AN ASSESSMENT OF TAX REVENUE PERFORMANCE BEFORE AND AFTER LIBERALIZATION OF EXCHANGE RATE IN KENYA: 1972-2000

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DECLARATION

This research paper is my original work and has not been presented for a degree in any other university

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This research paper has been submitted for examination with our approval as university supervisors.

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DEDICATION

This paper is dedicated to my beloved mother Catherine, wife Rinah and late father Dimus, all whose passionate virtues have been the gearing spirit in all my endeavors including the struggle to accomplish this paper. Their contribution will linger in me for the rest of my life.

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ABSTRACT

This paper evaluates the performance of tax revenue before and after liberalization of exchange rate market in Kenya. The recently developed econometric techniques associated with cointegration of time series are applied.

Analysis of stationarity was done for both the exchange rate function and the three behavioral tax revenue models. The real exchange rate measure used in this paper is a relaxed version of Edwards (1989), which does not impose the purchasing power parity (ppp) that has been under immense criticism.

The estimation of dynamic error-correction models, using the ordinary least squares estimation technique found that the real exchange rate has a positive effect on the Direct and Customs Duty Tax Revenues, while real exchange rate lagged once has a deleterious effect on Other Indirect Tax Revenue. The coefficients of all the revenue functions were found to be significant at 5% level. In order to verify the reliability of the models specified, several diagnostic tests were carried out. The outcome of these tests confirmed that the model is well specified and it is consistent with the statistics.

The outcome obtained after estimating the error correction dynamic specification demanded prudence in the use of the real exchange rate policy. It also demands that the fiscal policy architects be cautious of the impacts of the real exchange rate on the tax revenue while dealing with important fiscal decisions.

CHAPTER ONE

1.0. BACKGROUND

1.1 Introduction

This paper was motivated by the imminent need to assess the efficiency of the growing range of liberalized and liberalizing foreign exchange markets in Sub-Saharan Africa. During the 1970s exchange rates were mostly held fixed with infrequent adjustments; and following severe terms of trade shocks, overvalued exchange rates were only sustained by more stringent rationing of foreign exchange. Black parallel markets consequently flourished throughout sub-Saharan Africa. The adverse macro economic consequences of the black markets are by now well documented (see for example Kiguel et al, 1997). In the 1980s Bretton woods institutions encouraged many countries to adopt transitional systems towards unified, market determined and convertible foreign exchange markets due to a positive relationship between price flexibility and economic development (Killick 1995).

An important strand of literature have emerged as to whether volatility of exchange rates which are associated with floating exchange rate regime are attributable to major budgetary deficits, fluctuations in tax revenue, inflation, capital flight and low output. In general Aron and Agogu (1995) and Klans Schmidt – Hebbel (1991) found that the Real Exchange Rate (RER) also do affect public revenue in either direction. Direct and indirect taxation on income or sales of traded goods is boosted by depreciation of exchange rate, while the opposite happens to taxation on non-traded goods producing sectors. Hence the net effect of the RER on tax revenue depends on the relative weight of traded and non-traded categories on total tax revenue.

It is on this premises that this research is intended to find out the effect of real exchange rate on tax revenue before and after liberalized exchange rate regime in Kenya. In chapter one of this paper the nature of Kenya's economy, macroeconomic performances: past and present, exchange rate dynamics, Kenya's exchange rate policy, direct and indirect effects of real exchange on tax revenue are discussed. The rest of the paper enumerates related literature, research methodology, and estimating model, including data type; source and refinement. Relevant tests, regression results, analysis and the conclusions are contained in chapter four and five.

1.2 The nature of Kenya's economy

Kenya has a free market economy with an active stock exchange. The local currency is the Kenya shilling (Kshs) with the US$ / Kshs being the major current exchange rate. Employment in Kenya is largely dependent on the agricultural industry with Kenya being one of the world's largest tea exporters (Kiguel et al, 1997). The horticultural and tourism industries are becoming some of the country's most important sources of foreign exchange. Although the industrial sector is still small, it is a growing source of East African exports. In addition to its oil industry, Kenya has an active chemical industry, as well as being one of the larger markets in the lubricants industry of the East African region. The mining industry in Kenya is limited but prospecting is continuing.

Steps have been taken to implement the removal of import licensing, price controls, and foreign exchange controls as well as fiscal and monetary restraint and the reduction of the public sector through privatization and civil service downsizing (Republic of

Kenya, 2000). Through these processes, the government hopes to realize major changes in economic liberalization and reforms. Kenya's debt portfolio is high, with the domestic and foreign debt currently standing at Kshs. 34.6 billion and 64.5 billion (Republic of Kenya, 2002), respectively. Interest payments on domestic debt cause a serious depletion of government revenue.

The major export commodities in Kenya include tea, coffee, cut flowers, fluorspar, gemstones, gold, pyrethrum, salt, soda ash, sodium carbonate, and sugar. Imports include automobiles, beverages, capital goods, consumer goods, crude oil, equipment, petroleum products, pharmaceuticals, professional and scientific instruments and resins. Import and exchange allocation licenses are not required except for a few items that are included on a negative list for healthy, security and environmental reasons.

1.3 Macroeconomic Performance: Past and Present

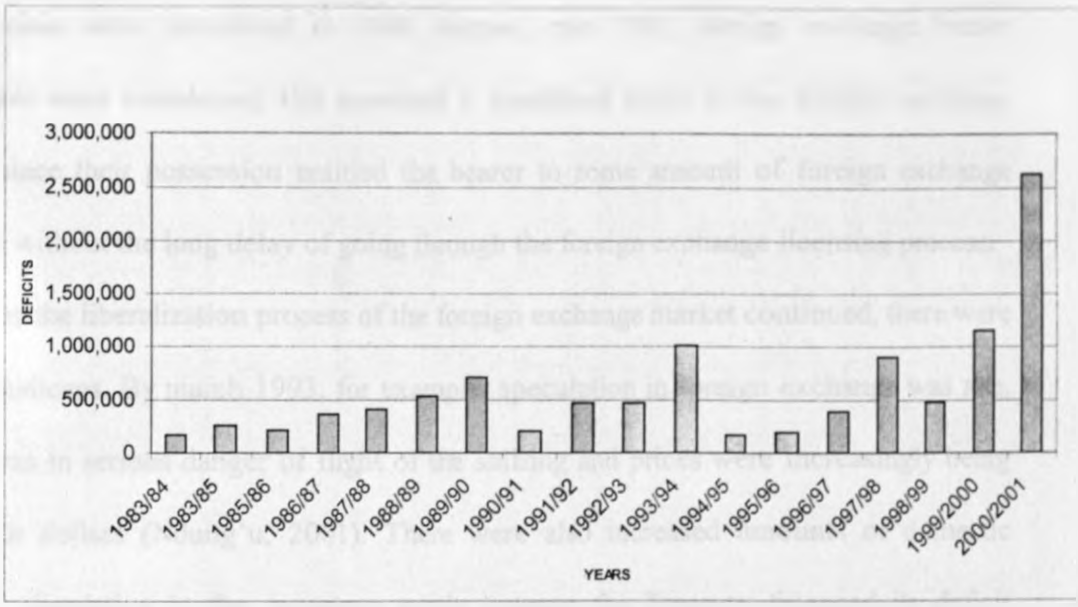
On the background of the development in the foreign exchange market, it is important to point out that the desire by Less Developed Countries for rapid economic and social development has induced increasing size of Government expenditure in economic activities. Kenya provides most of these services at subsidized rates, which still does not suffice the demand, for instance, education, health, maintenance of law and order. The provision of the above social services has been part of the development strategy since independence (see Republic of Kenya, 1983). These services require a lot of finances. However, Kenya like many other developing countries has relatively limited resources that it can obtain from external borrowing, domestic borrowing and non-tax revenues. This leaves Kenya with no alternative other than to rely on tax revenue as the

major source of budgetary revenue. The role of taxation in raising the resources needed for financing government activities in developing countries is widely recognized (Adedoyin, 1997). In Kenya, tax revenue contribute about 85 per cent of the total budgetary revenues and is derived from two broad tax categories, namely, direct tax and indirect tax resources (Republic of Kenya, 1999 and 2000).

The tax system in Kenya has undergone several reforms since 1970's. The reforms have been mainly on the tax structure with the general objective of raising the tax revenue, economic efficiency, and ensuring equity and fairness in the tax system. The governments of most Sub-Saharan countries, nevertheless, have not succeeded in generating enough tax revenue to meet the current need for Government services (Adedoyin, 1997).

Kenya during the first decade after independence (1964-1974) and part of the second decade (1974-1977) was able to finance all it's current expenditure and part of capital expenditure using the recurrent revenue receipts and hence had small fiscal deficits (Republic of Kenya, 1968 and 1975). The situation changed for the worst from 1983 to date. Kenya has been experiencing chronic fiscal deficits since then. This can be seen from the graph of figure 1.1 below.

Figure 1.0 Budgetary Deficit



Source: Republic of Kenya (Statistical Abstracts, various issues, Nairobi, Government Printers)

The reason for this has been Kenya's ever-increasing population, which has led to increased demand for social services. This has resulted in the expansion of the recurrent expenditure at a rate above the tax revenue growth and hence created budget deficits. The figure above shows ever-growing budgetary deficits with overshoots at the end of the 1980's, mid and end of 1990's which coincide with the picks of depreciation of the Kenya Shilling (also see Figure 1.2 in section 1.4.1). Kenya has always emphasized the pressing need for the government to eradicate or reduce the fiscal deficits (Republic of Kenya, 1988 and 1986). To achieve this, two options were suggested. The Government was required to increase the tax or reduce its expenditure. The two options although effective in reducing the fiscal deficits had some undesirable effects on the economy.

Beginning 1990, Kenya actively implemented several reform measures. First, interest rates were liberalized in 1990. Second, mid 1992, foreign exchange bearer certificates were introduced; this provided a significant relief to the foreign exchange market since their possession entitled the bearer to some amount of foreign exchange currency without the long delay of going through the foreign exchange licensing process.

As the liberalization process of the foreign exchange market continued, there were a few handicaps. By march 1993, for example, speculation in foreign exchange was rife. Kenya was in serious danger of flight of the shilling and prices were increasingly being quoted in dollars (Ndung'u, 2001). There were also increased amounts of domestic currency circulating in the economy, partly because the Treasury financed its deficit domestically since foreign funds were not available. Seasonal increases in cash, which coincided with the 1992 general elections, put yet more pressure on the domestic prices. In addition, the drought of 1990/91 continued into 1993, which meant that food prices continued to rise while large amounts of foreign exchange were required for food imports. Furthermore there were financial scams, involving a few banks, which contributed to increased money supply in the economy and led to the collapse of these banks.

Towards the end of march 1993 price instability had reached such a state that all financial liberalization measures were supposed to stop in order to allow time for a more orderly process to be worked out (Ndung'u, 2001). The new process included stepping up weekly Treasury bill auctions from Kshs. 1 billion to Kshs. 5 billion (Kiguel et al, 1997). This was associated with a rapid rise in the Treasury bill discount rate, which was viewed as benchmark for all interest rates. A consequence of this was that the difference between

Kenyan and foreign interest rates widened, which was a sure recipe for speculative capital to flow in.

In April 1993, both imports and foreign exchange licenses were eliminated and 100 per cent retention was established, thus both the supply and demand for foreign exchange in the trade account became market driven. Initially, in part due to the backlog of demand and expectations that there would be backtracking on the policy, the market exchange rate depreciated faster than the gradual devaluation of the official rate.

Interest rate differential, exchange rate expectations and forecasts on inflation made investment speculators to take advantage of the liberalized regime to profit by bringing funds back, converting them to shillings and benefiting from the high interest bill rates. The market exchange rate overshot, since first, inflation responded to the drying up of liquidity and then as returns on treasury bills grew to be excessive, the interest rate started to track inflation down. But still, interest rates remained high enough to encourage and ensure an inflow of speculative short-term capital. The whole period was characterized by a shift in attention a way from the real economy to one in which trade in financial assets predominates. With rates on secure government paper earning excess premium per annum, lending for investment or the purchase of inputs from abroad became unattractive (Ndung'u, 2001).

