If foreign investors perceive that domestic demand will increase in the future, they are likely to increase current period real investment expenditure. Furthermore, the legislation regulating and protecting foreign direct investment requires that foreign investors enter into partnership with local stakeholders. This requirement has resulted in joint ventures between the public sector and foreign investors, and foreign investors and private sector investors partnerships. Foreign direct investment once undertaken in a given period proceeded for a number of years. Therefore, foreign direct investment (I_F), is expressed as a function of current period output (Y), past period output (Y_{-1}), public sector investment (I_G), once lagged foreign direct investment (I_{F-1}), once lagged public sector investment (I_{G-1}), and real investment expenditure in the private sector (I_P). It is expected that a rise in all the above mentioned explanatory variables will lead to a rise in foreign direct investment. The equation for foreign direct investment can therefore be written as:

$$I_F = i_{0f} + i_{1f}Y + i_{2f}Y_{-1} + i_{3f}I_{F-1} + i_{4f}I_G + i_{5f}I_{G-1} + i_{6f}I_P \qquad (4.2.20)$$

Public sector real investment expenditure and private sector real investment expenditure account for joint venture between the public sector and foreign investors and private sector and foreign investors, respectively. Lagged public sector real investment accounts for real investment expenditure by the government in infrastructure that precedes foreign direct investment, and lagged foreign direct investment accounts for continuity of this type of investment. Lagged output can be taken to represent expectations about current period economic performance, basing on past level of real income.

Foreign direct investment could further be subdivided into sectors and sub-sectors, e.g. industry and the manufacturing sector. However, this level of desegregation will not be undertaken in this research paper. The same applies to private sector and public sector real investment expenditure.

Equation specification for private sector real investment expenditure should take into account the factors described here. The level of economic performance determines the level of investment. If it is expected that aggregate demand will rise in the following period, the level of investment is likely to increase. Prospect for profit making will cause real investment expenditure in the private sector to rise. Public sector real investment expenditure in infrastructure generates positive externalities and induces private sector investment. Credit availability and the level of capital stock also influences investment decisions. For example, credit constraints and high level of capital stock result in low levels of investment expenditure. However, prospects for high profits will lead to high levels of investment expenditure. Finally, it should be noted that this type of investment was also dependent on the inflow of foreign resources. From the above description, private sector real investment expenditure (I_p) is written as a function of output (Y), past level of output (Y_{t-1}), net transfer on debt (NTD), the level of

grants (GT) once lagged private sector real investment expenditure (I_{P-1}), and public sector real investment expenditure (I_G). Furthermore, foreign direct investment (I_F), once lagged public sector investment (I_{G-1}), capital stock (K), domestic credit (DC) and profitability (PF), are also regarded as plausible explanatory variables. Real interest rate was by far and large low to negative, and credit allocation was on the basis of priority sector. In the latter years, patronage, political and social connections were partly responsible for credit allocation. Therefore, it is considered that this variable was not influential in credit allocation, hence it is not included the final equation to be estimated. It is expected that a rise in current period and past period output level, net transfer on debt, public sector real investment expenditure, and foreign direct investment will increase private sector real investment expenditure. Similarly, a rise in domestic credit, expected profit, and previous level of real investment expenditure in the public sector is expected to increase the variable being explained. On the other hand, a rise in capital stock will lead to a fall in real investment expenditure in the private sector. Therefore the equation that explains real private sector investment expenditure is specified as:

$$I_p = i_{0p} + i_{1p}Y + i_{2p}Y_{-1} + i_{3p}NTD + i_{4p}I_G + i_{5p}I_{G-1} + I_{6p} + i_{7p}I_{P-1} + i_{8p}K + i_{9p}DC + i_{10p}PF + i_{11}NTD + i_{12}GT \qquad (4.2.21)$$

Public sector real investment expenditure equation specification should take into account the level of dependency of this economy on capital flows. In addition, the government can use domestic resources: government revenue and domestic savings to finance its expenditure in investment. Furthermore, public sector investment does not always depend on the level of GDP or profitability. The government may wish to invest when the economy is experiencing a recession in an attempt to stimulate economic growth. Public sector real investment expenditure can also be undertaken on social infrastructure that generates positive externalities which in turn induces the private sector to invest and also attract foreign direct investment An increase in government revenue, the level of foreign financing and real

investment expenditure in the private sector, as well as foreign direct investment is expected to boost real investment expenditure in the public sector. Hence, public sector real investment expenditure is expressed as a function of government revenue (GR) net transfer on debt (NTD), grants (GT), a lagged dependent variable (I_{G-1}), real investment expenditure in the private sector (I_P), and foreign direct investment (I_F):

$$I_G = i_{0g} + i_{1g}GR + g_2 NTD + i_{3g}GT + i_{4g}I_P + i_{5g}I_F + i_{6g}I_{G-1} \qquad (4.2.22)$$

The lagged dependent variable accounts of the long-term nature of real investment expenditure in the public sector. Real private sector investment expenditure accounts for joint ventures between the private and public sectors, while foreign direct investment accounts for public sector and foreign investors joint ventures. Domestic savings variable was excluded from this equation for the reasons mentioned above.

Foreign Sector

Although theoretical consideration make a strong reference to relative prices and the price of foreign exchange in determining the behaviour of foreign sector, they will not be considered in the equations that follow for the following reasons. Firstly, the concept of relative prices assumes tradable goods. The only factor to be considered other things being equal is the relative price. If domestic prices are higher relative to foreign prices, then domestic consumers will opt for foreign produced goods, for example. However, with respect to Mozambique, and in particular for the period being studied, most of the imported goods could not produced locally. Even those that could be produced (largely consumer goods) were not getting to the markets because of disruptions in communication lines. Most of capital goods as defined in this paper, (see data description) had to be imported for investment purposes in order to generate wealth, unlike in developed countries were the primary consideration is domestic price versus foreign price. The main constraint for importing these goods therefore, is the availability of

foreign exchange. Secondly, it is assumed that the price of foreign exchange is determined by the market, and in turn, the market determines the demand and allocation of foreign exchange. However, in the economy of interest, the exchange rate was for the most part fixed and was allocated administratively. Furthermore, regarding exports, it is stated that developing countries are less likely to influence the relative prices for their export goods, and these face inelastic demand.

Import of consumption goods (C_m) is specified as a function of disposable income (Y_d), grants (GT), net transfer on debt (NTD), tax (T_{cm}) on imported consumption goods. A rise in the level of disposable income, the level of grants and net transfer on debt is expected to boost expenditure on consumption of imported goods, while a tax on import of consumption goods will have the opposite effect. The above arguments can be expressed as:

$$C_m = c_{0m} + c_{1m}Y_D + c_{2m}NTD + c_{3m}GT - c_{4m}T_{mc} \qquad (4.2.23)$$

Import of capital goods (CG_m) is written as a function of real income (Y), net transfer on debt (NTD), grants (GT), real investment expenditure in the private sector (I_P), real investment expenditure in the public sector investment (I_G), foreign direct investment (I_F), and a tax rate levied on import of capital goods (T_{CG}). It is expected that a rise in output, net transfer on debt, grants, foreign direct investment, real investment expenditure in the private sector, and public sector real investment expenditure, will cause import of capital goods to rise. On the other hand, an increase in the tax rate is expected to lower the quantity of import of capital goods. Therefore, import of capital goods is expressed as:

$$\begin{aligned} CG_m = {} & cg_{0m} + cg_{1m}Y + cg_{2m}NTD + cg_{3m}\ GT \\ & + cg_{4m}I_P + cg_{5m}I_G + cg_{6m}I_F - cg_{7m}T_{CG} \end{aligned} \qquad (4.2.24)$$

Although n t explicitly specified in the above model, it is expected that some or all of the dependent variables will lag import of capital goods beca. e of delays in delivery from the time orders are placed.

The level of exports in the economy of interest is believed to depend upon the availability of export goods, tax rate levied on these goods, which is a feature of the economy being studied, and lagged export level. Therefore, the level of exports (X) is expressed as a function of the level of supply of export goods, tax rate on export goods (T_X). Agricultural output (Y_A) is used as a proxy for the supply of export commodity, because a great share of export is generated from this sector. Past level of exports can be considered to account for export stability as perceived by foreign buyers. Export stability in the context of this paper can be taken to mean that the level of exports did not fluctuate significantly from one period to the next. If significant fluctuations did occur, then foreign buyers would have been forced to look elsewhere for export commodities that were previously supplied by this economy. It is expected that a rise in the level of agricultural output will increase the level of exports, while a rise in the tax rate on exports will reduce its supply. The equation for export function is written as:

$$X = x_0 + x_1 Y_A - x_2 T_X + x_3 X_{-1} \qquad (4.2.25)$$

Labour Demand

The final step involves modelling for labour demand. The brief theoretical outline in Chapter Two, section (2.5) suggests that employment level is a function of the level of real income, prevailing wage rate and capital stock. A clear distinction has to be made regarding the level of employment and the number of hours worked. Disruptions in production due to war and black outs, may have caused a reduction in labour input in terms of number of hours worked, but employment level did not change significantly. In this exercise labour input in terms of the number of people, not labour input in terms of number of hours worked is being modelled. Prior and during the course of the implementation of the structural adjustment there were calls to reduce employment level. Moreover, existing data

shows that employment level increased between 1991 and 1996 as *GDP* was also increasing, but real wages declined because of rising inflation rate, since wages were not indexed to inflation rate. For these reasons, employment level (E) is postulated to be a function of *GDP*, once lagged employment level (E_{-1}) to account for stickiness in the level of employment, wage rate (W) and capital stock (K). It is expected that a rise *GDP* will cause employment level to increase, while an increase in real wage rate and capital stock will cause a decline in employment level. Mathematically, the above can be expressed as follows:

$$E = e_0 + e_1 GDP + e_2 E_{-1} - e_3 W - e_4 K \qquad (4.2.26)$$

4.3 DATA DESCRIPTION AND DATA MANIPULATION

The national account components: gross domestic product (*GDP*), domestic consumption (C_D), gross domestic investment (I_D), and net foreign demand ($X - M$) are all measured in nominal terms. GDP measures the total value of goods and services at market prices. Private domestic consumption (C_P) encompasses both durable and non durable goods. Government consumption (C_G) is the total value of government purchases of goods and services. Total investment (I) is the sum of gross domestic investment and foreign direct investment. Gross domestic investment is made up of public sector real investment expenditure (I_G) and private sector real investment expenditure (I_P). Foreign direct investment (I_F) is undertaken by foreigners, usually in the form of multinational corporations. Disposable income (Y_D) was estimated by subtracting direct taxes (T), which include both personal and profit income tax, from *GDP*.

Data on government revenue (*GR*) encompasses all forms of tax revenue and non-tax revenue such as income from rent and sale of assets. Price subsidy (P_S) refers to the amount set aside from the government budget to subsidise consumption of basic goods and services. Data on import of consumption goods (C_m) and import of capital goods (*CG*) as well as exports (X) was converted from US dollars to

meticais. Imported consumption goods include durable and non-durable goods. Capital goods is a broad definition encompassing raw materials, machinery and equipment, and spare parts. Tax revenue data on imported consumption goods, capital goods, and export goods is available from 1985 onwards. Data prior to 1985 was approximated using available qualitative information, with the aid of a graph. For example, if the characteristic of taxes on import of consumption goods was a rising trend, the missing data points were approximated in a way that the graph line would show a rising trend for those years. Although there are other methods of estimating missing data points, the one used here is able to incorporate available qualitative information. This approach was also applied to approximate data for private sector real investment expenditure and public sector real investment expenditure, for 1981 to 1983 period. The tax rate for import of consumption goods (T_{cm}) was estimated by dividing the total value on tax revenue (TR_{cm}) derived from these goods by the total value of imported consumption goods. Similarly, the tax rates for import of capital goods (T_{CG}) and exports (T_X) were estimated by dividing the value of tax revenue on import of capital goods (TR_{CG}), and tax revenue on export goods (TR_X) by the value of imported capital goods and exports, respectively.

Data on domestic credit (DC) measures the volume of credit available in the economy. This variable encompasses both domestic and foreign resources. A measure of profitability index (PF) was constructed by subtracting wages from GDP. The wage bill refers to the total amount received by workers, it excludes profit income and other forms of income. Wage rate was computed by dividing the total wage bill by total number of workers in the economy. Comprehensive data on employment level is available for 1980, and from 1991 to 1996. The missing data points were approximated by using capital labour ratio estimated for the years in which comprehensive data on employment is available. Specifically, capital labour ratio was estimated using existing data, and then capital stock was divided by the capital output ratio to yield missing data on work force. This method of estimating employment level is plausible since capital labour ratio for the years in which comprehensive data on employment is available did not vary significantly.

The data just described was obtained from a series of annual publications from what is now called "Instituto National de Estatistica". Private sector and public sector real investment expenditure were derived by multiplying each variable percentage share in the *GDP* by gross domestic investment. It should be noted that the data shows slight differences in the values of gross domestic investment reported by the "Instituto National de Estatistica" and those obtained by adding the private and public sector investment as derived above. This was probably caused by the fact that their factor shares and respective *GDP* values come from difference sources. Until recently, data published by the World Bank and IMF was not entirely similar to that published by the "Instituto National de Estatistica". Ideally it is desirable to use data from a single source but this was not possible because the required data is not all available from a single source.

Grants (*GT*) are by definition donations made to the government without any legal obligations for repayment. Net transfer on debt (*NTD*) is defined as disbursement minus interest and principal payment on existing stock of debt. Agriculture value added and foreign direct investment were converted to dollars to meticais. Data on imports and exports was deflated by respective values. The unit value data was adjusted using the graph method decried above for the period between 1982 and 1985. The data just described, including disbursement, principal and accumulated interest was obtained from African Development Indicators and World Debt Tables published by the World Bank. All the data used in this study was deflated to 1987 constant prices using *GDP* price deflator. *GDP* deflator was used as domestic price level, because the series for CPI is incomplete. In any case, they both move in the same direction. In instances were there were discrepancies in data reported in different annual publications by the same agencies, data published in the latter publications was used to perform the analysis.

Capital Stock and Depreciation

In calculating depreciation a number of assumptions were made taking into consideration data limitations. Specifically, using the average growth rate of domestic investment the values from 1975 to 1989 were estimated backwards. Furthermore, its was assumed that buildings depreciate at a rate of 20 percent, and that machinery and transport equipment depreciate at 80 percent. The life span of buildings was taken to be 50 years, while that of transport and equipment was taken to be 10 years. This implies that the depreciation period for buildings is 10 years, while that of machinery and transport and equipment is 8 years. Adding the two sets of years of depreciation, it follows that the average life span is 18 years, but because of the war the life span of the assets was downgraded to 15 years, with a depreciation rate of 6.6 percent. The initial value of capital stock was estimated by adding the first 5 years of gross fixed investment. For the first 10 years, the capital stock was estimated by adding the previous amount of capital stock to the current year level of real investment expenditure. Thereafter, the level of real investment expenditure for 1975 was subtracted from the estimated capital stock for 1990, and so on.

4.4 DATA BEHAVIOUR

This subsection presents a brief description of the way the data behaved. Attempts were made to provide qualitative explanations about the behaviour of the variables by drawing from the information contained in various Economist Intelligence Unit Country reports, Country Profile reports and other writings by Hanlon (1991) and Abrahamsson and Nielsson (1995).

While direct taxes generally remained constant, GDP and disposable income show a considerable decline from 1980, and hit a rock bottom in 1984, then increased again thereafter. The decline in the level of GDP and disposable income was due to the fact that in this period the country was cut-off from much needed foreign financial assistance, except grants which in any case where low. The economy relied heavily on imported raw material, equipment and spare parts for industrial and agricultural production. With severe shortage of foreign exchange at the time,

the country was deprived from essential imports needed to fuel the economy, and for consumption.

Domestic consumption and disposable income moved relatively close together from 1980 until 1990, where a noticeable gap between these variables begun to emerge up to the end of the period of study. The gap could be a reflection of increased consumption of imported goods. Although there was emphasis on poverty alleviation in the second phase of the structural adjustment programme, this was not reflected in the budget share of the price subsidy in real terms. In fact while prices of goods and services were rising the former variable did not change significantly, and was considerably small in magnitude compared to disposable income. It is therefore, concluded that that disposable income had a far-reaching effect in determining the level of private domestic consumption.

