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**MONETARY POLICY AND THE MONETARY
APPROACH TO THE BALANCE OF PAYMENTS:
The case of Ethiopia (1967/68 – 1999/00)**

BY:
HAILE KIBRET



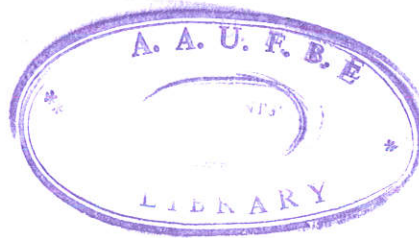
**A THESIS SUBMITTED TO THE SCHOOL OF GRADUATE STUDIES
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School of Graduate Studies

**MONETARY POLICY AND THE MONETARY APPROACH TO
THE BALANCE OF PAYMENTS: THE CASE OF ETHIOPIA
(1967/68 - 1999/00)**

BY
Haile Kibret



Approved by the Board of Examiners:

Gebrehiwot Ageba

Advisor

[Signature]

Signature

Geoffrey Mwan

Examiner

[Signature]

Signature

Haile Kibret

Examiner

[Signature]

Signature

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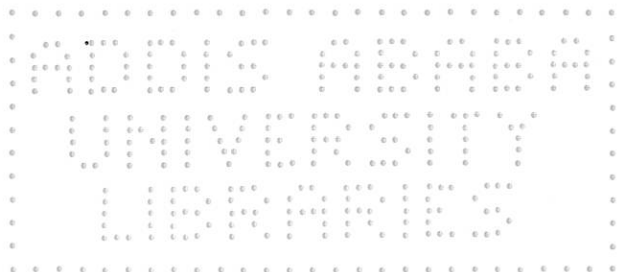


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Abstract

This paper empirically tests the reserve flow equation of the monetary approach to the balance of payments in the case of Ethiopia during the period 1967/68 to 1999/00 with quarterly dis-aggregated data. It examines whether disequilibrium in the money market played a role in determining balance of payments deficits. The study employed the Johansen Maximum likelihood vector error correction modeling technique. Reserve or balance of payments is assumed to depend on domestic credit, domestic price, real income, interest rate, money multiplier, and exchange rate variables. Both the vector autoregressive and the vector error correction mechanisms are estimated to determine the long run and short run relationships of the variables. The empirical result suggests that money played a significant role in explaining balance of payments. The key proposition of the model, which is a one-to – one offsetting relationship between reserves and domestic credit is not observed. Instead the result suggests that a one percent increase in credit implies a 1.3 percent decline in reserves. The policy implications is that given the assumptions of the model, balance of payments deficit can be improved through appropriate monetary and fiscal policies together with complementary and reinforcing policies that remove supply side rigidities in the Ethiopian economy.

CHAPTER ONE

INTRODUCTION

1.1 General Background

Inspection of the balance of payments statements of Ethiopia for the last three or four decades indicate that with the exception of very few years the current account balance has been in deficits. This chronic imbalance in the current account is stemmed from the country's low economic performance. There are a wide range of factors that are discussed among policy makers, which are believed to have contributed for such low economic performance and their consequent effects on the balance of payments. These factors include deterioration in the terms of trade, shortfall in the volume of export trade, persistent low commodity prices in the world market, sharp rise in the interest rate and acceleration in the inflation rate in industrialized countries, the oil shock, external debt burden, limited number of exportable items which are predominantly agricultural products, vulnerability of the economy to recurrent drought and civil conflicts. These problems can also be categorized as internal and external factors.

This external imbalance indicates that the country is in a serious macroeconomic problem. Governments in historical perspectives have been pursuing various policy measures in order to tackle this problem. Adopting exchange control regulations of administering and allocating of

foreign exchange, 'Franco valuta' import scheme, relying on inflow of foreign capital, import substitution and export promotion as well as similar other measures.

Apart from these measures, however, policy makers argue that this external imbalance is caused by internal imbalance, which in turn is caused by persistent budget deficit, and under competitiveness of the economy due to the overvaluation of the Birr which is the result of persistent fiscal deficit and domestic credit creation. This implies that inappropriate fiscal, monetary and exchange rate policies have contributed to the problem. For instance, in the realm of monetary policy, fixing interest rate far below foreign interest rate may cause capital out flow.

As of October 1992 the Transitional Government of Ethiopia adopted the Structural Adjustments Program (SAP). The key objectives of which were to restore macroeconomic stability and bring a foundation for sustained growth and development. The elements of the SAP were fiscal and monetary policy reforms and implementing structural changes in the macro economy.

1.2 Statement of the Problem

Like most developing countries Ethiopia has been in severe macroeconomic imbalance that can be indicated by widening budget deficits, large misalignments in the exchange rates (i.e. in the parallel and official rates), persistent external imbalance and the like. Ethiopia has been experiencing balance of payments disequilibrium for over three or more decades. According to the monetary model, this balance of payments problem is assumed to have posed a serious

macroeconomic disequilibrium and low economic performance. Despite the different policy measures pursued under the different socio-economic and political regimes, the current account remains to be imbalance with wide swings from equilibrium position.

Many studies have indicated that a range of both internal and external factors are believed to have contributed to this problem. The external factors include deterioration of the long run terms of trade, sharp increase in interest rate and accelerated inflation in developed countries, the oil shocks, and external debt burden. Excess domestic credit creation that is caused by fiscal imbalance (monetization of the deficit) inappropriate policies, vulnerability of the country to recurrent drought, civil conflicts and others are some of the most important internal factors mentioned in various studies.

According to monetarists, external imbalance or payments of dis-equilibrium is a monetary phenomenon. Their argument is dis-equilibrium in the money market is reflected in the balance of payments position. The monetary approach to the balance of payments model postulates that the external imbalance is essentially a monetary and not a real phenomenon (Johnson, 1976). Conversely, it is argued that due to the underdevelopment of the financial sector and existence of rigidities in the economy this model may not apply to developing countries (see Khan and Montiel, 1991)

Accordingly, both the academia and International Monetary Fund (the pioneer of the model) believe that the severe balance of payments problem is manifestation of expansionary monetary and fiscal policies. They argue that if equilibrium in the money market is

maintained via tight monetary and fiscal policies the balance of payments can be improved and the desired growth can be achieved. [IMF, 1997]. Monetary policy stance is therefore an integral part of the model in controlling excessive credit, creation specially lending to government [In view of this Ethiopia has been implementing SAP supported by the IMF and WB as of October 1992].

Finding the real causes of this sustained balance of payments deficit requires both theoretical and empirical investigations. Whether monetary factors are important in explaining balance of payments disequilibrium is therefore an empirical issue. There are very few studies in this area for Ethiopia, which are descriptive and failed to run empirical econometric analysis. [Elias, 1993, Teklebirhan, 1992]. Rigorous studies that prove or disprove the monetarist thesis in the case of Ethiopia which focuses on the behavior of changes in domestic credit and net foreign assets of the banking system are scanty or non existent. Few studies on the money demand function for Ethiopia have confirmed stability of the money demand function as well as studies on the determinants of money supply suggest the significance of the traditional approach of money supply, (Ergete, 1998, Martha, 1999, Alemayehu, 1995). However these studies too did not go into addressing balance of payments issues directly. Hence there exists a wide research gap in this area. It is therefore believed that studying the validity of the monetary model of BOP is a timely issue.

This paper tries to establish the relevance of the monetary approach to the balance of payments in the case of Ethiopia. The study will mainly be concerned with testing the significance of certain variables such as domestic credit creation, the money multiplier,

interest rates, the price level, exchange rate, net foreign assets and real income in explaining balance of payments within the monetary approach to the balance of payments. The effect of disequilibrium in the money market on the balance of payments will be examined. Moreover given the time series characteristics of the variables included in the reserve flow equation, co-integration of the variables will be tested using the Johansson procedure with the view of suggesting a framework to the formulation of Ethiopia's balance of payments situation.

1.3 Objectives of the Study

The main objective of this study is to test whether the monetary approach to the balance of payments is applicable to Ethiopia. To test the hypothesis that any disequilibrium in the balance of payments is a reflection of disequilibrium in the money markets. (Hallwood and Macdonald, 2000) In accordance with the statement of the problem presented in the foregoing section, this paper aims to apply the monetarist model of the monetary approach to the balance of payments to Ethiopia's experience. In other words the paper aims at testing the validity or relevance of the hypothesis that given the assumptions of the model in a fixed exchange rate regime, changes in the demand for money relative to its supply would imply opposite and equal changes in international reserves using multivariate co-integration and error correction modeling. The study will estimate the reserve flow equation and based on the results obtained from the estimation, policy implications will be drawn. Moreover the Granger causality tests are examined to verify if causation is unidirectional and from domestic credit to reserves that indicate whether the monetary model is appropriately explain balance of payments in the case of Ethiopia.

1.4 Significance of this Study

Persistent imbalance in the external sector indicates that an economy is in a serious macroeconomic problem. This in turn affects a nation's credit worthiness and hinders different forms of capital inflows such as foreign direct investment, grants and loans. Above all it is one of the main constraints to economic growth. Results of this study are presumed to inform policy makers in designing and implementing appropriate policy measures for the improvement of the balance of payments problems. For instance, whether control on domestic credit could improve balance of payments. This study will also contribute to the scanty literature on the monetarist model on Ethiopia and it is hoped that it may trigger future studies on this area in Ethiopia or elsewhere.

Finally, given the nature of the Ethiopian economy which is agriculture dominated with about 50 percent of GDP generated from the sector, and in which harvest is not evenly distributed over the year (about 95% of harvest is between September and January), quarterly disaggregating the data would increase the plausibility and validity of the result to be obtained from the study. Despite the fact that the expected result from this study may be influenced by the quality and reliability of the data, the model is known for its rich policy insight. Moreover, some of the variables are proxies like the Addis Ababa price index is taken for the national price index, interest rates were administratively controlled for a long time and so on.

The policy implications to be drawn from the empirical results are therefore highly essential.

1.5 Organization of the Study

The rest of this paper is presented in the following order. Chapter Two will present a macroeconomic overview of the Ethiopian economy that also focuses on the review of policies and developments in the financial sector as well as the balance of payments situations. Chapter three is all about literature review, which includes alternative theories of BOP, theoretical framework and survey of empirical studies of the monetary approach to BOP. Formulation of the monetary approach to BOP model, data sources and econometric procedures are treated in chapter four. Chapter five deals with the estimation of the model and reporting the empirical results. The paper finally provides concluding remarks and policy implications.

CHAPTER TWO

MACROECONOMIC OVERVIEW OF THE ETHIOPIAN ECONOMY

2.1 Overview of the Economy

Measured by per capita GDP, Human Development Index (HDI), health status as well as macroeconomic indicators, Ethiopia is categorized as one of the poorest countries in the world. For example, Ethiopia is ranked 169th in per capita income among 174 countries with \$120 in 1998.¹ Similarly, it ranked 171st in human development index from 174 countries in 1995². A recent World Bank study has also indicated that Ethiopia is one of the lowest in Sub-Saharan Africa in health status indicators.³ The level of poverty is also so intense that about 46 per cent of the population lives under a dollar a day. Furthermore various studies suggest that the distortion and poor performance of the economy is manifested in all the sectors of the economy.

Agriculture is still the mainstay of the economy accounting for about 50 per cent of GDP, 85 per cent of the labor force and 90 per cent of export earnings. The industrial sector on average contributes only 10 – 12 per cent of Gross Domestic Product. The service sector grew moderately but with large variations in the performance of the sub-sectors.

¹ World Development Report 1998/99

² Human Development Index, 1995

³ World Bank, Ethiopia Social Sector review, 1998.

However, economic theory tells that the share of agriculture should decline as an economy progressively deepens its transformation whilst the share of service and industry must increase.

Growth and transformation of the economy is hindered by both internal and external factors. These include: low level of saving stemming from low level of income, high population growth rate⁴, the economy's dependence on agriculture and frequent occurrence of drought and famine, sluggish export performance and deteriorating terms of trade, increasing interest rates and price hike in manufactured commodities in developed nations, rapid degradation and soil erosion, poor and inadequate infrastructure and unmonetised sector. Above all it is believed that institutional factors and inappropriate policies, especially in the Derg period have contributed for the country to remain in a throes of underdevelopment. Economic theory put greater emphasis on the role of institutions and policies for economic growth and development (see Rodrik: 2000).

Structure of Ethiopia's economy is characterized by moderate inflation (partly due to rigidities and non economic factors in the economy), about 85 percent of the population residing in rural areas, underdeveloped and rudimentary financial sector, overvalued exchange rate, and persistent current account and balance of payments deficits.

The performance of the economy can also be analyzed using macroeconomic indicators. Selected macroeconomic indicators of the economy for the period 1967/68 – 1999/00 are

⁴ High population growth rate is an outcome of high fertility and low mortality rates. A world Bank study also indicate that the average fertility rate for Ethiopian women is 7.7 children.

presented in table 2.1 below. The last eight years in each regime namely the Imperial era, the centrally planning regime and the current market-oriented system as well as period averages are presented for comparisons.

Table 2.1
Selected macroeconomic indicators between 1967/68 and 1999/00

Fiscal Year	Real GDP growth	GDP per capita growth	Estimated Population growth rate	GDP Real per capita Growth	Agriculture as % of GDP	Inflation Rate	GDS as % of GDP*	Debt to GDP ratio	Debt Servicing Ratio**
1967/68			1.8		23.0	-0.2	6.2	10.0	n.a
1968/69	3.7	3.7	2.6	1.1	39.4	-0.4	6.5	10.4	n.a
1969/70	4.0	1.3	2.5	1.4	40.3	7.2	8.3	10.4	n.a
1970/71	3.6	1.0	2.8	1.1	42.4	6.7	8.8	11.1	12.0
1971/72	4.1	1.6	2.4	1.3	48.9	-5.2	5.0	12.0	10.9
1972/73	4.5	1.6	1.2	1.3	47.1	0.9	5.4	11.7	8.2
1973/74	2.5	0.1	2.3	2.1	45.6	10.4	4.1	11.7	6.0
1974/75	1.4	0.2	2.6	1.3	44.2	4.7	1.7	13.9	7.9
Average	3.4	1.4	2.3	1.4	41.3	3.1	5.8	11.4	9.0
1983/84	-6.3	-8.2	2.0	-8.3	53.3	-0.2	6.1	31.7	16.2
1984/85	-9.7	-11.5	3.6	-13.4	46.7	18.4	6.7	33.8	16.1
1985/86	9.9	6.0	3.7	6.1	49.3	4.6	10.2	36.1	23.6
1986/87	14.1	10.0	3.2	10.9	51.3	-9.6	3.8	37.4	20.8
1987/88	0.0	-3.1	-3.3	3.3	49.9	2.2	10.7	41.3	22.0
1988/89	0.4	3.8	2.9	-2.6	50.3	9.6	10.0	41.2	39.2
1989/90	4.1	1.1	3.1	1.0	50.9	5.2	17.0	43.1	58.9
1990/91	-4.3	-7.2	3.2	-7.6	55.9	20.9	12.2	39.1	69.9
Average	1.0	-1.1	2.3	-1.3	51.0	6.4	9.6	38.0	33.3
1992/93	12.0	8.4	3.2	8.8	53.5	6.4	5.3	70.4	53.0
1993/94	1.7	-1.5	3.1	-1.4	50.7	10.0	13.3	90.6	58.9
1994/95	5.4	2.2	3.2	2.2	49.7	1.2	11.3	81.8	36.7
1995/96	10.6	7.2	-0.4	11.0	51.5	13.4	18.0	71.4	34.5
1996/97	5.2	5.6	3.1	2.1	50.7	0.9	18.0	63.4	40.5
1997/98	-0.5	-3.5	3.0	-3.6	45.4	-0.2	27.0	61.2	19.2
1998/99	6.3	3.2	3.1	3.2	44.4	2.5	26.7	64.1	22.9
1999/00	6.4	3.2	3.0	3.4	42.6	0.9	-7.0	na	Na
Average	3.1	0.1	2.7	0.5	47.8	3.6	14.1	71.8	37.9

Source: Ministry of Economic Development and Cooperation, IFS, NBE, and own computations

* GDS stands for Gross Domestic Saving

** Debt servicing ratio is computed as the ratio of gross external debt to the sum of total merchandise exports and gross service exported

During the last eight years of the Imperial era, average real GDP growth rate was 3.4 percent.

This shows that the economy had performed fairly well compared to 1.0 per cent average growth rate recorded during the Derg regime. The figure for the current regime is 3.1 percent which indicates that the economy is performing well as in the pre- Derg period. Real per

capita GDP growth⁵ that takes into account the population growth rate indicates a 1.4 per cent growth in the Imperial period but a negative 1.3 per cent for the period between 1983/84 and 1990/91. In the current regime however, the figure shows a positive trend with 0.5 per cent average growth rate. The contribution of agriculture to the total GDP on average grew from 41.3 percent during the Imperial period to 51.0 percent between 1983/84 – 1990/91 that indicates slow down in transformation of the economy. The decline of this share to 47.8 percent witnesses a slight improvement in the performance of the economy in the present market oriented regime.

Average inflation rate as measured by the Addis Ababa consumer price index between 1967/68 and 1974/75 was 3.1 per cent per annum. This low level of price is resulted from a moderately growing economic performance. The increase in money supply was partly backed by growth in real sector. Coupled with rigidities in the economy, the price level was turned out to be very low. In the centrally planning period however, the inflation rate was in upsurge due to inefficiencies and slow down in production, (especially the manufacturing sector) and required subsidies to these inefficient enterprises. The long-standing civil war has also contributed to the problem. The combined effects of these resulted in budgetary deficit that in turn led to printing of money or adoption of expansionary monetary policy.