Apart from tax reforms, uses of other instruments affect tax policy (Carlos A. et al 1981). Macroeconomic policies, for instance exchange rate and inflationary, can have a strong contractionary and expansionary impact on the tax base, and therefore, can have a considerable effect on tax revenue particularly in open economies in which foreign trade is an important tax base. Real evaluation, for example, may have short run contraction

effects on the output. The depressed output will then narrow the output dependent tax bases such as consumption and imports. General equilibrium model applied to developing countries arrive at the conclusion that devaluation indeed is contractionary in the short-run. This was confirmed empirically by Edwards (1987). Other economists such as Rojas – Suarez (1987), Montiel et al (1991) have supported this idea.

1.4 Kenya's Exchange Rate Regimes and Policy

Exchange rate regimes are chosen to minimize fluctuations arising from either domestic or foreign sources of real output around potential levels. The appropriate exchange regimes depend on three major factors; the nature of the shocks the economy is experiencing, the macroeconomic policy stance of policy makers and the specific characteristics of the economy. Flexible exchange rates are usually presumed more appropriate in case of shocks either originating from the domestic goods market or foreign sources (Dordunoo, 1996). Floating rates have not been of great success in terms of avoiding misalignments, and unless managed they can be very volatile. This is the reason for the importance of finding the response of macroeconomic factor like revenue to the exchange rate dynamics, especially in the floating exchange rate regime currently operational in Kenya.

Kenya, since independence, has undergone three foreign exchange rate regimes viz, fixed exchange rate regime, managed float, and floating exchange rate regime. In 1960's and 70's Kenya had adopted fixed exchange rate policy. The Shilling was pegged to the sterling pound from the Independence Day to 1975. Thereafter, between 1975 and 1980 Kenya shilling was pegged to the Special Drawing Rights (SDR). This was

discontinued by a succession of devaluation in 1981 and 1982. At the end of 1982, Kenya shifted from fixed exchange rate regime to managed floating Exchange Rate. Under this regime, the shilling was pegged to a basket of currencies and was allowed to fluctuate within certain margins. This continued throughout the 1980's and early 1990's until 1993 when the Government yielded to Bretton Woods institutions and international donor communities' demand to liberalize the foreign exchange market.

Kenya adopted a floating exchange rate system in 1993 when the foreign exchange market was liberalized. This meant that there was no predetermined price at which the shilling exchanges with other currencies. Thus when the demand for the shilling increases, the price in terms of other currencies, tends to rise, and the shilling becomes stronger.

1.4.1 Exchange Rate Dynamics

Like any other price, exchange rate can be fixed or alternatively allowed to float or freely fluctuate. When the latter applies a country's foreign exchange rate is determined by supply and demand of its currency vis-à-vis the foreign currency. When the shilling becomes stronger its value relative to other major currencies rises. This benefits consumers and the business community particularly those whose production processes use large quantities of imported inputs. On the other hand when the value of the shilling increases the goods and services including tourism become expensive for foreign consumers. As a result the foreign consumers of local goods will buy less. Even without foreigners reducing their consumption of local goods, with a stronger shilling export earnings in local currency are bound to be low.

When the value of the shilling falls in relation to other currencies prices of imported goods and services in terms of shillings rise for consumers. At the same time prices for local products fall in foreign markets thus making exports more competitive. Since one dollar can buy more shillings exporters are able to earn more shillings even if they export the same amount of goods. Alternatively, they can boost their export market share due to the reduced cost of the shilling. There are a number of countries that are known to have embraced a weaker or depreciating currency as a deliberate policy for managing an economic crisis and even as a long term economic stance. A weaker yen for instance, helped the Japanese exporters dominate global electronic and car market during the 1970's and 80's. A number of countries including Russia, Brazil, Turkey and Indonesia either deliberately or under market pressure have allowed their currencies to fall in recent years (Republic of Kenya, 2000).

The movements of the nominal and real exchange rate seem to take the same trend. The movements during the period under study can be seen from Figure 1.1 below.

Figure 1.1 Movement Of Nominal (NER) and Real Exchange Rate (RER) (1972-2000)

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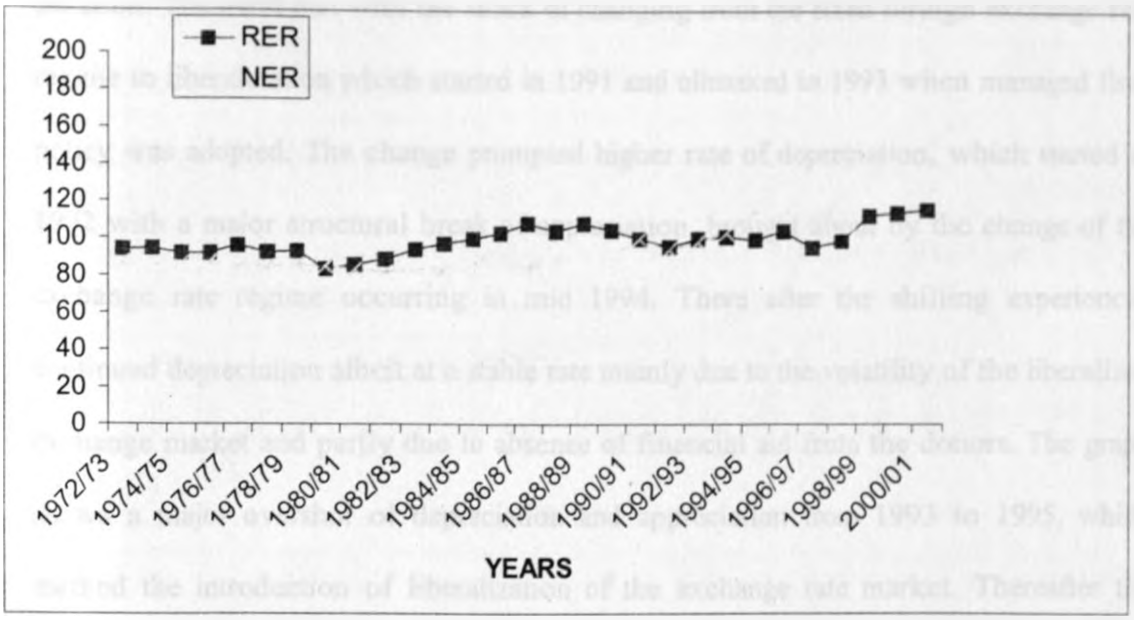

From the graph it can be seen that Kenya's exchange rate was stable for the early part of the 1970's. This was mainly due to the controls excised then. Both the nominal and the real exchange rate were stable during the period 1972 to 1976 period in general. The period that followed up to 1979 experienced appreciation of the shilling in the real terms. This is a period that was characterized with unsustainable increasing Balance of Payment and budgetary deficits. The level of total direct tax and custom duties collected were explicitly low as can be seen from figure 1.2 below in section 1.4.2 below.

This was followed by a period of general depreciation from 1980 to 1987, probably this could have been as a result of the draught of 1980 to 1983.However, the depreciation was insignificant because this was at a time when the exchange rate was under the fixed regime and the depreciation were a result of exchange rate devaluation done in 1982 and 1983. Between 1983 and 1987, the Kenya shilling witnessed stability. The real exchange rate then had a period with significant depreciated during the second half of 1980's and

The depreciation coincided with the 1992 general elections, which perpetuated the situation. The trend met with the shock of changing from the fixed foreign exchange rate regime to liberalization which started in 1991 and climaxed in 1993 when managed float policy was adopted. The change prompted higher rate of depreciation, which started in 1992 with a major structural break of appreciation, brought about by the change of the exchange rate regime occurring in mid 1994. There after the shilling experienced continued depreciation albeit at a stable rate mainly due to the volatility of the liberalized exchange market and partly due to absence of financial aid from the donors. The graph shows a major overshot of depreciation and appreciation from 1993 to 1995, which marked the introduction of liberalization of the exchange rate market. Thereafter the exchange rate continued depreciating to the year 2000.

1.4.2 Movements Of Tax Revenues

It is important at this stage to also look at the trend of the tax revenues over the period of study. The graph on figure 1.2 below gives much clarity in the dynamics of the revenues.

Figure 1.2 Movements Of Tax Revenues

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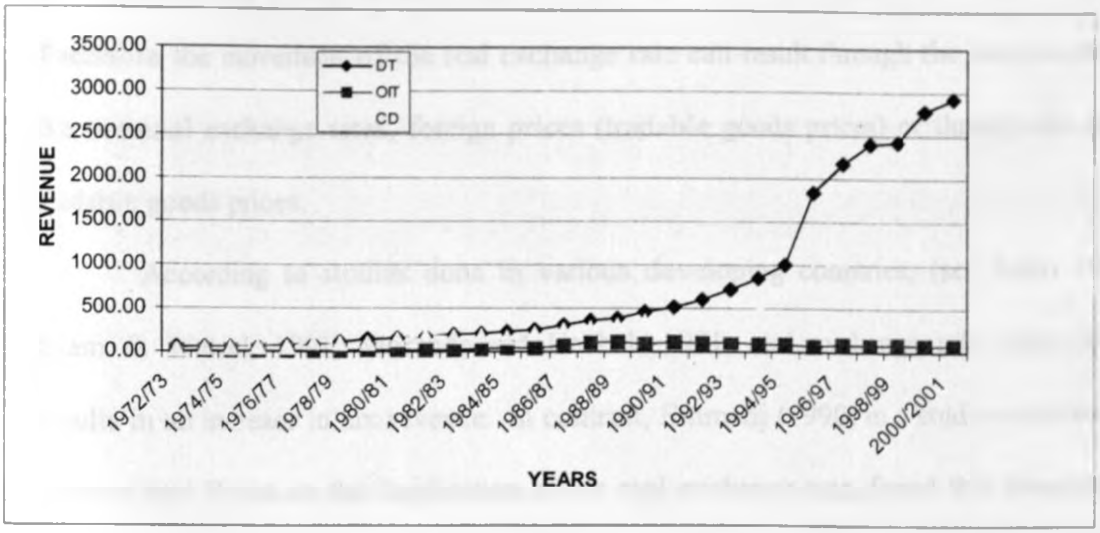


The levels of total direct tax and custom duties collected were explicitly low as can be seen from the figure above, during the period before the liberalization of the exchange rate. The tax revenues of direct tax and custom duty indicate with much prominence an increase after 1993's liberalization of exchange rate. The impact was different on the other indirect taxes probably due to a shift of consumption from imports towards domestic production.

1.4.3 Real Exchange Rate Vs Tax Revenue

An important concept forming the main focus in this study is the real exchange rate (RER). According to Bautista (1987), RER can be broadly defined as the real worth of foreign exchange in terms of domestic currency, hence, the reason for using it to determine effects of exchange rate on tax revenue. For the present purpose, real exchange rates are defined as the foreign price of tradable goods relative to non- tradable

essentially the real worth of the foreign exchange in the terms of domestic currency (Bautista, 1987), is one of the macroeconomic variables that affect the tax revenue. Therefore the movement of the real exchange rate can result through the movements of the nominal exchange rates, foreign prices (tradable goods prices) or through the non-tradable goods prices.

According to studies done in various developing countries, (see Tanzi 1989; Islam & Wetzel, 1991; Morande and Habbel, 1991; real exchange rate depreciation results in an increase in tax revenue. In contrast, Emmerij (1990) in a study conducted in Mexico and Korea on the implication of the real exchange rate, found that devaluation slightly reduced real tax receipt in both countries during 1980's. This was attributed to the shifting away from the tax base in Korea and short run contractionary output response in Mexico. The link between the real exchange rate and the tax revenue can be split into two, the direct and indirect links, which are discussed in details in sections 1.4.3 and 1.4.4.