Prior to 1984 the government systematically experienced a budget surplus. This was largely due to the fact that most of the planned investment was not undertaken for a variety of reasons, such as the lack of trained managers. However, from 1984 onwards, there was a significant gap between government revenue and government expenditure up to the end of the period being studied. Poor economic performance was largely responsible for low government revenue experienced between 1984 and 1986. Although the level of government revenue increased after 1986, it never went above the initial levels experienced in the early part of the decade. The high level of government expenditure can also be attributed to war efforts, taking into consideration that military expenditure accounted for up to 40 percent of the government budget. High level of government consumption after the war, that is 1992, can be attributed to payments made to demobilised military personnel and social expenditure.

Domestic investment and *GDP* were roughly moving in the same direction. As foreign aid, excluding grants, rose in 1985 from zero level and rose again to a maximum level for the entire period in 1987, the level of investment and *GDP* also rose. The assistance was primarily geared towards supporting the structural

adjustment programme and alleviating some of the problems it caused. The dramatic increase in foreign aid in 1987 immediately resulted in a high level of real investment expenditure in the public sector, hence domestic investment. Moreover, the momentum was not maintained, and public sector real investment expenditure fell considerably in the following year, and basically increased slightly thereafter, but remained at lower levels relative to the period before 1982. On the other hand, real investment expenditure in the private sector was increasing, and accounted for a greater proportion of domestic investment. The trend between real investment expenditure in the public and private sectors was primarily caused by donor agencies' policies, which insisted on a reduction of the public sector share in the economy in favour of the private sector. During the process, the IMF and the World Bank called for privatisation of publicly owned enterprises, and support for private sector initiative. Both these institutions and other development agencies such as USAID approved and/or provided funding for this sector. Foreign direct investment was basically non-existent, until 1986, when in the previous year legislation was passed to regulate and protect it. The basic trend is an increase, but its magnitude is significantly lower than compared to government sector and private sector real investment expenditure.

Net transfer on debt was at zero level between 1980 and 1984, primarily because the country was cut-off from foreign aid. However, as the government agreed to implement the structural adjustment programme, the restrictions were lifted, and net transfer on debt rose from a zero level to almost 50 billions meticais in 1985, and rose again to a maximum level in 1987. Thereafter it declined to lower level in 1991, and again in 1993. Although this variable fluctuated considerably, the general trend is an increase with the passage of time. On the other hand, the level of grants was at low level between 1980 and 1984, but it experienced an increasing trend thereafter. This could have been a reward to the Mozambican government for implementing the structural adjustment programme. In the latter years there was a slight decline in the level of grants, probably showing donor fatigue.

In the first half of the period, domestic credit was extremely high compared to private sector investment. In the second half of the period real investment expenditure in the private sector increased steadily while domestic credit declined. The IMF and the World Bank argued that the inflation rate experienced in the economy at the time was caused by excessive money growth, and stressed the need to reduce it in order to stem the rising inflation.

Initially there was a wide gap between *GDP* and total imports, but as time passed, the former variable fell while the latter rose. The lag between these two variables can be explained in terms of delays from the time the orders are placed until delivery actually takes place. The rise in the level of imports was probably part of the programme of victory over underdevelopment. Moreover, as the shortage of foreign exchange became severe, and *GDP* declined, there was a noticeable decline in the level of imports. Under the structural adjustment programme, there was recognition of the need to repair and upgrade the industrial infrastructure, communication facilities and improve agricultural production. This meant that donor agencies had to disburse a good deal of foreign exchange for import of raw material, equipment and spare parts. These imports were needed to boost industrial production, which had fallen considerably between 1982 and 1985. Foreign exchange was also made available for import of consumption goods. From 1992, there was a widening gap between the level of *GDP* and imports. While *GDP* was on the rise, the level of imports was declining. At this stage domestic currency had been devalued considerably as prescribed by donor agencies. Nevertheless, the tax rate on the import of capital goods, which was on the rise, could have played a major role in reducing the level of imports. In fact, the business community complained bitterly about high tax rates which, as they argued, weakened their ability to import capital goods for investment purposes.

The behaviour of disposable income, import of consumption goods, and tax rate on these goods and the level of grants suggest that a significantly lower proportion of disposable income was spent on imported consumption goods. The level of GDP, import of capital goods shows a similar pattern as GDP and total imports. This

suggests that government policy and the availability of foreign exchange was influential in deciding the level and type of goods imported into the country on the basis of priority criteria.

4.5. ESTIMATION AND TESTING PROCEDURE

The estimation procedure will employ modern time series techniques and diagnostic testing will apply a number of specification tests.

Recent time series is largely associated with "General to Specific" methodology. This methodology begins with preliminary modelling and progressively identifying an adequate model after exhaustive checks and balances. This approach commences with a broad theoretical underpinnings of the relationships between economic variables leading to the identification of a tentative econometric model. This is followed by a thorough diagnostic checking of the characteristics of the data, that is, the order of integration. If the cointegrating relationships exist, then estimation follows otherwise the present data is transformed or the model is re-specified (Mizon, 1994).

Unit roots and Cointegration

The first step in the estimation procedure involves testing for unit roots and cointegration. This test is essential because of the assumption that the means and the variances are well-defined constants and independent of time. Variables whose means and variances change over time are known as non-stationary variables. Stationarity implies that the data fluctuates around a constant mean independent of time, and variance of the fluctuation remains essentially constant over time. When a variable is not stationary, it is said to contain unit roots. Disregarding the presence of unit roots would imply ignoring important information about the underlying process generating the data and thus lead to spurious results (Harris, 1995, p.1). Spurious regression refers to a model showing non-existent statistically significant relationships which arises from contemporaneous correlation, trend and other misleading factors. For example, in a model encompassing two unrelated

variables the regression results may depict very significant correlation that may simply be due to the fact that the series are trending in the same direction.

The application of unit roots and cointegration techniques essentially comprises of four steps. The first step involves testing for unit roots to determine if the variables in the regression are stationary. The second step entails estimating cointegrating resgressors in the variables that have the same order of integration. "These cointegrating regressors are the long run equilibrium relationships between these variables". In the third step, the dynamic disequilibrium relationships are estimated utilising the estimates from the long run parameters, i.e., once lagged residual term. Finally, standard regression diagnostic tests are employed to assess the robustenes" "the estimated disequilibrium relationships (Rao, 199 ., pp. 5-6).

Stationarity and Unit Roots

A time series is said to be stationary provided that its mean, variance and autocovariances are independent of time. Y_t is covariance stationary provided that the following conditions hold:

$$E(Y_t) = \mu \tag{4.3.1}$$

$$E[(Y_t - \mu)^2 = \text{var}(Y_t) = X(0) \tag{4.3.2}$$

$$E[(Y_t - \mu)(Y_{t-\tau} - \mu)] = \text{cov}(Y_t, Y_{t-\tau}) = X(\tau) \quad \tau = 1,2,... \tag{4.3.3}$$

Equations (4.3.1) and (4.3.2) require the proces to have a constant mean and variance, but equation (4.3.3) requires that the covariance between any two values from the series depends only on time interval between those values (τ). Therefore, the mean variance and autocovariances are required to be independent of time. The application of the condition for stationarity in (4.3.1), (4.3.2) and (4.3.3) can be illustrated by considering the following first order autoregressive, *AR(1)* process.

$$Y_t = \theta Y_{t-1} + e_t \qquad t = 1,2... \tag{4.3.4}$$

where e_t is a white noise error term. Assuming that the variances of Y_t and Y_{t-1} exist, then the following must hold:

$$V\{Y_t\} = \theta^2 V\{Y_{t-1}\} + \sigma_e^2 \tag{4.3.5}$$

Since the condition of stationarity requires that the variance of Y_t be independent of t, equation (4.3.5) can be solved for $V\{Y_t\}$, which yields an expression for the variance of a stationary *AR(1)* process:

$$V\{Y_t\} = \sigma_e^2 / 1 - \theta^2 \tag{4.3.6}$$

The solution is valid provided that $|\theta| < 1$. On the other hand, if $|\theta| \geq 1$, it follows from (4.3.5) that the variance of Y_t is larger than the variance of Y_{t-1}. Therefore, $V\{Y_t\}$ increases with t and the process in (4.3.4) is not stationary. If it turns out that $|\theta| = 1$, then it is said that the process has a unit root. "The process with a positive unit root ($\theta = 1$)",

$$Y_t = Y_{t-1} + e_t \tag{4.3.7}$$

is termed a random walk. A non stationary series can be rendered stationary by first differencing it. If a series is differenced d times in order to achieve stationarty, then it is said to be integrated of order d $I(d)$. Therefore, a series Y_t is said to $I(d)$ if Y_t is non stationary, but $\Delta^d Y_t$ is stationary. Δ is the first difference operator $\Delta Y_t = Y_t - Y_{t-1}$ (Verbeek, 1992, p. 2).

Testing for Unit Roots

Testing for unit roots entails testing for a presence of one or more unit roots in the $(p+d)$th order autoregressive polynomial $\theta(L)$ in following the model:

$$\theta(L)Y_t = \alpha(L)e_t \tag{4.3.8}$$

The testing procedure can be explained by considering the following regression equation:

$$Y_t = \theta Y_{t-1} + e_t \tag{4.3.9}$$

A test for unit root entails testing for $\theta = 1$ hence it is appealing to use least squares procedure to estimate $\hat{\theta}$ for θ. However, Dickey and Fuller (1979) demonstrated that under the null hypothesis that $\theta = 1$ the standard t-ratio does not have a Student's t distribution.

To overcome the above mentioned pitfall, the following regression procedure is used:

$$Y_t - Y_{t-1} = (\theta - 1)Y_{t-1} + e_t \tag{4.3.10}$$

from which the t statistic for $(\theta - 1) = 0$ is identical to $\hat{\tau}$ (where $\hat{\tau}$ is distinguished form the conventional t-statistic), because the least squares method is invariant to linear transformations of the model. Two alternative regressions which continue to assume that (4.3.9) with $\theta = 1$ is the correct model were suggested by Dikey and Fuller. These are expressed as:

$$Y_t = \alpha_1 + \beta_1 Y_{t-1} + e_t \tag{4.3 11}$$

and

$$Y_t = \alpha_2 + \beta_2 Y_{t-1} + \gamma_2 t + e_{2t} \tag{4.3.12}$$

Equation (4.3.11) contains an intercept term, but (4.3.12) has both an intercept and a deterministic trend. In these cases, the null hypotheses is as follows:

$$H_0: \alpha_1 = 0 \text{ and } \beta_1 = 1 \qquad \text{for equation (4.3.11)}$$

and

$$H_0: \alpha_2 = \gamma_2 = 0 \text{ and } \beta_2 = 1 \text{ for equation (4.3.12)}$$

In practice the *t*-ratios based on $\hat{\beta}_1$ and $\hat{\beta}_2$ denoted by τ_μ and τ_τ respectively are commonly used as an alternative to estimating the above hypotheses, still assuming that the zero restrictions in the null hypotheses are satisfied. These *t*-ratios posses non-standard distribution, different from the one of $\hat{\tau}$. Since critical values for τ_μ are lesser than those for τ, while those for τ_τ are even smaller, it therefore, follows that the probability that β_2 is larger than 1 with an intercept and a deterministic trend included is negligible (Holden and Perman, 1994, pp. 56-57).

Given that the empirical distributions are not altered by adding differences such as ΔY_{t-1}, ΔY_{t-2}, led to further modification of the Dickey-Fuller test procedure, to allow the testing for a single unit root in higher order *AR* process, which is termed the Augmented Dickey-Fuller test. This testing procedure can be described by considering the following *AR(2)* model:

$$Y_t = \theta_1 Y_{t-1} + \theta_2 Y_{t-2} + e_t \tag{4.3.13}$$

which in factorized form is expressed as:

$$(1 - \varphi_1 L)(1 - \varphi_2 L) Y_t = e_t \tag{4.3.14}$$

where $\varphi_1 + \varphi_2 = \theta_1$ and $\varphi_1 \varphi_2 = -\theta_2$. The stationarity condition requires that $\varphi_1 < |1|$ and $\varphi_2 < |1|$. Moreover, if $\varphi_1 = 1$ and $|\varphi_2| < 1$, then it is said that there is a presence of a single unit root, $\theta_1 + \theta_2$ and $\theta_1 + \theta_2 = -\varphi_2$. Unit root hypothesis

Equation (4.3.11) contains an intercept term, but (4.3.12) has both an intercept and a deterministic trend. In these cases, the null hypotheses is as follows:

$$H_0: \alpha_1 = 0 \text{ and } \beta_1 = 1 \qquad \text{for equation (4.3.11)}$$

and

$$H_0: \alpha_2 = \gamma_2 = 0 \text{ and } \beta_2 = 1 \text{ for equation (4.3.12)}$$

In practice the t-ratios based c $\hat{\alpha}_1$ and $\hat{\beta}_2$ denoted by τ_μ and τ_τ respectively are commonly used as an alternative to estimating the above hypotheses, still assuming that the zero restrictions in the null hypotheses are satisfied. These t-ratios posses non-standard distribution, different from the one of $\hat{\tau}$. Since critical values for τ_μ are lesser than those for τ, while those for τ_τ are even smaller, it therefore, follows that the probability that β_2 is larger than 1 with an intercept and a deterministic trend included is negligible (Holden and Perman, 1994, pp. 56-57).

Given that the empirical distributions are not altered by adding differences such as ΔY_{t-1}, ΔY_{t-2}, led to further modification of the Dickey-Fuller test procedure, to allow the testing for a single unit root in higher order *AR* process, which is termed the Augmented Dickey-Fuller test. This testing procedure can be described by considering the following *AR(2)* model:

$$Y_t = \theta_1 Y_{t-1} + \theta_2 Y_{t-2} + e_t \qquad (4.3.13)$$

which in factorized form is expressed as:

$$(1-\varphi_1 L)(1-\varphi_2 L)Y_t = e_t \qquad (4.3.14)$$

where $\varphi_1 + \varphi_2 = \theta_1$ and $\varphi_1\varphi_2 = -\theta_2$. The stationarity condition requires that $\varphi_1 < |1|$ and $\varphi_2 < |1|$. Moreover, if $\varphi_1 = 1$ and $|\varphi_2| < 1$, then it is said that there is a presence of a single unit root, $\theta_1 + \theta_2$ and $\theta_1 + \theta_2 = -\varphi_2$. Unit root hypothesis

entails testing for $\varphi_1 + \varphi_2 = \theta_1$, given $|\varphi_2| < 1$. The test is performed by first rewriting equation (4.3.13) as:

$$\Delta Y_t = (\theta_1 + \theta_2 - 1)Y_{t-1} - \theta_2 \Delta Y_{t-1} + e_t \qquad (4.3.15)$$

Least squares regression is then used to estimate the coefficients in (4.3.15) consistently. The coefficient for Y_{t-1} forms the basis for testing the null hypothesis $\theta = \theta_1 + \theta_2 - 1 = 0$. The ensuing t-ratio has the same distribution as t above. An intercept term and an intercept and time trend can be added to the regression in line with Dikey-Fuller procedure. The resulting test statistics is compared to critical value (Verbeek, 1992, pp. 17-19).

It should be noted that unit root testing can be complicated because the data generating process is not certainly known. It may include a time trend, stochastic or deterministic, it may not be simple autoregressive process (ARI) commonly assumed. The test for unit roots can be affected by factors such as the size of the sample and presence of structural breaks (Harris 1995, pp. 27-28). While there are other methods for testing unit roots such as the graphical and coreelogram techniques, the most widely used unit root tests are the Dikey-Fuller and the Augmented Dikey-Fuller tests, because of their generality and simplicity. A more powerful alternative is the Philips-Peron non-parametric test. In this paper the Dicker-Fuller method will be used because of its simplicity and wide use in other studies. Given that this test is affected by small samples, the autocorrelation function which is described below, will be used as well.