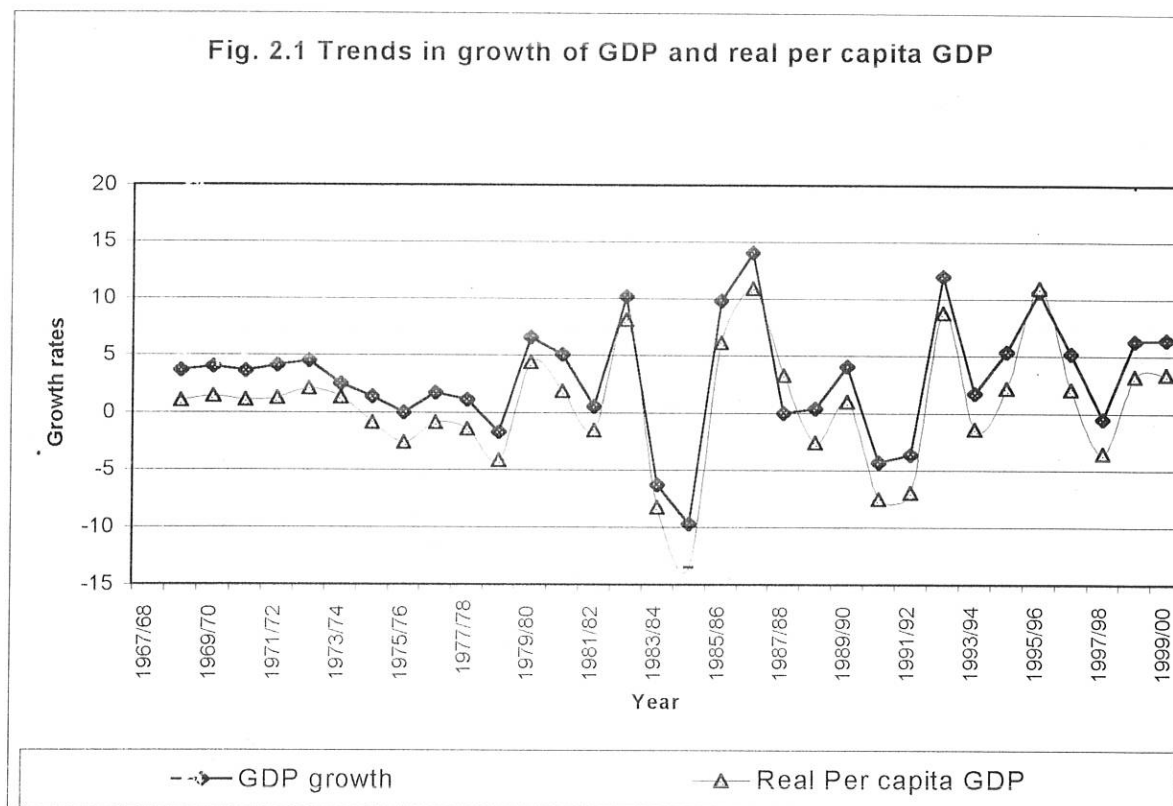
Despite these expansionary fiscal and monetary policies, the inflation rate did not go up due to protracted wages and direct price controls. Consequently, the average inflation rate between 1974/75 and 1991/92 was only 9.8 percent, but there were drastic up and downs with the

⁵ Real per capita GDP is computed as the difference of growth rates in real GDP and estimated population.

highest inflation rate recorded was 21 percent in 1991/92 and the lowest negative 9.6 per cent recorded in 1986/87.

When the Ethiopian Revolutionary Democratic Front (EPRDF) took power in May 1991, the economy was in a devastating state and a worse economic condition. The Transitional Government therefore launched a new economic policy that averts the worst economic situation. As a result the Structural Adjustment Program (SAP) was launched in October 1992. Accordingly a series of reform measures and policy changes have been made. Marked devaluation of the Birr by 58.6 percent in dollar terms, freeing wage ceiling, deregulating prices of major commodities, upward adjustment of the interest rates and rehabilitation of the war torn economy were the major policy changes adopted from the beginning of the reform.

When the Structural Adjustment Program was launched, supported by the IMF and World Bank, it was feared that the price level would be pushed upwards to the tune of 24.2 percent (PFP p.30). Nevertheless, due to rigidities in the economy and removal of non-economic factors that contribute to high prices, the inflation rate successively declined in the following years.



In 1995/96 however there was a pick up in the price level and hence the inflation rate was pushed to 13.4 percent mainly due to an overwhelming coffee boom enticed by shoot-ups in price of coffee in the world market. The price level was pushed up during this period due to the increase in money supply which in turn was enticed by increase in inflows.

Both theoretical and empirical studies underscored the issue of price and conclude that Ethiopia is historically a low inflation country. [Yohannes 2000]

Trends in annual growth rates of real GDP and real per capita GDP for the last three decades is depicted in figure 2.1. It is evident from the figure that drastic ups and downs are observed in real and per capita GDP since the 1984 drought. This macroeconomic imbalance seems to be stabilized and get back in track as it was in the pre 1974 period in recent years. The period

between 1983/84 and 1991/92 was characterized by a dismal economic scene as indicated by unprecedented movements in the growth rates of real GDP. Ethiopia faced serious economic problems from mid 1970's and the entire 1980's (Asmerom: 1997)

Gross domestic saving as a per cent of GDP has been steadily growing over the years. The average growth rate for the last eight years of the Imperial, Derg and present regime respectively were 5.8, 9.8 and 14.1 per cent. Despite such steady increases, however, it is still below the required level for sustainable economic growth. A study by Berhanu and Seid (1999) for example suggest that, Ethiopia requires a 16 per cent saving rate to register a 10 percent growth in GDP to catch up with the average low-income countries level of economic development in 17 years.

Currently, Ethiopia is in a severe external debt crisis. (Ministry of Finance, 1999). The stock of external public debt was Birr766.9 million at the eve of the 1974 revolution. It grew by seven fold over the 17 years Derg period from Birr943.1 million in 1975/76 to Birr6551.4 million in 1991/92. The main factor that has contributed to such accumulated external debt is mentioned in many studies to be inflows from eastern block in the form of military equipment and armaments for the intensified civil war in the country. According to a recent report from the Ministry of Finance, a significant portion of this accumulated debt denominated in Rubles was taken from the former Soviet Unions and negotiation is underway in this regard. Ethiopia's external debt grew from 8.8 billion USD in 1992 to 9.7 billion U.S. dollar in June 1998. Of the total outstanding balance reported on June 30, 1998, 5.3 billion or about 55 percent is an arrears on principals and interest. In the following sections we shall briefly look

into the monetary and fiscal policies, exchange rate policy, financial sector developments, and trends in balance of payments.

2.2. Monetary and Fiscal Development

Monetary policy is the exercise of central banks or monetary authorities of controlling money supply as an instrument of achieving the objectives of full employment, price stability, balance of payments equilibrium and economic growth. Fiscal policy on the other hand deals about government revenue and expenditure, whose primary objective is reducing fiscal deficits. Monetary and fiscal policies are complimentary and reinforcing and hence sometimes it is difficult to put a watershed between them. The effectiveness of these policies depend on the degree to which the above objectives are fulfilled. Table 2.2 presents average growth rates in selected macro variables, which may broadly indicate developments in monetary and fiscal policies during the period under study.

Table 2.2
Average Growth Rates in Monetary and Fiscal policy indicators

Period	Nominal GDP growth	Deficit as % of GDP	Broad money supply	Nominal interest rate	Inflation rate	Official exchange rate	Parallel rate
1967/68 - 1970/71	6.9	0.9	8.0	5.3	3.3	2.5	2.5
1971/72 - 1975/76	4.4	1.7	18.1	6.0	6.0	2.2	3.1
1976/77 - 1980/81	9.0	4.4	10.9	6.0	13.6	2.07	3.6
1981/82 - 1985/86	6.5	7.7	13.2	6.0	6.7	2.07	3.8
1986/87 - 1990/91	7.2	9.1	12.6	6.0	5.7	2.07	5.7
1991/92 - 1995/96	14.9	12.1	14.0	7.7	9.3	5.2	6.9
1996/97 - 1999/00	10.0	6.8	9.8	7.6	0.1	7.3	7.81

Source: MEDaC, MOF and NBE

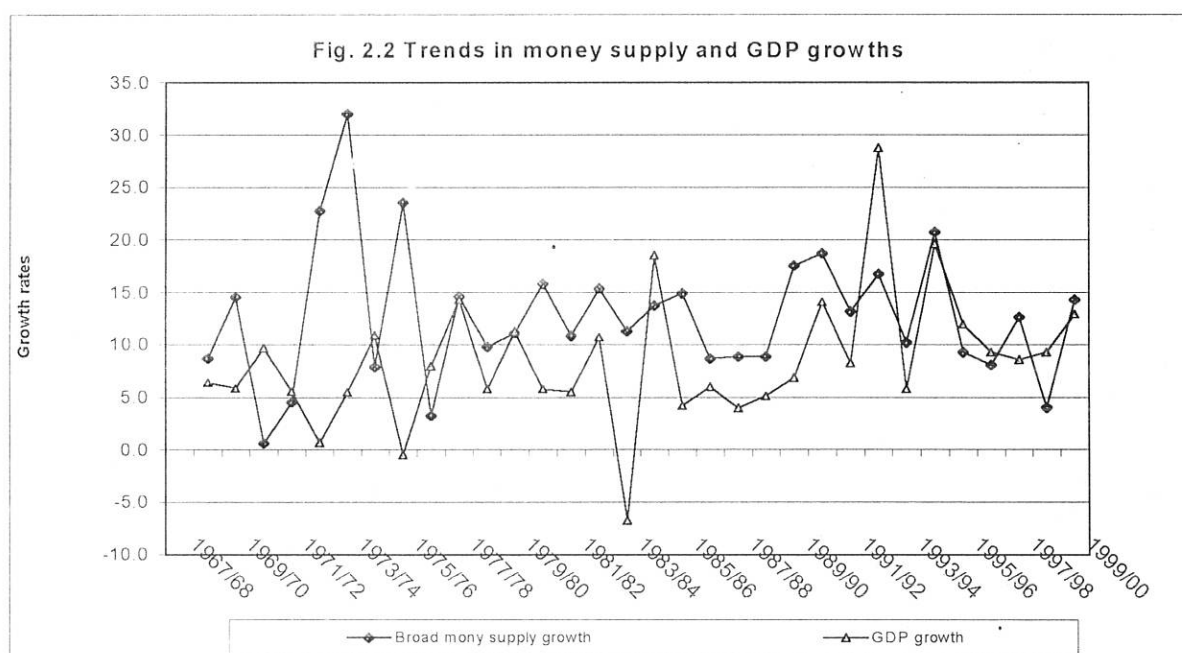
During the Imperial era contractionary and cautious fiscal as well as monetary policies were adopted. Fiscal deficit to GDP ratio was very low with average ratio of 1.3 percent between 1967/68 and 1975/76. A moderately low average inflation rate of less than 5 percent confirms that the money supply growth was not inflationary during this period. Moreover a positive real interest rate was maintained. Consequently, the economy has been moderately growing. (Eshetu and Makonnen: 1993)

Expansionary fiscal and monetary policies were adopted in the Derg period. Government budget deficit as a ratio of GDP was steadily increasing and reached a peak of 14.4 percent in 1989/90. This wide budgetary deficit resulted from both the revenue and expenditure side pressures. Apart from narrow tax base, in the revenue side the tax rate was very high that induced tax evasion. Furthermore, the residual surplus collected from public manufacturing enterprises was very low due to their mismanagement and inefficiencies. In the expenditure side, subsidies to these inefficient enterprises, increasing military expenditure as well as the bureaucracy have contributed to the rise in expenditure.

One of the sources of financing this deficit is external inflow. Nevertheless, due to the government's anti imperialist ideology inflows from the rich western world was not significant. Thus the government was forced to use domestic financing sources, mainly massive domestic credit from the banking system (monetization of the deficit). This in turn caused the money supply to grow faster than the GDP growth rate and hence caused the general price level to rise. Nevertheless, due to freeze in wages ceilings and direct price controls, rigidities in the economy and other non-economic factors, the inflation rate did not

go up as expected. The inflation rate reached a peak of 21 percent in 1991/92. Despite less prudent fiscal and monetary policies, inflation was contained to be low but it is argued to be at the expense of recession. Real interest rate was very low and it was also negative for many years in this period.

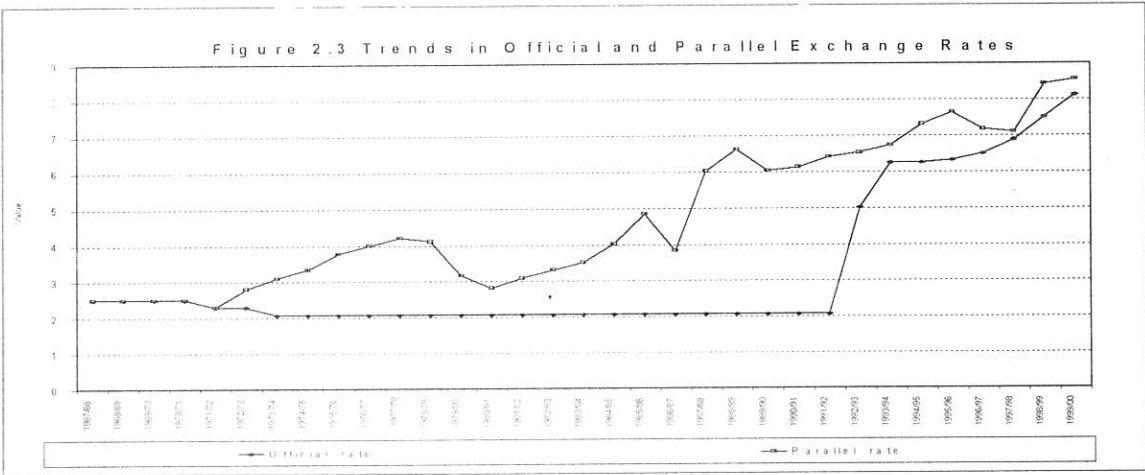
In post reform period however, increased government savings and reduced budgetary deficit were achieved (Berhanu and Seid, 1999). This was a result of the fiscal reform and use of different sources of non-inflationary financing. The re-introduction of the Treasury Bills auction in 1995, inflow of external financing in the form of official assistance, grants, loans and other transfers as well as the cut in military expenditure are the major factors that contributed to the stability and fiscal squeeze. Since the money supply growth was targeted to be consistent with the growth rate in income, inflation is contained to be lower single digit. Positive real interest rate has also been maintained so as to encourage savings and ultimately a considerable growth in financial savings has been recorded in this period.



Growth rates of nominal GDP and money supply are depicted in figure 2.2. It is exhibited in the figure that growth in money supply and nominal GDP are consistent over the past three decades with the exception of three major episodes. First, the slow down in production due to the 1974 drought and the subsequent revolutionary (due to the uncertainties and change of ownership in productive forces) movements, gave rise to unmatched and opposite growth in money supply and GDP. Second, the 1984 drought that hit the agricultural sector severely as reflected in sharp decline in the GDP growth rate by about 10 percent. Third, the 1994 boom in agriculture resulted from favorable weather condition.

2.3 Exchange Rate Policy

The nominal exchange rate of the Ethiopian currency (Birr) was not only pegged to the U.S. dollar but also has been administratively fixed at 2.07 per a US dollar for over three decades



except for devaluation of the dollar in the early 1970's. One of the disadvantages of fixed exchange rate regime is the fact that the exchange rate is not periodically adjusted to the

fundamentals of the economy. Like many developing countries, Ethiopia's exports are not diversified and they are predominantly agricultural products whose price in the international market is declining against persistently rising prices of imports.

The country therefore faces deteriorating term of trade⁶ and overvaluation of the domestic currency or under competitiveness of the economy. This implies exports are unnecessarily dearer while imports are very cheap. In other words exports are over taxed and imports are subsidized which in turn discourages domestic production. Coupled with restrictive trade policies this causes for the development of illegal border trade and parallel foreign exchange market. Ultimately, this results in external disequilibrium and balance of payments deficit.

As it is depicted in figure 2.3, during the Imperial period both the official nominal exchange rate and the parallel exchange rate were the same, which means that there was no parallel market. There is a consensus that the parallel rate was emerged towards the beginning of 1970's. William Nauede and Abu Girma as refereed by Derese Degefa (1996) pointed out that foreign exchange rationing impact and capital controls gave rise to an active illegal parallel foreign exchange market in Ethiopia. As to the time when the market is emerged

⁶ Terms -of -Trade is defined as the ratio of commodity price of exports to imports. Secular declining terms of trade is not peculiar to Ethiopia. Declining TOT for LDCs is refereed to as Prebisch and Singer hypothesis. The underlying essence of this hypothesis identifies four major factors that cause the decline in TOT in LDCs. These are: difference in income elasticity of demand for exports of primary products of LDCs and manufactured goods of DCs., unequal market power in product and factor markets, technological changes that reduces the demand for primary products for example use of synthetic products and multinational corporations intra firm trade and repatriation of profits. (Field, 1998).

Befekadu Degiffe (1994) suggested that there are strong reasons for it to be in pre revolution period.

The misalignment between the parallel and official exchange rates widened in the centrally planning period due to fixing of the exchange rate for a long time and adoption of expansionary monetary and fiscal policies that resulted in overvaluation of the birr. Wide misalignments between the official and parallel exchange rates indicate overvaluation of the currency. Despite the risks involved, a parallel foreign exchange market is argued to be nearer and reflect the market value of the currency (Haile 1993) A study by Alem (1994) estimated the overvaluation of the Birr during this period to be 70 percent. Trends of both the official and parallel exchange rates are depicted in figure 2.3. It is vividly shown in the figure that the whole seventeen years of the Derg period is characterized by wide misalignments in the two rates.