1.4.4 Direct effects of Real Exchange Rate on Tax Revenue

The negative relationship between the real exchange rate and the tax revenue can be traced from the direct effects of the real exchange rate on the import duty, export taxes, sales, excise and income taxes. Most developing countries rely heavily on the international trade taxes i.e. import and export, especially during their early stages of economic and political development (Wawire, 1991). These taxes provide the most direct link between the real exchange rate and the real tax revenue. Import duties in most cases are levied on an ad-valorem basis and their tax base, import volume, is determined

by the domestic value of the imported product measured at the official exchange rate. The appreciation of the real exchange rate would lead to a fall in the value of imports measured in domestic price for a given import volume coming through the official channel. However, if the country in question has plenty of foreign reserves or has unlimited access to foreign loans or both, a fall in domestic prices of the imported goods accompanying the appreciation of the real exchange rate might lead to high import volume. This could offset the negative revenue effects of the overvaluation, if the price elasticity of import is greater than unity.

In the same way the RER appreciation has an inverse relationship with the tax revenue derived from the exports. The appreciation of the RER as revealed by many empirical studies (Bautista, 1990; Ikiara, 1992; Fosu, 1992) results in the reduction of the export volume, which is the export tax base. However, export taxes are less important in Kenya. In many countries especially developed countries export taxes do not exist at all. The domestic indirect taxes may therefore be expected to fall as a consequence of appreciation of the RER. This is because a large share of general sales taxes is collected from imports.

A fair proportion of excise duties are collected from imported goods such as cars, tobacco, beverages and alcohol. Real devaluation raises the domestic value of these goods. Devaluation therefore can have both direct and indirect effects on the domestic taxes. The net effect of the real devaluation on the domestic indirect taxes will depend on the income elasticity of consumption, the substitutability of domestic goods for imports and the structure of the tax rates. If devaluation succeeds in shifting consumption from imports to domestic production, which escapes taxation or is taxed at a lower rate, the net

effect on the indirect taxes may be negative in spite of the indirect price effect (Emmerij, 1990).

1.4.5 Indirect effects of Real Exchange Rate on Tax Revenue

The real exchange rate movement has an effect on the incentives to produce export goods and to export. The effects depend upon the direction of the RER. For instance, the appreciation of RER reduces the incentives to produce export goods and to export. This may lead to a fall in the export volume and as a consequence the country's foreign exchange earnings decreases. With less foreign exchange available, imports must be reduced. As a consequence, revenue from import duties, export duties, excise and sales taxes falls (Tanzi, 1989). It may also reduce revenue from income tax if the taxable income is partly or wholly tied to exports. However, even though the taxable income may not be tied directly to exports, the scarcity of foreign exchange reduces the domestic activities by reducing import of raw materials and other inputs. This will obviously narrow the income tax base and as a result reduce the tax revenue derived from income tax.

An overvalued exchange rate, if it is accompanied with balance of payment problems, induces the government to impose stringent restrictions on the imported manufactured goods which are regarded as non essential in favour of importation of raw materials and capital input which are considered essential. This implies that the structure of imports will change in favour of goods with low or zero import duties and sales taxes and against those with high import duties and sales taxes. The change in the structure is costly in many countries in terms of losses in tax revenue (Tanzi, 1989).

A further channel through which the exchange rate affects tax revenue is inflation. The exchange rate movement causes inflation and the effect is popularly known as pass-through effect. The pass-through effects is based on the assumption that induced increases in the prices of imported inputs and final goods following a real devaluation will be passed on to domestic prices. This proposition has its roots in the cost-push theory of inflation. For countries with unimportant local import competing industries, a real devaluation raises local prices of imported materials and commodities. In the face of rising import prices the exporting and import competing firms may raise the prices. Improved external competitiveness involved in real devaluation will lead to wage inflation in the tradable and higher cost of living throughout the country. The real devaluation hence rises inflation beyond what it would be, which in turn erodes the real value of tax collections. Tax receipt do not keep pace with inflation because progressive income taxes produces only a small share of tax revenue and many are levied at specific rates with lags in collection (Tanzi 1989).

These channels through which the real exchange rate affect the real tax revenue calls for empirical investigation. This study has attempted to investigate the impact of RER on the real tax revenue within the period 1972 to 2000 in Kenya, which also witnessed the liberalization of the exchange rate market.

1.5 Statement of the Problem

From the foregoing, it is apparent that the performance of the tax system in raising revenue can be affected by macroeconomic policies, in particular, real exchange rate and inflation. These policies could have detrimental or favorable effects on the tax

revenue depending on their movements.

Kenyan economy is plagued by chronic fiscal deficits and by inadequate social and economic infrastructure. Increasing tax revenues provide an avenue to address these problems. Tax reforms are widely used in many developing countries to meet this end. However, the use of the tax reforms to raise tax revenue may be futile if at the same time the Government is pursuing macroeconomic policies like exchange rate, and inflationary policies that may neutralize the potentially positive effects arising from the tax reforms.

Despite the apparent recognition and acceptance that a relationship exist between real exchange rate and real tax revenue, little empirical analysis, if any, has been done to assess the effect of real exchange rate and other factors on the tax revenue during the liberalized exchange rate regime in Kenya. The aim of this study was to fill in this information gap by conducting an empirical investigation on the effect of real exchange rate and other related factors on the real tax revenue in Kenya.

1.6 Research Questions

The major research questions, which were addressed by the paper towards achieving the objectives, were:

i) How were the movements of the real exchange rate of the Kenya shilling during the period 1972-2000?

ii) Were there any quantitative effects of the changes of real exchange rate on tax revenue within the period?

iii) What are the policy implications arising out of the movements and the effects derived?

1.7 Objectives of the study.

The broad objective in this study was to examine the effects of the real exchange rate and other related variables on the tax revenue in Kenya during the period 1972 to 2000. The specific objectives were:

(i). To measure the movements of the real exchange rate of the Kenya shilling within the period 1972-2000.

(ii). To estimate the quantitative effects of real exchange rate movement and other related variables on the tax revenue in Kenya during the period.

(iii). To draw policy implications from the findings.

1.8 Hypotheses

(i) Gross domestic product and import price indices have positive on tax revenue. This is because increases in output, increases exports and hence, increases in earnings thereby contributing to further investment and imports, which increase revenue.

(ii) The real exchange depreciation inverse effect on tax revenue because with depreciation imports become more expensive a situation, which decreases imports thereby decreasing revenues collectable from the imports.

(iii) Inflation has positive effect on tax revenue because during high inflation real value of disposable income reduces thereby reducing imports, hence a reduction on revenue collected from imports.

(iv) General elections and the liberalization of exchange rate represented with dummies have same effects on revenue like inflation and depreciation, respectively.

1.9 Justification of the study

The theme of this study is relevant due to a number of reasons. First, the tax revenue contributes about 85 per cent of the total budgetary revenue in Kenya (Republic of Kenya 2000). Therefore, a study on the factors that determine the tax revenue receipt is crucial. The study sought to provide useful information on the effects of real exchange rate on tax revenue during the period 1972-2000 within which the floating exchange regime was introduced. It attempted to find out whether real exchange rate movement slowed or accelerated tax revenue. The result of the study would help the Government to make appropriate policy adjustments. For instance, the Ministry of Finance and the monetary authorities would find results of the study valuable since the result could form a basis for adjustments, which can in effect move the foreign exchange in the desired direction, for instance using an interest rate dependent policy.

The result will also be a guide to Kenya Revenue Authority and Treasury to make appropriate tax reforms apart from forming a base for further research.

1.10 Organization of the rest of the study

In setting off to accomplish what was proposed in this chapter (1), the following brief outline was adhered to. Chapter two is a review of the existing literature on the impact of real exchange rate on real tax revenue and the behavior of the factors during the liberalized exchange rate and on related issues. The factors that have a bearing on tax revenue are identified. In chapter three, the research methodology that was used in this study is presented. It starts with the measurement of the real exchange rate, which is an important factor in this study. A specification of the model that was used to capture the

impact of real exchange rate on the real tax revenue in Kenya is also provided in this chapter.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

Both empirical and theoretical literature directly related to the study is limited. However, there is a lot of literature on related work. The literature reviewed in this chapter includes, those on real exchange rate impacts on real tax revenue, and also literature on related work such as the effect of real exchange rate on output, imports and exports which are the direct and indirect imports and export tax bases, respectively. The work of scholars like Elbadawi and Soto (1995), Oluremi (1998), Fosu (1992), Berman (1970), Diaz (1965), Krugman and Taylor (1978), Tanzi (1989), Emmerij (1990), Mashalls and Habbel (1991), Haque and Montiel (1991) among others have been reviewed in this chapter.

2.2 Review of Theoretical Literature

Exchange rates exhibit volatility or fluctuations and large persistent and misalignments or disequilibria in economies. This disrupts the pattern of international trade and specialization and lead to unstable international financial conditions throughout the world. The persistence of excessive volatility and disequilibria in exchange rates has led to calls for reforms of the present international monetary system, along the lines of establishing target zones of allowed fluctuation for the major currencies, and for more international co-ordination of macroeconomic policies (Salvatore, 1987).

Krugman and Taylor (1978) argued that devaluation might be contractionary in so far as it redistributes income from low to higher savers. The depressed demand directly

affects the taxes, which are imposed on the units of consumption. Krugman and Taylor (1978) pointed out that many developing countries derive substantial proportion of their revenues from import and export taxes. Thus, a nominal devaluation that succeeds in depreciating the real exchange rate will increase the real tax burden on the private sector by increasing the real value of trade taxes for a given level of imports and exports. The relationship will continue to hold after allowing the quantity responses on the part of imports and exports as long as the price elasticities of demand for imports is not too large. However, the result depends on the presence of ad valorem rather than specific taxes on foreign trade. To the extend that nominal devaluation results in increases in the domestic price levels, the presence of specific taxes would reverse the effect emphasized by Krugman and Taylor (1978), since the real value of non indexed specific taxes would fall as a result of an increase in the general price level brought about by nominal devaluation.

A devaluation policy rises real output and thus raises real income measured in terms of domestic goods (Bhagwati, 1958). Furthermore one can build models in which devaluation reduces domestic output (see Salop, 1974), where the supply of labor depends on the real wage defined in terms of a price index containing the foreign good. By reducing the real wage, devaluation reduces the supply of labor and, therefore, domestic output. Alternatively, consider an economy that has debt service payments dominated in foreign currency. A devaluation increases the amount of domestic currency that must be used to make those payments and this can reduce domestic consumption and hence production, which in both cases reduce tax revenues (Kenen, 1985).

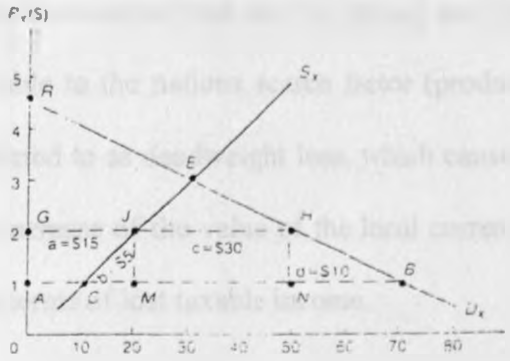
The importance of the elements in understanding the dynamic behavior of the real

exchange rate and its relation to the current account is emphasized in Mussa (1980). Models developed by Marion (1981) consider the effects of temporary disturbances in the current account that can be created by the behavior of the exchange rate. Kouri (1976) developed the idea that the current exchange rate, which depends primarily on the conditions of the asset market equilibrium, affects the current account balance, which determines the rate of change of foreign asset positions. Change of these asset positions, in turn feedback through the conditions of asset market equilibrium to determine the rate of change of the exchange rate. A similar view of the essential elements in the dynamic interaction between the exchange rate and the current account is embodied in the models developed by Branson (1977) and Dornbusch and Fischer (1980).

2.3 The Concept Of Measuring Consumer/Producer Surplus

This concept can also be applied to measure the costs and benefits of control and decontrol of foreign exchange rate. In this example a case of appreciated Kenya shilling is used. These are shown in the figure below.

Figure 1.2 Costs and benefits of Appreciated Exchange rate



Source: Killick, T. (1995), Flexibility and Economic Progress, Cambridge University

When the Kenya shilling appreciates by 100 percent revaluation of the Kshs./$ the price of commodity importable x decreases from Px=$2 to Px=$1, consumption increases from GH=50x to AB=70, production decreases from GJ=20x to AC=10x, imports decreases from CB= 60 to JH=30x and the government collects MJHN in import duties. Further more consumer surplus increase by AGHB=$60 and producer surplus decrease by AGJC=$15.