Test of Stationarity Based on Correlogram

A simple test for stationarity is based on the autocorrelation function. The autocorrelation function at lag k is denoted by:

$$\rho k = \gamma k / \gamma o \qquad (4.3.16)$$

where ρk is covariance at lag k, and $\gamma 0$ is variance. Given that both the covariance and variance are measured in the same units of measurement, ρk is a pure number, and lies between −1 and +1. Since a realisation of a stochastic process is observed, then only the sample autocorrelation function $\hat{\rho} k$ can be estimated. To do so, it is first necessary to estimate the sample covariance at lag k, $\hat{\gamma} k$, and the sample variance, $\hat{\gamma} 0$, which are defined as:

$$\hat{\gamma} k = \frac{\sum (Y_t - \overline{Y})(Y_{t+k} - \overline{Y})}{n} \tag{4.3.17}$$

$$\hat{\gamma} 0 = \frac{\sum (Y_{t-i} - \overline{Y})^2}{n} \tag{4.3.18}$$

where n is the sample size and $\overline{Y}$ is the sample mean. Therefore, the sample autocorrelation function at lag k is:

$$\hat{\rho} k = \frac{\hat{\gamma} k}{\hat{\gamma} 0} \tag{4.3.19}$$

A plot of ρk against k yields the sample correlogram. Provided that a stochastic process is purely random, its autocorrelation at any lag greater than zero is zero. If a series is purely random, the sample autocorrelation coefficients are approximately normally distributed with zero mean and a variance 1/n, where n is the sample size. It must be the case that all the $\hat{\rho} k$ coefficients up to the specified maximum number of lags are individually statistically insignificant, that is, not significantly different from zero (Gujarati, 1995 pp. 714-717).

Cointegration

Cointegration tests are used to directly test or falsify the underlying theory that presumes long run stable equilibrium relationships between variables. There are two major broad steps in cointegrating analysis. Firstly, the univariate characteristics of the data is thoroughly examined, that is testing for unit roots.

Secondly, follows the examination of the multivariate characteristics of the data, that is, cointegration properties of the data as explained in Engle-Granger (1987). The Engle-Granger two step approach attempts to establish whether the residuals from the regression are cointegrated $I(0)$ or integrated of higher order. Where the residuals are approximately $I(0)$ it is said that the variables are cointegrated. Analogously, where the residuals are not $I(0)$, there is no cointegration. Therefore, cointegration can be ascertained by examining the residuals from the cointegrating regression and in particular testing the null hypothesis that assumes the residual series has a unit root against an alternative that that the series is stationary, i.e. the null hypothesis is no cointegration and the alternative hypothesis is cointegration

The concept of cointegration explained by considering the model below:

$$Y_t = a + bx_t + e_t \tag{4.3.20}$$

Provided that $Y_t - \beta X_t$ is *I(0)*, then β is the true value. If, $b \neq \beta$, the least square residual $\hat{e}_t$ is non-stationary and consequently possess a very large variance in any finite sample. In the case where $b = \beta$, however, the estimated variance is much smaller. Since least squares chooses a and b to minimise the variance of $\hat{e}_t$ it tends to pick an estimate close to β. If Y_t and X_t are both *I(1)*, are said to be cointegrated if there exists a β such that $Z_t = Y_t - \beta X_t$ is *I(0)*, hence there is a long run relationship between Y_t and X_t. β is the cointegrating parameter. Since both Y_t and X_t are *I(1)*, "they will be dominated by a "long wave" components that practically cancel out to produce Z_t". This is related to the concept of long-run equilibrium expressed as:

$$Y_t = \alpha X_t \tag{4.3.21}$$

then Z_t is the "equilibrium error". The equilibrium error tells about the extent to which the system (Y_t, X_t) is out of equilibrium. If Z_t is *I(0)*, the equilibrium error fluctuates around the mean and often crosses the zero line. Therefore, equilibrium is likely to occur occasionally. Moreover, if Y_t and X_t are not cointegrated, which implies that Z_t is *I(1)*, the equilibrium error drifts away and zero crossings may not occur. Under such circumstances, "the concept of equilibrium has no practical implications". Consequently, the presence of a cointegrating vector implies the existence of long run equilibrium relationship. It is therefore, important to distinguish instances where there is a cointegrating relationship between Y_t and X_t and spurious regression cases. If Y_t and X_t are cointegrated *I(1)*, and suppose that the cointegrating regression below is estimated,

$$Y_t = \alpha + \beta X_t + e_t \tag{4.3.22}$$

the error term in (4.3.22) is *I(0)*. Otherwise it is *I(1)*. As previously mentioned, the presence of a cointegrating relationship can be ascertained by testing the unit root in the least squares residual $\hat{e}_t$ from (4.3.22). This can be done by running the regression below:

$$\Delta\hat{e}_t = \gamma_0 + \gamma_1\hat{e}_{t-1} + \mu_t \tag{4.3.23}$$

The test for unit root implies testing for $\gamma_1 = 0$ and is carried out using the Dickey-Fuller test (Verbeek, 1992, pp. 28-31).

Cointegration and Error Correction Mechanisms: Engle and Granger (E-G) Approach

There are two well known approaches to dealing with nonstationary variables: the Engle-Granger two-step approach and Johansen technique. These techniques have been extended in order to address certain short comings. For instance, Harris (1995, P. 56) discusses the extensions of the standard Engle-Granger two-step

approach phrased as Engle-Granger-Yoo three step procedure which takes into account the limitations of the Engle-Granger two step approach. The critical limitation of the Engle-Granger two step approach is that the use of the Augmented Dickey-Fuller unit root tests effectively restricts short run dynamics. As such, the reaction of one variable to another is the same both in the long run and in the short run. In fact, the model acts as if variables were in equilibrium. The other limitation of the Engle-Granger technique is the prevalence of non standard distribution to the estimators. The third step of the Engle-Granger-Yoo procedure, therefore, is to provide corrections of the first stage estimation of the long run parameters of the model, in order to ensure that the distributions return to normal distribution.

For the purpose of this study the Engle-Granger two-step approach is used largely because of its widest use in other studies and because of its relative simplicity. In fact, the Engle-Granger two step procedure represents a simple test for the presence or otherwise of cointegration, and is often used as a first indication of whether a particular set of variables represent a combination which is consistant with long run equilibrium relationships vector. It also allows the use of the supper consistency property of the property of the Ordinary Least Squares to obtain consistent estimates of the cointegrating vector, provided a unique cointegrating vector exists. Lastly, since the Engle-Granger approach is combined with the second stage of estimating the short run dynamics by means of the error correction mechanism which employs the measure of disequilibrium obtained from the equilibrium relationship, it also provides the speed of adjustment to equilibrium.

The intuition behind the Engle-Granger technique can be explained by considering the Engle-Granger theorem (1987) which states that if a set of variables are cointegrated, then there is a valid error correction representation of the data. Thus if Y_t and X_t are both $I(1)$ and have a cointegrating vector $(1,-\beta)$, there exists an error correction representation, with $Z_t = Y_t - \beta X_t$, which takes the form:

$$\theta(L)\Delta Y_t = \omega(L)\Delta X_t - \gamma Z_{t-1} + \alpha(L)e_t \qquad (4.3.24)$$

where e_t is white noise and $\theta(L)$, $\omega(L)$ and $\alpha(L)$ are polynomials in the lag operator L (with $\theta_0 = 1$). Considering a special case of (4.3.24)

$$\Delta Y_t = \omega_0 + \omega_1 \Delta X_t - \gamma(Y_{t-1} - \beta X_{t-1}) + e_t, \tag{4.3.25}$$

and suppose thatbthe cointegrating parameter β is known. When $\Delta Y_t = \Delta X_t = 0$ we obtain the "no change" steady state equilibrium

$$Y_t - \beta X_t = \omega / \gamma \tag{4.3.26}$$

The steady state growth path, obtained when $\Delta Y_t = \Delta X_t = g$, takes the form:

$$Y_t - \beta X_t = \frac{\omega_0 - g(1-\omega_1)}{\gamma} \tag{4.3.27}$$

Essentially then, the error correction mechanism comprises of two steps as described above. In the first step the long run relationship of the form:

$$Y_t = \alpha X_t + \varepsilon_t \tag{4.3.28}$$

is directly estimated using least square regression. Secondly, the residuals from the first step provide estimates of the disequilibrium, which enters the error correction form, in order to provide an estimate of the speed of adjustment. This entails estimating a first differenced equation of the form:

$$\Delta Y_t = \alpha \Delta X_t + \lambda \mu_{t-1} + \varepsilon_t \tag{4.3.29}$$

where ΔY and ΔX are first differenced Y and X variables, and μ_t is one period lagged value of the residual in equation (4.3.10) and satisfy the $-2 < \lambda < 0$. The closer is λ to 1, the faster is the speed of adjustment (Boswijk, 1991, p. 18). λ is

also the empirical estimate of the disequilibrium term, and ε_t is the error term. This equation shows the relationship between the change in Y and change in X and the equilibrium error term in the past. ΔX captures the short run disturbances in ΔY and the error correction term λ shows the speed of adjustment towards long run equilibrium. Provided that λ is statistically significant, it tells us the proportion of the disequilibrium in Y in one period that is corrected in the following period (Gujarati, 1995, pp. 727-729).

In the second instance, a test for a measure of degree of multicollinearity was conducted. Multicollinearity implies the existence of a perfect or near perfect linear relationship among some or all explanatory variables of a regression model. This test is necessary because of the assumption that no exact linear relationship exists between sample values of any two or more of the explanatory variables. When this assumption is violated, the least square regression estimating procedure breaks down. In models that include more than one explanatory variable multicollinearity is apparent if R-squared values are very high, while the estimated coefficients are insignificant in terms of the t-test. High correlation coefficients values amongst independent variables also indicate the presence of multicollinearity. The Eigenvalues and condition index can be used to assess multicollinearity, as well. The condition number index is given by $k = (ME)/(me)$, and the condition index is $CI = \sqrt{k}$. ME is the maximum eigenvalue and me is the minimum eignvalue. A k value that is bellow 100 indicates the absence of multicolinearity. If k is between 100 and 1000 it shows that there is a presence of moderate to strong multicollinearity, and when k is greater than 1000 the problem of multicollinearity is severe (Gujarati, 1988, pp. 283-309).

Thirdly, a test for first order autocorrelation was performed. This test is essential given the assumption of interdependent stochastic disturbances in the model. The usual test for first order autocorrelation utilises the Durbin-Watson (DW) (d) statistic. The statistic (d) is defined as the ratio of the sum of squares of the differences of the residuals to the sum of squares of the residual themselves:

$\sum_{t=2}^{T}(e_t - e_{t-1})^2 / \sum_{T=1}^{T} e_t^2$. In models containing lagged dependent variables, the D.W test is no longer reliable, and instead the *h*-test using the following expression:

$$[h = \hat{\rho}\sqrt{N / 1 - N[\text{var}(\hat{\alpha}_2)]} \tag{4.3.29}$$

is employed to carry out the test. N is sample size, $\text{var}(\hat{\alpha}_2)$ is the variance of the coefficient of the lagged variable, $\hat{\rho}$ is the estimate of the first order serial correlation given by $\hat{\rho} = (1 - 1/2d)$. The null hypothesis that $h = 0$ is conducted using the standard normal distribution table (Maddala, 1994 pp. 204-205). Although the test is strictly valid for large samples it is often employed in small samples (Berndt, 1991, p. 282). In instances where the term $N[\text{var}(\alpha_2)] > 1$ the test can no longer be applied. A more robust alternative is the Lagrange Multiplier serial correlation test (*LM*) because of its generality. This test also allows testing for higher order autocorrelation. The workings of the *LM* test can be explained by considered the expression below:

$$y = \sum_{i=1}^{k} x_{it}\beta_i + \mu_t \qquad t = 1,2,...,n \tag{4.3.30}$$

The *xs* include lagged dependent variable as well, and the residual term is expressed as:

$$\mu_t = \rho_1\mu_{t-1} + \rho_2\mu_{-2} + ... + \rho_p\mu_{t-p} + \varepsilon_t \tag{4.3.31}$$

The objective is to test H_0: $\rho_1 = \rho_2 = ... = \rho_p = 0$

The procedure involves two steps: firstly equation (4.3.30) is estimated using least squares regression, and secondly, the residuals obtained in the first step are estimated using the equation below:

$$\hat{\mu}_t = \sum_{i=1}^{k} x_{ti}\gamma_i + \sum_{i=1}^{p} \hat{u}_{t-i}\rho_i + \eta \qquad (4.3.32)$$

A test is conducted to determine whether the coefficients of $\hat{\mu}_{t-i}$ are all zero (Maddala, 1984, pp. 206-207).

In the fourth instance, the researcher then moved to check the assumption that the error are normality distributed and heteroscedasticity, where the assumption that the variances of the stochastic disturbance terms are finite and constant over the sample, is tested to determine whether it holds. A simple test for heteroscedasticity is conducted by examining the residuals against the predicted variable plot. This plot allows for a general-purpose diagnostic. From the residual plot, it is possible to check for other least square regression violations, such as influential cases, and non-normal residual distribution (Hamilton, 1992, p. 51-53). Heteroscedasticity can also be assessed by performing the White test which consists in regressing the residuals on the dependent variable and its squares and cross product to obtain R-squared. A highly significant value of R-squared implies that heteroscedasticity is present. However, this test wastes degrees of freedom (White, 1980). A test to determine whether the errors are normally distributed, constructed by Jarque and Bera, which is a joint test for the absence of skewness and for kurtosis was also employed (Otto, 1994, pp174-175).

The fifth step involved addressing specification error and variable selection issues. This step is also essential given the problems that arise, particularly when relevant variables are omitted from the model. Often, theory provides only a vague guidance concerning possible explanatory variables of a given dependent variable. Several changes are said to occur as more variables are added in the equation. Firstly, the prediction value R-squared increases, but the standard deviation decreases. Estimated coefficients provide clues on how additional coefficients affect the predicted value, and spurious coefficients may diminish. Additional variables can be retained in the model if there is a substantial improvement in the R-squared value, the estimated coefficients of the new variables are statistically

significant, and if the added variables significantly change the conclusions regarding the effects of other explanatory variables (Hamilton, 1992, p. 72).

Since the objective of variable selection is to achieve in the final model a balance of simplicity and fit (parsimony), the adjusted R-squared reflects parsimony. It combines the measure of fit R-squared with a measure of difference in complexity between data and model. Addition of more variables in the model causes the R-squared to rise, but R-squared adjusted may remain the same or decrease if improvement in fit is small compared to increase in complexity. Therefore, adjusted R-squared is a better measure of the explanatory power of the model (Theil, 1978, p. 135).

Variable selection entails two scenarios: inclusion of an irrelevant variable or exclusion of a relevant variable. X_k is irrelevant if the true value of b_k is small enough to have no substantive importance. The inclusion of irrelevant variables results in coefficient estimates and predictions that have sample to sample variation. X_k is considered to be relevant if the true value of b_k is non zero. Variable omission makes aspects of regression, for example, coefficients, standard errors and so on, unreliable. Variable omission can be detected by examining the residuals and the *DW* value. If a relevant variable is omitted, the serial correlation residual plot exhibit a strong positive or negative trend, and the *DW* value is very low (Hamilton, 1992, p 73). Other test for variable omission include *DW* and the Ramsey's RESET test. The simplest version of Ramse's RESET test can be explained by considering the following model:

$$Y = \beta_0 + \beta_1 X_i + \mu_i \qquad (4.3.33)$$

The above expression is run to obtain $\hat{Y}_i$, and then rerun with $\hat{Y}_i$ included as a regressor, i.e.:

$$Y = \beta_0 + \beta_1 X_i + \beta_2 \hat{Y}_i + \cdots + \mu_i \qquad (4.3.34)$$

The F value is computed using the expression:

$$F = \{[(R^2_{new} - R^2_{old})/r_n]/[(1 - R^2_{new})/p_n \qquad (4.3.35)$$

where r_n is the number of new regressors and p_n is the number of parameters in the new model. The above expression is employed to determine weather the increase in R-squared in (4.3.35) is statistically significant. If this turns out the estimated F value is statistically significant, then it is accepted that the model (4.3.33) was misspecified (Gujarati, 1988, pp. 410-412).

In addition to statistically significant coefficient estimates, other desired properties of the estimated regression coefficients is that they are as close as possible to the true regression parameters. A lowest possible value of mean squa.. error (MSE) is an indication that there is a good chance that the sample estimates are near the population parameter. The other property of the model is that it has a good explanatory power, regarding the history of the variable being explained. Low values of the root mean square error (RMSE) provide such a measure. Therefore, variable selection should ensure that the estimated equation yields very low values of RMSE.

Although the justification for employing the above tests relies, in general, on large sample arguments, Harvey, (1981, p. 154), has demonstrated that these arguments do not preclude the use of large sample tests in small sample sizes.

CHAPTER 5
ANALYSES AND INTERPRETATION OF RESEARCH RESULTS

5.1 INTROUDCTION

This section begins by outlining the rationale for relying on robust regression results, presents and analyses the Augmented Dikey-Fuller test results, then proceeds and presents, analyses and interprets the regression results from the long run equilibrium and short run disequilibrium dynamic equations.