Since the launchement of the Structural Adjustment Program, towards the end of 1992, a series of reform measures and policy changes have been made. In the beginning of the program, the Birr was devalued significantly (58.6 percent in dollar terms) and subsequently a retail foreign exchange auction system was introduced as of May 1993. Starting August 1998 the retail auction system was replaced by a whole sale one in which only commercial banks and investors with a minimum foreign exchange demand of 500,000 USD are allowed. The opening of foreign exchange bureaus within commercial banks and series of current account liberalization measures taken were the major policy changes made. Thus a managed floating (dirty floating) type of exchange rate system is in implementation now. Consequently, the

widen misalignment that prevailed is wiped out significantly but not eliminated albeit there was a pick up in the premium in 1997/98 due the fall in the inflows and the Ethio-Eretria conflict. The exchange rate adjustment or devaluation policy adopted was able to produce the desired results and the supply of coffee; the major export item in the country has increased [Asmerom 1997]. In fact the increase in coffee export was due to a number of other factors. These include; favorable world prices and other policy reforms.

2.4. Financial Sector Development

An efficient and developed financial sector is critical for economic development. Banks play pivotal role in making available loan able funds, facilitating both domestic and international trade, easing the payment system, and employment generations. Similarly, insurance facilities are critical in sharing different forms of risks. Development of capital market for example, is argued that it widens the base of financial system and induces use of indirect instruments of monetary policy (Gebrehiwot, 2000).

The financial sector development in Ethiopia like in many other developing countries is shallow and rudimentary. Moreover, the sector was repressed during the 17 years of the Derg period. The structure of financial system in Ethiopia includes formal and informal institutions. The formal institutions currently consist of the central bank (National Bank of Ethiopia), nine commercial banks, one specialized bank, nine insurance companies, seventeen micro-financing institutions and over six hundred saving and credit unions. The traditional informal institutions on the other hand include traditional informal money markets like *Equib*, *Iddir*, *Mahber*, and *moneylenders*.

In pre 1974 period financial services were limited to cities and major towns. Addis Ababa alone for example accounted for 64 percent of bank branches. There were significant number of private and foreign undertakings in both banking and insurance services.

After nationalization of private banks and insurance undertakings in 1975, the sector gone through a one-tier mono-banking system. Like it was the case for other sectors, the financial sector was guided by the central plan. The National Bank of Ethiopia has been playing passive role of controlling the finance industry and it was an administrative arm of the central plan. The financial sector was highly controlled and repressed during this period. The financial institutions did not have management autonomy in terms of recruiting labor, appointing managers, approving loans above a certain limit and the like. Interest rates were administratively fixed for a long time. Moreover preferential lending and deposit rates were also set for different sectors. Credit was rationed based on priorities that favors of public enterprises and cooperatives.

A new monetary and banking law was enacted in 1994. According to this proclamation private participation in the sector was allowed for Ethiopian nationals and to-date six private banks, eight insurance companies and over sixteen micro financing institutions are granted business license and are now in operation. Interest rates were adjusted periodically to maintain it to be positive in real terms so as to induce mobilization of savings.

Despite these measures, the financial sector in Ethiopia remained underdeveloped that there is a very thin money market represented by a biweekly T-bills auction. Capital and stock exchange (equity) markets are not yet established. The inter-bank money market is still not operational. Interest rates are not fully market determined, the banking services are limited in range and concentrated in cities and major towns. Moreover, a government owned commercial bank dominates the sector. At the end of 1998/99 for example this Bank accounted for 80.0, 67.2 and 58.8 percent of assets, deposit liabilities and loans disbursement of the banking system, respectively. Thus Ethiopia is under banked even by Sub-Saharan African standards as measured by population to bank branch ratio. Nonetheless, monetary deepening measured by broad money to GDP ratio is 30 per cent compared to 20 per cent for African countries average and 40 per cent for non African developing countries.[Adam 1999]

2.5. Balance of Payments Development

2.5.1 Definition

Balance of payments is a statistical information or summary of transactions of a country vis-a-vis the rest of the world for a given time period, usually a year. There is no unique format for the presentation of balance of payments statements, although the International Monetary Fund provides a standard guideline manual for compilation of balance of payments for its member countries. The criterion of compiling balance of payments statistics involves dealings between a resident of the reporting country and residents in the rest of the world. The underlying criterion of classification and aggregation of BOP statistics is the center of economic interests of economic agents.

Traditionally, the balance of payments statement is broadly divided into current and capital accounts in view of their nature. The former refers to flow of income while the latter records changes in assets and liabilities. For analytical purposes the BOP can also be divided into four sub accounts. These are the trade balance, current account balance, capital account balance and official settlement balance.

Balance of payments is one of the most important macro economic indicators of an open economy. It shows the position of a particular economy with regard to its transactions with the rest of the world. Different policies may be geared depending on the position of balance of payments problems.

2.5.2 Trends in Ethiopia's Balance of Payments Statistics

Based on the theoretical discussion above, we shall see trends of Ethiopia's BOP position in the period 1967/68 – 1999/00. Table 2.5(a) presents summary of major sub accounts in the balance of payments table for the last few years of the Imperial period. As discussed earlier, economic performance in this period was moderately growing and thus the balance of payments situation was comfortable (see Eshetu and Mekonnen, 1993). A positive trade and current account balances in 1972/73 and 1973/74 affirms this situation. Moreover, the magnitude of the deficits in the current account and overall balance of payments were very low. In most of the years in this period the overall balance was positive owing to increasing inflows in non-monetary capital and official transfers. The average deficits/surplus in the

overall balance in this period was only 1.3 per cent of GDP. In general, the balance of payments position during the Imperial era was favorable.

Table 2.5(a)
Balance of Payments Statements of Ethiopia (1967/68 – 1974/75)
In millions of Birr.

Year	Trade Balance	Invisible (net)	Private transfers	Current account	Public Transfers	Capital Account	Errors and Omissions	Overall Balance
1967/68*	-157.5	50.1	-6.0	-113.2	35.4	75.3	10.3	-7.8
1968/69*	-86.7	37.0	-7.5	-57.2	35.4	31.7	1.2	-11.1
1969/70*	-121.8	22.9	-6.6	-105.5	26.6	45.0	8.4	42.3
1970/71	-140.4	25.3	-11.5	-126.6	28.4	72.5	-21.1	-46.8
1971/72	-140.3	26.2	3.2	-114.9	29.7	76.3	26.3	17.4
1972/73	16.9	33.0	16.6	66.5	28.8	63.4	34.7	193.4
1973/74	76.0	65.9	34.3	176.2	48.5	65.7	-27.3	263.1
1974/75	-195.2	13.3	31.0	-151.0	61.5	160.1	-56.8	13.8

Source: National Bank of Ethiopia Annual Reports, various issues

** The data are according to Gregorian calendar*

During the entire Derg period the current account was in deficit, The deficit grew from 0.1 percent of GDP in 1975/76 to 6.3 percent in 1990/91. The maximum was 14.4% of GDP in 1990/91 and the minimum was 3.4% in 1977/78. This chronic current account problem was mainly believed to have been attributed to persistently widening deficits in trade balance. The trade balance deficits widened from 2.1 percent of GDP in 1975/76 to 8.0 percent in 1990/91, with average deficit over the entire period of 6.9 percent of GDP. Except in 1990/91, the net service account balance was positive and contributed to narrow the current account deficits. Similarly, private transfers have been contributing to narrowing the current account deficits over the entire period. Its contribution was significant, especially after 1983/84 due to policy measures taken to allow Franco Valuta imports (See council of Ministers Reg. No. 3, 1989) as one of the remedies for the acute foreign exchange shortages during the period.

Consequently, the overall balance of payments was positive only in fiscal years 1975/76, 1976/77, 1981/82, 1984/85 and 1985/86. Positive BOP positions were obtained in 1975/76 and 1976/77 due to significant unilateral inflows accounting 60% and 57% of total inflows in the two years, respectively. Similarly, the surplus in 1981/82 was obtained due to significant capital inflows. The favorable balance obtained in 1984/85 and 1985/86 was also mainly due to drastic increase in inflows in both private and public unilateral transfers in response to the 1984/85 catastrophic drought.

Table 2.5(b)
Balance of Payments Statements of Ethiopia (1975/76 – 1991/92)
In millions of Birr

Year	Trade Balance	Invisible (net)	Private transfers	Current account	Public Transfers	Capital Account	Errors and Omissions	Overall Balance
1975/76	-140.3	89.6	42.9	-6.8	60.8	71.2	-45.0	80.2
1976/77	-101.4	42.7	34.2	-23.4	88.1	112.1	-127.7	48.1
1977/78	-127.1	41.0	30.7	-55.4	110.1	48.1	-363.3	-260.5
1978/79	-475.2	42.2	48.2	-334.8	123.5	111.8	54.3	-95.1
1979/80	-517.6	55.1	41.3	-421.2	124.0	169.5	44.1	-83.6
1980/81	-552.7	70.3	51.2	-411.2	123.9	322.0	-158.3	123.6
1981/82	-853.5	60.2	33.6	-709.7	139.8	679.4	-22.8	125.3
1982/83	-943.4	85.9	175.8	-681.7	191.4	401.7	-59.4	-148.0
1983/84	-1137.4	112.0	222.0	-803.4	335.2	395.8	-15.2	-87.6
1984/85	-1026.5	103.1	403.7	-520.0	617.6	423.7	-425.5	95.8
1985/86	-1277.4	107.8	353.9	-815.8	607.1	547.5	11.5	350.3
1986/87	-1442.0	121.3	336.4	-984.3	438.6	395.4	106.7	-43.6
1987/88	-1501.1	90.6	245.3	-1165.2	388.7	549.7	-198.6	-383.3
1988/89	-1205.0	66.9	389.1	-749.0	433.0	425.2	-132.2	-23.0
1989/90	-1067.3	89.2	354.6	-623.5	335.4	237.6	-498.7	-549.2
1990/91	-1538.2	-62.0	413.9	-1206.3	604.3	330.2	140.6	-131.2

Source: National Bank of Ethiopia

In post reform period the trade balance deficit continued to grow rising from 9.9 percent of GDP in 1992/93 to 14.7 percent at the close of 1999/00. Although significant and steady growths in net services and private transfers have been recorded, each respectively grew from 0.1 and 4.0 percent of GDP in 1992/93 to 0.7 and 6.1 per cent in 1999/00, the current account

balance remained to be in persistent deficits. The deficit, which was 6.2 percent of GDP in 1992/93, grew to 9.2 percent in 1999/00. (See Table 2.5(c))

Table 2.5 (c)
Balance of Payments Statements of Ethiopia (1975/76 – 1991/92)
In millions of Birr

Year	Trade Balance	Invisible (net)	Private transfers	Current account	Public Transfers	Capital Account	Errors and Omissions	Overall Balance
1992/93	-2668.8	-36.0	1057.9	-1646.9	1708.7	-45.4	-515.6	-499.2
1993/94	-3321.1	173.2	1434.3	-1713.6	1447.7	1233.2	635.6	1602.9
1994/95	-3711.2	333.0	1944.9	-1431.3	2560.2	186.6	-275.2	1038.3
1995/96	-6255.5	415.0	1980.0	-3860.5	2474.2	-30.1	1141.2	-275.2
1996/97	-3562.2	718.7	1671.6	-1171.9	1453.0	-785.3	-881.6	-1385.8
1997/98	-4226.7	699.3	2186.5	-1341.0	1793.0	751.2	-1357.9	-154.7
1998/99	-8066.9	612.2	2172.1	-5282.7	1598.9	1725.8	1213.5	-744.6
1999/00	-8156.6	399.9	3341.6	-5117.4	2368.3	1233.6	-1463.6	-2977.0

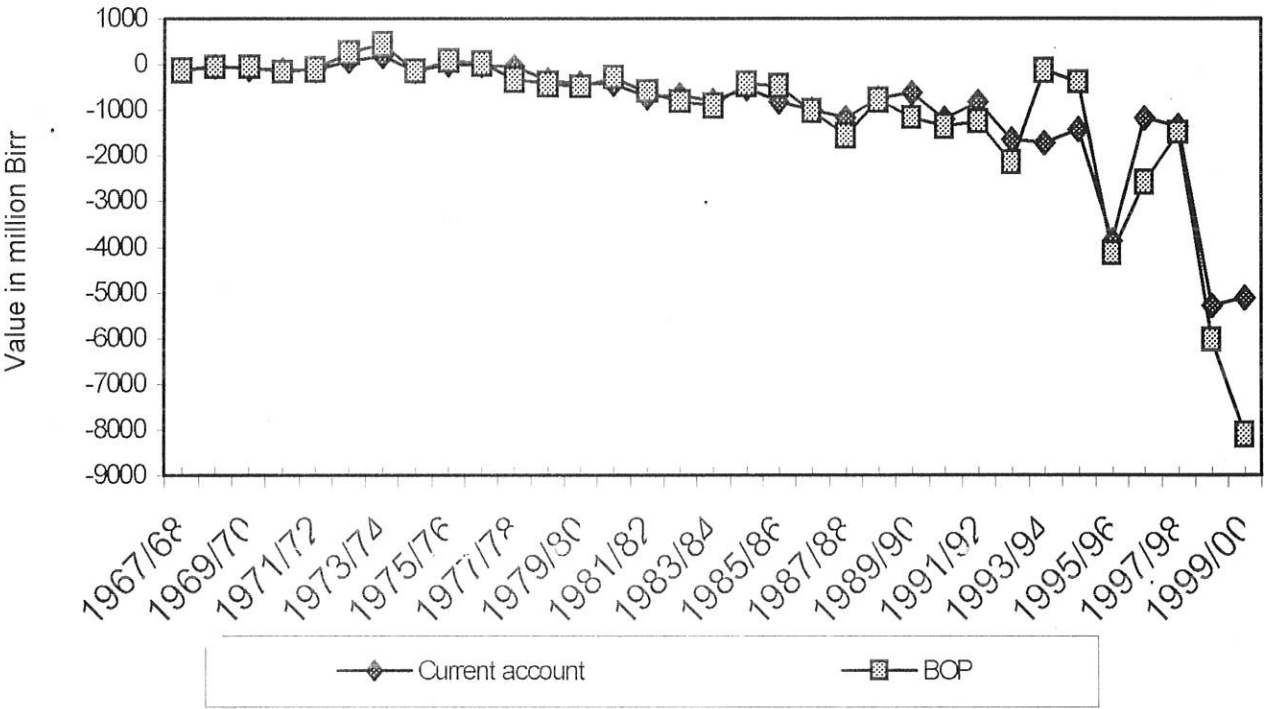
Source: National Bank of Ethiopia

Following the embankment of the SAP and the comprehensive economic reform program, a significant amount of inflows in public transfers (on average 14.2% of GDP) was observed during this period, with a peak of 20.2 percent of GDP in 1994/95. Nonetheless, the overall balance remained to be in a wider deficit. Except in fiscal years 1994/95 and 1995/96 in which a positive balance of payments was recorded due to drastic inflows in services and private transfers as well as favorable world coffee price, the balance in the rest of the years were in deficits.

2.5.3 Implication of Persistent BOP Deficits

As it is described in the foregoing discussion, the current account balance has been in deficits. Thus the balance of payments position was in deficits except in some years where there was exceptionally high inflows in invisible and unilateral transfers in response to the recurrent droughts as well as significant capital inflows especially in post reform period from bi-lateral, multilateral institutions. The trade and current account balances are important variables to explain and find out the causes of external sector deficits. The trade balance was increasingly being in deficit over the years mainly due to stagnant or declining exports as against increasing imports in both volume and value terms. Trends in the current account and BOP are depicted in figure 2.4..

Figure. 2.4
Trends in current account and BOP



It is clearly indicated in the figure that Ethiopia's external sector disequilibrium is steadily widening that requires policy intervention. How can this situation be averted is one of the areas that should be given emphases by policy makers. Moreover, the country's high stock of external debt made the policy makers to have a serious concern on the balance of payments problem. It is worthwhile therefore to mitigate the potential causes of the current account deficits. Economic theory suggests that if the cause is that of widening government budgetary deficits, tight fiscal policies that reduces spending or raising taxes would solve the problem. A tight monetary policy is also recommended to reduce the deficits if the cause of the problem is consumer boom or low saving due to expanded consumption. And if the deficit is due to expansion in investment expenditure then expected future exports may reduce the deficits and hence no policy intervention may be opted at the moment.

The monetary approach to the balance of payments model or its application the Financial Programming Model posts the hypothesis that disequilibrium in the balance of payments is a reflection of the dis-equilibrium in the money markets. Widening government budgetary deficits or expansionary monetary policy leads to imbalance in the supply and demand for money, which in turn causes the external sector to be in imbalance. The thesis of this study is therefore to undertake an empirical investigation to test this hypothesis.

CHAPTER THREE

LITERATURE SURVEY

3.1 Theoretical Literature

Balance of payments may be defined in a number of ways. Bilson (1984) defined it narrowly as changes in the international reserve of a central bank or broadly as the change in net foreign assets of the economy as a whole. This study applies the wider definition. The balance of payments is one of the key macroeconomic areas that has been widely studied and alternative theories are developed about it. It caught the attention of researchers and policy makers because balance of payments problem is one of the main factors that impede economic growth. The balance of payments constrained growth model for example argues that the main constraint on economic growth is the balance of payments position (Hussain 1999) Balance of payments which may be caused by both internal and external factors necessitates the development of different alternative approaches. These include the elasticity approach, the absorption approach, the monetary approach and the eclectic approach. (Umo and Fakiyes; 1995) There is vast literature regarding these alternative approaches in their historical perspectives. Moreover, the theoretical premises, empirical evidence and policy implications of each approach are widely discussed in the literature.

The elasticity and absorption approaches were designed to tackle the question of whether devaluation or depreciation of the exchange rate would lead to current account improvement.