The above figures shows that the increase of the consumer surplus of AGHB=a+b+c+d=$60, MJHN=c=$30 is collected by the government as revenue, AGJC=a=$15 is redistributed as revenue to domestic consumers of commodity x in the form of increased consumer surplus, while the remaining $15 (the sum of the areas of triangle CJM=b=$5 and BHN=d=$10) represents the cost or deadweight loss to the economy due to fixing exchange rate high.

The consumption component (CJM=b=$5) of the deadweight loss arises because with the revaluation some domestic resources are transferred from the more efficient production of importable commodity x to less efficient production of exportable. Thus, the fixed exchange rate redistributes income from domestic producers (who receive low prices) to domestic consumers (who pay low prices) and from the nations abundant factor producing importable to the nations scarce factor (producing exportable). This leads to inefficiencies, referred to as deadweight loss, which causes policy distortions in terms of jobs lost due the increase of the value of the local currency. The jobs so lost also affect the tax revenue in terms of lost taxable income.

2.4 Review of empirical literature

Berman (1976) discussed the short run effect of real devaluation on the tax receipt. The study found that the fiscal impact depended on the response of output, export and import to devaluation. But the study was not able to show the fiscal response to the shift between the prices of tradable and non-tradable that underlies a sustained real devaluation of the exchange rate.

Diaz (1965), investigated the redistribution effects of devaluation on tradable, the study drew the distinction between wage earner and non wage earner with different propensities to save. The study assumed that the wage earners spend all their income on tradable and non-tradables, while the "Capitalists" save a fraction of their income. The study shows that the profits in the tradable sector do increase and the real wages in both sectors do fall. The study concluded that the Government would loose tax revenue when taxes are based on wages and domestic consumption than on corporate income and export taxes.

Tanzi (1989) did a study on the macro-economic policy effects on the level of taxation and the fiscal balance in developing countries. The motivation to conduct the study was due to sudden and large changes in the taxation level over a short period of time, which was attributed to deterioration in tax administration or changes in the traditional determinants of tax revenue. He argued that the changes could be attributed to a considerable extent to the connection between the tax levels and macroeconomic policies, such as the changes in the real exchange rate, the rate of inflation and the level of interest rate.

Tanzi (1989) observed in the study that in LDC's, the relationship between the

countries' tax revenue and the real exchange rate is an inverse one. The appreciation of the real exchange rate leads to decrease in the tax revenue to GDP ratio, ceteris paribus.

Nashashibi and Bazzoni (1991) did a study of exchange rate strategies and fiscal performance in Sub-Saharan Africa. The study investigated the relationship between the fiscal performance and movement in the exchange rate, the terms of trade, and other macroeconomic aggregates in Twenty-eight sub-Sahara African countries over the 1980-1991 period. They found that the overall budget deficit for the fixed rate countries worsened during the study period while it improved in the variable exchange rate countries. Such a revelation raised a number of questions, for example; what are the major factors contributing to the deterioration in revenue performance in the fixed–rate countries, and the relative success of the variable rate countries. To what extent have changes in the RER affected tax revenue and government expenditure in both groups? In an attempt to address these questions, Nashashibi and Bazzoni (1991) established the tax base profile of typical sub-Saharan countries. An analysis of major component of the tax base in selected African countries that included Cameroon, Cote De Voire, Kenya, Mali and Tanzania, revealed that the imports and the formal segment of the traded goods sector constitute overwhelming share of the tax base in Sub-Saharan Africa. According to the analysis, imports constitute the largest segment of tax base. They are either directly taxed through customs or indirectly through sales and excise taxes. Their analysis also revealed that income taxes are levied mostly on large enterprises in the import substitution and non-traded sectors, mostly government services, domestic trade, and subsistence agriculture, which contribute only 10 to 15 per cent of total tax revenue in Sub-Saharan Africa.

They established that those imports, export and import substitution in the formal sector constitute a bulk of the tax base in Sub-Saharan countries. They also analyzed the factors that affect these activities viz, the terms of trade, the exchange rate, inflation and efficiency factors-associated with trade regime, and tax structure and administration. The analysis reveals that the terms of trade (TOT) deterioration in different countries affected the tax base differently. The study concluded that deterioration in TOT could have positive effect on tax base depending on the relative impacts of the decline in export prices and increase in import prices.

Nashashibi and Bazzoni (1991) concurred with Tanzi (1989) in their argument that other components of macroeconomic mix have a significant impact on tax revenue. They pointed out that when inflationary policies are pursued by the government through expansionary fiscal policies, monetization of the budgetary deficit and frequent devaluation, tax revenue could be affected negatively. In the fixed exchange rate countries, the rate of inflation improved during the study period. This was attributed to high monetary expansion and substantial real depression of the exchange rate in a number of countries. Some countries including Kenya made some progress in reducing inflation in 1980's. During the same period, these countries' tax revenue increased. On the other hand, for those countries, which experienced increased rate of inflation during the period, it was observed that their tax revenue declined. These countries were Uganda, and Zambia.

Ikiara (1992) found that real exchange rate was an important determinant of Kenya's horticultural exports. Using regression analysis on annual time series data, he found that real exchange rate depreciation would enhance the export performance.

Specifically 10 per cent devaluation would increase the volume of Kenya's horticultural exports by 6.1 per cent. A similar study was conducted in Tanzania by Balassa (1990) but on agricultural export in general. The result showed that the exports in general and agricultural exports in particular were responsive to price in sub-Saharan Africa, that is, they are highly responsive to the changes in the real exchange rate. This means that with increased export there are more earnings in the country and this would contribute more tax revenue. Moreover, with more earning there is likely to be more importation leading more revenue received from custom duty. Jebuni et al (1991) conducted a study on exchange rate policy and macroeconomic performance in Ghana. They concluded that the real devaluation had an expansionary effect on GDP, imports and exports.

Fosu (1992) conducted a study on the real exchange rate and Ghana's agricultural exports. The objective of the study were to measure the real exchange rate of Cedi for the period 1960-1987, to estimate the quantitative effects of the real exchange rate on agricultural exports. The results revealed that the real exchange rate appreciation that was registered during 1960-1987 period was associated with decline in the real aggregate agricultural exports.

Other studies whose results concurred with Ikiara, (1992), include Balassa (1990), Jebuni et al (1991), on the effect on real devaluation of exports include, Fosu (1992), and Akara (1989). These studies showed that real devaluation have a positive impact on export, import and GDP. These variables are important determinants of the tax base. The export volume is often used as the export tax base; the import volume for the custom duties tax base and GDP is often used as the proxy for the direct tax and sometimes for indirect tax base. Therefore, a variable that is capable of changing these tax bases would

automatically lead to changes in the tax revenue, ceteris paribus.

Thomas et al (1991) conducted a study on the best practices in trade reforms in African countries including Kenya. The study found that trade reforms lead to higher growth rate and the depreciation of the real exchange is associated with output growth. The real exchange rate according to the estimation results broadens the output, which is a tax base and hence would lead to an increase in the tax revenue.

Emmerij (1990) conducted an empirical study on the implication of the real exchange rate on the real tax receipts. Sims test of causality was applied to establish the causal relationship between the tax revenue and the real exchange rate. The hypothesis of unidirectional causality running from taxes to the real exchange rate was rejected. The causal inferences from the Sims test allowed him to use the real exchange rate as an exogenous variable in the model. The study utilized a simultaneous equations model to determine the short run price and output response of the tax revenue following an exogenous change in the real exchange rates.

The model was estimated using quarterly data for Korea and Mexico covering first quarter of 1980 to the first quarter of 1988 for Korea and the second quarter for Mexico. The model was estimated using the Two Stage Least Square technique in double logarithm version. He found that real devaluation develops the strongest impact on the tax receipt with a lag of five quarters. For Korea and Mexico, he found that the overall impact of real exchange rate on the real tax revenue to be slightly negative. The elasticities were 0.05 for Korea and 0.14 for Mexico.

However, Emmerij (1990) defined the real exchange rate of period average exchange rate of the US dollars per domestic currency weighted for changes in domestic versus the U.S

consumer price index. This imposes Purchasing Power Parity (PPP) that cannot work in Kenya. The obvious way is to relax the PPP assumption (see Ndung'u 1995). Like Tanzi, (1989), the study found an inverse relationship between the tax revenue and real devaluation in Columbia. The inverse relationship was attributed to the negative correlation between the real exchange rate and quantitative imports restrictions or due to a highly elastic demand.

Haque and Mountiel (1991) estimated three equations for tax revenue. Direct taxes were regressed with Gross National Product. The other estimates were for indirect taxes, other than trade taxes. The model did not include dummies to capture discretionary change in the rates. These changes were captured by the residuals. The study found that tax revenue increase in Pakistan was as a result of an increase in trade taxes, as both export and import rose rapidly during the study period. They attributed these rises in import and export to real exchange rate depreciation fuelled by the depreciation of the US dollar against the currencies of Pakistan's trading partner's in the late seventies.

Easterly (1991) conducted a study of the public sector deficit in developing countries. He concluded that public revenue is boosted by real depreciation from higher surpluses of traded goods producing firms and from direct and indirect taxation on production or sale of traded goods. Real exchange rate depreciation raises public expenditure by increasing foreign indirect payments and the cost of traded goods, capital and intermediate goods acquired by the public sector. Hence, the net effect of the real exchange rate on the deficit, in real terms as a share of GDP, depends on the relative weights on the traded and non-traded items in public expenditure and revenue.

Marshall and Habbel (1991), in their attempt to decompose the non-financial

public sector deficit in Chile, measured the contribution of the exogenous and endogenous fiscal policy to fiscal deficit. Endogenous variables included: tax rates, public investments, and sector wages. The exogenous variables included inflation, out put growth, real exchange rate and the rate of interest. Other public sector variables estimated include indirect taxes, direct taxes, and corporate taxes. These variables were regressed on their respective tax bases. Inflation rate, real exchange rate and dummies reflecting changes in the discretionary tax rate were also included. The improvement in the tax revenue between 1974 and 1975 was due to tax reform. The real exchange rate had a positive impact on the taxes from copper and was insignificant in the other tax handles estimated.

Morande and Hebbel (1991) estimated behavioral equation for tax revenue functions for Zimbambwe. The equations were estimated using Ordinary Least Squares. Real depreciation of exchange rate, GDP and the ratio of inflation were found to be positively related to the direct tax revenue. Dummy variables representing the 1978 to 1980 pre-independence conflict contributed to erosion in tax revenue, other dummies were not significant. The real exchange rate depreciation, the GDP (Y) and inflation rate had some positive effect on the indirect tax revenue.

For the custom duties, the relevant tax base, which was import volume, had a marginal tariff rate of about 10 per cent for 1970/71-1981/82 period. Changes in the tax regime reflected by the dummies raised revenue through customs duties gradually above 10 per cent level.

Islam and Deborah (1991) used Ordinary Least Square, to estimate four separate tax revenue functions for Ghana. The model they adopted resembled one used by

Morande and Wetzel (1991), in a similar study in Zimbambwe, except that the model was adjusted slightly to suit Ghanian situation. For instant, export taxes function was added as well as the terms of trade as an explanatory variable in the impact tax function. They found real exchange rate depreciation, and Gross Domestic Product to have a positive correlation with the direct and indirect tax handles. Direct taxes, export taxes and other indirect taxes were affected negatively by inflation. This indicated that the negative effects on income tax revenue due to collection lags i.e. Olivera-Tanzi effect, out weigh the positive effect that inflation may have on direct tax revenue.