Although least squares regress. s more robust against specification errors it performs poorly when errors are not normally distributed. Hence the justification for applying t and F distributions is lost, particularly in small samples. Least squares regression tracks outliers, which leads to a violation of the assumptions that the residuals are normality distributed. Heavy tailed error distributions cause large variations from sample to sample variance. Robust regression techniques provide an alternative to least squares regression, and work with less restrictive procedures. These procedures seek to identify the outliers and minimise their impact on the coefficient estimates. In the presence of outliers in the data, robust regression provides better coefficient estimates (Hintze, 1995, p. 1195). If on the other hand the estimated coefficients using least squares regression and robust regression do not vary significantly, then it is said that they complement each other (Hamilton, p. 200). Therefore, least squares regression was essentially employed to perform specification tests using ECONOMETRIC VIEWS (EVIEWS) statistical package, followed by robust regression to obtain better coefficient estimates. In the latter case, NUMBER CRUNCHER STATISTICAL SYSTEM (NCSS) statistical package was employed.

Estimation and testing was carried out using specification tests outlined in section 4.4. Specification search of the model proceeded from general to preferred equations, as it relates to variable selection for each equation.

5.2 Empirical Results

This section reports on testing and estimation exercise, examines the results of diagnostic tests, and proceeds to analyse the parameter estimates of each estimated equation. The first section reports on unit root testing exercise of the variables in levels, in first difference form, and residual variables for each estimated long run equation. The second step reports on regression results of both long run and short run disequilibrum dynamic relationships, including diagnostic testing for the latter set of equations. Thereafter, the regression results are interpreted.

5.2.1 Unit Root Test Results

The Augmented Dickey-Fuller test results for the variables used in this study are reported below. Although more variables were tested for unit roots in order to broaden the scope of variable selection, only those that were employed in estimating the outline equations are reported. The left hand side shows the test results for variables in levels (which comprise of 17 data points), while the right hand side shows the results for first differenced variables (which comprise of 16 data points). Given finite data sample and following a comment in Makridakis, Wheelwright and Hyndman (1998, pp. 329-330), the maxim number of lags was set at 3. For variables in levels, the test was carried out with both trend and intercept term included, given that they display a trend. For the first differenced variables, the test was carried out with the intercept term include, since differencing removes the trend. The EVIEWS statistical packages provides both the estimated and MacKinnon critical values for rejection of the null hypothesis of a unit root.

	Lag 1	Lag 2	Lag 3	Lag1	Lag2	Lag3
Private Domestic Consumption	-2.66	-2.39	-2.28	-3.03	-2.61	-3.09
Disposable Income	-3.58	-3.9	-2.67	-3.69	-3.20	-6.63
General Price Level	-2.59	-2.966	-3.05	-2.25	-2.10	-2.04
Price Subsidy	-0.64	-0.9	-1.06	-1.54	-1.14	-0.90
Government Consumption	-1.54	-1.41	-0.97	-2.21	-1.98	-1.819
Government Revenue	-3.16	-2.16	-2.81	-2.96	-2.18	-1.78
Grants	-2.18	-1.55	1.47	-3.31	-2.24	-1.68
Net Transfer on Debt	-1.31	-1.72	-1.94	-2.30	-1.94	-2.03
Foreign Direct Investment	-1.94	-1.61	-1.75	-3.95	-2.06	-1.34
Private Sector Real Investment Expenditure	-1.69	-1.08	-1.11	-2.93	-1.85	-1.64
Public Sector Real Investment Expenditure	-2.97	-4.09	-3.71	-3.06	-3.11	-3.17
Import of Consumption Goods	-1.91	-2.02	-1.92	-2.75	-2.16	-1.81
Import of Capital Goods	-2.79	-3.09	-2.25	-2.79	-3.22	-2.64
Exports	-2.97	-3.28	-3.22	-2.12	-2.03	-2.17
Tax Rate on Import of Consumption Goods	-2.24	-1.56	-2.01	-3.25	-1.87	-1.81
Tax Rate of Import of Capital Goods	-3.31	-5.22	-3.51	-2.87	-4.24	-4.41
Tax Rate on Exports	-2.62	-2.79	-2.18	-1.96	-2.54	-2.00
Employment	-2.26	-2.58	-2.79	-2.70	-2.36	-2.68
Wage Rate	-1.36	-1.62	-1.88	-1.83	-1.63	-1.85
Agricultural Valued Added	-1.83	-1.95	-1.89	-2.59	-2.13	-1.82
Manufacturing Sector Output	-2.2	-2.97	-3.57	-1.98	-1.96	-2.485
Capital Stock	-2.34	-2.60	-2.45	-2.78	-2.54	-2.89
MacKinnon Critical Value	5%	10%		5%	10%	
	-3.79	-3.86		-3.12	-2.70	

The Augmented Dikey-Fuller test results for unit roots suggests the presence of unit roots in variables in levels when lagged once at both 5 percent and 10 percent confidence level. At lag 2, the estimated Augmented Dikey-Fuller indicates that the estimated values for disposable income, public sector real investment expenditure, and the tax rate on imported capital goods are greater than the critical value at 5 percent and 10 percent. These results could be caused by problems that arise in applying the test in small sample size. An inspection of the data did not provide evidence that these variables are stationary. The remaining variables are shown to have unit roots. Moreover, at lag 3, the test suggests that all the variables are not stationary.

For variables in first differenced form, the Augmented Dikey-Fuller test was not particularly reliable. Hence, attention was focused on the autocorrelation function of each variable. Although not reported here because of space constraint, the researcher was satisfied that stationarity was achieved by first differencing the variables in question. Therefore, there is an indication that the variables in levels are not stationary, and that first differencing is sufficient to achieve stationarity.

The table below reports on unit root testing exercise for the residuals of the long run equilibrium equations.

	Lag 1	Lag 2	Lag 3
Private Domestic Consumption	-2.15	-1.89	-2.55
Government Consumption	-4.12	-2.63	-2.01
Foreign Direct Investment	-1.19	-1.06	-1.49
Private Sector Investment	-4.13	-2.71	-2.16
Public Sector Investment	-3.05	-3.15	-1.74
Import of Consumption Goods	-2.17	-1.89	-1.65
Import of Capital Goods	-2.44	-3.67	-2.76
Exports	-1.83	-2.38	-2.26
Labour Demand	-3.14	-2.11	-2.92
Mackinnon Critical Value	5%	10%	
	-1.97	-1.63	

Number of observations: 17

The Augmented Dikey-Fuller test suggests that the residual variables for all the estimated equations are stationary when lagged once at 5 percent confidence level, except the variable residual estimated from export equation which is shown to be stationary at 10 percent confidence level. At lag 2, except for private domestic consumption and import of consumption goods residual variables, the remaining variables are stationary at 5 percent confidence level. The former set of variables is stationary at 10 percent confidence level. At lag 3 all variable residuals are stationary at 5 percent confidence level, except that for public sector real investment expenditure, which is not stationary even at 10 percent confidence level. As a further test for stationarity of the residuals variables, hence cointegration amongst respective variables, the autocorrelation function was employed. The auto correlation test results are reported in appendix II. Non of the estimated correlation for each residual variable is significantly greater than zero. Therefore, by implication the residual are *I(0)*, and the respective relationships for each equation are *I(1)*. This suggests the Engle-Granger two step approach is

suitable for estimating the relationships in the model. However, the above conclusions do not apply to foreign direct investment, since the respective variable residual is not *I(0)*. The autocorrelation function also indicated that this variable is not stationary.

The next step presents and long run and short run disequilibrium dynamic relationships.

5.2.2 Regression Results

The estimated equations are specified in logarithms because the estimated coefficients can be directly interpreted as elasticities and are commented in a straightforward manner.

The test results for specification errors (Ramsey's RESEST test), first order autocorrelation (LM test), the test for normality of the residuals (Jarque and Bera test) and heteroscedasticity (White test) are reported together with least squares estimates in appendix II for the short run disequilibrium equations. A modified version of the White test which does not include cross terms was used. Least squares estimates for the long run equilibrium relationships are also reported in appendix II. Heteroscedasticity and other violations of normality assumption employing robust regression. In extreme cases, multicollinearity was handled by drooping one of the highly collinear variables. A continuous specification search ensured that variables, which remained in the equation, are statistically significant and bear the predicted sign. Variables which are believed to have influenced the variable being explained with statistically insignificant coefficient estimates, but removing them changed the conclusions about the estimated coefficients were kept in the model. Their insignificance can be attributed to measurement errors. The resulting equation is the preferred equation of the model. Although reference is made to least squares regression results, the interpretation will largely be based on robust regression results. Unless otherwise indicated, the estimated equations should be considered to have passed all specification error test and free from

autocorrelation. In applying the Ramsey's reset test, the number of fitted terms was fitted at 1 and 2. The LM serial correlation test was decisively relied upon to test for first order autocorrelation. Some short run disequilibrium equations did not pass the White and the Jarque Bera tests (see appendix II). However, these problems were addressed by employing robust regression.

Domestic Consumption Function

The estimated long equation is reported below:

Dependent	Private Domestic Consumption					
Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	1.43	0.68	2.11	0.05	Accept Ho	0.50
Disposable Income	0.72	6.45	6.45	0.00	Reject Ho	0.99
Domestic Price	5.28E-03	1.36E-02	0.39	0.70	Accept Ho	0.07
Price Subsidy	0.13	2.21E-02	5.75	0.00	Reject Ho	0.99
R-Squared	0.81					

In the long run, private domestic consumption equation (4.2.18) was influenced by disposable income, domestic price, and price subsidy. Estimation by robust regression as in the case of estimation by least squares resulted in a statistically insignificant coefficient for domestic price. On the one hand least squares regression results indicate that there was a negative relationship between private domestic consumption and domestic price. On the other hand robust regression shows a positive relationship between these variables. It is thus not clear from the empirical estimate the exact effect of domestic price on private domestic consumption in the long run. The estimated coefficient for this variable is also statistically insignificant at 10 percent confidence level. However, given the assumption that robust regression yields better estimates in the presence of outliers, then one can be inclined to suggest that price expectation effect may have prevailed in the long run. *GDP* price deflator was used as a measure of domestic price As per initial expectations, disposable income and price subsidy estimated coefficients bear positive signs.

Robust regression results indicates that a one percent increase in disposable income, domestic price and price subsidy, increased private domestic consumption by 0.72 percent 0.01 percent and 0.13 percent. As it can be seen from the estimated coefficients, disposable income was the most influential variable in determining private domestic consumption behaviour. While domestic price may have had marginally expansionary effects on private domestic consumption, price subsidy had relatively substantial expansionary effects on private domestic consumption. This finding has profound policy implications in the economy being studied, in terms of stimulating consumption of basic foodstuff, given the prevailing level of poverty in the country.

Dependent: Private Domestic Consumption

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Disp. Income	0.67	1.17E-02	57.54	0.00	Reject Ho	1.00
Dom. Price	0.19	5.31E-03	36.23	0.00	Reject Ho	1.00
Residual(-1)	-5.32E-02	2.23E-02	-2.35	0.08	Accept Ho	0.44
Dom. Price(-1)	-0.22	5.77E-03	-38.82	0.00	Reject Ho	1.00
Price Subsidy(-1)	5.33E-02	3.67E-03	14.51	0.00	Reject Ho	1.00
R-Squared	0.99					

The estimated preferred short run disequilibrium dynamic equation for private domestic consumption is better explained by current period disposable income and current period domestic price. Once lagged domestic price and once lagged price subsidy are plausible explanatory variables as well. Least squares regression estimation resulted only in current period disposable income and past period domestic price being statistically significant at 5 percent confidence level. However, the estimated *t*-values from robust regression show that the estimated coefficients are all statistically significant at 5 percent confidence level and that the lagged residual variable is statistically significant at least at 10 percent confidence level.

The estimated coefficients for disposable income and domestic price in the current period show a positive relationship with respect to private domestic consumption. Thus an increase in disposable income had expansionary effects by way of increasing consumers purchasing power, leading to an increased demand for domestically produced consumer goods.

At time t, domestic price had price expectations effects, as such, may have led consumers to believe that prices would keep on increasing and induced them to purchase goods and services ahead of the expected price increase, which in turn increased the demand for these goods in time period t. On the other hand at time $t=-1$ domestic price shows a negative relationship with respect to private domestic consumption. High prices in the previous period depleted consumers wealth resulting in a loss of purchasing power in the current period. This in turn resulted in lower demand for domestically produced goods at time t. Price subsidy had marginally positive effects on private domestic consumption. The effect of increase in price subsidy kicked in with a lag. This can be understood by noting that price subsidy is set institutionally and there are lags between when a decision is made to increase the size of budget of price subsidy until it filters in the economy.

The absence of a lagged dependent variable is probably an indication that private domestic consumption on aggregate, in this economy, was not a stable phenomenon, but rather depended on the availability of financial resources, i.e., disposable income. However, this excludes non commercialised consumption goods, taking into consideration that there is a large peasantry farming activity going on in this economy, where stability on consumption largely depends on good weather.

A one percent increase in current period disposable income and current period domestic price increased private domestic consumption by 0.67 percent and 0.19 percent, respectively. At time $t=-1$, a one percent increase in domestic price reduced current period private domestic consumption by 0.22 percent, while a one

percent increase in price subsidy at time $t = -1$ increased current period private domestic consumption by 0.05 percent. The magnitude of the estimated elasticity coefficients in both the long run and the short run equations are in line with the proposition that disposable income is the most significant variable in determining the level of private domestic consumption. That is, a greater proportion of disposable income is spent on consumption goods in developing countries, such that changes in this variable has profound effects on private domestic consumption. Furthermore these results are consistent with the proposition that as income rises, consumption rises but not by as much as a rise in disposable income.

Disposable income and price subsidy had strong positive effects on private domestic consumption. The magnitude of the estimated residual coefficient is extremely small suggesting that the speed of adjustment to long run equilibrium was very low. 0.02 of the discrepancy between the actual and the long equilibrium value of private domestic consumption was corrected each period. It is noted that the above results apply to private domestic consumption on aggregate. Segmentation of private domestic consumption into durable and non-durable goods, or a demand for a particular set of goods may yield different results. This is what the equation failed to capture.

Government Consumption

Dependent: Government Consumption

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	1.62	0.49	3.29	0.01	Reject Ho	0.86
Gov. Revenue	0.58	0.12	4.67	0.00	Reject Ho	0.99
Net Transf. Debt	0.16	0.02	8.29	0.00	Reject Ho	1.00
Grants	0.10	4.30E-02	2.41	0.03	Reject Ho	0.61
R-Squared	0.98					

In the long run, the above regression equation (4.2.19) suggests that government consumption was influenced by government revenue, net transfer on debt and the

level of grants. Except for the level of grants variable, all the estimated coefficients are statistically significant at 5 percent confidence level when least squares regression was employed. Robust regression rendered this coefficient statistically significant. The cointegrating equation demonstrates that all the explanatory variables show a positive relationship with respect to government consumption as per initial prediction. Obviously, government consumption was the most influential variable, since the government has a free hand in using this type of financial resource, compared to others, which may have had strings attached. A one percent increase in government revenue, net transfer on debt and the level of grants increased government consumption by 0.58 percent, 0.16 percent and 0.10 percent.

Dependent Variable: Government Consumption

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Net Transf. Debt	6.33E-02	3.60E-03	17.56	0.00	Reject Ho	1.00
Residual (-1)	-0.39	6.59E-02	-5.90	0.00	Reject Ho	1.00
Net Transf. Debt (-1)	8.33E-02	3.93E-03	20.58	0.00	Reject Ho	1.00
Grants (-1)	0.19	1.80E-02	15.933	0.00	Reject Ho	1.00
R-Squared	0.99					

In the short run, government consumption is better explained by current period net transfer on debt, once lagged net transfer on debt and once lagged level of grants. Least squares regression estimates show that all the estimated coefficients, except current period net transfer on debt are statistically insignificant at 5 percent confidence level. Estimation by robust regression resulted in statistically significant parameter estimates for the all the variables.

The selected explanatory variables influenced government consumption positively, with past level of grants being the most significant variable. Lagged net transfer on debt and the level of grants are likely to account for delays in fund disbursement by donor agencies. The absence of lagged government consumption variable in the

right hand side of the equation seems to suggest that this variable like private consumption was not stable, but rather depended on the availability of financial resources.