Both approaches picked current account as macroeconomic variable of international trade and try to see if devaluation or depreciation of domestic currency worsens or improves the current account balance. The eclectic approach attempts to take some relevant elements from the conventional balance of payments theories and apply it to a particular economic system where the standard theory may not be applicable. Although our interest is to deal with the monetary approach, it is worthwhile to give a brief explanation about the other approaches. In the subsections that follow we shall briefly discuss both the theoretical and policy relevance of the elasticity and absorption approaches. The theoretical as well as empirical literature about the monetary approach to the balance of payments will be dealt subsequently.

3.1.1. Elasticity Approach

The elasticity approach was pioneered by A. Marshall and A. Lerner and later developed by J. Robinson (1937) and Fritz Machlup (1955). This approach is the first of non-classical or Keynesian approach to the analyses of current account deficit due to change in exchange rate or devaluation. It states that those relative prices of exports and imports or as the name implies the elasticity of demand for exports by foreigners and that of imports by domestic residents determine trade balance or balance of payments. The approach relies on the use of devaluation as instrument of dealing with current account deficit and predicts the effect of devaluation on the current account balance by changing prices of exportables and importables.

The elasticity approach assumes partial equilibrium analysis⁷ that deals with partial market for exports and imports. According to this approach, due to devaluation, a partial equilibrium value of exports in relation to the partial equilibrium value of imports would bring about a balance of payments surplus or deficit that imply resource inflow or outflow.

Devaluation, which is considered to be one of the major policy options for balance of payments deficits, can have two effects; namely bad effects and good effects (Pilbeam 1994). “Bad “in this context means when a country devalues its currency its exports will be cheaper to foreign buyers and at the same time importable goods and services will be more expensive for domestic buyers. The country’s terms of trade (defined as the ratio of export to import prices) therefore will be unfavorable. Thus the unfavorable terms of trade worsen the trade balance. The “good “on the other hand means that due to the devaluation of the domestic currency, exports are now cheaper and hence it is presumed that the devaluing country can export more in terms of volume. Similarly, since imports are more expensive now domestic agents will shift towards domestic products and non-tradable and hence resulting in a fall in the volume of imports. These effects are therefore the terms of trade effect (bad), which worsens the trade balance and the volume effect (good) which improves the trade balance. The net effect on the trade balance depends on which of the two effects dominates.

⁷ It is the option of Marshallian partial equilibrium analysis to the separate markets for exports and imports on the assumption that capital movements are excluded or held fixed so that an excess or deficiency of the partial equilibrium value of exports in relation to excess or deficiency of partial equilibrium value of imports give rise to balance payments surplus or deficit (Johnson: 1976)

Whether devaluation or depreciation of the nominal exchange rate brings about improvements or deterioration in the trade balance depends on the elasticity of supply of exports and demand of imports, which can be summarized by what is called the Marshall - Lerner condition. The simple mathematical derivation of the Marshall-Lerner condition is presented in Annex I.

In the 1930's the elasticity approach was given attention to provide answers to three fundamental questions (Johnson, 1976). These are first, whether devaluation would improve the balance of payments; second, whether devaluation would increase domestic employment (as the trade balance and employment may move in opposite directions); and third, whether it would turn the terms of trade favorable or unfavorable. The answer to these questions and whether the elasticity approach improves the balance of payments is an empirical issue and depends on the assumption of the Marshall - Lerner condition. Proponents of this approach argue that the elasticity of supply and demand for exports and imports respectively exceeds unity and hence the trade balance improves.

With regard to the empirical relevance of the Marshall - Lerner condition, economists are divided into two camps; the "elasticity optimists" who believe that the sum of these elasticities tended to exceed unity and the "elasticity pessimists" who argue the reverse. The empirical evidence however suggest that in the short run the Marshall - Lerner condition may not be fulfilled and can generally hold in the medium and long run (see Pilbeam, 1998). The general

consensus among economists as indicated by the empirical investigations on the elasticity approach is summarized by what is called the J-curve effect.⁸

Despite its contribution in terms of both theoretical and empirical relevance, the elasticity approach has been criticized on a number of grounds. Some of these include: (i) It wrongly assumes that demand for imports and supply of exports depend on money prices and cross price effects are assumed to be zero; i.e. factors other than prices which affect import and export are ignored. (ii) The dynamic effects of income and its interdependence with expenditure is ignored and it lacks to explicitly explain the sources of production increase that cause a trade balance to improve; (iii) The approach simply assumes other things to remain unchanged and ignores any direct effect of devaluation on the domestic price level and wages; (iv) It deals with only the current account and ignores the capital account of the balance of payments.

3.1.2 Absorption Approach

This approach was developed by Alexander (1952). He attempted to explain the problems by switching the focus of analysis of the trade balance (the difference of value of exports and

⁸ The underlying thought about the J-curve effect of devaluation (according to the general consensus) is that in the short run supply elasticity of exports and demand elasticity of imports is generally low. This implies that due to time lag in consumers and producers' response to the exchange rate change as well as imperfect competition and other reasons in the short run the expected increase in volume of exports and decrease in the volume of imports may not be realized. Thus the trade balance will be worsening. In the medium and long run however it will progressively improve and becomes positive. The movement or the shape of the current account over time looks like the letter J. [See Pilbeam 1998] Proponents of devaluation however believe that the J curve effect does not exist and they argue that devaluation improves the current account.

imports) to the difference between aggregate domestic income and aggregate expenditure. Basically, this approach is developed from the criticism or weakness of the partial equilibrium analysis of the elasticity approach. The approach puts emphasis on the difference between domestic output and spending or absorption. It gives emphases on the use of expenditure switching/reducing policies to deal with balance of payments problems. Like the elasticity approach, it tries to predict the effect of devaluation on domestic absorption and its effect on the current account balance. The model can be explained using simple mathematical derivation as follows.

Taking the open economy basic macroeconomic equilibrium model

$$Y=C+I+G+X-M \dots\dots\dots[3.1]$$

Defining domestic absorption as $A=C+I+G$ then, current account can be written as

$$CA = X - M = Y - A \dots\dots\dots[3.2]$$

Equation [3.2] says that the current account (CA) is equivalent to the difference between domestic output (Y) and domestic absorption (A). Current account surplus/deficit means that domestic output exceeds/less than absorption for a given period.

Taking the difference of equation [3.2] gives

$$dCA = dY - dA \dots\dots\dots[3.3]$$

Equation [3.3] is central to this approach, indicates how devaluation affects income and absorption. The effect of devaluation on the current account depends on how the devaluation affects national income relative to its effect on domestic spending or absorption that is determined by either Y or A or both.

Absorption can be divided into the part that is determined by the increase in income, the marginal propensity to absorb (a) and direct absorption (Ac). Thus the change in total absorption can be shown as

$$dA = aY + dAc[3. 4]$$

Substituting equation [3.4] into [3.3] yields

$$dCA = (1-a)dY-dAc[3.5]$$

[3.5] Shows that the effect of devaluation on CA depends on three factors, namely, the effect on marginal propensity to absorb, national income and direct absorption. The effect on income depends on the employment effect and terms of trade effect, which requires the fulfillment of Marshal-Lerner condition. If the economy is less than full employment and the Marshall-Lerner condition is satisfied then net exports will increase so that devaluation may lead to increase in national income. Conversely, if the Marshall – Lerner condition is not satisfied then net exports would fall implying that national income falls and leads to deterioration in the current account. Similarly, the terms of trade effect lowers national income because devaluation makes price of exports lower and that of imports higher.

The effect of devaluation on direct absorption is also ambiguous which take different forms. If the devaluation reduces direct absorption then it will lead to an improvement in the current account and if the reverse holds the current account will be deteriorated. There are different possible ways of devaluation impacting upon direct absorption. These include real balance

effect, money illusion effect, expectation effect, income redistribution effect and Laursen - Metzler effect.

In the case of real balance effect economic agents have to maintain their demand for real balance by selling their assets to adjust for the price change brought about by the devaluation. The disposing of assets or bonds in this case leads to decline in income (via increasing the rate of interest) and ultimately reducing in direct absorption. In the case of money illusion effect consumers may not cut their purchases due to the price rise so actually they spend more on direct absorption than before. However, the money illusion effect may work in reverse and consumers may actually decide to cut back direct absorption by more than the increase in price and so direct absorption falls (Pilbeam, 1998). On the other hand economic agents may expect the price rise may lead to a further rise in price in the future which ultimately leads to increase in direct absorption so that BOP worsens. Devaluation leads to an increase in the general price level and this in turn results in redistribution of income from those with low marginal propensity to high propensity. Laursen and Metzler (1950) pointed out two effects of devaluation, namely the negative income effect and positive substitution effect. If the positive substitution effect outweighs the negative income effect then devaluation may lead to rise in absorption.

In sum, according to this approach, the over all effect of devaluation on the current account depends on the assumptions of the state of that economy i.e. if it is less than full employment and on the fulfillment of the Marshall – Lerner condition.(i.e. the effect of devaluation on current account is inconclusive and ambiguous).

The absorption approach is criticized on two grounds. Like the elasticity approach it deals only with the current account and assumes away other components of the balance of payments. It deals only with the real side of the economy and ignores assessment of changes in exchange rate and prices. The approach assumes devaluation as a single policy variable that brings about improvements in the trade balance while it should have been accompanied by complementary and reinforcing policies. Johnson (1976) pointed out the limitations of the absorption approach that it failed to elucidate the essentially monetary policy role of devaluation under non-Keynesian conditions.

Although initially the absorption approach was considered to be a substitute to the elasticity approach, studies by Tsiang (1961) and Alexander (1959) as referred in Pilbeam (19998) showed that they are rather compliments. Since these approaches are inconclusive in tackling the balance of payments problems, the monetary approach to the balance of payments was developed.

3.2. The Monetary Approach to the Balance of Payments

The monetary approach to the balance of payments basically postulates that balance of payments disequilibrium is essentially a monetary phenomenon and tries to explain it using tools of monetary theory. The approaches discussed above lack monetary explanation of the balance of payments problems. The central proposition of the monetary approach as put forward by Frenkel and Johnson (1976), Whitman (1975) implies that balance of payments

problem is a monetary phenomenon which cannot be analyzed with the aid of barter or real trade theory but tools of monetary theory. Since money is stock and real theories deal with flows, then a balance of payments theory should integrate both the stock and flows and it can be analyzed either through affecting domestic credit creation (the domestic component of money supply) or through international reserve flows (the foreign component of money supply)

The statement “balance of payments disequilibrium is a monetary phenomenon” implies that such disequilibrium is a reflection of and can be explained by the imbalance between demand for and supply of money or imbalance in the money market. A balance of payments deficit leads to a loss or draw down of reserves, which follows that there, must be a counterpart to this deficit in the form of either credit creation (sterilization) or decline in the money stock. It means that any credit creation ultimately is reflected in balance of payments via the money market dis-equilibrium.

The theoretical root of the monetary approach to the balance of payments can be traced as far back to the eighteenth century seminal work of David Hume (1752) and the classical specie-flow monetary theory⁹

Despite its long history, however, this approach was widely researched and developed later in the 1960's and 1970's. Two developments that contributed to the heightened interest among

⁹ The classical specie-price-flow mechanism is the argument that a country could achieve sustainable trade balance or balance of payments surplus through the adoption of import substitution and export promotion strategies. Movement of the relative prices leads to a balance of trade deficit or surplus then these deficits or surpluses change the stock of money in the direction of equilibrium.

economists during this period were: first, the concern of direct policy control at the International Monetary Fund and second, the renaissance of academic interest in monetary problems (IMF, 1977), (Williamsons, 1983)

Milton Friedman has been the main proponent of the quantity theory of money. In this case it is worth noting that one of the crucial assumptions of the monetary approach is the existence of stable demand for money function. Mundell and H. Johnson from the University of Chicago have introduced the monetary approach to balance of payments to the academic circles. Though neglected due to their highly mathematical treatments, articles by Hahn (1959) and Kemp (1970) were also important contributions. Most of the works done in this school had a polemical edge that causes clash with the Keynesian analysis. (IMF, 1977)

The other factor, which preceded the academic interest, was the concern of the International Monetary Fund (IMF) in monetary policy issues of member countries. In this regard staffs of the IMF did most of the innovative works. In the 1950's many less developed countries did not have adequate capability to have detailed analysis of their national income and balance of payment determinants along the existing Keynesian, income – absorption nor the elasticity approaches. The justification for the involvement of the Fund in this was to develop simply understandable models that could help to monitor macroeconomic management in less developed countries. The argument is that the monetary approach to the balance of payments permits a meaningful approximate analysis of relevant aggregates with the help of such model. Because the framework for the model can be compiled from the available data of central bank supervisory role over commercial banks and Customs Administration records.

A monetary framework analyzing the balance of payments effects of economic policy for less developed countries was appropriate control over domestic credit, which was considered as a major instrument for demand management, and balance of payments control (Williamsons, 1983)

Both the academia and the Fund argue that the balance of payments to be an essentially a monetary phenomenon and underscore the importance of the demand for and the supply of money. Specification of the money supply function would be the single important element that distinguishes the monetary approach from earlier analysis. (IMF, 1977) The money supply process is determined endogenously being influenced by surpluses and deficits in the over all balance of payments. It implies that as long as there is a balance of payments surplus or deficit the money supply is changing and equilibrium in the money market cannot be maintained.

Similarly, both the IMF and the academia deal with long run consequences of economic changes for the balance of payments. Both reach at a conclusion that a change that does not interfere with the monetary balance of payments adjustment process will have no lasting influence on the balance of payments, but the level of reserves [IMF, 1977]. Although the model is researched both in the Fund and academic circles no significant difference is made between the two. The Fund gives emphases from the practical application point of view whilst the later for theoretical explanations and conceptual developments of the model, i.e. academic purpose.

The IMF's monetary management or Financial Programming Model emerged from the monetary approach framework for the need to discuss with the authorities of a member country that request to use Fund resources in the form of financial assistance. When member countries come to IMF to use Fund resources for their balance of payments deficits, the Fund has to understand about the causes of a deficit as well as the policy measures that should be taken to overcome the problem. Before granting the loan the Fund examines whether that country's policies are sufficient or not to restore equilibrium. The IMF therefore puts some conditionality to be fulfilled before disbursing balance of payments adjustment loans.

The monetary approach was then the model that IMF introduced in late 1950's that is used to easily understand and recommend adjustment policy measures. One of the typical features of this model is its simplicity in that the model can be applied simply from banking and trade data. (Polak, 1997) Similarly, the model focused on the key variables that government could control like domestic credit creation, which was considered as the crucial variable to the correction of BOP problems. The financial programming model is therefore the application of the monetary approach to the balance of payments model developed from the basic Polak Model

3.2.1 The Polak Model

Formal research on monetary theory of balance of payments models in the Fund begins with the work of J J Polak (1957), under the title 'Monetary Analysis of Income Formation and

Payments Problems'. Following this article the model was widely researched both at the IMF and in the academia in the 1960's and 1970's.

The structure of all fund programs is built on a framework that links the financial sector with the balance of payments. The approach, which has come to be termed as the monetary approach to the balance of payments, ensures consistency between the monetary impact of policy changes and the desired balance of payments outcome. (Khan, etal: 1986)

The objectives of the IMF monetary model are to have sustainable balance of payments position and price stability. To meet these objectives the model contains instruments, targets, and endogenous as well as exogenous variables. The key instruments are domestic credit and exchange rate adjustments.

The set of four equations in the model constitutes the logical core of the IMF's programming exercise, which is known as "financial programming ". Since the early 1950's it has been the centerpiece of the analysis leading to IMF conditionality. The policy action that a borrowing country must take to have access to IMF credit (Polak, 1997)

These four equations are two identities and two behavioral equations

$$\Delta Ms = \Delta DC + \Delta R \dots\dots\dots [3.6]$$

Where Ms stands for money supply, DC stands for domestic credit, R represents international reserves and Δ indicates change. It means money supply is defined as the sum of domestic

money creation (Domestic credit) and foreign reserves. A change in money supply is therefore the sum of changes in the two determinants.

$$\Delta R = X - \alpha Y + \Delta F \dots\dots\dots [3.7]$$

Equation [3.7] says the change in foreign reserves by definition must be equal to the difference between exports (X) and imports (αY) plus change in inflows. Where α is a constant and stands for the marginal propensity to import that must assume a value between zero and one.

$$\Delta Md = k \Delta Y \dots\dots\dots [3.8]$$

The change in a country's money demand (Md) is proportional to the change in income by a factor k which is a constant and the inverse of the velocity of circulation of money.

$$\Delta Md = \Delta Ms \dots\dots\dots [3.9]$$

By definition at equilibrium the change in money demand must be equal to the change in money supply.

The central argument of the model follows the transmission mechanism that changes in domestic credit, given the level of reserves in equation [3.6], implies a change in money supply. This in turn makes money demand to change via equation [3.9] The change in money demand implies changes in income through [3.7] which in its turn leads to changes in import. It follows that a change in import [3.7] in its turn implies an equivalent and opposite direction change in foreign reserves [3.6]. Therefore the model concludes that balance of payments is a monetary phenomenon, that is, an increase in money supply (via domestic credit) assuming other things are unchanged, results in lower reserves and ultimately to balance of payments deficits

This is the basic financial programming model of the IMF, which is the application of the monetary approach to BOP. Its prominent feature is to limit excessive credit to government. Hence, the basis for IMF prescription is to control domestic credit. The intuitive reasoning of the model is domestic credit or money supply in general is the basic element in maintaining balance of payments problems. [Khan and Montiel, 1991]

The central feature of this approach was to estimate prospective demand for money on the bases of GDP, assumption about price expectation or inflation and other relative factors. (IMF, 1977) The argument is that by controlling domestic credit creation the authorities could keep the external accounts in balance and the change in international reserves to zero.