2.5 Overview of Literature

From the above literature, it's apparent that different studies have come up with conflicting finding on the impact of real exchange rate on real tax revenue. Further more, other macroeconomic variables such as inflation, which have featured prominently in the literature review as an important determinant of real tax receipts affects tax revenue differently in the various countries. The findings of the studies conducted by Morande and Habbel (1991), Islam and Deborah (1991), Haque and Montiel (1991), Nashashi and Bazzoni (1994), concurred on the fact that real exchange rate depreciation have a positive effect on real tax receipts. There is a sharp contrast from the findings of Emmerij (1990), Easterly (1991), and Tanzi (1989), who found quite the opposite of their counterparts. Real exchange rate depreciation was found to have a negative relationship with real tax revenue. The reasons for these conflicting findings were the circumstances prevailing in the countries under study. The other studies reviewed in the preceding section on the impact of the real exchange rate on the different tax bases yields conflicting results. The

studies by Ikiara (1992), Jebuni et al (1991), Fosu (1992), and Akara (1989) found real exchange rate depreciation to be positively related to exports, import and output. In other words, depreciation of the real exchange rate increase exports, imports and outputs, *ceteris paribus*. Nashashibi and Bazzoni (1991) also found that the overall budget deficit for the fixed rate countries worsened during their study period while it improved in the variable exchange rate countries.

The studies reviewed above do not take into account the time characteristic of the data. Owing to the fact that many macroeconomics time series data are not invariant with respect to time, this study has departed from the previous study by utilizing recent economic estimation techniques. In this case, stationarity and cointegration tests have been performed within the study. Most of the studies reviewed did not indicate how real exchange rate was derived. The few that did, defined the real exchange rate as relative price of tradable to non-tradable and measured real exchange rate using the purchasing power parity approach. This study has departed from the previous studies by adopting a real exchange rate measure that was formulated by Ndung'u (1995). The relaxed version does not impose the purchasing power parity and hence can be applied in Kenya.

CHAPTER THREE

3.0. CONCEPTUAL FRAMEWORK, RESEARCH METHODOLOGY AND DATA

3.1 Introduction

This chapter explains the conceptual and methodology, which has been applied in the study. It commences by presenting the real exchange measure and explanation about the suitability of the measure in Kenya. The economic model used is explained and specified. The chapter ends with a section on the nature and the source of data.

3.2 Conceptual Framework

The focus of this study adopted both descriptive and econometric techniques for analysis. The descriptive analysis encompasses the use of graphs to document the movements overtime in the RER and revenue and deterministic variables. The model specified in the next section was adopted for estimation. The appropriate single equation estimation technique used in this study is the ordinary least square (OLS) on annual time series data. The choice of this estimation method was supported by the outcomes of the preliminary econometric tests that were performed on the data employed in this study (see chapter 4).

3.3 Methodology

3.3.1 Measurement of Real Exchange Rate

The model used in measurement of real exchange rate is adopted from Ndungu (1995), which is a relaxed version of Edwards (1989). The real exchange rate is defined by Edwards (1989) as the relative price of tradable to non-tradable goods expressed in domestic currency, that is;

$$RER = EP_T / P_N \quad \ldots\ldots(1)$$

Where: P_T = the foreign price of tradable goods (T= the tradables).

P_N = the nominal price of non-tradable goods (N=Non-tradables).

E = the nominal exchange rate in shillings per US dollars.

The foreign price is approximated by using the Wholesale Price Indices (WPI). The Wholesale Price Indices weighted by trade shares is used for Kenya's main trading partners. This study has used Kenya's eight trading partners namely, United States, United Kingdom, Germany, Canada, Japan, Netherlands, India and Australia. These constitute about 66 per cent of Kenya's external trade.

At this point, one may wonder what criterion was used to select Kenya's trading partners, since some of Kenya's major trading partners especially from Africa were conspicuously excluded. The selection was purely made based on the availability of data. The use of WPI as a proxy for foreign prices has been commended by many authors on the basis that it contains mainly tradable goods (see for example, Harberger, 1986). The Consumer Price Index (CPI) was utilized as the proxy for the non-tradable. The CPI is widely used since the data for it is readily and periodically available for Kenya. And also the non-tradable goods and activities such as retail are heavily influenced by it.

Edwards (1989), definition of the real exchange rate when applied in Kenya imposes a Purchasing Power Parity assumption. However, the use of the purchasing power parity relation cannot hold in Kenya because; Kenya has had periods of fixed exchange rate; CPI, which is usually used as a proxy to the prices of non-tradable goods, includes both tradable and non-tradable, and contains price-controlled goods (See

Ndungu, 1995).

Expressing equation 1 above in logarithms, it becomes:

$$\text{Log RER} = \beta_1 \log E_o + \beta_2 \log P_T - \beta_3 \log P_N \quad \ldots\ldots(2)$$

Where β_1, β_2 and β_3 are coefficients that were estimated.

The equation above could not be estimated in its present form since real exchange rate is non-observable. Therefore, the above equation was estimated as a regression of the form:

$$LE_t = \beta_o + \beta_1 LP_T + \beta_2 LP_N + \epsilon_t \quad \ldots\ldots(3)$$

The variables in the equation were tested for stationarity using Dickey Fuller (DF), and Augmented Dickey Fuller Unit root tests. Where the variables were non-stationary, the series was differenced to make it stationary, and then perform the co-integration analysis using the unit root tests. These tests are discussed explicitly in chapter four. If the variables in the above regression were found to be co-integrated, i.e. I (o), the error term expressed in equation (4) below was taken to be a good representation of the real exchange rate. The error correction mechanism found was of the nature as the equation below:

$$\epsilon_t = LE_t - LE_{t-1}.$$

And hence our regression equation took the form:

$$\epsilon_t = LE_t - \beta_o - \beta_1 LP_T - \beta_2 LP_N \quad \text{.....(4)}$$

It should be noted that the real exchange rate equation (2) and the error correction of equation (4) resemble i.e. the variables on the right hand side of equation (2) and (4) are the same, hence, the error term in equation (4) was used to represent the real exchange rate. The error term is a vector that does not impose purchasing power parity relation. However, the equation above was used to measure the real exchange rate but only when the variables were co-integrated.

3.3.2 Model specification: Estimation of Real Exchange Rate and Tax Revenue model

This section of the chapter deals with the model specification of the real tax revenue and the real exchange rate and other determinants of tax revenue in Kenya. In the preceding chapter on literature review, it was identified that several factors affect the real tax revenue viz, inflation, terms of trade, the different tax bases and the real exchange rate. These factors are included in the model. From the literature review in chapter two, two feasible models were identified that can be applied in the present study.

The first model is a simultaneous equation model that was formulated by Emmerij (1990) in the study on the implication of the real exchange rate on the real tax revenue in Mexico and Korea. The other model is a single equation model, which was formulated by Morande and Schmidt-Habbel (1991) and Wetzel and Islam (1991) while estimating behavioral equations for tax revenue functions for Zimbabwe. In this study, it was opted to adopt the single equation model. The model to be used consists of three separate

behavioral equations for the tax revenue and the separate tax functions have been modified to suit the Kenyan situation.

Equation (1) in the model is a behavioral equation for the direct tax revenue. It has been found necessary to include Gross Domestic Product as a proxy for tax base, inflation rate, and the real exchange rate as determinants. All the variables included in this equation affect direct tax revenue in one way or another as explained in chapter one and two. The direct tax revenue equation was specified as follows:

$$LDT_t = \alpha_0+\alpha_1 LY_t+\alpha_2\pi_t+\alpha_3\ LRER_t +LDT_{t-1} +\epsilon_t \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(1)$$

Where: DT = Direct tax revenue

Y = Gross Domestic Product

π = Inflation rate

RER = Real exchange rate

$DT_{\{t-1\}}$ = Lagged dependant variable

t = time in years

ϵ_t = Disturbance term

α_0 = Constant (Drift term)

$\alpha i \ldots\ldots_4$ = Parameters estimated

L = Logarithm

The second behavioral equation for the tax revenue estimated was for the import taxes. The custom duties were regressed on the import price indices as a basis of real import duty, which was taken as proxy for import tax base, the real exchange rate and the

inflation rate. The equation was specified as:

$$LCD_t = \beta_0+\beta_1 LM_t+\beta_2\pi_t+\beta_3 LRER_t+\beta_4 LCD_{t-1}+\epsilon_t \quad \ldots\ldots (2)$$

Where: CD = Customs duties

M = Import price indices

$\beta_{i.....4}$ = Parameters estimated

The other variables (Y, π, t, RER) are defined in the equation (1) above.

The third behavioral equation, which was estimated in this paper, is for the other indirect taxes apart from the import taxes. The regressors in the equations were similar to those in equation one above. The equation took the form:

$$LOIT_t = \lambda_0+\lambda_1 LY_t+\lambda_2\pi_t+\lambda_3 LRER_t+\lambda_4 LOIT_{t-1}+\epsilon_t \quad \ldots\ldots (3)$$

Where: OIT = other indirect taxes

$OIT_{(t-1)}$ = lagged dependant variable

$\lambda_{i.....4}$ = Parameters estimated

Other variables (Y_t, t, RER_t) were defined earlier in equation one above.

Note that all the regressions were performed on real variables except for those variables that are indices. This has been done to eliminate collinearity between the explanatory variables.

3.4 Data type, Sources, Refinement and Analysis

Data requirement for the study were published time series data. Data were collected from national accounts sources, which included Statistical Abstracts, Economic Surveys, and Central Bank of Kenya monthly and annual reports. These were supplemented by data from international sources such as IMF and IFS publications. Most of the data were on annual basis.

In the three equations presented in section 3.2.2, the real direct tax revenue, real custom duties and real other indirect tax revenues were derived by dividing nominal values by the consumer price index (CPI). Real Gross Domestic Product figures were obtained by dividing nominal GDP by GDP deflator. All figures were obtained from the International Financial Statistics (IFS).

The figures for the tax revenues, GDP, inflation, and the RER were each converted to logarithm to ease of interpretation of the coefficients and also to fit the data well. The real exchange rate was measured as shown earlier in section 3.3.1. For the real customs duties equation, the import price index (1990 = 100) was one of the regressors and the others were analogous with the ones used in the other tax revenue equations in section 3.3 of this chapter.

The study period was from 19972-2000. The reason for the choice of the study period is that it provided a sufficient range, which comprises period before and after exchange rate market reforms in Kenya; including the introduction of the floating exchange rate regime.

CHAPTER FOUR

4.0 DATA ANALYSIS AND RESULTS

4.1 Introduction

In this chapter the concepts of cointegration and error correction modeling were applied. By using the recently developed econometric technique related to the cointegration of economic time series and dynamic specification associated with error correction modeling, the problems associated with non-stationery time series, which are a common problem in all macroeconomic data, were tackled as discussed in chapter three (3).

The chapter starts with the testing for stationarity of the various variables regressed in the equations specified in chapter 2. This was done using PC-Give computer software. After that, the variables in the model were tested for cointegration. To analyze the results obtained, error correction specification followed.

4.2 Stationarity Analysis

Before proceeding to test the set of variables for cointegration ,it was useful to analyze the time series properties of individual series. The stationarity is a prerequisite for sound econometric modeling and reliable results, the unit root tests were performed to test for the order of integration of the variables with intent to detrend the data if found non stationarity. To circumvent the problem arising from the use of non-stationary series already discussed in chapter 3, stationarity analysis was conducted. The test for stationarity applied in the study included Unit root tests suggested by Dickey-Fuller (1979). The tests for stationarity were carried out with a view of transforming the time series data into stationary process.

4.2.1 Dickey-Fuller (DF) Unit Root Test

Dickey and Fuller (1979) formulated the DF Unit root test (see Johnstone , 1958), which is known to be an appropriate test and simple method of testing for the order of integration. It is also used for the simultaneous existence of a deterministic trend and absence of stochastic trend in the series. The DF test relies on the estimation of regression equation (1) below.

$$\Delta Y_t = \delta Y_{t-1} + \mu_t \quad \ldots\ldots(1_1)$$

Where μ_t = disturbance term and is assumed to be a white noise process and Δ is the difference operator ($\Delta Y_t = Y_t - Y_{(t-1)}$).