A one percent increase in current period net transfer on debt increased current period government consumption by 0.06 percent. Likewise, a one percent increase in net transfer on debt and level of grants at time $t = -1$ increased government consumption at time t by 0.08 percent and 0.19 percent, respectively. Net transfer on debt and grants had strong positive effects on government consumption. The estimated residual coefficient indicates that the speed of adjustment was relatively low with 0.39 of the proportion between the actual and the long run value of government consumption being corrected each period.

Foreign Direct Investment

Dependent Variable: Foreign Direct Investment

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Private Invest.	1.30	0.15	8.54	0.00	Reject Ho	1.00
Govt. Invest. (-1)	0.15	3.49E-02	4.30	0.00	Reject Ho	0.98
R-Squared	0.95					

The estimated residual variable for foreign direct investment was not stationary, thus hinting that the variables in question were cointegrated (manufacturing sector output was also experimented with as an explanatory variable, but did not change previous conclusions). Therefore, the data was first differenced and then specification search followed. It was determined that public sector real investment expenditure is explained by current period real investment expenditure in the private sector and once lagged public sector real investment expenditure. Current period private sector real investment expenditure explains the joint venture approach between this sector and foreign investor. Once lagged public sector real investment expenditure on the other hand is likely to explain the joint venture approach between this sector and foreign investment, as well as the lead that public

sector investment in terms of provision of public infrastructure, which generally leads foreign direct investment.

A one percent increase in private sector real investment expenditure at time t increased foreign direct investment by 1.30 percent, and a one percent increase in public sector real investment expenditure at time $t=-1$ increased foreign direct investment by 0.15 percent. As it can be seen from the estimated coefficients which are all statistically significant at 5 percent confidence level when robust regression was employed, private sector real investment expenditure was the most influential variable. Estimation by least squares resulted in statistically insignificant coefficients at 5 percent confidence level.

Private Sector Real Investment Expenditure

Dependent: Private Domestic Consumption

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	1.24	0.26	4.81	0.00	Reject Ho	0.99
Net Transf. Debt	0.22	1.56E-02	13.84	0.00	Reject Ho	1.00
Grants	0.54	6.27E-02	8.59	0.00	Reject Ho	1.00
Foreign. Invest.	0.11	3.17E-02	3.58	0.00	Reject Ho	0.91
Manuf. Output	0.17	8.20E-02	2.09	0.06	Accept Ho	0.48
R-Squared	0.99					

In the long run private sector real investment expenditure equation (4.2.21) is explained by manufacturing sector output, net transfer on debt, grants and foreign direct investment. The coefficient estimates for the explanatory variables bear predicted signs. The role of foreign financing in bankrolling private sector real investment expenditure is evident. Net transfer on debt and grants both singly or combined, explain a large proportion of private sector real investment expenditure. The significance of foreign direct investment as an exploratory variable validates the proposition that for the period studied, there was a substantial joint venture taking place between private sector investors and foreign investor.

From the estimated elasticity coefficients, it can be deduced that a one percent increase in net transfer on debt and the level of grants increased private sector real investment expenditure by 0.22 percent and 0.54 percent, respectively. Similarly, a one percent increase in foreign direct investment and manufacturing sector output increased the dependent variable in question by 0 11 percent and 0.17 percent, respectively.

Dependent Variable: Private Sector Real Investment Export

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Net Transf. Debt	0.12	0.01	21.41	0.00	Reject Ho	1.00
Grants	0.33	1.83E-02	18.21	0.00	Reject Ho	1.00
Foreign Inv.	0.16	1.41E-02	11.26	0.00	Reject Ho	1.00
Manuf. Output(-1)	0.23	3.67E-02	6.33	0.00	Reject Ho	1.00
Net Transf. Debt(-1)	0.14	6.60E-03	20.65	0.00	Reject Ho	1.00
Residual(-1)	-0.21	6.54E-02	-3.2196	0.02	Reject Ho	0.76
R-Squared	0.99					

In the short run, private sector real investment is better explained by current period net transfer on debt, the level of grants and lagged foreign direct investment. Furthermore, once lagged manufacturing sector output and net transfer on debt are also explanatory variables. The estimated coefficients for all the explanatory variables are positively related to the dependent variable in question and are all statistically significant at 5 percent confidence level when robust regression was used as a method of estimation. Those estimated by least squares regression indicate that once lagged manufacturing sector output and the residual variables are statistically insignificant at 5 percent confidence level.

As in the case of the long run equation, the influence of foreign financial resources is evident, as well as the joint venture approach between the private sector investors and foreign investors. Once lagged net transfer on debt accounts for delays in fund disbursement by donor agencies, while once lagged manufacturing sector output shows the lead that it has over real investment expenditure in this

sector. Private sector investors are likely to have incorporated past output level in forming expectations about future economic outlook to decide the current level of investment expenditure.

The expansionary effects of current period net transfer on debt, grants and foreign direct investment on private sector real investment expenditure, following one percent increase was 0.12 percent, 0.33 percent and 0.16 percent. Similarly, at time period $t = -1$ a one percent increase in net transfer on debt and manufacturing sector output increased private sector real investment expenditure by 0.14 percent and 0.23 percent, respectively. All the explanatory variables in the above equation had strong positive effects on private sector real investment expenditure. The speed of adjustment to long run equilibrium was relatively low. The estimated coefficient for once lagged residual shows that 0.21 of the discrepancy between the actual and the long run equilibrium private sector real investment expenditure was corrected each period.

Public Sector Real Investment Expenditure

Dependent	Govt. Investment					
Independent	Regression	Standard	T-Value	Prob	Decision	Power
Variable	Coefficient	Error	(Ho: B=0)	Level	(5%)	(5%)
Intercept	-3.72	0.59	-6.29	0.00	Reject Ho	1.00
Foreign Invest	0.24	5.71E-02	4.15	0.00	Reject Ho	0.97
Manuf. Output	1.57	0.14	10.87	0.00	Reject Ho	1.00
R-Squared 0.95						

Real investment expenditure in the public sector equation (4.2.22) estimation in levels suggests that foreign direct investment and manufacturing sector output are plausible explanatory variables. Estimation by least squares resulted in foreign direct investment being statistically insignificant bearing a sign which is inconsistent with initial predictions, but robust regression rendered this coefficient statistically significant with a predicted sign. Manufacturing sector output had very high expansionary effects: a one percent increase in this variable increasing public sector real investment expenditure by 1.57 percent.

sector. Private sector investors are likely to have incorporated past output level in forming expectations about future economic outlook to decide the current level of investment expenditure.

The expansionary effects of current period net transfer on debt, grants and foreign direct investment on private sector real investment expenditure, following one percent increase was 0.12 percent, 0.33 percent and 0.16 percent. Similarly, at time period $t=-1$ a one percent increase in net transfer on debt and manufacturing sector output increased private sector real investment expenditure by 0.14 percent and 0.23 percent, respectively. All the explanatory variables in the above equation had strong positive effects on private sector real investment expenditure. The speed of adjustment to long run equilibrium was relatively low. The estimated coefficient for once lagged residual shows that 0.21 of the discrepancy between the actual and the long run equilibrium private sector real investment expenditure was corrected each period.

Public Sector Real Investment Expenditure

Dependent	Govt. Investment					
Independent	Regression	Standard	T-Value	Prob	Decision	Power
Variable	Coefficient	Error	(Ho: B=0)	Level	(5%)	(5%)
Intercept	-3.72	0.59	-6.29	0.00	Reject Ho	1.00
Foreign Invest	0.24	5.71E-02	4.15	0.00	Reject Ho	0.97
Manuf. Output	1.57	0.14	10.87	0.00	Reject Ho	1.00
R-Squared 0.95						

Real investment expenditure in the public sector equation (4.2.22) estimation in levels suggests that foreign direct investment and manufacturing sector output are plausible explanatory variables. Estimation by least squares resulted in foreign direct investment being statistically insignificant bearing a sign which is inconsistent with initial predictions, but robust regression rendered this coefficient statistically significant with a predicted sign. Manufacturing sector output had very high expansionary effects: a one percent increase in this variable increasing public sector real investment expenditure by 1.57 percent.

The significance of the relationship between manufacturing sector output and public sector real investment expenditure can be understood by noting that an increase in domestic output requires an increase in real investment expenditure. Increase in real investment expenditure may be necessary even in sectors, which do not yield immediate profits, if at all, within a specified period of time. These include investment in infrastructure where domestic private sector may not have had the will or capacity (technical or financial) to engage itself in investment projects such as the rehabilitation of Beira Corridor. An increase in real income thus caused the government to expand its investment, particularly in sectors that the private sector would not invest. The proviso was the availability of financial resources, which for the period studied were largely foreign.

Foreign direct investment validates the proposition made earlier regarding the joint venture approach between the public sector investment and foreign investment as mandated by law. It is also a form of inflow of foreign financial resources. A one percent increase in this type of investment increased government sector real investment expenditure by 0.24 percent. Although other forms of foreign financing: net transfer on debt and grants are not explicitly incorporated in the estimated equation, they also explain public sector real investment expenditure. As previously shown, foreign direct investment explains private sector real investment expenditure, which in turn is explained by net transfer on debt and grants in addition to other variables. Since foreign direct investment explains public sector real investment expenditure, it therefore follows that these types of financial inflows also influenced government real investment expenditure in the long run.

Dependent: Govt. Investment

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Manuf. Output	2.06	0.37	5.56	0.00	Reject Ho	1.00
Residual(-1)	-0.46	0.11	-4.38	0.00	Reject Ho	0.98
Net Transf. Debt(-1)	0.44	9.92E-02	4.47	0.00	Reject Ho	0.98
R-Squared	0.95					

The estimated equation for : : run disequilibrium dynamic relat.onships indicates that public sector real investment expenditure was influenced by manufacturing sector output and foreign financing: net transfer on debt. Manufacturing sector output had strong expansianry effects: a one percent increase increased public sector real investment by 2.06 percent. The arguments used to explain the relationship between these two variables in the long run equation apply here as well. Similarly, a one percent increase in net transfer on debt at time $t=-1$ increased public sector real investment expenditure by 0.44 percent at time t. The lag in net transfer on debt is likely to account for delays in fund disbursement by nor agencies. Both of these variables had strong positive effects on public sector real investment expenditure. 0.11 of the discrepancy between actual and the long run value of government sector real investment expenditure was corrected each period. Thus the speed of adjustment was on the low side.

Import of Consumption Goods

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-0.85	0.89	-0.95	0.37	Accept Ho	0.14
Disp. Income	0.74	0.144	4.89	0.00	Reject Ho	0.99
Tax Rate	-0.05	3.072E-02	-1.42	0.19	Accept Ho	0.24
Net Transf. Debt	0.19	1.44E-02	12.92	0.00	Reject Ho	1.00
R-Squared	0.96					

The estimated cointegrating equation for import of consumption goods (4.2.23) suggests that disposable income, the tax rate and net transfer on debt are appropriate explanatory variables. Estimation by least squares regression yielded statistically insignificant coefficients for all the explanatory variables at 5 percent confidence level. Robust regression on the other hand, resulted in statistically significant coefficients estimates for disposable income and net transfer on debt. The coefficient for tax rate variable is statistically insignificant even at 10 percent confidence level, nonetheless part of the model. As per initial expectations, both

disposable income and net transfer on debt show a positive relationship with respect to import of consumption goods, while the tax rate shows a negative relationship. In the long run, a one percent increase in disposable income and net transfer on debt increased the demand for imported consumption goods by 0.70 percent and 0.19 percent, respectively. Conversely a one percent increase in the tax rate lowered the demand for imported consumption goods by 0.05 percent.

Dependent: Import of Consumption Goods

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Disp. Income	0.22	3.70E-02	5.97	0.03	Reject Ho	0.83
Rresidual(-1)	-0.17	1.43E-02	-11.52	0.01	Reject Ho	1.00
Disp. Inocme(-2)	0.81	0.48E-02	17.06	0.00	Reject Ho	1.00
Tax(-1)	4.56E-02	1.50E-03	3.04	0.09	Reject Ho	0.39
Net Transf. Debt(-2)	0.22	4.85E-03	46.03	0.00	Reject Ho	1.00
Imp. Cons. Goods(-2)	0.07	2.02E-02	3.33	0.08	Reject Ho	1.44
R-Squared	0.99					

The estimated first differenced equation shows that consumption of imported goods was influenced by current period disposable income, twice lagged disposable income, twice lagged tax rate, twice lagged net transfer on debt and twice lagged consumption of imported goods. Estimation by least squares resulted in statistically insignificant coefficients for all the dependent variables, except twice lagged disposable income. Estimation by robust regression on the other hand was able to yield statistically significant coefficients for all explanatory variables, except twice lagged tax rate and twice lagged consumption of imported goods.

A one percent increase in disposable income at time t and $t=-2$ increased the demand for imported capital goods by 0.22 percent and 0.81 percent, respectively. Current period income is likely to explain consumption of non durable imported goods, such as food stuff, while income at $t=-2$ it is likely to explain the

consumption of durable imported consumption goods. Most of the imported consumption good are expensive and are generally not attainable on one-month income. This coupled with the non-existence of credit system at the time, required consumers to accumulate a portion of their income for a number of months to be able to purchase these goods. Thus, an increase in income at time $t = -2$ is likely to have boosted consumer's wealth such that at time t increased consumers purchasing power which led to an increase in the demand for imported consumption goods.

A one percent increase in tax rate in time $t = -2$ had marginal expansionary effects; increased the demand for imported consumption goods by 0.05 percent. Consumers are likely to have believed that the tax rate which had the effect of reducing purchasing power in the current period, was going to increase in the coming period, thus leading them to purchase desired goods, particularly durable goods before the expected increase in tax rate in the coming period. Net transfer on debt which can be taken as a proxy for foreign exchange had expansionary, but lagged behind import of consumption goods probably because of delays in fund disbursement by donor agencies. A one percent increase in net transfer on debt at $t = -2$ increased import of consumption goods by 0.22 percent at time t. The estimated coefficient elasticities demonstrate that either singly in either period or jointly, disposable income was the most influential variable in explaining the behaviour of import of consumption goods. Disposable income and net transfer on debt had strong positive effects on import of consumption goods. The speed of adjustment was relatively low with 0.13 of the discrepancy between the actual and the equilibrium value of import of consumption goods corrected each period. The influence of net transfer on debt in both the long run equilibrium and the short run disequilibrium dynamic relationships validates the argument that developing countries use borrowed funds for consumption purposes. It also validates the argument that foreign exchange constraint affects import of consumption goods in the economy being studied. The Ramsey's specification test suggested misspecification when employing the first power, higher powers did not indicate evidence of misspecification. Although the LM serial correlation test suggests the

presence of first order autocorrelation, the serial correlation residual plot did not provide evidence of first order autocorrelation. This is corroborated by the serial correlation section in NCSS along with the serial correlation residual plot.

Import of Capital Goods

Dependent Import of Capital Goods

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	6.76E-02	0.15	0.4547	0.66	Accept Ho	0.07
Tax	-0.91	3.00E-02	-30.405	0.00	Reject Ho	1.00
Manuf. Output	0.44	0.04	10.02	0.00	Reject Ho	1.00
Net Transf. Debt	5.24E-02	7.87E-03	6.66	0.00	Reject Ho	1.00
Govt. Invest.	9.25E-02	2.18E-02	4.24	0.00	Reject Ho	0.96
Foreign Invest.	9.69E-02	1.43E-02	6.77	0.00	Reject Ho	1.00
R-Squared	0.99					

In the long run the import of capital goods equation (4.2.24) is better explained by the tax rate, manufacturing sector output, net transfer on debt, public sector real investment expenditure and foreign direct investment. Robust regression was able to yield statistically significant coefficients for all the variables, while estimation by least squares resulted in net transfer on debt and public sector real investment expenditure estimated coefficients being statistically insignificant at 5 percent confidence level. The signs displayed by the estimated coefficients of all explanatory variables are in accordance with initial predictions. Thus while manufacturing sector output, net transfer on debt, public sector real investment expenditure and foreign direct investment had expansionary effects on import of capital goods, the tax rate had contractionary effects. What this equations shows is that an increase in real income is made possible by an increase in real investment expenditure which required capital goods. Without imported capital goods, real investment expenditure was deficient since most of the required imported capital goods were not produced domestically.