3.2. Empirical Literature

In the 1950's and 1960's of the Briton Wood's system and fixed exchange rate regime, studies on monetary models on international trade theory gave emphases on the monetary approach to the balance of payments. With the shift to flexible exchange rate regime in 1973, however, there was a corresponding shift in the literature to the study of exchange rate behavior and monetary approach to the exchange rate. In this sub section we shall briefly review the empirical studies conducted on the monetary approach starting with the earliest works.

Polak and Boissonneault (1960) made early empirical research on the MABP applied to 39 countries. Their topic is "Monetary Analysis of Income and Imports and its Statistical Application." The study indicates that the model can predict import reasonably well from monetary data. If appropriate forecasts are made on exports and net capital flows which are exogenous to the model, the study shows that it is possible to determine alternative effects of credit policies and other induced policy changes on balance of payments.

J. Marcus Fleming and Lorette Boissonneault (1961) studied the relationship between money and imports based on the Polak model. Their empirical study on 36 countries for the period 1950 to 1958 revealed a good correlation between actual imports and the import data predicted based on the model. Moreover, the study appears to show better relationship for less developed countries than for large industrialized countries. The study states that money creation and imports move together indicating a deliberate increase or decrease in credit leads to simultaneous increase or decrease in imports that ultimately influence balance of payments situations.

S. J. Prais, (1961) recasts the Polak model in a differential equation form and adds mathematical elegance to it. He also pioneered formulation of the model in terms of continuous time that gives precise specification of ratio of the variables. He specified domestic expenditure function that emphasizes the role of deviation of actual from desired money holdings as the link between the real and monetary sectors of the economy, which has been implicit in the Polak model. The study employed the dynamic adjustments of income,

money and changes in the BOP. It also discusses the observed movements in income and imports that are attributable to the process of adjustment.

Rhomberg (1965) studied money, income and the foreign balance and focused on the money and expenditure relation. He argues that the Polak model may be improved if the Prais expenditure function is used for short-term predictive properties. He then estimates the entire Polak model using multiple regression technique. He was able to increase the predictive performance of the Polak model by estimating the structural equation rather than the reduced form.

Unlike his predecessors Argy (1969) formulates the entire Polak model by taking the variables in real terms. He shows two-policy targets income and the balance of payments that may be achieved by selecting proper values of the instruments, government expenditure and the money supply and he investigates the implication of alternatively using money or domestic credit or central bank credit as a policy variable.

Polak and Argy (1971) broaden the Polak model by incorporating capital market so as to make the model work for advanced countries. They considered the effectiveness of credit ceilings and monetary ceilings on the balance of payments in the face of unanticipated domestic and foreign disturbances. They concluded that a credit ceiling is a superior stabilizer as far as the balance of payments is concerned. With regard to stabilizing output, however, it depends on the type of disturbance or threatening stability whether credit ceiling or monetary ceiling is to be performed.

Guitian (1973) emphasized similar point that in an open economy the monetary authorities can control only domestic credit creation. Unlike the conventional IS-LM theory, money supply can be influenced by factors outside of the control of the authorities. He then concluded that domestic credit is the appropriate policy instrument to dictate balance of payments situation.

Johnson (1976) studying on monetary approach to the balance of payments emphasized the uniqueness of this approach from previous approaches in that it introduced stocks as well as current expenditure into the adjustment process and balance of payments disequilibrium as transitory and conditional on domestic monetary policy. A similar study by Hahn tried to investigate whether and in what circumstance the excess demand for financial assets be reflected in the balance of payments and concluded that the monetary model has surely made a contribution by giving policy insights.

Khan (1977) conducted a study on the determinants of the balance of payments and Income in Developing Countries. He applied the monetary approach to ten less developed countries for the period 1952-70 and found that the monetary model is able to explain the behavior of the balance of payments satisfactorily for many counties. He concluded that the approach confirming on the monetary aspects of BOP and nominal income determination is useful.

Aghevil and Khan (1977) conducted another empirical cross-sectional study of 39 less developed countries on the long run implication of the monetary approach for changes in international reserves. The study concludes that the monetary approach performs well in cross-sectional data given that the assumptions of full employment, perfect capital mobility

and fixed exchange rate regime are satisfied. If these assumptions are not satisfied, however, the study concluded that an increase in the domestic component of money supply will not all lead to a balance of payments disequilibrium.

Much of the recent empirical studies on the model try to test the so-called “offset coefficient” (Pilbeam, 1998). According to the MABP theory, estimates of the model in a fixed exchange rate regime, suggest that an increase in the domestic component of money supply lead to exactly offsetting fall in reserves.

Though the correct sign may be obtained, in many empirical estimates the magnitude failed to be statistically equal to negative one. Pilbeam (1998) in his work on International finance summarized results of empirical estimates done on offset coefficients for some industrialized countries. According to these studies, the result was mixed and some of the studies seem to shed grave doubt on the model. These studies were made in different periods, Bean (1976) found an offset coefficient of -0.67 for Japan, Genberg (1976) got -1.1 for Sweden, Kouri and Porter (1974) found -0.47 for Australia, -0.77 for Germany, -0.43 for Italy and -0.59 for Netherlands. Obstfeld (1982) found 0.003 for Germany and Taylor (1990) -0.49 for United Kingdom.

One explanation given for lower than expected offset coefficient as put forward by Mager (1976), as cited by Pilbeam, 1998, is that exchange rates were not rigidly fixed under the Briton Woods system. This causes part of the increase in domestic component of the money supply to be absorbed by the exchange rate depreciation, instead of being reflected in the fall

in reserves. Similarly, the cause for the offset coefficient to be above negative one as discussed by Obstfeld is due to frequent practices of sterilization of foreign exchange intervention by the authorities.

Abebayehu Tegene (1989) studied monetary explanation of inflation for six African countries for the period 1960-1983. According to the empirical results of this study, the monetary model is found to explain inflation. The empirical result therefore did not reject the monetarist view of inflation.

A similar econometric study was conducted on the role of exchange rate and monetary policy in the monetary approach to balance of payments in the case of Malawi by Exley B. D. Silumbu (1995) using both annual and quarterly series. The study found that domestic credit is revealed to have the expected negative impact (offset coefficient) followed by a positive coefficient that suggests the effective use of selective credit policy stance favoring export oriented plantation sector. The study also rejects sterilization operation from annually estimated data but weakly accepted in the case of quarterly dis-aggregated data. He also conducted causality tests and found that it runs from credit to reserves when annual data is used while the test reveals that it is from both directions in the case of quarterly data.

An empirical study on MABP in the case of Zimbabwe by R. Dhliwayo (1996) failed to reject the validity of the model. The study was made for the period 1980 to 1991 with quarterly disaggregated series. The empirical results obtained in the study suggest that money played a significant role in determining balance of payments. Thus the offset coefficient is found to

have the correct sign and magnitude. The paper concludes that given the assumption of stable demand function for money, balance of payments disequilibrium can be corrected by financial programming and money targeting.

Nyokawa (1997) undertaken an econometric study on the monetary approach to balance of payments for Kenya for the period 1970-1995 using quarterly extrapolated data. The study concludes that the empirical estimate support the thesis of monetarist approach and the offset coefficient. The result also suggest that causal relationship is one direction and that is domestic credit drives reserves which support the validity of the model

Rigorous studies that directly focus on testing the validity of the monetary approach to the balance of payments in Ethiopia is scanty or non-existing. Nevertheless, there are some empirical studies done on certain issues using the monetary model.

Gamech (1993), as referred in Martha (1999), estimated a money demand function model with gross domestic product as a scale variable, index of coffee production as a proxy for the effect of monetization and expected exchange rate, as an opportunity cost variable. He found that money demand is positively related to income, the price level and the rate of monetization and negatively related to the expected depreciation or the exchange rate. He obtains high-income elasticity of 1.2, owing to limitation in asset substitution and instability due to predicted economic disorders.

Alemayehu (1996) studied adjustment and effectiveness of monetary policy in Ethiopia during the period 1992/93 – 1994/95. He concluded that although the adjustment program was presumed to bring about improvements in the economy by pursuing tight monetary policy, the effectiveness of monetary policy was constrained by some factors. These factors include limited control of money by the authorities, feed back effects from foreign asset counterpart to domestic asset counterpart, and lack of integration in information for policy formulation that include timeliness and coverage of data base.

Another study by Ergete (1998) estimated money demand function for Ethiopia using quarterly data for the period 1972(3) to 1995(4) by taking real income, the interest rate on deposits and exchange rate premium. This econometric study using the Johanson (1988) approach indicated that very low adjustment towards equilibrium and inflation has significant effect in the short run. Moreover, the parallel exchange rate premium is found to have significant effect on both the short and long run demand for real money balances. The study also failed to reject the existence of stable money demand function.

Yohannes (2000) conducted an empirical study on the dynamics of inflation for Ethiopia using quarterly dis-aggregated data for the period (1970/71 – 1998/99) by employing the Johansen procedure. He made use of different models to find an appropriate model that can predict or explain inflation in Ethiopia. The empirical result suggested an upward slopping Phillips curve from which the author concluded that apart from the emphases given to the demand management policies should also be geared to address supply side problems. The argument of inflation as a monetary phenomenon awaits the removal of rigidities that is prevailing in the

economy. Unlike the empirical findings of Abebayehu indicated above, this study seems to cast doubt on the applicability of the monetary explanation of inflation in Ethiopia.

As indicated in section 1.2 under statement of the problem, rigorous studies that are conducted in testing the empirical relevance of the monetary approach to the balance of payments in the case of Ethiopia is scanty or non-existing.

CHAPTER FOUR

MODEL SPECIFICATION, DATA SOURCES, AND METHODOLOGY

4.1. Model Specifications

Proponents of the monetary approach to the balance of payments argue that balance of payments dis-equilibrium is essentially a monetary and not a real phenomenon, (see Polak: 1957, Johnson 1976, Hahn 1977). The model postulates that balance of payments deficit is the divergence between the growth rate of money demand and domestic credit creation. Given the assumptions of the model (i.e. stable demand for money function, the purchasing power parity condition and vertical aggregate supply function or full employment), an increase in domestic credit creation¹⁰ will cause an opposite and equal change in international reserves. Testing the validity of this statement is possible by estimating a reserve flow equation, which is taken to be a proxy for balance of payments.

Formulation of the simple monetary approach to the balance of payments model makes use of the following sets of equations:

The money supply (M^s), which is the sum of the domestic component of money stock or domestic credit (D) and the international reserve (R), is specified as

¹⁰ domestic credit creation is referred to as the stock of claims of the banking system constituting both claims on government and claims on the private sector. It is the domestic component of monetary base.

$$M^s = h(D+R) \dots\dots\dots[4.1]$$

The long run money demand function (assumed to be stable) is positively related to domestic price level (p) and real income (y) but negatively related to the opportunity cost of holding cash or interest rate (r) is specified as a product

$$L = pyr \dots\dots\dots[4.2]$$

Monetary equilibrium requires equality of demand and supply, that is

$$M^s = L \equiv h(D+R) = pyr \dots\dots\dots[4.3]$$

From the equilibrium condition, the fundamental reserve flow equation would be specified as

$$\Delta R = \Delta[L(p,y,r)] - \Delta D \dots\dots\dots[4.4]$$

The formal monetary approach to balance of payments model can be estimated using the reduced form of the reserve flow equation. Most empirical studies conducted on both developing and developed countries like Dhliwayo(1996) for Zimbabwe, Nyakawa:(1997) for Kenya, Silumbu (1997) for Malawi, and Macdonald and HolLiwood (2000) for Japan are expansions of the model specified by Johnson (1976) that rests on the money supply identity, stable demand for money equation and equilibrium condition in the money market.

Equation [4.4] implies that the balance of payments, represented by changes in international reserves, is the divergence between money demand and domestic credit creation. This

proposition is the core of the model. Taking the difference of [4.4] and rearranging to express these equilibrium situations in terms of the reserve flow equation may take the form

$$\frac{R}{H} \dot{R} = B_1 \dot{p} + B_2 \dot{y} + B_3 \dot{h} + B_4 \dot{r} + B_5 \frac{D}{H} \dot{D} \dots\dots\dots [4.5]$$

Where the (.) over a variable indicates growth rates, H represents the money stock, h is the money multiplier and the other variables are as defined earlier.

Equation [4.5] can further be simplified into an estimable form after being transformed into logarithm. Transformation is made to avoid problems of normality in the data and for convenience. Recent empirical studies like Silimbu (1997), Macdonald and Halliwood (2000) applied the transformed form of [4.5] as specified in the following equation.

$$\frac{R}{H} \Delta \ln R_t = B_0 + B_1 \Delta \ln p_t + B_2 \Delta \ln y_t + B_3 \Delta \ln h_t + B_4 \Delta \ln r_t + B_5 \frac{D}{H} \Delta \ln D_t + u_t \dots\dots\dots [4.6]$$

However, estimating equation [4.6] would only tell information about the short run behavior of the model while our interest is to know about the fundamental long run relationship as well. The long run information is contained in the error correction term. Co-integration analysis is therefore an appropriate technique to examine the potential long run relationship of the variables involved in the model. Moreover, in equation [4.6] the coefficient of domestic credit is predicted to be negative one (the offset coefficient). Nevertheless in some empirical studies this magnitude is found to be lower than the predicted value. Mguee (1976), as cited in Macdonald and Halliwood (2000), argued this result arises due to the exclusion of the

exchange rate variable from the model. In this study the above model is modified to include long run analysis and the exchange rate variable. The model is

$$nfa_t = \beta_0 + \beta_1 p_t + \beta_2 gdp_t + \beta_3 r_t + \beta_4 m_t + \beta_5 rer_t + \beta_6 dc_t + u_t \dots \dots [4.7]$$

Where nfa is net foreign assets which is a proxy for balance of payments, p is the Addis Ababa price index which is assumed to represent the country's price index as the national level price index is not available, m is the money multiplier, r represents real deposit interest rate, gdp is real gross domestic product which represents the level of income, dc is domestic credit, rer is real exchange rate and u_t is the stochastic error term. Lower case letters are used to indicate that the variables are in log form.

Theories of monetary approach to the balance of payments suggest that the coefficients should indicate expected signs and magnitudes. The constant term of the model (β_0) is predicted to be zero. The coefficients of domestic price and real income are predicted to be positive one while the coefficients of interest rate, money multiplier and domestic credit are expected to be negative. Moreover, the offset coefficient or coefficients of domestic credit is predicted to be -1. The sign with respect to real exchange rate will be empirically determined in the model.

4.2 Data Sources and Transformation

4.2.1 Sources of Data

The data used in this study are collected from different institutions and secondary data sources. Annual data on Gross Domestic Product (GDP) and quarterly data on manufacturing

public enterprises are obtained from National Accounts Units of Ministry of Economic Development and Cooperation (MEDaC). Data on monetary statistics and exchange rates are obtained from Annual and Quarterly Bulletins of the National Bank of Ethiopia and International Financial Statistics database of the IMF. Quarterly data on the Addis Ababa price index is collected from CSA. Both qualitative and statistical data, which are used for generating quarterly data, and graphic as well as tabular presentations used in this paper are either own computations or collected from various secondary sources.

4.1.2 Generating Quarterly Data

Gross Domestic Product (GDP)

The National Accounts unit of MEDaC has two annual series on GDP. The old series that runs from fiscal year 1960/61 to 1992/93 and the new series that starts with fiscal year 1980/81 runs to-date. Our interest is to generate annual data for the study period 1967/68 – 1999/00. Since these two series have major structural break, adjustment is made to revise the new database backwards for the period 1979/80 to 1967/68. The adjustment is made as the preceding year's level is computed to be the ratio of the current year level to one plus the growth rate of the old series¹¹

After obtaining annual series for the period 1967/68 to 1999/00, attempts have been made to disaggregate these annual data into quarterly series. The quarterly series is computed using

¹¹ $GDP_{t-1} = (GDP_t) / (1+g)$; Where GDP_t is the level of real GDP in year t and g is the growth rate in the old annual series.

coefficients that take into account seasonality of the data for the different sectors. (For the detailed discussion on the coefficients and their computation see annex 1).

Quarterly dis-aggregated data on GDP for Ethiopia is not available. Yohannes (2000) tried to generate quarterly GDP based on a technique from Ichero Otani as applied by Ibrahim and Teklewold (1991). He studied the quarterly contribution of each sector and came-up with seasonality adjustment coefficients for each quarter. Based on these coefficients he disaggregated the annual GDP of each sector into quarterly series using moving average method.

Here we tried to study the behavior of seasonality fluctuations of each sector in its contribution to the annual GDP¹². The study is based on both qualitative (interview, informal discussions etc with different people) and statistical information obtained from the different units of CSA, Ministry of Agriculture, MEDaC and Development Bank of Ethiopia. The Seasonal fluctuation of Agriculture, Manufacturing and the Distributive Services are studied to arrive at seasonality adjustment coefficients for each sector and for the different quarters.

The quarterly coefficients for Agriculture are studied from the amount of labor exerted in each activity on man-days data for which data on quarterly basis are available. The coefficients for Industry are computed from quarterly compiled data on twenty-eight manufacturing public enterprises by MEDaC. The coefficients for the service sector are computed based on the sector's credit disbursement from the banking system. These coefficients are computed for the

¹² I am indebted to my colleagues Tura kebede and Equar Desta who made a collaborative effort in studying the seasonality adjustment coefficients for GDP.

major contributing sub-sectors. According to the information obtained from CSA about 80 per cent of agricultural output are cereals so that seasonality of agriculture is represented by production of cereals. Similarly, Industry is represented by the production pattern of the twenty-eight manufacturing public enterprises. The service sector is also represented by the distributive sub-sector, which accounts for about 15 % in the annual GDP. Other services sub-sector is, however, equally divided into four quarters because it is less sensitive to seasonality.