The DF test consists of testing the negativity in an ordinary least square of equation (1). The null hypothesis (Ho) and the alternative (Hi) under DF are given as:

Ho: $\delta = 0$ (non-stationarity)

Hi: $\delta < 0$ (Stationarity exist)

In this test, the conventional student t- test is not used. Critical values computed, by Dickey (1978) are used (see Johnstone. 1958). The decision, rule for DF test is to reject Ho if the computed t- value is less than the critical value. The rejection of Ho in favor of the alternative hypothesis H_1 implies that the series is stationary i.e. I(0) (see Maurotas, 1993).The DF test above was conducted without a drift and a trend, and because the test is sensitive to whether a drift (c) and time trend (t) are included, it was repeated in different forms for each variable.

The original Dickey-Fulley test has a limitation in that it assumes that the Data generating process (DGP) is an AR (1) Process under the null hypothesis. This is not always the case if the DGP is not an AR (1) process. The autocorrelation in the disturbance terms in DF equation is bound to result in bias test outcomes. To eliminate this problem the Augmented Dickey Fuller (ADF) test was used.

4.2.2 Augmented Dickey Fuller Test (ADF) Unit Root Test

The ADF differ from the original DF test in that, the left hand variables are lagged and used as additional explanatory variables to approximate autocorrelation.

The ADF test allows for more dynamics in the DF regression and consequently is over-parameterized in the first order case but correctly specified in the higher order case (Engle and Granger 1987). The ADF test regression takes the form:

$$\Delta Y_t = \delta Y_{t-1} + \sum^{k}_{t-1} \delta Y_{t-1} + \mu_t \quad \ldots\ldots (1_2)$$

Where: i = number of lags for $\Delta Y_{(t-1)}$ with the maximum number of lags being equal to k. The lags show the spread necessary for an explanatory variable to exhaust the explanatory influence on the dependent variable. The maximum number of lags k should be relatively low enough to save the degrees of freedom and equally large enough to remove the presence of serial correlation. The null hypothesis (Ho) and alternative hypothesis (Hi) under the ADF tests are given as:

Ho: $\delta = 0$ (non-stationary)

Hi: $\delta < 0$ (stationary)

The ADF uses the same critical values employed by the original DF and the decision rule is also analogous. The results of the unit root tests are presented in table 4.2.1 below

Table 4.2.1 Results-Unit root test for stationarity

	ADF/DF Test statistic	δ	Lag
DDLRER	-5.6503	4.1340	1
DDLRDT	-4.2538	153.02	0
DDLROIT	--5.9327	13.852	0
DDLIPI	-7.2767	35.891	0
DDLRCD	-4.9275	68.964	1
DDLRY	-4.6737	6.8664	0
DDLIR	-6.8864	9.4655	0

Critical values: 5%=-3.594 1%=-4.355

Note that: $DF \Rightarrow \Delta Y_t = \alpha_0 + \delta Y_{t-1} + \epsilon_t$

$$ADF \Rightarrow \Delta Y_t = \alpha_0 + \tau.t + \sum^{k}_{t-1} \delta \Delta Y_{t-i} + \epsilon_t$$

It can be seen from table 4.2.1 that the variables tested were non-stationary at 1% significance level. Since differencing twice produced stationarity, it was safely concluded that the series were integrated of order two i.e. I (2). For the second difference, Dickey fuller with a drift was used to confirm the level of integration. The results for the second deference are reported in table 4.1.1 below.

Table 4.2.2 Unit Root Test Results For The Second Difference

	DF (1)	DF (2)	DF (3)	ADF	Longest lag
Δ TDT	-4.171	-4.166	-4.127	-2.7	2
Δ GDP	-1.804	-4.705	-.4.640	-3.633	2
Δ INF	-4.655	-4.865	-5.23	-1.115	2
Δ LOIT	-2.655	-4.396	-4.554	-3.305	2
Δ LGDP	-3.795	-5.3	-6.117	-5.495	2
Δ LINF	-4.701	-4.627	-4.248	-5.173	1
Δ LCD	-2.805	-3.298	-2.97	-3.267	1

Critical values: -3.6 for DF (3); -3.0 for DF (2)-1.95 at 5%: -1.6 for DF (1), -2.63 for DF (2), -3.24 for DF (3) at 10%.

Once the order of the series was determined, it was possible to assess in what form they should enter in the equation so as to obtain unbiased coefficients.

4.3 Cointegration Analysis

4.3.1 Introduction

Granger (1986) and Engle et al (1987) developed cointegration in an effort to overcome the problem of spurious and inconsistent regression inherent in a non-stationary data series. The use of the error correction mechanism (ECM) overcomes the loss of long run explanatory power of the model associated with detrending data through differecing to establish a stationarity series. By capturing the short and long run features of variables, cointegration provides a powerful test for spurious regression. The presence of cointegration validates the regular regression results while its absence indicates presence of spurious, which tends to invalidates inferences from such correlations.

The results of the unit root test above shows that all the variables were stationary at 1% level after deferencing. However cointegartion analysis was still perfomed to avoid problems of spurious regression. The test for cointegration to ascertain the long run relationship among the I (1) economic variables is analogous with the unit root tests discussed earlier in this section although in this case, they were applied on residuals. These tests were performed as explained below.

4.3.2 Dickey Fuller (DF) Unit Root Test for Cointegration.

The DF cointegration test consisted testing the significance of students t-ratio in the ordinary least square regression;

$\Delta\mu_t = \delta\ \mu_{t-1} + \in$ .....(1_3)

Where: $\Delta\mu = \mu_t - \mu_{(t-1)}$

δ= Standard deviation of the data distribution

$\in_t$= Error term(assumed to be a white noise process).

The null hypothesis (Ho) and alternative hypothesis (Hi) for the DF tests were tested were:

Ho: $\delta = 0$ (non cointegration)

Hi: $\delta < 0$ (cointegration exisits)

The decision rule in this case is to reject the null hypothesis of non cointegtation in favour of the alternative hypothesis for cointegration if the calculated t-value is less than the critical value.

Table 4.3.1 Results-Unit root test (DF) for cointegration in exchange rate function

	DF (1)	DF (2)	DF (3)
Exchange Rate	-2.41045 Accept at 10%	-2.06653 Accept at 5%	-3.75642 Accept at 5%

Critical values: -3.6 for DF (3); -3.0 for DF (2)-1.95 at 5%: -1.6 for DF (1), -2.63 for DF (2), -3.24 for DF (3) at 10%.

From the table it can be seen that DF (1) is accepted at 10%, DF (2) and DF (3) at 5%, hence variables are cointegrated. For the same reason of the limitation that the original Dickey-Fuller tests (see section 4.2.1) autocorrelation in the disturbance term may cause bias in the test, the Augmented Dickey-Fuller is also done to purge out the problem.

4.3.3 Augmented Dickey Fuller (ADF) Unit Root Test.

The ADF test for cointegration takes the form:

$$\Delta V_t = \delta V_{t-1} + \sum^{k}_{t-1} \delta_i V_{t-i} + \epsilon_t \quad \ldots\ldots (2_3).$$

Where: V_t = are the ordinary least squares residuals (can be interpreted as the

deviations of y_t from its long run path). The null hypothesis (Ho) and alternative (Hi) that were tested are given by:

Ho: $\delta = 0$ (non cointegration)

Hi: $\delta < 0$ (cointegration exists)

Using the above unit root test, the exchange rate function was tested for cointegration.

The static model whose residual were examined is:

$E_t = \alpha_0 + \alpha_1 CPI_t + \alpha_2 WPI_t + D_1 + D_2 + \epsilon_t$.....$(3_3)$.

The results for cointegration for exchange rate function are reported in table 4.2.1 below.

Table 4.3.2 Results-Unit root test t(ADF) for cointegration in exchange rate function

ADF	Critical value	Accept/Reject
-3.457	-3.6 at 5% and –3.24 at 10%	Reject at 10%

The results reported above depicts clearly that the variables in the static exchange rate equation were cointegrated at 10%. The presence of cointegration led to the utilization of the error correction model (ECM) as the real exchange rate in the three tax revenue functions.

After testing for cointegration for the exchange rate function, cointegration analysis was performed for the tax revenue functions. The static equations whose residuals were tested for cointegration are:

Total Direct tax Equation $\Rightarrow L\,TDT_t = \alpha_0 + \alpha_1\, L\,Y_t + \alpha_2\, L\,II_t + \alpha 3\, L\,RER_t + \epsilon_t \ldots (4_3)$

Total imports taxes $\Rightarrow LCD_t = \beta_0 + \beta_1\, LIPI_t + \beta_2\, L\,II_t + \beta_3\, L\,RER_t + \epsilon_t \ldots\ldots\ldots\ldots (5_3)$

Total other indirect taxes $\Rightarrow LOIT_t = \lambda_0 + \lambda_1\, L\,Y_t + \lambda_2\, L\,II + \lambda_3\, L\,RER_t + \epsilon_t \ldots\ldots (6_3)$

The results of the unit root test for cointegration for the three separate behavioral tax functions above are summarized in table 4.2.3 below:

Table 4.2.3 Cointegration Results for tax revenue functions

Var.	DF	Crit.t at 5%	Crit. t at 10%	ADF	Crit.t at 5%	Crit.- t at 10%
LDT	-3.3109	-3.58	-4.323	-4.0364	-3.58	-4.323
LCD	-3.0686	-3.612	-4.394	-4.7363	-3.12	-4.394
LOIT	-2.0460	-3.622	-4.417	-2.7199	-3.622	-4.417

The results reported above in table 4. 2.3 indicate that the residuals are integrated of order two. However, the most reliable test, Augmented Dickey Fuller statistics indicate non-stationarity for the total direct tax (TDT) function and stationarity for the customs duties tax function residuals only at 10% significance level.

Nevertheless, considering the results of all the tests performed for cointegration and inspection of the relevant variables, it seems plausible to conclude that cointegration existed between the variables of direct tax and the custom duty revenue functions. As a

consequence of this, the error correction model (ECM) was incorporated in the final specification of the two functions except the other indirect tax functions and it's significance re-confirmed cointegration position in the two functions.

Before accepting the results of dynamic specification, it is of importance to ensure that the models track the data well. Several diagnostic tests were conducted. The diagnostic tests ensure that the models capture the salient features of the data and are consistent with the theory as discussed below.

4.4 Diagnostic Tests

4.4.1 Jarque-Bera Normality Test

This is a test of the distribution of the error term. It actually tests whether or not the error term is a white noise process. The Jarque-Bera normality test uses the first four moments of distribution (Mean, standard deviation, skew-ness, and excess kurtosis). The distribution is distributed as Chi-square statistic. The results of the Jarque Bera test are reported in table 4.4.0 below.

Table: 4.3 Analysis of scales residuals Results

	ΔOIT	ΔTDT	ΔLCD
Mean	.0000	.000	.000
Std.	.881917	.902671	.902671
Skew ness	.140305	.76411	-0.087893
Excess kurtosis	-0.675869	1.315049	-0.556557
Minimum	-1.484	-1.60524	-1.843250
Maximum	2.033118	2.72658	1.818554
Chi-square	0.469	3.730	0.312

With regard to Jarque- Bera test results in table 4.3, the null hypothesis of the normality of the residuals cannot be rejected. From the table, it is clear that the value of the chi-square computed are less than the critical value of chi-square at 5% significance level, which is 5.99. Therefore, the null hypothesis that the residual follows a normal distribution is accepted. This implies that the OLS estimates are efficient and consistent.