A one percent increase in manufacturing sector output and net transfer on debt increased the demand for imported capital goods by 0.44 percent and 0.05 percent, respectively. Similarly, a one percent increase in public sector real investment expenditure increased import of capital goods by 0.093 percent and 0.1 percent, respectively. On the other hand, a one percent increase in the tax rate lowered the demand for import of capital goods by 0.91 percent. The estimated elasticity of import of capital goods with respect to the tax underscores the concerns raised by private sector investors. The high tax rate that prevailed at the time considerably reduced the demand for import of capital goods, lowered real investment expenditure, and had a adverse effect economic growth.

Dependent: Import of Capital Goods

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Tax	-0.58	0.09	-6.85	0.00	Reject Ho	1.00
Residual(-1)	-1.60	0.22	-7.18	0.00	Reject Ho	1.00
Tax(-1)	-0.15	0.08	-1.82	0.10	Accept Ho	0.34
Manuf. Output(-1)	0.65	8.63E-02	7.57	0.00	Reject Ho	1.00
Govt. Invest.(-1)	0.13	2.60E-02	5.13	0.00	Reject Ho	0.99

The first differenced equation regression results indicate that the dependent variable being explained was influenced by current period and past period tax rate, as well as once lagged public sector real investment expenditure and once manufacturing sector output. The tax rate in period t and $t=-1$ had a contractionary effect, while manufacturing sector output and public sector real investment expenditure had expansionary effects. The lags can be explained in terms of delays from the time orders for capital goods are made until when delivery takes place.

In the short run, a one percent increase in the tax rate at time t and $t=-1$ reduced the demand for import of capital goods by 0.56 percent and 0.15 percent respectively. A one percent increase in the public sector real investment

expenditure and manufacturing sector output at time $t = -1$ increased the demand for imported capital goods at time t by 0 65 percent and 0.13 percent, respectively. Both the public sector real investment expenditure and foreign direct investment had strong positive effects of the demand of imported capital goods, while the tax rate had strong negative effects on import of capital goods. 1.62 of the discrepancy between the actual and the long run demand for import of capital goods was corrected each period. Although least squares regression yielded statistically insignificant coefficients for most of the variables, robust regression rendered these statistically significant.

Export Function

Dependent: Exports

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-1.25	0.25	-5.05	0.00	Reject Ho	0.99
Tax	-0.64	3.58E-02	-17.92	0.00	Reject Ho	1.00
Exports	0.28	0.02	11.28	0.000	Reject Ho	1.00
R-Squared	0.97					

The estimated cointegrating equation (4.2.25) for export goods is explained by agricultural value added and the tax rate imposed on export goods. Both least squares regression and robust regression estimates are statistically significant at 5 percent confidence level. As per initial model prediction, the tax rate had contractionary effects, while agricultural value added had expansionary effect. In the long run, a one percent increase in agricultural output increased exports by 0.28 percent, while a one percent increase in the tax rate lowered exports by 0.64 percent. This is yet another example where a rise in the tax rate did harm, by a way reducing the level of exports, thus limiting the potential for much needed foreign exchange earnings.

Dependent: Export Goods

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Tax	-0.22	4.62E-02	-4.72	0.01	Reject Ho	0.960
Agric. Added	6.31E-02	1.75E-02	3.61	0.02	Reject Ho	0.82
Residual(-1)	-0.23	5.01E-02	-4.5997	0.01	Reject Ho	0.95
Tax(-1)	-0.70	4.35E-02	-16.05	0.00	Reject Ho	1.00
Tax(-2)	0.51	3.63E-02	13.99	0.00	Reject Ho	1.00
Agic. Added(-2)	9.62E-02	2.77E-02	3.47	0.02	Reject Ho	0.79
Export (-2)	0.17	4.64E-02	3.61	0.024	Reject Ho	0.82
R-Squared	0.99					

In the short run, the export variable was influenced by current period tax rate and current period value added. Once lagged and twice lagged tax rate as well as twice lagged agricultural valued added and twice lagged export also influenced the behaviour of export variable. A one percent increase in the tax rate levied on export goods at time t and $t=-1$ reduced the level of exports by 0.22 percent and 0.7 percent respectively. At time $t=-2$ however, a one percent increase in the tax rate increased the level of exports by 51 percent. Expectations may have played a role: exporters may have anticipated that the tax rate would increase in the coming periods and were induced to export goods that could well be sold in the coming period, in the current period, thus increasing the export level. A one percent increase in both agricultural output and export goods at time period $t=-2$ increased the level of export at time t by 0.10 percent and 0.17 percent, respectively.

Lagged agricultural output is likely to account for the time it takes for harvesting agricultural export goods, processing and finally exporting these goods. Past level of exports can be regarded as a measure of the country's ability to provide a steady supply of export goods, and thus capable of meeting the demand of foreign markets. A systematic high level of export supply could have been taken as an indication by foreign buyers that the economy was likely to maintain the same quantity of supply in the coming periods. Conversely, low levels of exports in

current period could have aroused doubts on the part of foreign buyers about the countries ability to supply expected quantities of export goods, in which case, they could have looked for substitutes in other countries. A share of these goods such as cashew nut is supplied by peasant farmers who do not necessarily depend on imported inputs such as fertilisers and other farming equipment. Goods weather. And transportation are the basic requirements. Also, a large proportion of export goods such as cashew nuts and tea can be obtained from other countries. The White test could not be performed because of insufficient data, but an inspection of the residuals suggested there was some form of trouble.

Labour Demand Function

The estimated long equation is

Dependent: Labour Demand

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	5.23	0.35	14.98	0.00	Reject Ho	1.00
GDP	0.39	5.66E-02	6.83	0.00	Reject Ho	1.00
Wage	-0.308	0.03	-10.31	0.00	Reject Ho	1.00
R-Squared	0.93					

which shows that labour demand was influenced by the level of real income and wage rate. The signs of the estimated coefficients are consistent with theory and initial model prediction. A one percent increase in real income caused labour demand to increase by 0.39 percent while a one percent increase in real income caused employment level to fall by 0.31 percent. As it can be seen from the estimated elasticity coefficient of labour demand with respect to real income, economic growth did not necessarily result in high level of employment growth.

Dependent: Labour Demand

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
GDP	0.21	5.56E-03	38.65	0.00	Reject Ho	1.00
Residual(-1)	-1.75	4.64E-2	-37.72	0.00	Reject Ho	1.00
GDP(-1)	0.96	4.94E-03	194.61	0.00	Reject Ho	1.00
Wage(-1)	-0.54	7.45E-03	-72.26	0.00	Reject Ho	1.00
Cap. Stock(-1)	-1.67	2.844E-02	-58.94	0.00	Reject Ho	1.00
Cap. Stock(-2)	-0.01	6.09E-03	-16.85	0.00	Reject Ho	1.00
R-Squared	0.99					

In the short run, the estimated equation shows that labour demand was influenced by current period real income, once lagged real income, once lagged wage rate,

once lagged and twice capital stock. The signs displayed by the estimated coefficients are consistent with theoretical underpinning and model expectations. On the one hand increase in GDP increased the demand for labour services. On the other hand both wage rate and capital stock had contractionary effects on employment level. Increases in *GDP* requires an increase in factor inputs, and labour input being one of them also increases. However, the price of substitute of labour in the production process, i.e. capital stock competes with labour. Low price of capital relative to labour will induce employers to prefer to employ the former in the production process. In the case of the economy being studied, real interest rates were very low to negative for almost the entire period of the study and the exchange rate was overvalued for a large part of the period studied. These factors may have contributed for the preference of capital instead of labour, which explains the large contractionary effects of capital stock on employment level. The lag in capital stock can be explained by the fact that capital equipment has to be imported, then installed. While the process was being implemented, the existing work force may not have been laid off. More labour services may have been hired, which resulted in an increase in the demand for labour in a situation where real income was expanding. However, once the process of capital equipment installation was complete, output could be increased with fewer labour services employed. In fact, this is what happened with most of the privatised firms.

A one percent increase in *GDP* at time t and $t=-1$ increased labour demand by 0.20 percent and 0.96 percent respectively. An increase in the level of real income at $t=-1$ could have acted as a signal that the demand for domestically produced goods and services would increase in the coming period. To meet the expected surge in demand, producers required more factor inputs, including labour in order to expand output. Therefore, past level of real income is likely to have been incorporated by firms in determining the level labour demand in the coming period.

A one percent increase in capital stock at time $t=-1$ and $t=-2$ reduced the demand for labour services by 0.67 percent and 0.1 percent respectively. Hence, a rise in the use of capital stock had substantial contractionary effects on labour demand. Similarly, a one percent increase in wage rate reduced the demand for labour services by 0.55 percent. While real income had strong positive effects on labour demand, the wage rate had the opposite effect. The coefficient preceding the error correction term suggests that 1.89 of the discrepancy between the actual and the long run value of labour demand was corrected each period. Although the Ramsey's Reset test suggested misspecification at power 1, the inspection of the serial correlation residual plot did not provide evidence of misspecification.

It should be noted however, that the estimated labour demand equation was highly aggregate, as the effect of an increase in explanatory variable could not be determined at a sectoral and sub-sectoral level.

5.2.3 HYPOTHESES TESTING

In order to test the hypotheses 1 through 3, it was necessary to build a small macroeconomic model using the aggregate expenditure sector, followed by a labour market function, then estimate the specified equations employing modern time series techniques.

HYPOTHESIS 1:

The first hypothesis was formulated as follows:

> *The inflow of foreign resources eased the resource gap and foreign exchange gap, thus stimulated economic growth in Mozambique.*

It was demonstrated that in all the estimated equations, both long run equilibrium and short run disequilibrium dynamics relationships, except domestic consumption and the export function, the direct influence of foreign resources: foreign direct

investment, net transfer on debt and grants was evident. Furthermore, the estimated coefficients were statistically significant. These results reveal the level of dependency of the Mozambican economy on international capital inflows, for the period studied. With inflow of foreign resources, the country was able to improve its economic performance. Therefore, the hypothesis is conclusively true.

HYPOTHESIS 2:

The second hypothesis was formulated in the following way:

> *The magnitude of the net transfer on debt ultimately determined the level of economic growth in Mozambique a country facing both resource gap and foreign exchange gap.*

Although multiplier analysis were not performed it can be seen from the net transfer on debt definitional equation that that lowering interest rate and/or the principal amount paid to service the debt will increase the size of net transfer on debt, hence capital flows. Conversely, excess of capital outflows would have caused a negative impact on economic growth. The larger the magnitude of the net transfer on debt, the larger will be the effect on economic growth. The hypothesis in relation to economy of interest is true.

HYPOTHESIS 3:

The third hypothesis was formulated as follows:

> *Economic growth stimulated by an inflow of international capital is likely to be channelled to capital intensive methods of production, thus weakening the economy' ability to create adequate employment levels*

It was evident that the estin ated employment elasticities were very low thus implying that economic growth did not result in high level of job creation. In addition, the short run equation demonstrated that increase in capital intensity resulted in a significant reduction in employment level. Therefore the hypothesis is true.

CHAPTER 6
SUMMARY, CONCLUSIONS AND POLICY ISSUES

6.1 Summary and Concluding Remarks

This chapter summarises the findings, provides conclusions and outlines policy issues, and ends with suggestions for further research emanating from this study.

The objective of this study was to assess the effect of international capital flov s on economic growth and employment in Mozambique for 1980-1996 period. In the process, the aggregate expenditure sector and a labour market function were used to formulate a model that is specific to the feature of the economy being studied. Partial analyses were performed to assess the theoretical impact of a change in the level of capital flows on economic growth. It was shown that positive international capital flows increased real income, and that an increase in wage rate and capital stock lowered the demand for labour. Thereafter, a set of behavioural equations were formulated in order to assess the impact of international capital flows on economic growth empirically. Aggregate time series data was used to estimate single equations, which are components of the model. The parameters of the preferred equations of the model bear theoretic ly predicted signs, and in most cases the estimated coefficients are statistically significant.

In general, the estimated equations appear to be useful in studying the effects of capital flows on economic growth and employment. While positive foreign capital flows improved economic performance, employment level did not grow substantially in the long run. Excessive tax rate on import of capital goods and exports that prevailed at the time stifled progress. There is thus an indication that the behaviour of the Mozambican economy is probably closer to the proposition that international capital flows help close the resource gap and trade gap, and thus fuel economic growth.

It should be noted however, that the conclusions drown from this study are based on single equations estimates. The extent to which the model explains the impact of capital inflows can only be ascertained when all the equations are estimates simultaneously. Finally, it is stressed that the objective of this paper is not per se about modern time series techniques. These techniques were used as a vehicle for assessing the impact of economic foreign capital flows on economic growth, and the effect of the latter on labour demand.

6.2 Policy Issues:

In view of the findings from this study the following policy issues are raised.

It is obvious that an increase in the magnitude of international capital inflows increased the level of economic growth. It therefore follows that a reduction in debt burden is desirable. This can be achieved by drastically reducing interest payments as well as the principal amount, or the cancelling part or the entire debt.

Within the country, foreign capital flows should be channelled to productive sectors, such as import of capital goods. The import of consumption goods with borrowed funds is not compatible with economic growth prospect.

It was determined that the use of capital intensive technologies led to a drastic reduction in the level of employment. Therefore, labour intensive rather than technologies should be encouraged.

Excessive tax rate levied on import of capital goods and exports have an adverse effect on the growth of the economy, hence are to be avoided.

A number of clear directions from this study for further research are indicated.

- Solve the model, perform policy simulation and multiplier analysis.

- Subject to data availability specify and estimate desegregated equations for better policy analysis and recommendations.

- Assess the impact of economic growth emanating from international capital flows on income distribution.

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APPENDIX I

Dependent: Private Domestic Consumption

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	1.52	0.95	1.60	0.133	Accept Ho	0.32
Disp. Income	0.72	0.16	4.56	0.00	Reject Ho	0.99
Dom. Price	-1.32E-02	1.76E-02	0.75	0.47	Accept Ho	0.11
Price Subsidy	0.10	2.94E-02	3.51	0.00	Reject Ho	0.90
R-Squared	0.66					

Dependent: Private Domestic Consumption

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Disp. Income	0.84	0.18	4.69	0.00	Reject Ho	0.99
Dom. Price	0.23	0.12	2.04	0.07	Accept Ho	0.45
Residual(-1)	-0.39	0.41	-0.96	0.36	Accept Ho	0.14
Dom. Price(-1)	-0.27	0.11	-2.37	0.04	Reject Ho	0.57
Price Subsidy(-1)	7.64E-02	6.64E-02	1.15	0.28	Accept Ho	0.18
R-Squared	0.70					

	F-statistic	Prob.	F-statistic	Prob.
Ramsy's Reset Test	0.80	0.40	1.16	0.36
LM test	0.43	0.53		
Jack Bareau Test	5.58	0.06		
White Test	0.70	0.71		

Dependent: Government Consumption

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	2.45	0.61	4.0071	0.00	Reject Ho	0.96
Govt. Revenue	0.40	0.16	2.4669	0.03	Reject Ho	0.62
Net Transf Debt	0.15	2.62E-02	5.7679	0.005	Reject Ho	1.00
Grants	0.12	5.9E-02	1.99	0.07	Accept Ho	0.45
R-Squared	0.95					

Dependent: Government Consumption

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Net Transf. Debt	7.08E-02	2.60E-02	2.72	0.02	Reject Ho	0.70
Residual	-0.37	0.41	-0.92	0.38	Accept Ho	0.13
Net Trans. Debt(-1)	4.87E-02	2.67E-02	1.83	0.09	Accept Ho	0.39
Grants(-1)	0.11	7.67E-02	1.49	0.16	Accept Ho	0.27
R-Squared	0.541					

	F-statistic	Prob.	F-statistic	Prob.
Ramsy's Reset Test	0.44	0.52	1.06	0.38
LM test	4.26	0.0.		
Jarque Bera Test	2.18	0.34		
White Test	0.37	0.90		

Dependent: Government Consumption

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	2.45	0.61	4.0071	0.00	Reject Ho	0.96
Govt. Revenue	0.40	0.16	2.4669	0.03	Reject Ho	0.62
Net Transf Debt	0.15	2.62E-02	5.7679	0.005	Reject Ho	1.00
Grants	0.12	5.9E-02	1.99	0.07	Accept Ho	0.45
R-Squared	0.95					

Dependent: Government Consumption

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Net Transf. Debt	7.08E-02	2.60E-02	2.72	0.02	Reject Ho	0.70
Residual	-0.37	0.41	-0.92	0.38	Accept Ho	0.13
Net Trans. Debt(-1)	4.87E-02	2.67E-02	1.83	0.09	Accept Ho	0.39
Grants(-1)	0.11	7.67E-02	1.49	0.16	Accept Ho	0.27
R-Squared	0.541					