Finally, the quarterly data for each sector is generated using their respective coefficients and summed up in quarters as a flow. Following [Bahamani-Oskooee, 1986) the flow quarterly real GDP is disaggregated as $QI + QII + QIII + QIV = \text{Annual GDP}$.¹³

Generation of Quarterly Data for Other Variables

Monetary data such as data on net foreign assets, domestic credit, money multiplier, and interest rates¹⁴ are collected from National Bank of Ethiopia Quarterly and Annual Reports of various issues. Data pertaining to price index is available on quarterly bases from CSA. The data on real effective exchange rate is computed from International Financial Statistics database. The index is computed by taking quarterly data on wholesale price index and exchange rates of 13

¹³ The annual GDP is as compiled by MEDaC, I dis-aggregated this annual series into quarterly based on the seasonality adjustment coefficients.

¹⁴ Real deposit interest rate is computed based on the following formula $R = \frac{1+i}{1+\Pi} 100$ Where i is the nominal interest rate and Π is the inflation rate R is real deposit interest rate

major trading partners of Ethiopia and applying weighted trade index to the base years of 1995.

The countries included in the computation are Belgium, Kenya, Italy, France, Germany, United States, United kingdom, S. Arabia, Netherlands, South Korea, Sweden, Japan and India. The countries are selected by their weight of import plus export to total trade of Ethiopia, and these countries have one percent and above weight. (For detail discussion on the computation of RER see Annex III)

Limitations of the method

Although the method is believed to be more plausible in accounting for seasonal variations of GDP for each quarter, it may have the following limitations

- It applies constant coefficients over the study period
- It ignores private sector contribution to industry
- The share of other sub-service sector is equally divided into four quarters

4.3. Econometric Procedures

The standard regression analysis requires that data series be stationary and therefore we have to test this requirement before we go into the estimation process (Thomas 1993). In empirical studies with time series data stationarity¹⁵ of the variables under consideration is crucial to avoid problems of spurious regression, which may give very high R^2 value and significant t-ratios even with out true relationship among the variables. That is if non-stationary variables

were regressed using OLS the results obtained would be spurious which implies that the variables have common trend in time and they may not have long run economic or causal relationship. For the classical regression model to hold all the variables involved in the regression must be stationary.

Most time series of macroeconomic variables are non-stationary in which case the variables may have consistent trend relationship rather than true or behavioral relations (Johansen, 1992). Although many economic variables exhibit long run trend movements, the literature provides techniques to make a variable stationary, namely the Difference Stationary Technique (DST) which is making a variable stationary by differencing and Trend Stationary Technique (TST)¹⁶ that deals with making a variable by de-trending.

The commonly used test for existence of unit root in the data is by detecting stationarity using the Dickey-Fuller and Augmented Dickey-Fuller tests. The Dickey –Fuller test is used for regression with random walk¹⁷, by adding drift, and by both drift and a time trend. The ADF is also based on the above except that it is augmented by a series of lags¹⁸.

¹⁵ A stochastic variable is said to be stationary if its mean and variance is zero or at least constant over time and the covariance between two time periods should only depend on distance in lags rather than actual time at which the covariance is computed (Gujarati, 1995)

¹⁶ Difference stationary and trend stationary techniques are key concepts in time series analysis. These concepts can be illustrated using the following two regression models.

$Y_t = B_1 + B_2 t + u_t$ u_t is in fact stationary with say mean zero and variance σ^2 , the regression represents a TSP if one subtracts the trend, (i.e. $B_0 + B_1 t$) from the equation, the result is a stationary process. However, if $Y = Y_t$ $Y_t = \alpha - U_t$ where α is a constant and U_t is stationary with mean zero and variance σ^2 we call such a process difference stationary process.

¹⁷ Assume ε_t is a random series with mean u and variance σ^2 . Then a process Y_t is said to be random walk if $Y_t = Y_{t-1} + \varepsilon_t$. Let us assume that Y_0 is zero. Then process evolves as follows $Y_1 = \varepsilon_1$ and $Y_2 = Y_1 + \varepsilon_2 = \varepsilon_1 + \varepsilon_2$

and so on. We can have then $Y_i = \sum_{i=1}^n \varepsilon_i$ Hence $E(Y_t) = u$ and $\text{var}(Y_t) = \sigma^2$. Since the mean and variance vary with time the process is non-stationary and it is random walk. (Maddala, 1995)

¹⁸ The ADF is the t-statistic for the estimated γ in the regression: $\Delta X_t = \alpha_0 + \gamma X_{t-1} + \alpha_1 t$

The augmentation is required to account for possible occurrence of autocorrelation (Gujarati, 1995).

Making a variable stationary by differencing only gives the short-run dynamics while our interest may be to know also about the long-run parameters. Non-stationary variables can be stationary by differencing but in differencing the variable there will be loss of considerable long run information. For this reason we appeal to the notion of co integration. Ci-integration refers to a linear combination of non-stationary variables (Harris, 1995). The concept of co-integration implies that time series variables may be non-stationary but their linear combination can be stationary.

There are two procedures for testing the existence of co-integration. These are the Engle-Granger (1987) two-stage procedure and the Johansen (1988), maximum likelihood estimation procedure.

In the case of Engle-Granger two-stage procedure, if the variables involved are in the same order (if all the variables are stationary in levels or by differencing once or so) then the first step is to estimate the long-run static model and obtain the residuals. Test for stationarity of the residual, which is the linear combination of the variables. If it is found to be stationary then we say the variables are co-integrated or they have long-run relationship.

+ $\delta_i \sum_{i=2}^p \Delta Y_{t-1} + \varepsilon_t$ Where t is the time trend p is the number of lags ε_t is the stochastic error term and

The second step of this procedure is to estimate the error correction model (ECM). That is regressing the first difference of the variables used in the static model with their appropriate lags by including the first lag of the residuals obtained from the static model (in the first step) as one of the explanatory variables.

This procedure has a number of limitations. These Weaknesses are: first, the residual obtained in the first step is suspected to be spurious because it is generated from non stationary variables, second, this procedure does not require testing for the endogeneity/exogeneity i.e. the procedure assumes a predetermined one way relationship. This procedure also assumes that there is only one co-integrating vector. Nevertheless, it is possible that there could be more than one co-integrating vectors, especially when more than two variables are regressed. This method has no systematic procedure for the separate estimation of the multiple co-integrating vectors. [Enders: 1995] The concept of a single co-integrating vector implies that there is only one equilibrium relationship among the variables involved in the vector auto regression. In the case of multiple co-integrating vectors however, there are more than one linearly independent relationship.

The Johansen (1988) Maximum Likelihood estimation procedure is superior in the sense that it overcomes the limitations of the Engle – Granger (1987) two stage procedure. The Johansen (1988) Maximum Likelihood estimation circumvent the use of two steps estimations.

augmentation with lagged difference ensures the error terms are white noise. The ADF has the same asymptotic distribution as DF statistics so the same critical value can be used. (Gujarati, 1995)

Unlike the Engle-Granger procedure, it does not require to establish a priori assumptions of at most one co-integrating vector. It also avoids arbitrary selection of dependent and independent variables. Testing the existence of co-integrating relationship is made on the bases of vector error correction mechanism (VECM). It rests on appropriate statistics for hypothesis testing for the number of co-integrating vectors. From these brief descriptions about the two available procedures it is evident that the Johansen Maximum likelihood procedure is superior in testing for co-integration.

In using time series data it is often assumed that data are non-stationary, (Harris, 1995). Given the time series properties of our variables and the limitations of the Engle-Granger procedure, it is believed that employing the Johansen (1988) and Johansen and Juselius (1990) Maximum Likelihood method is an appropriate procedure for this study.

Given the variables of our interest in equation [4.7], the Johansen procedure does not require to pre-classify these variables as exogenous and endogenous. The variables involved in the model are nfa, p, m, r, rer, gdp, and dc where the lower cases indicate that the variables are transformed into logarithm. To apply the Johansen procedure we first represent these variables in a vector form as X_t and model it as unrestricted vector autoregression (VAR) with k lags as follows

$$X_t = \beta_1 X_{t-1} + \beta_2 X_{t-2} + \dots + \beta_k X_{t-k} + \gamma D_t + U_t \dots \dots \dots [4.8]$$

Where X_t is an (nx1) matrix of variables, β 's are (nxn) matrix of parameters and U_t is independently and identically distributed error term with mean zero vector and variance of

constant Ω vectors; D_t represents a vector of constant, dummies and other unrestricted non stochastic variables.

The vector error correction model (VECM) can then be specified as:

$$\Delta X_t = \Gamma_1 \Delta X_{t-1} + \Gamma_2 \Delta X_{t-2} + \dots + \Gamma_{k-1} \Delta X_{t-k+1} + \gamma D_t + \Pi X_{t-k} + U_t \dots \dots [4.9]$$

Estimated coefficients Γ and Π in equation [4.9] respectively represent short-run adjustments and long-run information. D_t represents vectors of intercepts and pre-determined and restricted exogenous variables.

If the rank r of Π is zero, no stationary linear combination can be identified, i.e. no co-integration exists among the variables under consideration. On the other hand if Π has full rank, then it means that the variables are stationary in levels. The interesting case is when Π has a reduced rank or when r is less than the number of variables in the regression. Thus Π may be decomposed into α and β' matrices. That is, $\Pi = \alpha\beta'$, where β' represents the coefficients of r distinct co-integrating vectors that makes $\beta'X_t$ stationary and α represents adjustment coefficients.

The number of co-integrating vectors can be identified using test statistics called λ -trace and λ --max. These statistics are given by the following formula.(Harris, 1995)

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^n \ln(1 - \lambda_i)$$

$$\lambda_{max}(r, r+1) = -T \ln(1 - \lambda_{r+1})$$

where λ_i = eigenvectors, T = number of observations.

The trace statistic tests whether there is at most one co-integrating relationship while the maximal statistics is used to test the null hypothesis that there are r – co-integrating vectors as against the alternative hypothesis of $r < 1$.

CHAPTER FIVE

EMPIRICAL ANALYSIS

5.2. Unit Root Tests

As described earlier, most macro economic variables are not stationary. One popular test of detecting stationarity of variables in time series econometrics is the unit root test. This test helps to detect whether a variable is stationary or not. It also provides the order of integration at which the variable can be stationary.¹⁹ If a variable is stationary in level, i.e. without any differencing, then that variable is said to be integrated of order zero or $I(0)$. Similarly, if it becomes stationary by differencing once, then the variable is said to be an $I(1)$ variable.

Up on detecting the stationarity of the variables used in our model (equation 4.7), the Dickey-Fuller (DF) and Augmented Dickey-Fuller (ADF) tests indicate that all the variables except real interest rate are not stationary in levels. The test result is presented in table 5.1 below.

¹⁹ A process is said to be integrated of order d , denoted as $I(d)$, if it has to be differenced d times before it becomes stationary (Thomas 1993)

Table 5.1 Unit Root Test Result

Variable	DF			ADF					
	With out drift and trend	With drift	With drift and trend	With out drift and trend With lag of		With drift With lag of		With out drift and trend With lag of	
				1	2	1	2	1	2
Nfa	0.44318	-1.91	-2.54	0.3639	0.8575	-1.90	-0.99	-2.55	-1.61
P	2.6836	-1.62	-0.32	1.8806	2.5956	-1.61	-1.60	-0.64	-0.67
Gdp	-0.75881	-4.55	-9.86	-0.7544	2.0264	-4.82	-0.38	-18.8	-3.22
R	-2.2906	-11.15	-11.2	-1.4081	-0.9858	-8.4	-6.7	-8.4	-6.8
M	-0.3303	-2.52	-3.1	-0.0626	0.5844	-2.06	-1.11	-2.58	-1.69
Rer	-0.1561	-1.46	-1.26	-0.1384	-0.0964	-1.35	-1.19	-1.10	-0.87
Dc	8.8377	-0.14	-1.82	7.6762	6.3091	-0.12	-0.11	-1.69	-1.27
Δnfa	-11.193	-11.4	-11.4	-11.955	-7.244	-12.3	-7.5	-12.3	-7.45
Δp	-9.5773	-10.6	-10.6	-6.9959	-5.5269	-7.4	-5.5	-7.41	-5.93
Δgdp	-11.199	-11.4	-11.4	-43.587	-22.923	-45.6	-27.5	-45.6	-27.5
Δr	-18.180	-18.5	-18.5	-13.597	-11.590	-13.8	-11.8	-13.8	-11.8
Δm	-13.091	-13.	-13.4	-11.088	-7.6078	-11.3	-7.9	-11.3	-9.85
Δrer	-11.646	-12.1	-12.1	-8.7023	-8.1213	-9.2	-8.7	-9.16	-8.67
Δdc	-8.8262	-12.2	-12.2	-6.4790	-3.9399	-10.9	-7.5	-10.8	-7.5
Critical value	1%	-2.58	-4.02	-2.58	-2.58	-3.48	-3.48	-4.02	-4.02
	5%	-1.94	-2.88	-1.94	-1.94	-2.88	-2.88	-3.45	-3.45

Table 5.1 depicts unit root test result of all the variables included in our reserve flow equation specification. The Dickey-Fuller and Augmented Dickey-Fuller tests with and without a constant and time trend as well as the decision criteria or critical values are provided in the table. According to the test result reported in table 5.1 above, both the Dickey-Fuller and augmented Ducky-Fuller tests for unit root indicate that all the variables are not stationary if no drift and trend are included in the test. If drift and time trend are included however real domestic product and interest rate are stationary in levels while the rest of the variables are non-stationary. If we take the first difference, all the variables with or without drift and time

trend are stationary. Our variables of equation [4.7] are therefore a mixture of $I(0)$ and $I(1)$. Unlike the Engle-Granger procedure, the Johansen procedure allows to use the variables of different orders, i.e. mixture of $I(0)$ and $I(1)$ variables. Indeed it is possible to use a mix of orders of variables in the Johansen likelihood procedure (Harris 1995 P. 80). The unit root test result suggest that the Johansen Maximum likelihood procedure can be employed to test for existence of co-integration or it allows to run the vector autoregressive process.

5.2. Co-integration Analysis

Once we checked the order of integration we can now move on to test for the existence of co-integration among the variables involved in our model. If computed λ_{trace} and λ_{max} values exceed the critical values we may reject the null hypothesis that co-integrating rank $r=0$. The Johansen test for existence of co-integration from equation [4.9] for quarterly data collected for the period 1967/68 to 1999/00 suggest that there is one co-integrating vector. Which means that in the long run the hypothesis of rank $p=0$ is rejected. The variables involved are co-integrated means that they have long run behavioral relationships. As it is depicted in table 5.2 existence of one co-integrating vector is supported by both λ -trace and λ -max statistics. Johansen and Juselius (1990) as referred in Dhliwayo (1996) recommended that the use of both tests is important because the power of the trace is lower than that of the maximum eigen value test.

Pcfirm1 test results of rank, α coefficients and β eigenvectors are presented in table 5.2 below. The null for no co-integration is rejected at 1% percent significance level, which means that there is one co-integrating vector implying the existence of one equilibrium relationship.

Table 5.2 Tests for rank, α coefficients and β eigen vectors using the Johansen method**a) Test of co-integration**

Ho: Rank = p	λ_{trace}	95%	λ_{max}	95%
$p \leq 0$	58.62**	45.3	143.5**	124.2
$p \leq 1$	32.49	39.4	84.85	94.2
$p \leq 2$	23.76	33.5	52.36	68.5
$p \leq 3$	15.47	27.1	28.6	47.2
$p \leq 4$	8.93	21.1	13.13	29.1
$p \leq 5$	4.05	14.1	4.21	15.4
$p \leq 6$	0.16	3.8	0.16	3.8

** Indicates rejection at 1% significance level

b) Standardized β eigenvectors

nfa	dc	m	P	rer	gdp	r
1.000	0.8563	1.071	-3.141	-6.717	-0.9004	4.634
0.4687	1.000	-2.963	-1.098	-0.6097	-3.841	-1.869
0.0206	-0.1953	1.000	0.4725	0.0385	-0.3922	0.01338
-0.5807	-3.691	3.549	1.000	-4.705	18.57	-0.9739
-0.1140	-1.464	-1.473	1.980	1.000	5.246	0.1376
-0.0051	-0.3247	0.1174	0.1931	0.1698	1.000	-0.0112
-0.2095	-5.313	15.62	9.157	-11.53	-12.06	1.000

b) Standardized α Adjustment Coefficients

nfa	-0.1197	-0.0917	0.9717	-0.04778	0.08165	-0.4282	0.0047
dc	0.01149	0.0175	-0.0733	0.0082	0.0021	-0.039	0.0002
m	0.01310	-0.0011	-0.0537	-0.0052	0.0338	-0.0171	-9.937
p	-0.0084	0.0115	-0.3043	-0.0098	-0.0024	-0.0339	3.663
rer	0.0083	0.0045	0.1279	0.0089	-9.285	-0.0379	-0.0002
gdp	0.0089	0.0221	0.1301	-0.0054	-0.0024	-0.0131	-7.121
r	-0.1964	0.2413	0.1625	0.0552	-0.0255	0.0584	-0.0004

The VAR includes four lags in each variable and the constant term

Vector AR 1-5 $F(245,411) = 1.6613 (0.201)$

Vector Normality $\chi^2(14) = 628.59 (0.042)^*$

Looking at the diagnostic tests, tests for vector serial correlation and normality are conducted and the former does not detect problem at 1% significance levels. With regard to normality, however, even if different transformation mechanisms such as logarithm, square root or moving average are tried normality did not improve. However by increasing the lag to nine

the problems of normality has been eliminated. Other diagnostic tests are not provided here because the test did not perform them due to small sample size.

The Pcfirm software result presented in table 5.2 indicated that the null hypothesis of at most one co-integrating vector ($p=1$) is not rejected at one percent significance level. Which implies that there is one co-integrating vector. It follows then that the first column of the α matrix is relevant.

Weak exogeneity test is also conducted by imposing a zero restriction on the α coefficients of the first column using Likelihood Ratio Test. This helps us to write the endogenous variables conditional on other variables in the VAR. The test for zero restrictions of α matrix is referred to as the test for weak exogeneity.