4.4.2 The LM Autocorrelation Test: Lagrange LM autocorrelation test

The standard Durbin-Watson statistic is not a sufficient test for autocorrelation unless all regressors are strictly exogenous and the error process is of first order (AR1). Also the lagged dependent variable tends to bias the test statistic towards two. To offset the shortcoming, the LM autocorrelation test AR (M) was conducted. The test is a general test for auto-correlation allowing for the case where higher order lagged dependent variables are included as regressesors and where the error process is AR (M). The test is distributed as Chi-squre, although a sample adjusted F from the test is reported. The null hypothesis (Ho) and alternative hypothesis (Hi) for LM autocorrelation tests that were tested are:

Ho: $\delta = 0$ (correlation)

Ha: $\delta < 0$ (non correlation)

In this case adjusted F-statistic is used since our sample size is small. The results of the LM autocorrelation diagnosis test are reported in table 4.3.4 below:

Table 4.3.1 Lagrange LM autocorrelation test Results

Δ LOIT	Δ TDT	Δ LCD
ARI-2F (2,19) =. 11	ARI-2F (2,20) =. 01	ARI-2F (2,20) =. 12
ARI-3F (3,18) =1.27	ARI-3F (3,19) =. 3	ARI-3F (3,19) =. 25
ARI-4F (4,17) =1.24	ARI-4F (4,18) =. 4	ARI-4F (4,18) =. 33
ARI-5F (5,16) =1.02	ARI-5F (5,17) =. 47	ARI-5F (5,17) =. 54
ARI-6F (6,15) =1.28	ARI-6F (6,16) =. 95	ARI-6F (6,16) =. 42

F critical values: F (2,19) = 3.52, F (3,18) = 3.16, F (4,17) = 2.96, F (5,16) = 2.85, F (6,15) = 2.79, F (2,20) = 3.49, F (3,19) = 3.13, F (4,18) = 2.93, F (5,17) = 2.81, F (6,16) = 2.74. -All at 5% significance level.

The Lagrange multiplier results for the first to sixth order serial correlation of the residuals do not reveal serial correlation problems. The calculated F value tends to be less than the critical values leading to the acceptance of the null hypothesis of non-existence of serial correlation.

4.4.3 The LM Autocorrelation Conditional Heteroscedasticity Test

The test was performed to test for heteroscedasticity. An ARCH process is one where the errors have Zero mean, and the error takes the form:

$$H_t = \alpha_0 + \alpha_1 \epsilon_t + \alpha_2 \epsilon_{t-1} + \ldots\ldots\ldots\ldots + \alpha m \epsilon^2_{t-m}$$

Where: H_t = first order arch process

The null hypothesis for the arch test is Ho: $H_t = \alpha_0$ against an alternative $H_t < = \alpha_0$ for a first or higher order ARCH process. The ARCH test is a chi-square distribution and the samples adjusted statistics are preferred in small sample models (see Adams, 1992). The results of the test are reported in table 4.3.2 below.

Table 4.3.2 LM Autocorrelation Conditional Heteroscedasticity Results

Δ LOIT	Δ TDT	Δ LCD
ARCH 1 F (1,19) =. 66	ARCH 1 F (1,20) =0.09	ARCH 1 F (1,20) =. 59
ARCH 2 F (2,17) =1.97	ARCH 2 F (2,18) =0.27	ARCH 2 F (2,18) =. 03
ARCH 3 F (3,15) =1. 19	ARCH 3 F (3,16) =0. 20	ARCH 3 F (3,16) =. 19
ARCH 4 F (4,13) =. 86	ARCH 4 F (4,14) =0. 19	ARCH 4 F (4,14) =. 21
ARCH 5 F (5,11) =. 60	ARCH 5 F (5,12) =0. 18	ARCH 5 F (5,12) =. 29
ARCH 6 F (6,9) =. 43	ARCH 6 F (6,10) =0. 15	ARCH 6 F (6,10) =. 21

F critical values: F (1,20) = 4.35, F (2,18) = 3.55, F (3,16) = 3.24, F (4,14) = 3.11, F (5,12) = 3.11, F (6,10) = 3.12, F (1,17) = 4.38, F (2,17) = 3.59, F (3,15) = 3.29, F (4,13) = 3.18. F (5,11) = 3.2, F (6,9) = 3.37 -All at 5% significance level.

The results of the ARCH test above indicate absence of heteroscedasity. That is, it does not reject the null hypothesis that the conditional variance of the estimated models is not related to the size of its errors. In the light of the reported diagnostic test statistics our tax revenues behavioral equations are well specified on statistical grounds.

4.5 Empirical Results and Analysis

The result for cointegration reported in the tables in section 4.3 above, appear promising. They revealed that the variables used in tax revenues behavioral functions were cointegrated. The null hypothesis for non-contegration was rejected in favor of the alternative hypothesis. This implies that the three tax revenues behaviour functions move together. The cointegration and the non-stationarity of all the variables except their exchange rates necessitated first differencing and inclusion of error correction mechanisms (ECM). This led to the formulation of an error dynamic specification for the three behavioral tax revenue functions of the form:

$$\Delta LTDt=\alpha_0 +\alpha_1 \Delta LYt +\alpha_2 \Delta LII_t +\alpha_3 LRER_t + \alpha_4 ECM_{t-1}+ \alpha_5 \Delta L TDT_{t-1}+\alpha_6 D_1+ \alpha_7 D_2+\epsilon_t \ldots\ldots (1_4)$$

$$\Delta LCD_t=\beta_0+\beta_1\Delta LIPI_t+\beta_2 LII_t+\beta_3 LRER_t+\beta_4 ECM_{t-1}+\beta_5\Delta LCD_{t-1}+ \beta_6 D_1 +\beta_7 D_2+\epsilon_t \ldots\ldots (2_4)$$

$$\Delta LOIT_t= \lambda_0+\lambda_1\Delta LY_t+\lambda_2 \Delta L II_t+\lambda_3 LRER_{t-1}+\lambda_4 \Delta LOIT_{t-1}+ \lambda_5 ECM_{t-1} +\lambda_6 D_1 + \lambda_7 D_2+\epsilon_t \ldots (3_4)$$

Where Δ = is the difference operator.

L = Natural logarithm

The other notations were earlier defined in section 3.2.2 of this paper. The error correction dynamic specification model was estimated using OLS and the results of the estimation are reported in the table below for total direct tax revenues, ΔLDT.

Table 4.5.1 Results of modeled ΔLDT by OLS

Variable	Coeff.	Std. Error	t-value	t-prob	HCSE	Part $\bar{R}^2$
Constant	-0.0111	0.017	-0.659	0.5204	0.0166	0.0301
DDLRY	0.408	0.169	2.410	0.0303	0.1587	0.2932
DDLIR	0.1587	0.044	3.619	0.0028	0.0447	0.4833
DDLIRER	-0.173	0.129	-1.339	0.2020	0.1028	0.1135
DDLRDT_1	0.859	0.179	4.782	0.0003	0.1827	0.6202
D1	-0.264	0.059	-4.464	0.0005	0.0684	0.5873
D2	0.0401	0.029	1.377	0.0903	0.0293	0.1192
ECM1_1	-1.2061	0.166	-7.280	0.0010	0.1336	0.7911

$\bar{R}^2$ = 0.565585 F (6, 17) = 3.6888 [0.0157] δ = 0.280483 DW = 2.38 RSS = 1.3374

From the results reported in table 4.5.1 above for the real direct taxes, it is evident that real gross domestic product (DDLRY) has a positive influence on this tax hardle at 5% level of significance. As for the inflation (DDLIR), the relationship is a positive one, indicating that the positive effects on direct tax revenue due to "bracket creep" outweigh the negative effect that inflation may have on the income tax revenue due to collection lags (the Olivera-Tanzi effects). The most important parameter in our study is certainly that of real exchange rate. In the light of the results reported in table 4.5.1 a negative and insignificant parameter estimate for the real exchange rate emerges. The negative relationship can be explained in two ways. Real exchange rate depreciation is likely to lead to decreased imports of capital goods and thus less investment in both the public and private sector. This is likely to affect incomes negatively, which would decrease the intake on tax revenue. This contradicts the studies by Ikiara (1992), Jebuni et al (1991), Fosu (1992), and Akara (1989) who found real exchange rate depreciation to be

positively related to exports, imports and output. Also direct tax receipts may have been lower in the non-traded goods sectors than in the traded goods sectors following consentional taxes created with the emergence of trading blocs within the region such as COMESA and the East African Community, leading to decreased revenue intake with depreciation.

All the other variables were found to be significant at 5% significance level except the constant, which was found to be insignificant. The dummy variable D1 is indeed significant at 5% significance level with a negative effect. This, as was expected, had the inflationary effect accompanying the elections of 1992, which the variable was used to capture. And indeed it appears the inflation that accompanied the elections reduced the real direct tax.

The dummy of much interest, D2, meant to capture the effect of introduction of the liberalized exchange rate regime, was significant at 10% level with a positive sign. This was expected because with the liberalized exchange rate, there was continuous depreciation, which as it were, impacts positively on tax revenue. This is in agreement with the findings of Nashashibi and Bazzoni (1991) on budgetary deficits for the fixed and variable exchange rate countries (see section 2.4).

It is also worth noting that the error correction term (ECM-1) in this model is significant statistically. This verifies our earlier conclusion that the variables in the direct tax revenue are cointegrated. That implies that there is existence of a stable long-run relationship among the variables in the model.

The error correction model and results for the estimation of the custom duty function are reported in the table below.

Table 4.4.1 Results of Modeled ΔLCD by OLS

Variable	Coeff.	Std.Error	t-value	t-prob	HCSE	Part R^2
Constant	0.015084	0.042218	0.357	0.7259	0.0314	0.0084
DDLRER_2	0.86343	0.25435	3.395	0.0040	0.17349	0.4345
DDLIPI	0.19809	0.28073	0.706	0.4912	0.20395	0.0321
DDLIR_2	-0.11104	0.047220	-2.352	0.0328	0.030266	0.2694
DDLRCD_1	0.28786	0.11606	2.480	0.0255	0.10762	0.2908
D1	-0.068040	0.12962	-0.525	0.6073	0.27998	0.0180
D2	0.042707	0.073355	2.582	0.0691	0.070284	0.0221
ECM2_1	-0.13169	0.025023	-5.263	0.0001	0.015962	0.6487

$\bar{R}^2$ = 0.818042 F (8, 15) = 8.4296 [0.0002] δ = 0.159587 DW = 2.12

RSS = 0.3820179785

From table 4.4.2, the results for the real customs duties revenue are reported, the variable of interest, real exchange rate was found to affect the customs duties positively and it was found to be significant at 5% level. This may result from the fact that an increase in the real exchange would increase exports thereby improving access to foreign exchange necessary to import. The ability to export increases ability to import, all other things held constant and hence depreciation also raises the import tax revenue by increasing the domestic value of imports. This is in line with the study of Fosu (1992) who conducted an analysis on the real exchange rate and Ghana's agricultural exports (see section 2.4).

All the other variables were found to be significant at 5% significance level except the constant and import price indices, which were found to be insignificant. The import price indices may not be significant as a result of the recent increase on counterfeit goods coming from the Eastern countries and smuggling practices to evade taxation. Inflation rate was significant at 5% level with a negative effect on this tax. The dummy variable, D1 that was meant to capture the elections of 1992, was insignificant. The dummy of much interest was D2, meant to capture the effect of introduction of the liberalized exchange rate regime. This was significant at 5% with a positive sign. The reason is the same as was explained in the case of direct tax function.

The t-value for the error correction term (ECM_1) was found to be very significant statistically, thus re-confirming cointegration between the variables in the real import duties function.

The error correction model and the OLS estimation results for other indirect tax is reported below.

Table: 4.5.3 Results of Modelled ΔLOIT by OLS

Variable	Coeff.	Std. Error	t-value	t-prob	HCSE	Part R^2
Constant	0.030775	0.072046	0.427	0.6746	0.08918	0.0106
DDLRY	1.3796	0.82486	1.672	0.1127	0.75682	0.1413
DDLIR_1	0.16731	0.07914	2.114	0.0496	0.054739	0.2082
DDLRER_1	-0.66767	0.38261	-1.745	0.0990	0.30632	0.1519
DDLROIT_1	-0.44369	0.19751	-2.246	0.0383	0.23813	0.2289
D1	-0.33712	0.21802	-1.546	0.1405	0.10976	0.1233
D2	0.130695	0.12284	2.250	0.8057	0.10048	0.0037
ECM3_1	-0.13169	0.025023	-5.263	0.0001	0.015962	0.6487

$\bar{R}^2 = 0.947295$ F (10, 14) = 25.163 [0.0000] $\delta = 0.0656193$ DW = 1.69

RSS = 0.06028253754

The results of the other indirect tax revenue function reported in table 4.5.3 above indicates that only the constant was found to be insignificant. All the other variables including the dummy variables D_1 and D_2, which were meant to capture the 1992 general elections and liberalization of exchange rate market introduced in 1993, were found to be significant at 1% and 10%, respectively. This means that high inflation rate known to accompany elections, affected the real other indirect taxes negatively, possibly due to the high consumer price index of that period which was used to refine the revenue figures. The variable of interest, real exchange rate lagged once, affected the other indirect tax revenue negatively. This may have been due to a shift of consumption from imports towards domestic production, which escape taxation or are taxed at lower rate.