	F-statistic	Prob.	F-statistic	Prob.
Ramsy's Reset Test	0.44	0.52	1.06	0.38
LM test	4.26	0.07		
Jarque Bera Test	2.18	0.34		
White Test	0.37	0.90		

Dependent: Foreign Direct Investment

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Private Invest..	1.04	0.64	1.62	0.13	Accept Ho	0.32
Govt. Invest.(-1)	0.21	0.15	1.3545	0.20	Accept Ho	0.24
R-Squared	0.45					

F-statistic	Prob.	F-statistic	Prob.
Ramsy's Reset Test	0.27	0.61	0.18	0.84
LM test	0.04	0.85		
Jarque Bera Test	6.89	0.03		
White Test	0.49	0.75		

Dependent: Private Sector Real Investment Expenditure

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	1.36	0.40	3.43	0.00	Reject Ho	0.88
Net Transf Debt	0.21	2.41E-02	8.6461	0.00	Reject Ho	1.00
Grants	0.54	9.40E-02	5.77	0.00	Reject Ho	1.00
Foreign Invest.	0.12	0.05	2.53	0.03	Reject Ho	0.64
Manuf. Output	0.14	0.12	1.16	0.27	Accept Ho	0.19
R-Squared	0.98					

Dependent: Private Domestic Investment

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Nnet Transf. Debt	0.10	2.42E-02	4.16	0.00	Reject Ho	0.96
Grants	0.28	8.15E-02	3.45	0.01	Reject Ho	0.88
Foreign Invest.	0.21	4.50E-02	4.58	0.00	Reject Ho	0.98
Manuf. Output(-1)	0.17	0.12	1.38	0.20	Accept Ho	0.24
Net Transf. Debt(-1)	0.177	2.84E-0.	5.83	0.00	Reject Ho	1.00
Residual(-1)	-0.29	0.27	-1.07	0.31	Accept Ho	0.16
R-Squared	0.94					

	F-statistic	Prob.	F-statistic	Prob.
Ramsy's Reset Test	1.66	0.23	0.74	0.51
LM test	0.00	0.99		
Jarque Bera Test	1.38	0.50		
White Test	6.81	0.14		

Dependent: Public Sector Real Investment Expenditure

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-3.71	2.22	-1.67	0.12	Accept Ho	0.34
Foreign Inv.	-0.12	0.16	-0.72	0.48	Accept Ho	0.10
Manuf. Output	1.77	0.54	3.26	0.00	Reject Ho	0.86
R-Squared	0.44					

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Manuf. Output	1.44	1.05	1.37	0.20	Accept Ho	0.24
Residual(-1)	-0.34	0.37	-1.10	0.29	Accept Ho	0.17
Net Transf. Debt	0.50	0.28	1.77	0.10	Accept Ho	0.37
R-Squared	0.61					

	F-statistic	Prob.	F-statistic	Prob.
Ramsy's Reset Test	2.12	0.17	2.43	0.14
LM test	1.66	0.22		
Jarque Bera Test	8.59	0.01		
White Test	0.67	0.68		

Dependent Variable: Import of Consumption Goods

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-0.68	4.91	-0.14	0.89	Accept Ho	0.05
Disp. Income	0.55	0.78	0.70	0.49	Accept Ho	0.10
Tax	-0.25	0.19	-1.32	0.21	Accept Ho	0.23
Net Transf. Debt	0.15	7.12E-02	2.07	0.06	Accept Ho	0.48
R-Squared	0.46					

Dependent: Import of Consumption Goods

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Disp. Income	0.32	0.58	0.55	0.60	Accept Ho	0.08
Residual(-1)	-0.25	0.26	-0.98	0.35	Accept Ho	0.14
Disp. Income(-2)	1.76	0.59	3.02	0.01	Reject Ho	0.75
Tax (-2)	7.07E-02	0.20	0.03	0.97	Accept	0.05
Net Transf. Debt(-2)	5.710E-03	0.08	0.68	0.51	Accept Ho	0.09
Imp. Cons. Goods	0.29	0.29	0.99	0.35	Accept Ho	0.14
R-Squared	0.74					

	F-statistic	Prob.	F-statistic	Prob.
Ramsy's Reset Test	7.53	0.03	4.93	0.05
LM test	7.14	0.02		
Jarque Bera Test	0.77	0.68		
White Test	0.97	0.67		

Dependent: Import of Capital goods

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	-0.53	0.81	-0.65	0.53	Accept Ho	0.09
Tax Rate	-1.04	0.19	-5.34	0.00	Reject Ho	0.99
Man. Output	0.54	0.19	2.82	0.02	Reject Ho	0.73
Net transf. Debt	0.03	3.66E-02	0.78	0.45	Accept Ho	0.11
Govt Investment	1.74E-02	8.14E-02	0.21	0.83	Accept Ho	0.05
Foreign Investment	0.20	5.32E-02	3.81	0.00	Reject Ho	0.93
R-Squared	0.85					

Dependent: Import of Capital Goods

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power 5%)
Tax	-0.58	0.24	-2.45	0.03	Reject Ho	0.56
Residual(-1)	-0.74	0.49	-1.51	0.16	Accept Ho	0.28
Tax(-1) 1	-5.30E-02	0.20	-0.26	0.80	Accept Ho	0.06
Manuf. Output(-1)	0.45	0.24	1.91	0.09	Accept Ho	0.41
Govt. Invest(-1)	0.13	6.72E-02	1.87	0.10	Accept Ho	0.40
R-Squared	0.84					

	F-statistic	Prob.	F-statistic	Prob.
Ramsy's Reset Test	1.103	0.32	0.49	0.63
LM Test	3.26	0.10		
Jarque Bera Test	1.02	0.60		
White Test	15.54	0.00		

Dependent: Export

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value Prob (Ho: B=0)	Decision Level	(5%)	Power (5%)
Intercept	-1.59	0.69	-2.30	0.04	Reject Ho	0.57
Tax	-0.68	9.98E-02	-6.84	0.00	Reject Ho	1.00
Agric. Aded	0.31	0.07	4.32	0.00	Reject Ho	0.98
R-Squared	0.81					

Dependent: Export

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Tax	-0.27	0.10	-2.69	0.03	Reject Ho	0.64
Agric. Aded	9.04E-02	6.35E-02	1.42	0.20	Accept Ho	0.23
Residual(-1)	-0.36	0.16	-2.21	0.06	Accept Ho	0.48
Tax(-1)	-0.66	0.12	-5.67	0.00	Reject Ho	1.00
Tax(-2)	0.51	0.13	3.82	0.00	Reject Ho	0.90
Agric Aded	7.03E-02	9.09E-02	0.77	0.46	Accept Ho	0.10
Export(-2)	0.21	0.17	1.27	0.247	Accept Ho	0.20
R-Squared	0.93					

Ramsy's Reset Test	0.04	0.84	0.03	0.97
LM Test	0.33	0.59		
Jarque Bera Test	1.58	0.45		
White Test				

Dependent: Labour Demand

Re: ssion Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
Intercept	4.78	0.58	8.20	0.00	Reject Ho	1.00
GDP	0.45	9.24E-0.	+.89	0.00	Reject Ho	0.99
Wage	-0.32	5.17E-02	-6.21	0.00	Reject Ho	1.00
R-Squared	0.83					

Dependent: Labour Demand

Regression Equation Section

Independent Variable	Regression Coefficient	Standard Error	T-Value (Ho: B=0)	Prob Level	Decision (5%)	Power (5%)
GDP	0.13	0.16	0.77	0.45	Accept Ho	0.11
Residual(-1)	-1.43	1.02	-1.40	0.20	Ar.ept Ho	0.23
GDP(-1)	0.79	0.15	5.36	0.00	Reject Ho	1.00
Wage(-1)	-0.44	0.16	-2.73	0.02	Reject Ho	0.67
Capital stock(-1)	-1.44	0.59	-2.42	0.04	Reject Ho	0.57
Capital stock(-2)	-1.67	0.19	-0.89	0.40	Reject Ho	0.12
R-Squared	0.80					

Ramsy's Reset Test	3.25	0.12	3.47	0.10
LM Test	0.35	0.28		
Jarque Bera Test	0.05	0.97		
White Test	40.11	0.12		

APPENDIX III

Year	Private Dom. Consumption	Disp. Income	Dom. Price	Price Subsidy	Govt. Consump.	Govt. Revenue	Net Transf. on Debt	Grants	Foreign Invest.
1980	6.116934016	6.264588031	2.667228207	1.098612289	4.584116777	4.63256916	0	2.525728644	0
1981	5.999198538	6.173009405	2.778819272	1.131402111	4.677057416	4.738701579	0	2.534386707	0
1982	5.918161728	6.032370308	2.949688335	0.916290732	4.625896317	4.69523101	0	2.75409414	0
1983	5.728173928	5.788231415	3.072693315	0.693147181	4.609789132	4.623519325	0	2.813410717	0
1984	5.589882939	5.702354737	3.246490992	0.587786665	4.489816105	4.463265873	0	3.32158692	0
1985	6.006431349	6.112768713	3.449987546	0.46203546	4.833001147	4.107485356	3.827398388	2.253794929	0
1986	5.991464547	6.126623136	3.569532696	0.400759217	4.979546684	3.785469225	3.774746985	2.396614043	-1.480140824
1987	6.004627534	5.900445149	4.605170186	1.62924054	5.081404365	4.062165664	4.669898377	3.629660094	0.556295998
1988	6.01165714	6.048473103	4.999237249	1.580013963	5.270628023	4.478837557	4.048410061	4.125763076	0.570251638
1989	6.05450807	6.043386647	5.387243576	1.346158316	5.377021999	4.640671555	4.221738679	4.291849644	0.022033601
1990	6.036264965	6.085688192	5.680172609	1.053229283	5.466316135	4.622091063	3.969452486	4.34685913	1.048683251
1991	5.803432434	6.134367005	6.060290738	0.837414205	5.410040329	4.647661731	3.095350546	4.528815729	2.04119002
1992	5.782828728	6.132219407	6.486922694	0.270009696	5.428864493	4.612001332	4.505147013	4.65493909	2.260191033
1993	5.855874794	6.309061255	6.872853227	-0.053245129	5.474762383	4.728723936	3.52925578	4.569649774	2.487801906
1994	5.83862221	6.349702477	7.288927695	-1.074319596	5.634130721	4.64658217	4.607476132	4.842960053	2.61092225
1995	5.858931838	6.388125456	7.697030487	-1.993248012	5.435778149	4.696143939	4.406378005	4.553059044	2.914723128
1996	5.91847507	6.424064382	8.018987599	-2.315205124	5.5	4.740682762	4.29870352	4.322926269	3.327924603

APPENDIX III

Private Invest.	Manuf. Output	Govt. Invest.	Import of Cons. Goods	Import of Cons. Tax Rate	Capital Goods	Import of Capital Goods Tax Rate	Export	Export Tax Rate
3.218875825	4.240527072	4.29629285	3.101252705	-3.077984078	4.684963538	-2.58225337	4.156266729	-7.141948666
3.258096538	4.215113703	4.317488114	3.733218941	-3.672774592	5.502462733	-3.466336137	4.142114099	-6.781171429
3.401197382	3.900437831	3.912023005	3.514750857	-3.419625844	5.45847616	-3.648552719	3.855018569	-6.222142182
3.555348061	3.740751285	2.302585093	3.397949021	-3.269506698	5.468041896	-3.843490345	3.260170521	-5.40557003
3.688879454	3.606808101	1.609437912	3.336636521	-3.183789339	4.979292825	-3.579913224	2.811155462	-4.656982153
3.745994657	3.1[illegible]7639	1.194948205	3.209448814	-3.038468111	4.578372104	-3.076666891	2.435716406	-3.930520166
3.963775912	4.046258376	5.350070274	2.943778589	-3.176094233	4.076[illegible]6938	-2.630451798	2.292114744	-4.63593465
5.029203827	4.216267166	3.274740142	4.207672596	-4.591865569	5.196925732	-2.916543346	3.338917556	-5.334017949
5.257208047	4.613697448	3.75213015	4.39214768	-4.778848227	5.553561961	-3.119539144	3.609806672	-5.360195824
5.189895343	4.690197284	3.657418472	4.448073561	-3.957181275	5.622888665	-3.204104735	3.621595356	-5.[illegible]04374746
5.318508395	4.675663638	3.753087368	4.456108338	-4.24260285	5.521366788	-3.100586387	3.711318537	-4.871478769
5.39047109	4.584896036	3.76591954	4.499457402	-4.195431536	5.106358266	-2.602091656	3.959118374	-4.980567226
5.448253149	4.415909146	3.716647602	4.429116141	-2.727249705	5.411487414	-2.677326571	4.187461029	-5.026817189
5.729337512	4.19830615	3.921448661	4.477628721	-2.451103715	5.471296554	-2.600169107	4.477801346	-5.766320414
5.731712145	4.136804559	4.166291118	4.14429336	-2.611084574	5.151383664	-2.627489226	4.714085465	-6.011548612
5.738969949	4.42293946	4.078238743	4.606737813	-3.396819293	4.934354664	-2.194522556	4.631261421	-6.444425371
5.770136786	4.5[illegible]3867633	3.986345486	4.284987473	-3.413668[illegible]21	4.921134219	-2.397192624	4.800958556	-6.621385083

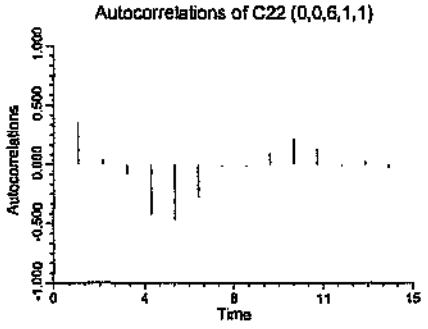
APPENDIX III

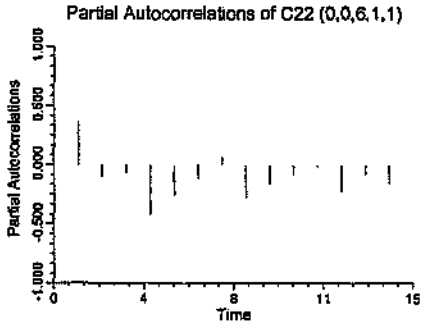
Agirc. Value Added	Emp. Level	GDP	Wage Rate	Capital Stock
3.42751469	8.648221454	6.313699001	-3.279523291	6.289178218
3.457010446	8.670090644	6.226953934	-3.33518383	6.286512391
3.609836247	8.656922955	6.10866568	-3.446093043	6.273344703
3.616308761	8.561657366	5.880170827	-3.418262582	6.178079113
3.897680644	8.588235149	5.784722714	-3.586720439	6.204656897
4.258445573	8.579513668	6.14289043	-3.750565211	6.195935415
4.261270434	8.949618086	6.15303232	-4.16919351	6.566039833
5.249652195	8.857194837	6.048081148	-4.321374729	6.473616585
5.693395382	8.87380993	6.094225598	-4.208451535	6.490231678
6.209997486	8.912960477	6.091297462	-4.077535761	6.529382225
6.458024755	8.79851113	6.125944722	-4.022173514	6.414932877
6.897502903	8.814983998	6.173542978	-3.742146632	6.444459475
4.989071116	8.820994646	6.165693022	-4.00250817	6.464198452
5.512218336	8.877828284	6.338143545	-3.937133069	6.547280656
5.928790953	8.924190459	6.381799836	-3.948493621	6.586465021
6.290828124	8.982221967	6.418214225	-3.999308667	6.543284641
6.691127206	9.021006295	6.457301894	-3.846259132	6.545675539

APPENDIX II

AUTOCORRELATION REPORT

PRIVATE DOMESTIC CONSUMPTION ACF RESIDUAL VARIABLE PLOT





Autocorrelations of C22 (0,0,6,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.358413	5	-0.470479	9	0.096322	13	0.033922
2	0.041875	6	-0.275042	10	0.216589	14	-0.026331
3	-0.083230	7	-0.012915	11	0.134059		
4	-0.424745	8	-0.013886	12	-0.010967		

Significant if |Correlation|> 0.485071

Partial Autocorrelations of C22 (0,0,6,1,1)