Table 5.3 Tests for zero restrictions on α coefficients for testing weak exogeneity

Coefficients	nfa	dc	m	P	rer	gdp	r
α Coefficients	-0.119	0.012	0.013	-0.008	0.008	0.009	-0.196
Likelihood Ratio test	6.382	5.362	3.807	1.181	2.466	3.167	12.50
Probability	0.000**	0.021*	0.051	0.277	0.12	0.075	0.000**

* Rejection at 5 percent significance level

** Rejection at 1 % per cent significance level

According to the result reported in table 5.3, the zero restriction on α coefficients is rejected for the net foreign assets (nfa), domestic credit (dc) and real interest rate (r) variables but not for the other variables. Hence, from the LR test result above it is evident that we may reject the weak exogeneity hypothesis for nfa, (our dependent variable), dc and r. Nfa and real

deposit interest rate are rejected at 1% level of significance while domestic credit at 5% significance level. This implies that we could have three equations for each endogenous variable conditional on those exogenous variables. This would mean that the discovered long run linear combinations might contain some important information, which can also explain the behavior of domestic credit and interest rates.

In this particular case therefore we may have three normalizing possibilities.²⁰ One possibility, which is of our interest, is to normalize with nfa by conditioning on the other variables. Thus, the single equation with the estimates of the long run coefficients, (in this case they are elastic ties,) can be written as equation [5.1] below.

$$nfa_t = 3.141p_t + 0.9gdp_t - 4.634r_t - 1.071m_t + 6.717rer_t - 0.856dc_t \dots\dots[5.1]$$

Since we have only one co-integrating vector, the error correction term is the first element in the α matrix presented in table 5.2(c) It measures the feed back effect or adjustment to equilibrium relation to the variables in the vector. The magnitude of this term is -0.1197. It is statistically significant at 1 % level of significance and its sign is as expected. The negative sign indicates that economic agents adjust towards long run steady state by about 12 percent per quarter after a shock is injected. Despite its statistical significance however, the magnitude of this term is low which implies that there is a very slow or weak adjustment

²⁰ Normalizing in this context refers to writing the model in terms of dependent and explanatory variables

process to the long run steady state path. Hence the disequilibrium can be fully adjusted in eight quarters, with about 50% adjustment every year.

The long run coefficients of the respective variables should be tested for their significance to determine which variable uniquely constitutes the co-integrating vector. Hence a zero restriction is imposed on each coefficient and the vectors for Likelihood Ratio tests are conducted. The result is summarized in table 5.4 below.

Table 5.4 Tests for Zero Restrictions on the long run parameters

Coefficients	Nfa	dc	m	P	rer	gdp	r
β Coefficients	1.000	0.856	1.071	-3.141	-6.717	-0.9004	4.634
LR tests	14.95	0.894	0.191	5.545	24.306	0.069	18.06
Probability	0.000**	0.344	0.662	0.185*	0.000**	0.792	0.000**

* Rejection at 5% percent significance level

** Rejection at 1% significance level

The test result in table 5.4 indicates that domestic credit (dc), money multiplier (m), and real income (gdp) are not statistically significant in explaining net foreign assets in the long run. The offset coefficient obtained is -0.856, which is very close to the expected one-to-one offsetting coefficient of -1. Nevertheless, the signs of the long run parameters are as a priori predicted by the monetary approach to the balance of payments model. The model assumes that the balance of payments is positively related to the domestic price and real income, while it is negatively related to interest rate, money multiplier and domestic credit. The empirical result suggests that balance of payments is directly related to the exchange rate in the long run. Nevertheless, the effect of exchange rate adjustment to balance of payments depends on the Marshall-Lerner condition.

In the foregoing discussion of the Johansen procedure we saw that long run relationship exists and proved to be significant. The associated long run parameters are also determined and to conclude the empirical analysis of the model we have to estimate the short run dynamics and obtain the coefficient for Γ 's in equation [4.9] through the estimation of parsimonious vector error correction model (PVECM).

5.3. Error Correction Mechanism

But before we move on to the short run analysis, the zero restriction tests on α coefficients indicated that there are three endogenous variables in our model. If we estimate the single equation through OLS it may lead to simultaneous equation bias. In this case therefore we appeal to the simultaneous equation estimation of net foreign assets, domestic credit and real interest rates using the two stage least square (2SLS) estimation method.

The general unrestricted error correction specification of the two stage least square (2SLS) estimation result in which net foreign assets, domestic credit and real interest rate are endogenous is reported in equation [5.2]. But only the results for net foreign assets equation is reported because our interest is not in the relationship of domestic credit and interest rate to the specified exogenous variables. Equations of domestic credit and interest rate are reported in annex IV.

In this two stage least squares estimation one period lag of each variable and the first lag of the error correction term are included. However, the VAR process is done with four lags as

lag length above and below four were not significant. Since we are using quarterly data taking four-lag length is equivalent to one lag in annual series, which is expected. Equation [5.2] below represents the 2SLS estimation of the general error correction representation for the reserve flow equation, which also consists the effects of domestic credit and interest rate.

$$\begin{aligned} \Delta nfa_t = & 0.038 + 0.2\Delta nfa_{t-1} - 0.42 \Delta dc_{t-1} - 0.004\Delta r_{t-1} + 0.43\Delta m + 0.07\Delta m_{t-1} - 0.28\Delta rer \\ & (0.65) \quad (1.14) \quad (-0.414) \quad (-0.041) \quad (0.69) \quad 0.10 \quad (-0.324) \\ & -1.52\Delta rer_{t-1} + 0.53\Delta p - 0.03\Delta p_{t-1} - 0.83\Delta gdp - 0.365\Delta gdp_{t-1} - 0.34VECM_{t-1} \dots\dots\dots[5.2] \\ & (-1.59) \quad (0.81) \quad (-0.05) \quad (-2.39) \quad (-1.15) \quad -1.63 \end{aligned}$$

The value in parenthesis is t-values

$$\sigma = 0.5370$$

Diagnostic Tests

AR 1-2p =	0.397 [0.526]	Vector AR 1-5 F(45,288) =21598[0]**
ARCH chi(4) =	9.027 [0.0604]	Vector Normality = 96.32 [0.0]**
F form (1,113) =	0.36487 [0.552]	Vector Xiy F (144,498) = 1.5078[0]**

** Indicates rejection at 1% level of significance

In the estimated equation, $VECM_{t-1}$ stands for the first lag of the co-integrating vector for international reserves or balance of payments specification. Δ is the difference operator indicating first difference of the variables, other variables are as defined earlier.. AR 1- 2F(0.397) [0.526] is the Breusch-Godfrey Lagrange multiplier test statistic for serial autocorrelation up to the second lag, ARCH is a test for autoregressive conditional heteroscedasticity, normality X^2 is the Jarque-Bera test for normality, σ is standard error of the regression .

Since all the variables included in the general error correction representation in equation [5.2] are stationary then the standard t and F ratios and other diagnostic tests are valid. The ECM has the correct sign and it is statistically significant.

But we cannot take this model as the final model of the reserve flow specification since there are a number of statistically insignificant coefficients. The coefficients of domestic credit and real interest rate are among those variables with small t values. Thus according to Hendry 's general to specific modeling approach as referred in Solomon Tesfay (1999) we have to leave this over- parameterized equation and move on to a more parsimonious model. The simultaneous equation framework is left and only the single equation framework is adopted.

Because, first of all, our interest is to estimate one variant of the monetary approach to balance of payments (the reserve flow equation) and not in knowing about either domestic credit or interest rate modeling, and hence we may not get meaningful domestic credit and interest rate equations in the alternative simultaneous equation specification. Secondly, the estimated domestic credit and interest rate equations could not pass constancy of parameter estimates, i.e. in addition to other diagnostic test problems reported under equation [5.2]. . According to Hendry (1988) failure to pass the parameter constancy test in such simultaneous equation estimations may be an indicative of taking the variables as exogenous variables in the system. Moreover, Ericsson (1991), as cited by Dheliwayo (1996), has also pointed out that a more powerful test for exogeneity is parameter stability.

To test for stability of parameters, the recursive graphs that plot sequential one-step ahead chow test, and one-step ahead residuals for domestic credit and interest rate variables corresponding to equation [5.2] are depicted in figure 5.1 and 5.2 below.

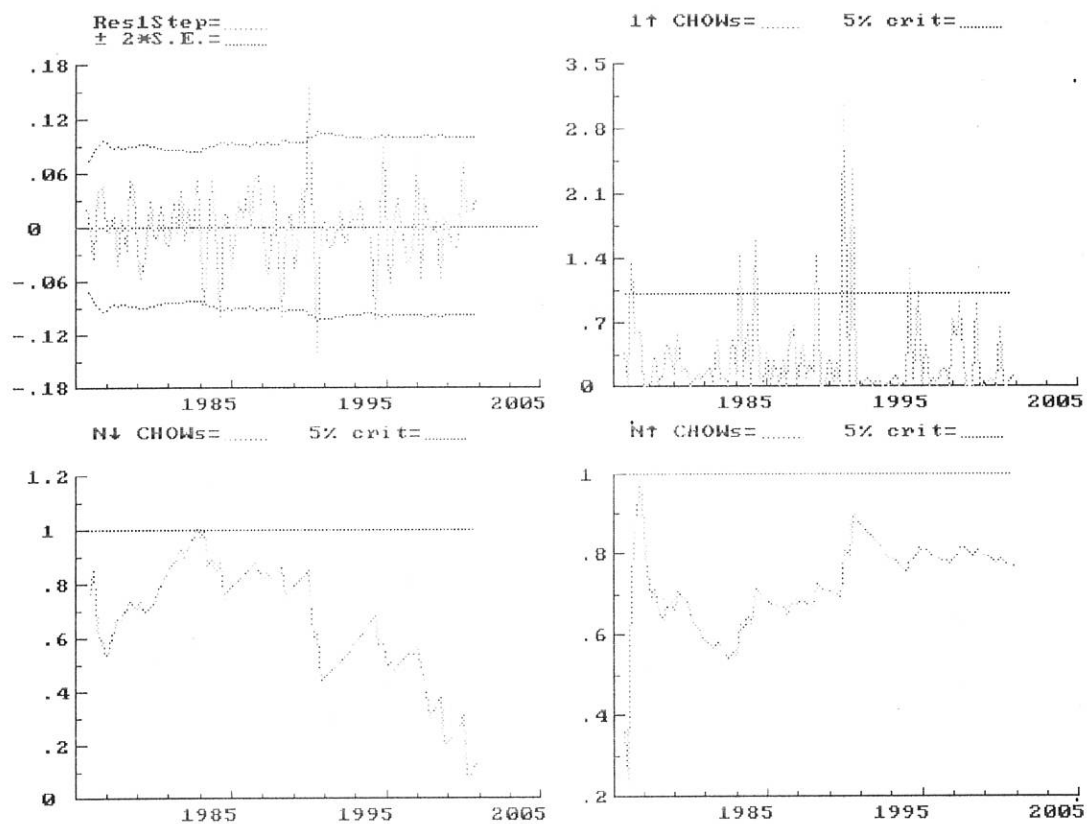


Figure 5.1 Parameter Stability test for Domestic Credit in two stage least square estimation of equation 5.2

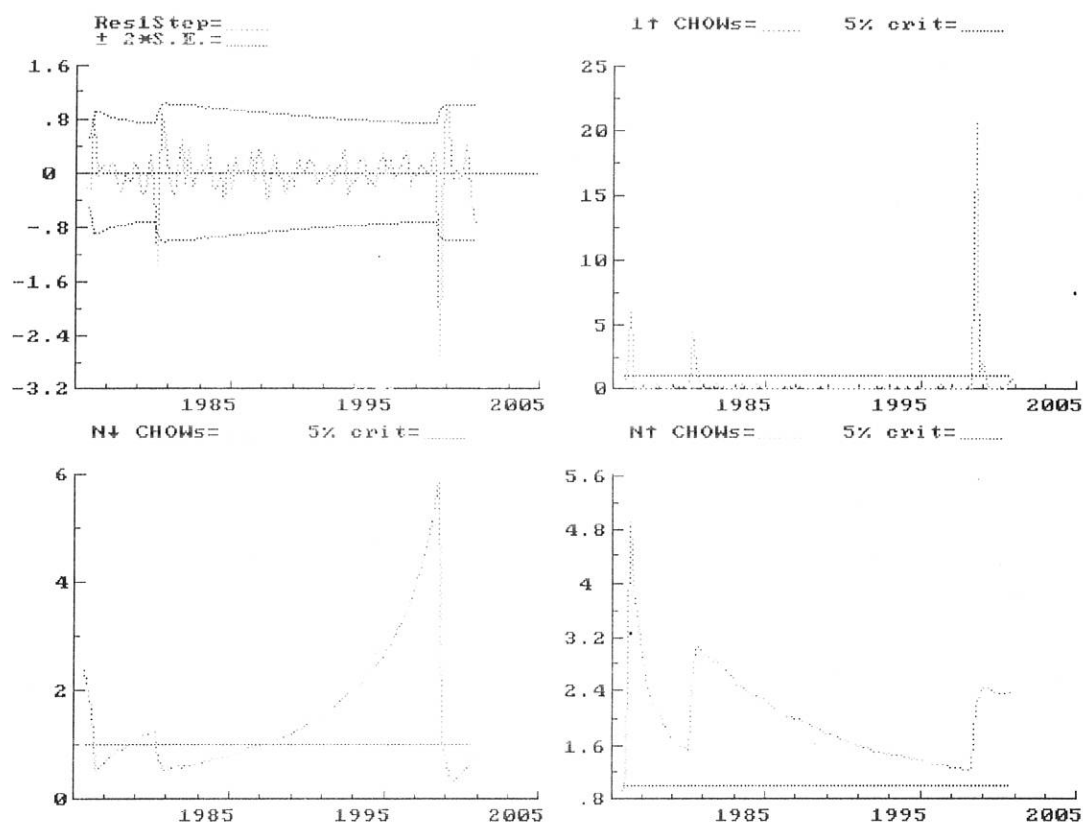


Figure 5.2 Parameter Stability test for Interest Rate in two stage least square estimation of equation 5.2

As can clearly be seen in the plots (fig.5.1 and 5.2), the variables fail to pass parameter stability tests. We can therefore assume that both domestic credit and interest rates are weakly exogenous variables in the system. Hence we can safely specify the reserve flow equation conditional on all explanatory variables (equation 4.7) and thus resort to single equation estimation. The variables in the error correction system are all stationary because they are differenced and hence OLS can be employed.

The over parameterized short-run dynamics reserve flow equation of our model can generally be specified as equation [5.3] as follows.

$$\Delta nfa_t = B_0 + \sum_{i=1}^k B_1 \Delta nfa_{t-i} + \sum_{i=0}^k B_2 \Delta dc_{t-i} + \sum_{i=0}^k B_3 \Delta m_{t-i} + \sum_{i=0}^k B_4 \Delta p_{t-i} + \sum_{i=0}^k B_5 \Delta rer_{t-i} + \sum_{i=0}^k B_6 \Delta gdp_{t-i} + \sum_{i=0}^k B_7 \Delta r_{t-i} + B_8 \epsilon_{t-1} + U_t \dots \dots \dots [5.3]$$

Where Δnfa_t is changes in log of international reserves or balance of payments, k is the number of lags used, ϵ 's are the residual of the restricted vector or the error correction term and the other variables are as defined earlier. The model reduction process with the single equation like equation 5.2 is estimated for nfa using OLS. Unlike in the two-stage estimation case here both domestic credit and interest rate are entered as exogenous variables.

Starting with nine lag lengths difference of each variable of the over parameterized error correction model is tried according to Hendry's general to specific approach to get the most parsimonious dynamic reserve flow equation using the t-tests against the information from each lagged variable. After a series of eliminations of insignificant variables, the parsimonious short run dynamics final result is obtained. The preferred result is presented in table 5.5 below.

Table 5.5 Regression Result for Short run Dynamics of the Reserve Flow Equation..

Variable	Coefficient	t-value	t-probability
Δnfa_{t-1}	0.67378	3.202	0.000
Δnfa_{t-3}	0.36332	3.500	0.000
Δdc	-1.3942	-3.456	0.000
Δm_{t-9}	1.4134	2.279	0.025
Δp	1.1747	2.382	0.019
Δrer_{t-1}	-1.9645	-2.489	0.014
Δrer_{t-2}	1.5044	1.673	0.097
Δgdp_{t-1}	6.0288	4.813	0.000
Δgdp_{t-8}	-1.6531	-5.490	0.000
Δr_{t-5}	0.14230	2.101	0.034
Seasonal -1	-2.0807	-4.441	0.000
Seasonal -2	1.2609	4.365	0.000
$VECM_{t-1}$	-0.78205	-3.401	0.000

Diagnostic Tests

AR 1-5F(5,104) = 1.2974 [0.2908]

ARCH 4 F(4,101) = 2.109 [0.0859]

Normality $\chi^2(2)$ = 47.79 [0.0193]

RESET F (1,108) = 0.4332 [0.5118]

R^2 = 0.4556 DW = 1.90 σ = 0.4395

Values given in square brackets are the probabilities of diagnostic tests.

In the process of obtaining the preferred parsimonious model, the t-value for significance of individual variables and F-test for model reduction were used as criteria in dropping insignificant variables. The $VECM_{t-1}$ stands for the first lag of the co-integration vector for the reserve flow equation, which indicates the long run feed back effects or adjustments of the error.