4.6 Hypothesis Testing

After the analysis of the tests and modeling results were done it became necessary to carry out a hypothesis testing:

$H0: \beta_i = 0$

$Hi: \beta_i \neq 0$

Where: β_1 = 1, 2..... are estimated parameters.

H0: states that all coefficients in the model are zero.

The results of the analysis for the direct tax function used to counter check the hypothesis were as shown in the table below.

Table: 4.5.4 Results of Modeled ΔLDT by OLS

Variable	Coeff.	t-value	Expected Coeff. Sign
Constant	-0.0111	-0.659	
LRY	0.408	2.410	Positive
LIR	0.1587	3.619	Positive
LIRER	-0.173	-1.339	Positive
LRDT_1	0.859	4.782	Positive
D1	-0.264	-4.464	Positive
D2	0.0401	1.377	Positive
ECM1_1	-1.2061	-7.280	Positive

From the table for the direct tax function above, it indicates that the signs of the coefficients of the GDP (Y) and dummy variable D2 emerged positive as was expected. This confirmed the proposition that tax revenue responds inversely to the depreciation of real exchange rate, although in this tax hurdle, it was found to be insignificant.

As for the custom duty, the results used to test the hypothesis were as follows.

Table 4.4.4 Results of Modeled ΔLCD by OLS

Variable	Coeff.	t-value	Expected Coeff. Signs
Constant	0.015084	0.357	
LRER_2	0.86343	3.395	Positive
LIPI	0.19809	0.706	Positive
LIR_2	-0.11104	-2.352	Positive
LRCD_1	0.28786	2.480	Positive
D1	-0.068040	-0.525	Positive
D2	0.042707	2.582	Positive
ECM4_1	-0.13169	-5.263	

From the table for the custom duty revenue function (ΔLCD) above it indicates that the sign of the coefficients of the RER is positive contrary to what was expected, import price indices and dummy variable D2 emerged positive as was expected. This confirmed the proposition that tax revenue responds inversely to the depreciation of real exchange rate. In this tax hurdle, the effect of RER was found to be significant.

The results of the ECM and OLS estimation for other indirect tax are reported in table 4.5.5 below.

Table 4.5.5 Results of modeled ΔLOIT by OLS

Variable	Coeff.	t-value	Expected Coeff. Sign
Constant	0.030775	0.427	Positive
LRY	1.3796	1.672	Positive
LIR_1	0.16731	2.114	Negative
LRER_1	-0.66767	-1.745	Negative
LROIT_1	-0.44369	-2.246	Positive
D1	-0.33712	-1.546	Positive
D2	0.130695	2.250	Positive

From the table for the other indirect tax revenue function (ΔLOIT) above it indicates that the signs of the coefficients of the GDP, and dummy variable D2 emerged positive as was expected. The real exchange rate (RER) sign emerged negative contrary to the expected sign, but this might have been caused by the shift of demand from imports to untaxed local production (see section 4.5), although in this tax hurdle, the effect of RER was found to be less important.

CHAPTER FIVE

5.0 SUMMARY AND POLICY IMPLICATIONS

5.1 SUMMARY

This paper has assessed the tax revenue performance before and after liberalization of exchange rate market in Kenya, covering the period 1972 to 2000. It started by measuring real exchange rate using the relaxed version of Edwards (1989) model. The related version does not impose purchasing power parity relation. The computed value of the real exchange rate was incorporated as one of the explanatory variables in the behavioral tax revenue functions. The investigation employed recently developed econometric techniques associated with cointegration of economic time series.

From the modeled tax revenue equations it can be seen that the results reported in table 4.5.1,4.5.2 and 4.5.3 in chapter 4 section 4.5 indicate that the explanatory power of the real direct tax revenue, import tax and other indirect models is 94%, 82% and 43% respectively. This implies that the factors identified in determination of the real tax revenue, customs duties and other indirect taxes, explained 92%, 81% and 56% respectively.

Real exchange rate was found to have an expansionary effect on real direct tax, and customs duties. On the other hand, the real exchange rate impact on the other indirect tax revenue was found to be negative. This was taken to have been due to a shift of consumption from imports towards domestic production, which escape taxation or are taxed at lower rate. The dummy variable D2 meant to capture the effect of introduction of the liberalized exchange rate regime was found to be only significant at 10% in all the revenue functions with a positive sign. This is also in agreement with the hypothesis that

liberalized exchange accelerated depreciation, which as it were, impacts positively on the tax revenue.

5.2 Policy Implications

Inadequacies of Kenyan exchange rate policies, has for some years been one of the stumbling blocks to the country's progress. Only recently has the long obstinate defense of fixing overvalued currencies been abandoned. On this premises the above results leads to conclusion that any policies that increase the real exchange rate (depreciate) may worsen or improve fiscal position. The net effect of the real exchange rate depend on whether the positive effects on the taxes is large enough to offset the inflationary effect on tax revenue due to collection lags (the Oliviera-Tanzi effects) also associated with the depreciation.

Another important aspect is whether the positive effect that the real exchange rate has on the direct tax and the custom duties out weigh any possible negative effect on the other indirect tax revenue as has been found in the study (see section 4.3). If the expansionary effect is larger than the contractionary effect, then real exchange rate depreciation would improve the fiscal position and the opposite of this will happen if the latter is larger than the former. This is because the depreciation of the shilling having inflationary effect sometimes raises the growth of total expenditure more than total revenue, hence perpetuating financial deficits. This implies that the floating exchange rate that eventually leads to volatile depreciation, significantly affects both the revenue and expenditure sides of the budget. Hence, a restrictive monetary policy may need to be implemented to complement the exchange rate policy adopted. It is therefore imperative

for the fiscal policy makers to consider the fiscal impact of the elasticities of the determinants of tax revenues, real exchange rate inclusive, while making important fiscal decisions. The positive and significant signs of the coefficients support the notion that reforms aimed at liberalizing exchange rate and increasing revenue are indeed compatible.

5.3 Limitation of the study

The current study has a number of limitations. First, the study relied on published data, which has several limitations, such as the method of collection and measurement errors. Moreover the effects of the exchange rate reforms on the productive base of the economy, which in turn influences government revenue and other macroeconomic variables, are not considered in the analysis. A more detailed modeling of the interactions between exchange rate, inflation and production is therefore necessary to come up with more definitive results.

5.4 Suggestion For Further Research

Further research in this area is still necessary, as there are many other emerging factors, which influence tax revenue and exchange rate, such as liberalization in goods market, economic integrations and the non-availability of foreign donor funds. Another area of contention remains as to why the other indirect taxes persistently respond different to the movement of the exchange rate compared to the other taxes. The opinion advanced in this paper that this could be a result of a shift of consumption from local production to imports, may not be resolute. Therefore further research is necessary to confirm this.

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7.0 APPENDICES

7.1 Appendix I: Raw Data (In Kenya Million Pounds)

YEAR	GDP (DEF.)	INF.(II)	NER	DT	OIT	CPI	GDP (Y)
1972	144.88	4.36	6.65	52.86	14.98	3.9	35894.56
1973	142.12	6.07	6.56	53.65	9.89	4.3	36589.36
1974	139.36	5.58	7.14	54.57	15.27	5.1	40792.60
1975	127.10	2.15	7.41	58.23	9.68	6	41971.60
1976	120.30	4.16	8.37	77.15	8.26	6.7	43818.40
1977	123.69	6.04	8.26	90.24	9.23	7.7	47380.60
1978	131.69	5.16	7.88	108.03	11.37	9	51009.20
1979	127.60	7.43	7.38	143.01	21.33	9.7	53520.20
1980	126.69	12.44	7.42	151.74	17.92	11.1	55656.80
1981	122.60	14.04	9.13	173.64	24.65	12.4	58980.60
1982	127.10	13.27	11.01	198.26	24.73	14.9	60985.00
1983	120.60	13.77	13.39	201.12	32.56	16.7	62837.40
1984	129.39	13.21	14.54	231.78	38.60	18.4	63057.20
1985	127.60	12.84	16.47	251.75	43.93	20.8	66289.60
1986	110.60	13.46	16.47	300.97	67.58	21.8	69963.80
1987	78.500	13.89	16.46	358.12	103.99	23.4	73362.80
1988	92.100	14.75	17.78	385.73	104.49	26	77139.40
1989	88.199	15.35	20.67	454.58	82.14	29.4	81062.00
1990	100.00	19.96	23.04	512.02	105.74	34	84472.60
1991	92.365	27.10	27.7	599.15	93.81	40.7	86230.00
1992	89.600	45.42	32.51	713.08	108.92	52.7	86644.40
1993	86.836	31.35	59.15	851.40	88.91	76.9	86855.80
1994	84.071	1.59	55.14	998.53	89.38	99.2	89491.60
1995	81.307	9.04	51.72	1838.37	66.90	100	93802.60
1996	78.542	11.27	57.22	2175.29	83.15	108.8	98151.80
1997	75.778	6.73	58.73	2404.12	79.62	121.9	100474.80
1998	73.014	3.56	60.21	2418.75	82.22	129.3	102270.00
1999	70.249	6.20	60.21	2778.98	79.00	133.8	105055.47
2000	67.485	6.21	76.54	2926.80	79.56	142	107569.59

SOURCE: Republic of Kenya Statistical Abstract (various issues), Nairobi, Government Printers and International Financial Statistics (IFS), Washington, IMF.

7.2 Appendix II Refined Data (Real)

YEAR	RER	RGDP	RDT	ROIT	RCD	IPI
1972	93.91	247.6	13.5538	3.84103	6.92051	13.65
1973	94.54	257.7	12.4767	2.3	9.24884	14.98
1974	91.86	293.5	10.7	2.99412	8.25686	15.03
1975	91.79	330.5	9.705	1.61333	8.19667	18.19
1976	96.1	365.2	11.5149	1.23284	7.88955	26.89
1977	92.4	382.1	11.7195	1.1987	13.5325	34.01
1978	92.79	386.4	12.0033	1.26333	11.2522	39.55
1979	83.5	418.1	14.7433	2.19897	10.5649	42.71
1980	85.39	438.2	13.6703	1.61441	13.1505	45.08
1981	88.94	479.5	14.0028	1.9879	14.8155	52.20
1982	94.17	480.2	13.306	1.65973	11.798	68.41
1983	96.97	519.3	12.0434	1.94988	10.9892	87.00
1984	99.53	488.8	12.5965	2.09766	8.97174	100.00
1985	103.05	517.9	12.1032	2.11212	10.1846	128.00
1986	107.98	630.3	13.8059	3.1	11.317	131.00
1987	103.69	733.6	15.3043	4.44402	11.6962	155.00
1988	108.01	838.5	14.8358	4.01885	11.5762	147.00
1989	104.61	921.2	15.4619	2.79388	11.8354	149.00
1990	100	1,069.3	15.0594	3.11	9.23529	164.00
1991	95.36	937.3	14.7211	2.30491	8.2231	198.00
1992	99.67	962.7	13.531	2.06679	4.85653	238.00
1993	100.84	998.3	11.0715	1.15614	5.97074	265.00
1994	99.31	1,065.4	10.0658	0.90096	7.45604	307.00
1995	103.73	1,158.1	18.3837	0.66896	9.29914	496.00
1996	95.18	1,242.4	19.9935	0.76425	9.73147	445.00
1997	98.61	1,322.0	19.722	0.65312	9.26746	513.00
1998	112.53	1,401.0	18.7065	0.63588	9.50002	560.00
1999	114.03	1,500.8	20.7696	0.59041	10.1422	598.00
2000	115.61	1,605.5	20.6113	0.5603	9.61493	614.00

Source: Computed from study data: Real Custom Duties (CD), Gross Domestic Product (GDP), Import Price Indices (IPI) and Consumer Price Indices (1990=100).