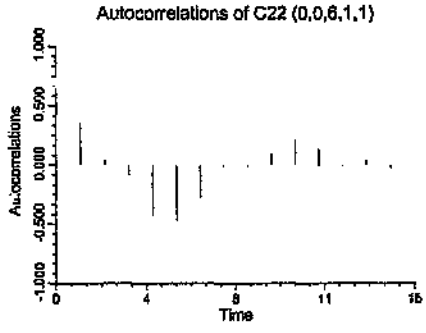
Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.358413	5	-0.255506	9	-0.170258	13	-0.080037
2	-0.099347	6	-0.122440	10	-0.082099	14	-0.165479
3	-0.074307	7	0.071538	11	-0.015251		
4	-0.422989	8	-0.277217	12	-0.230996		

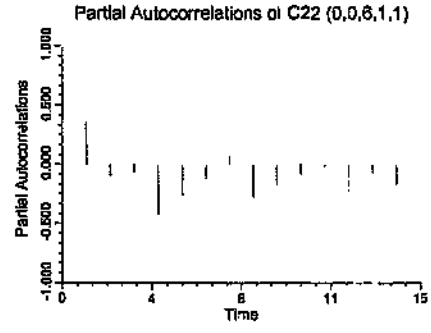
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APPENDIX II

AUTOCORRELATION REPORT

PRIVATE DOMESTIC CONSUMPTION ACF RESIDUAL VARIABLE PLOT





Autocorrelations of C22 (0,0,6,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.358413	5	-0.470479	9	0.096322	13	0.033922
2	0.041875	6	-0.275042	10	0.216589	14	-0.026331
3	-0.083230	7	-0.012915	11	0.134059		
4	-0.424745	8	-0.013886	12	-0.010967		

Significant if |Correlation|> 0.485071

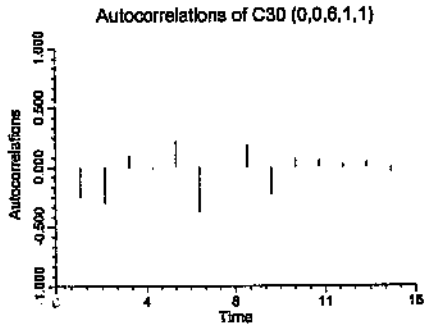
Partial Autocorrelations of C22 (0,0,6,1,1)

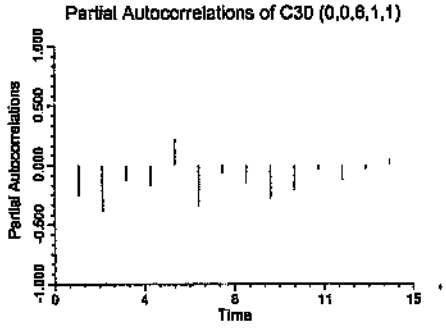
Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.358413	5	-0.255506	9	-0.170258	13	-0.080037
2	-0.099347	6	-0.122440	10	-0.082099	14	-0.165479
3	-0.074307	7	0.071538	11	-0.015251		
4	-0.422989	8	-0.277217	12	-0.230996		

Significant if |Correlation|> 0.485071

AUTOCORRELATION REPORT

GOVERNMENT CONSUMPTION AFC RESIDUAL VARIABLE PLOT





Autocorrelations of C30 (0,0,6,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.250714	5	0.225314	9	-0.223610	13	0.043963
2	-0.296805	6	-0.371010	10	0.073051	14	-0.040424
3	0.096669	7	-0.001142	11	0.060463		
4	-0.014159	8	0.186796	12	0.024751		

Significant if |Correlation|> 0.485071

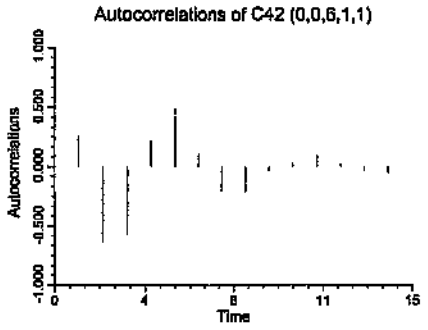
Partial Autocorrelations of C30 (0,0,6,1,1)

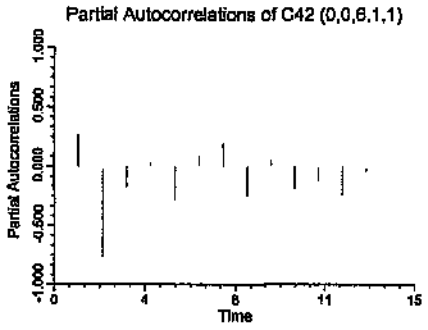
Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.250714	5	0.218305	9	-0.280080	13	-0.041355
2	-0.383786	6	-0.347682	10	-0.214571	14	0.053446
3	-0.128297	7	-0.069788	11	-0.037910		
4	-0.171953	8	-0.153387	12	-0.129108		

Significant if |Correlation|> 0.485071

AUTOCORRELATION REPORT

FOREIGN DIRECT INVESTMENT ACF RESIDUAL VARIABLE PLOT





Autocorrelations of C42 (0,0,6,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.266759	5	0.486604	9	-0.038407	13	-0.041291
2	-0.646893	6	0.105000	10	0.030075	14	-0.054616
3	-0.579194	7	-0.209672	11	0.094354		
4	0.214383	8	-0.212954	12	0.026561		

Significant if |Correlation|> 0.485071

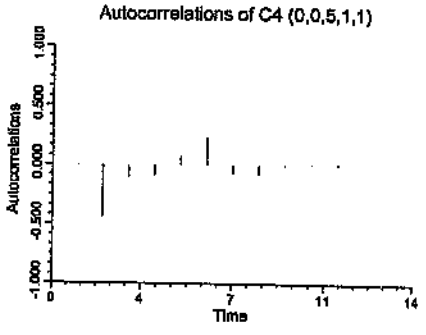
Partial Autocorrelations of C42 (0,0,6,1,1)

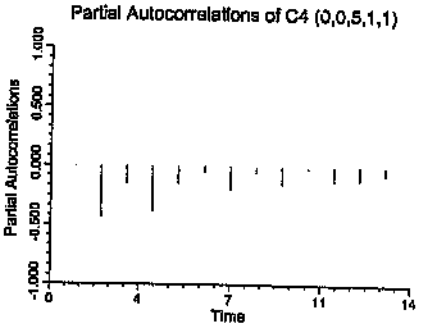
Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.266759	5	-0.285866	9	0.051494	13	-0.056271
2	-0.773065	6	0.085551	10	-0.201060	14	-0.083787
3	-0.179281	7	0.195516	11	-0.125719		
4	0.029434	8	-0.250989	12	-0.244830		

Significant if |Correlation|> 0.485071

Autocorrelation Report

Autocorrelation Plot Section for Private Sector Real Investment Expenditure Equation Residuals





Autocorrelations of C4 (0,0,5,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.012371	5	0.071284	9	-0.011405	13	0.005615
2	-0.442540	6	0.230769	10	0.013581		
3	-0.112461	7	-0.078584	11	0.015674		
4	-0.096485	8	-0.081111	12	-0.007551		

Significant If |Correlation|> 0.500000

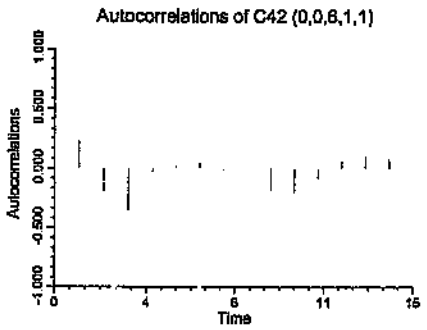
Partial Autocorrelations of C4 (0,0,5,1,1)

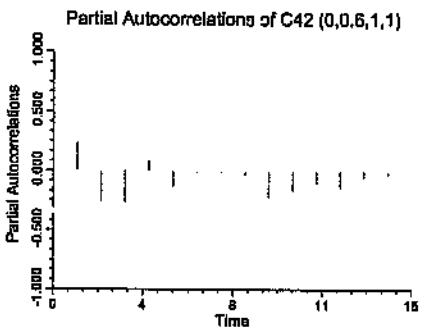
Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.012371	5	-0.152961	9	-0.158428	13	-0.075042
2	-0.442761	6	-0.051286	10	-0.032817		
3	-0.156545	7	-0.205551	11	-0.132308		
4	-0.389471	8	-0.058640	12	-0.117846		

Significant If |Correlation|> 0.500000

AUTOCORRELATION REPORT

PUBLIC SECTOR REAL INVESTMENT EXPENDITTURE ACF RESIDUAL VARIABLE PLOT





Autocorrelations of C42 (0,0,6,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.235841	5	0.019185	9	-0.186858	13	0.103462
2	-0.195528	6	0.048718	10	-0.205856	14	0.078412
3	-0.354724	7	-0.014859	11	-0.086491		
4	-0.031831	8	-0.004783	12	0.064807		

Significant if |Correlation|> 0.485071

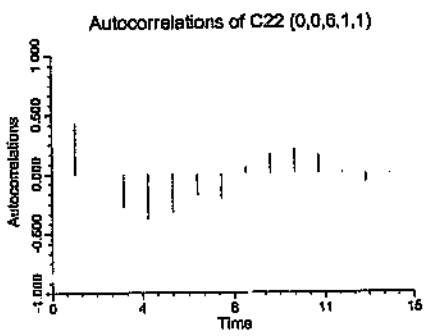
Partial Autocorrelations of C42 (0,0,6,1,1)

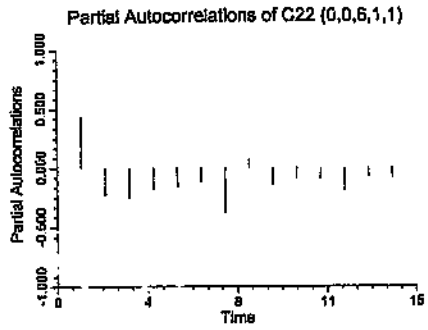
Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.235841	5	-0.137002	9	-0.228653	13	-0.063267
2	-0.265941	6	-0.020169	10	-0.172671	14	-0.033634
3	-0.266215	7	-0.014155	11	-0.104975		
4	0.092334	8	-0.036042	12	-0.141586		

Significant if |Correlation|> 0.485071

AUTOCORRELATION REPORT

IMPORT OF CONSUMPTION GOODS ACF RESIDUAL VARIABLE PLOT





Autocorrelations of C22 (0,0,6,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.438819	5	-0.328184	9	0.158421	13	-0.075674
2	0.006731	6	-0.181759	10	0.200959	14	-0.013133
3	-0.292156	7	-0.209724	11	0.153800		
4	-0.383623	8	0.049880	12	0.012374		

Significant if |Correlation|> 0.485071

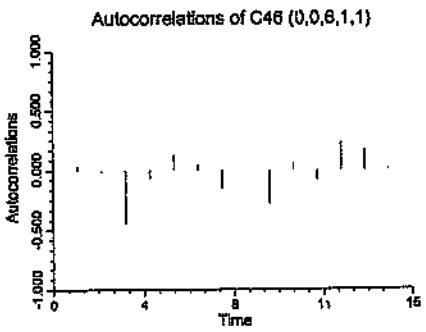
Partial Autocorrelations of C22 (0,0,6,1,1)

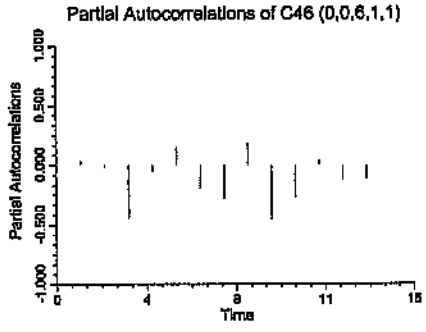
Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.438819	5	-0.162276	9	-0.148150	13	-0.082248
2	-0.230149	6	-0.123678	10	-0.102228	14	-0.090952
3	-0.254746	7	-0.379383	11	-0.102482		
4	-0.182690	8	0.068213	12	-0.201557		

Significant if |Correlation|> 0.485071

AUTOCORRELATION REPORT

IMPORT OF CAPITAL GOODS AUTOCORRELATION PLOT SECTION





Autocorrelations of C46 (0,0,6,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.031834	5	0.126839	9	-0.285306	13	0.170241
2	-0.017530	6	0.044981	10	0.0600	14	0.011403
3	-0.447274	7	-0.152815	11	-0.0822		
4	-0.068978	8	-0.002885	12	0.22461		

Significant if |Correlation|> 0.485071

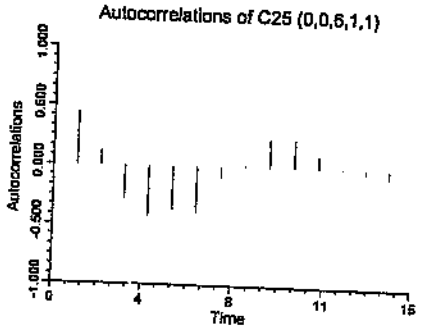
Partial Autocorrelations of C46 (0,0,6,1,1)

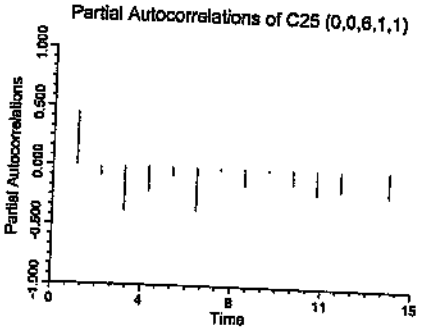
Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.031834	5	0.149107	9	-0.457120	13	-0.118653
2	-0.018562	6	-0.200657	10	-0.271805	14	0.003845
3	-0.446722	7	-0.277902	11	0.038449		
4	-0.055088	8	0.181825	12	-0.122893		

Significant if |Correlation|> 0.485071

AUTOCORRELATION REPORT

EXPORT ACF RESIDUAL VARIABLE PLOT





Autocorrelations of C25 (0,0,6,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.443704	5	-0.371930	9	0.246821	13	-0.036653
2	0.125505	6	-0.386815	10	0.238108	14	-0.070275
3	-0.283242	7	-0.099140	11	0.113365		
4	-0.429797	8	0.016919	12	0.010792		

Significant if |Correlation|> 0.485071

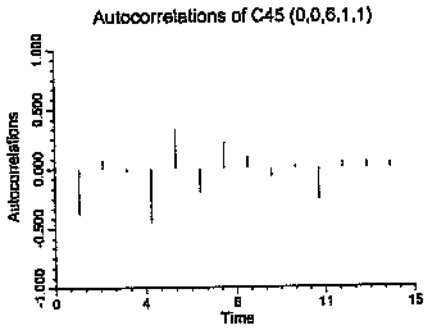
Partial Autocorrelations of C25 (0,0,6,1,1)

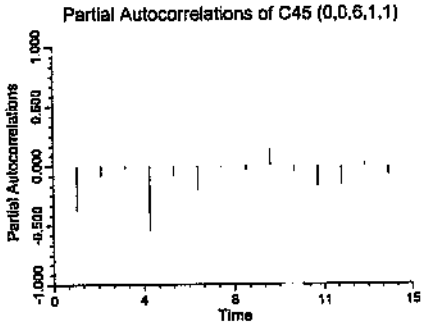
Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	0.443704	5	-0.077691	9	-0.025795	13	0.004633
2	-0.088863	6	-0.366714	10	-0.130446	14	-0.211750
3	-0.382097	7	-0.024535	11	-0.204190		
4	-0.213164	8	-0.146235	12	-0.170310		

Significant if |Correlation|> 0.485071

AUTOCORRELATION REPORT

LABOUR DEMAND AFC REDIDUAL VARIABLE PLOT





Autocorrelations of C45 (0,0,6,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.380022	5	0.337582	9	-0.071470	13	0.053471
2	0.070120	6	-0.200943	10	0.025355	14	0.038990
3	-0.021621	7	0.217415	11	-0.267933		
4	-0.453130	8	0.092105	12	0.050844		

Significant if |Correlation|> 0.485071

Partial Autocorrelations of C45 (0,0,6,1,1)

Lag	Correlation	Lag	Correlation	Lag	Correlation	Lag	Correlation
1	-0.380022	5	-0.088731	9	0.146545	13	0.028193
2	-0.086838	6	-0.199412	10	-0.048975	14	-0.080752
3	-0.030219	7	-0.014007	11	-0.173703		
4	-0.550048	8	-0.044050	12	-0.158361		

Significant if |Correlation|> 0.485071

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