A new test of Ramsey's RESET is included as model evaluation as shown in the diagnostic test. The diagnostic tests detect no problems. The F tests for the joint significance of coefficients strongly suggest that the null hypothesis that all coefficients are zero at the same time is rejected. Despite the fact that we have time series regression equation, the R^2 value of about 46% suggests that the reserve flow equation is not sufficiently explained. The estimated

coefficients are statistically valid since the residuals are suggested to have all the required properties. These properties include no evidence of serial autocorrelation, the presence of autoregressive conditional heteroskedasticity in the residuals is also rejected, no problem of misspecification and functional forms. Generally the diagnostic tests are Gaussian except the rejection of normality at 5% significance level. Following Harris, 1995 we can say the result is satisfactory.

Lagged values of the dependent variable (reserves) are found to be significant that may suggest two implications. One could be that if previous period reserves were good (increased) then it may result in that the country gains credit worthiness so that current reserve may increase. Secondly, it may also imply that if previous period reserves were high there would be increased import of intermediate inputs so that there will be an increase in the production of tradables that ultimately lead to increase in reserves.

Domestic price, interest rate and the money multiplier are found to be statistically significant in the short run, but the expected negative signs of the multiplier and real interest rate are rejected. This may imply that the variables have limited power of explaining reserves due to the shallowness of the financial sector development and low degree of monetization of the Ethiopian economy. The above preferred model also suggest that real effective exchange rate is statistically significant in the short run but with switches in signs. Its one-quarter lag bears the correct expected negative sign, while the second lag indicated a positive relationship. Since the sign with respect to exchange rate change is an empirical issue that depends on the

Marshall-Lerner conditions, the switch in signs in the short run may suggest that the effect of exchange rate is ambiguous.

The effect of real income in the short run on balance of payments is mixed. One-quarter lag of real gross domestic product indicates a significant and positive coefficient as predicted by the model, while the eighth lag however become significant but negative. The positive coefficients may suggest that the increase in income did not leak out in import and hence draw down in reserves. On the other hand, the negative coefficient may suggest that previous period increase in income may lead to increase in imports in the current period and hence decline in reserves.

The coefficient of the error correction term is negative and statistically significant implying provision of powerful support for co-integration. It gives a measure of the average at which reserve flows adjust to the dis-equilibrium condition and about 78 percent of the adjustment in reserves in the short run is made in one quarter.

Finally, the preferred model indicates an expected negative coefficient for domestic credit but the model's central postulate of one-to-one offsetting coefficient is not consistent. Instead the result indicates an overstated coefficient, implying that increase in domestic credit deteriorates balance of payments by more than the increase in domestic credit.

5.4. Causality Tests

One very important issue in verifying the validity of the monetary approach to the balance of payments model is the direction of causation between reserve flows and domestic credit creation. The most popular test in checking causality is the pair wise Granger causality test. The procedure we applied in testing the causality of these two variables is based on the following null hypotheses. The hypothesis and the test results are presented in table 5.6

Table 5.6 Eviews Test Result of Causality

Null Hypothesis	No of observations	F-tests	Probability
DC does not Granger cause NFA	126	8.256	0.004
NFA does not Granger cause DC	126	0.007	0.930

According to the test result provided in the table above, the null that “Domestic Credit does not Granger Cause Reserve flows” is rejected at 1 percent significance level and hence the direction of causality is from domestic credit to reserves, which confirms validity of the monetary approach to the balance of payments model.

CHAPTER SIX

CONCLUSION AND POLICY IMPLICATIONS

6.1 Conclusions

This paper has attempted to empirically examine the relevance of the monetary approach to the balance payments model in the case of Ethiopia. The study is undertaken on quarterly data collected for the period 1967/68 (1) to 1999/00 (4). The Johansen (1988) Maximum Likelihood estimation technique is employed in the study. Our interest was to estimate one variant of the model (the reserve flow equation), which indicates the overall balance of payments effects of the variables included in the model; namely net foreign assets, domestic credit, domestic price, real gross domestic product, real exchange rate, real interest rate, and the money multiplier.

Given the time series properties of the variables, both the vector autoregressive (VAR) and the short run dynamics error correction models were estimated to verify the validity of the monetary approach to balance of payments model. Accordingly, the empirical result suggested that the variables are co-integrated in the long run as indicated by a rejection of the null hypothesis of zero co-integrating vector. Existence of one co-integrating vector is failed to be rejected by both λ -trace and λ -max statistics. The error correction coefficient is also found to be statistically significant and correctly signed.

The long run reserve flow (balance of payments) equation was estimated and the result suggests that only exchange rate and real interest rates are statistically significant. However, all the variables involved in the model have exhibited the correct signs as predicted by the monetary theory. The monetary approach to the balance of payments model predicts that balance of payments is positively related to real income and domestic price while it is inversely related to interest rate, money multiplier and domestic credit. The sign with respect to the real exchange rate is however an empirical issue and hence the evidence here indicated that it is positive in the long run while it is mixed in the short run.

Balance of payments is found to have significantly explained by its lagged value. This may suggest that increase in previous quarters reserves may lead to an increase in current period reserve through its impact on credit worthiness of the country and increase in the production of tradables that ultimately may lead to build-up in reserves.

The empirical result seems to support the model prediction of unitary elasticity of domestic price in the short run. Real exchange rate is found to be significant both in the long and short run analysis of the model. In terms of its sign it was positive in the long run and switched to negative in the short run with one-quarter lag and immediately switched to positive after two quarter lags. This implies the general consensus among economists regarding devaluation that it has a negative effect in the short run, but in the median and long run devaluation improves balance of payments as summarized by the J-curve effect. Although Ethiopia's financial sector is shallow and capital and money markets are not developed, interest rate is found to explain balance of payments both in the long and short runs, but the short run sign is inconsistent in

the model. Real income is predicted to have a positive sign unitary coefficient in the model. The Empirical evidence, however, suggested consistent sign but failed to verify the magnitude in the long run. In the short run, however, there is a switch in sign

The underlying key proposition of the model is that a change in the domestic credit will result in an equi-proportionate change in reserves or balance of payments. The most critical issue in verifying the monetary approach to balance of payment model is then predicting unitary elasticity for domestic credit, or the offset coefficient. The empirical results suggested that both in the long and short runs the sign is found to be consistent as predicted. With regard to the offset coefficient however it was insignificant in the long run while significant in the short run but the predicted one-to-one relationship is rejected. The unitary elasticity of the offset coefficient is overstated from the predicted value. The empirical test on the offset coefficient for many developing and developed countries was mixed (see Pilbeam, 1998, Hallwood and Macdonald, 2000). In some instances it is found to be under the predicted value and in others it becomes above negative one in absolute terms. The reasons why this coefficient is higher than predicted value, as argued by researchers, are exclusion of exchange rate expectation from the model, sterilization practices of central bank and simultaneity biases in the variables under consideration. In fact, even if the simultaneity bias is accounted for, the exogeneity assumptions of real income, price, interest rate, and exchange rate, in the real world is not justified (see Macdonald and Hallwood, 2000).

To account for the simultaneity bias the two stage least square estimation method was conducted. The result suggest that the authorities have been practicing sterilization as

indicated by a significant coefficient of the net foreign assets in the two stage least square estimation of domestic credit. The estimation result is reported in annex IV.

Causality tests between domestic credit and net foreign assets based on the Granger causality procedure support the monetary approach to the balance of payments that causality is from domestic credit to reserves.

6.2. Policy Implications

The purpose of this paper has been to empirically test the validity of the monetary approach to the determinants of balance of payments in the case of Ethiopia. The empirical result suggested that money plays significant role in explaining balance of payments. This implies that the monetary authorities have to pay attention in controlling domestic credit creation in order to improve external imbalance.

Apart from tight monetary and fiscal policies, other reinforcing policies that induce export diversification and build up in reserves by improving supply side rigidities have to be implemented.

The MABP relies on certain assumptions the plausibility of which in the Ethiopian context is questionable. Insignificance of interest rate and money multiplier as well as their inconsistent signs seem to be the reflection of this fact. To this end, financial sector development and monetary deepening would increase the applicability of the model. It also enables the

authorities to implement indirect monetary policy instruments so policies have to be geared accordingly.

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Annex-I A Simple Mathematical Derivation of the Marshall-Lerner Condition

The current account is defined as

$$CA = X - M \dots\dots\dots [A.1]$$

Where X and M respectively represent exports and imports. Given the assumptions of the model that both domestic and foreign prices are fixed and any changes in relative prices are due to changes in nominal exchange rate; i.e.

$$CA = PX_v - EP^* M_v \dots\dots\dots [A.2]$$

Where P and P^{*} stand for domestic and foreign price levels, X_v and M_v represent the volume of exports and imports, respectively and E is the nominal exchange rate or the domestic currency unit per unit of foreign currency.

By making simplifying assumption or indexing prices as P = P^{*} = 1, then equation [A.2] becomes

$$CA = X_v - E M_v \dots\dots\dots [A.3]$$

Taking the total difference of [A.3] and dividing through out by dE (changes in the exchange rate) gives

$$\frac{dCA}{dE} = \frac{dx}{dE} - \frac{EdM}{dE} - M \dots\dots\dots [A.4]$$

Defining elasticity of exports as the ratio of percentage change in exports to that of percentage change in exchange rate and the elasticity of imports as a ratio of percentage change in imports to percentage change in exchange rate, we get

and

$$\eta_x = \frac{dX}{dE} \frac{E}{X}; \quad dX = \eta_x \frac{dE}{E} X \dots\dots\dots [A.5]$$

$$\eta_m = \frac{dM}{dE} \frac{E}{M}; \quad dM = -\eta_m \frac{dE}{E} M \dots\dots\dots [A.6]$$

Substituting [A.5] and [A.6] for dX and dM into [A.4] yields

$$\frac{dCA}{dE} = \left(\eta_x \frac{X}{E} \right) + \eta_m M - M \dots\dots\dots [A.7]$$

Dividing each term by M and assuming that the current account is initially in balance that implies $X = EM$, then [3.7] becomes:

$$\frac{dCA}{dEM} = \eta_x \frac{X}{EM} + \eta_m - 1 \dots\dots\dots [A.8]$$

$$\frac{dCA}{dE} = M (\eta_x + \eta_m - 1) \dots\dots\dots [A.9]$$

Equation [A.9] shows the Marshall - Lerner condition, which implies that if the sum of elasticity of exports and imports exceeds unity then we say that devaluation improves the current account balance. Conversely, if the sum of the two elastic ties is less than one, then we may conclude that devaluation worsen the current account.

Annex II. Methods of Quarterly Dis-aggregation of GDP Data

Agriculture Sector

Ethiopia's GDP is believed to be highly affected by seasonality of agricultural harvest. This is mainly due to the fact that agriculture is rain fed. The structure of agricultural harvest is divided into main harvest, which accounts about 95 per cent of the total agricultural GDP, and the Belg harvest that accounts for the balance. According to information obtained from CSA, any thing harvested between September and January is classified as main harvest; and the rest are Belg harvest. Moreover, a survey by CSA has also suggested that about 80 percent of agricultural GDP are cereals.

Studying the behavior of quarterly contribution of the Agriculture Sector to the total GDP is computed based on the amount of labor exerted to each activity in the production of cereals for which data is available. The data and the computed coefficients are presented in the following table.

Table Annex -11(a). Labor Requirement for different activities for selected cereals
(in man-days)

	Barely	Wheat	Teff	Maize	Sorghum	Average	Ratio
1 st Ploughing	4	4	5	7	5	5	0.075
2 nd Ploughing	4	4	5	7	5	5	0.075
3 rd Ploughing	3	3	5	3	-	3	0.045
Planting, sowing, covering	4	4	6	8	4	5	0.075
1 st weeding	15	11	22	20	24	18	0.268
2 nd weeding	-	-	-	24	7	6	0.089
Harvesting	13	18	18	9	9	13	0.194
Threshing, widdowing (shelling)	7	10	17	19	9	12	0.179
Total	50	54	78	88	63	67	1.00

Source: CSA, Development Bank of Ethiopia, and Ministry of Agriculture

The allocation of each activity to each quarter and the derivation of the coefficients are performed as follows: These coefficients give the quarterly weights of agricultural output.

July, August & September (QI) = Sowing & 1st weeding

October, November & December (QII) = 2nd weeding & Harvesting

January, February & March (QIII) = Threshing

April, May & June (QIV) = Ploughing (1st, 2nd & 3rd)

For each quarter the coefficients are:

$$QI = 0.075 + 0.268 = 0.343$$

$$QII = 0.089 + 0.194 = 0.283$$

$$QIII = 0.179$$

$$QIV = 0.075 + 0.075 + 0.045 = 0.195$$

Since the Belg season (small rain season) is very small, about 5%, relative to main season, it is ignored.

Industrial Sector

The coefficients for seasonality of industry in the total GDP are computed from quarterly production data compiled by MEDaC on twenty-eight manufacturing public enterprises for which data is available since fiscal year 1993/94. These coefficients are presented as follows

Table Annex- II (b) Quarterly Manufacturing Sector GDP and corresponding ratios

Quarter	Total	Ratio
QI	1162178	0.217
QII	1385103	0.259
QIII	1412160	0.265
QIV	1388841	0.259
Total	5348282	1.000

Source: MEDaC

Services Sector

The quarterly seasonal adjustment coefficients are calculated for the distributive sub-service sector based on loan disbursement from the banking system. The distributive sub-sector includes trade, hotels and restaurants, and transport and communications. The distributive sub-sector accounts for about 15% of the total service sector's GDP. It is also believed that the distributive sub-service sector actively uses bank credit in the form of overdraft facilities and term loans. The time series quarterly disbursement of bank loans to the distributive service sector is available from the quarterly bulletin of National Bank of Ethiopia and data from 1985/86 to-date are used. For Other Services, however, the annual data is equally divided into the four quarters because this sub-sector is believed to be less seasonal sensitive.

The average quarterly loans disbursed as well as the corresponding ratios are provided in the following table²¹

Table Annex- II(c) Average Quarterly Disbursement for Distributive Services and computed coefficients.:

Distributive Services	QI	Ratio	QI	Ratio	QI	Ratio	QI	Ratio
Domestic trade	458	0.164	3351.5	0.377	2705.3	0.304	1368.6	0.154
International trade	791.4	0.184	1006.4	0.234	1476.2	0.344	1019.8	0.237
Hotels & Restaurants	300.2	0.258	314.7	0.271	247.4	0.212	299.8	0.257
Transport & Comm.	459.1	0.198	598.6	0.258	566.4	0.244	693.1	0.299
Average Ratio		0.201		0.285		0.276		0.237
Other Services		0.25		0.25		0.25		0.25

Source: National Bank of Ethiopia Quarterly Bulletin various issues

After getting the coefficients for agriculture, industry and service sectors for each quarter , we multiply the annual GDP by each coefficient to get quarterly sectoral values and then add them to generate the quarterly annual GDP.

²¹ The other sub-service sector includes banking and insurance, administration, defense, justice, education , health and the like.

Annex III Computation of Real Effective Exchange Rate Data

The data for the construction of real effective exchange rate is obtained from various sources. Exchange rate and wholesale prices are obtained from International Financial Statistics monthly database, March 2000 issue. Trade weight is computed from the direction of trade of Quarterly Bulletin of NBE. The base year is taken to be 1995 as this year seems to be normal in that there was no war or drought in the country.

It is very difficult to include all trading partners of Ethiopia in the study. Therefore partners, which has one percent and above of import plus export to total trade of the country are selected. Accordingly thirteen countries are included in the study. Jointly these countries account for about 80 percent of the total trade. The countries and their corresponding weight is presented in the following table.

Table Annex III Trade weights of selected countries

Name of country	Weight
Belgium	0.0239
Germany	0.1538
India	0.0195
Italy	0.1068
Japan	0.0153
Kenya	0.0221
Korea	0.0863
Netherlands	0.0327
France	0.0274
Saudi Arabia	0.1205
Sweden	0.0186
UK	0.0454
US	0.0906

After collecting the data the nominal effective exchange rate is computed as follows. The nominal effective exchange rate is defined as the weighted average of exchange rate of the domestic currency per a unit foreign currency as

$$NEER = \sum_{j=1}^n W_{ji} E_{ji}$$

Where W_{ji} = trade weight of country j at time i

E_{ji} = nominal exchange rate defined as domestic currency per a unit of foreign currency

N = number of trading partners

The real effective exchange rate is computed by deflating the NEER by the ratio of relative prices of tradable to non-tradable. In choosing the relevant price index we take the whole sale price index where available as a proxy for price of tradable. In the absence of whole sale price we take the CPI. The REER is then calculated using the formula:

$$REER = \sum_{j=1}^n W_{ji} E_{ji} \frac{P_i^*}{P_i}$$

Where P_i^* = Whole sale price index of partner countries

P_i = CPI of Ethiopia proxy by the Addis Ababa price index.

Annex IV General Unrestricted Error Correction Specification of the two Stage Least Square (SGS)

Annex IV (a) Two stage Least Square Equation for Domestic Credit

Variable	Coefficient	T-value
DLDC_1	-0.125	-1.296
DLNFA_1	-0.040	-2.344
DLR_1	-0.005	-0.596
DLm	0.018	0.303
DLm_1	0.009	0.14
DLp	0.032	0.504
DLp_1	0.054	0.867
DLRER	0.036	0.432
DLRER_1	0.034	0.377
DLRGDP	-0.011	-0.348
DLRGDP_1	0.012	0.404
VLNFA_1	0.048	2.465
Constant	0.037	6.614

Diagnostic tests

$\hat{\alpha} = 0.0508911$ RSS = 0.2952492207

AR 1-1 F(1,113) = 2.4361 [0,12]

Normality Chi(2) = 41.304[0.] **

Hetro F(1, 112) = 0.0084 [0.927]

Vector AR 1-5 F(45,288) = 21598 [0] **

Vector Normality = 26.32 [0] **

Vector Xiy F(144,498) = 1.5073 [0] **

Annex IV (b) Two stage Least Square Equation for interest rate

Variabl	Coefficient	t-value
DLDC_1	-0.140	-0.147
DLNFA_1	-0.062	-0.373
DLR_1	-0.426	-4.789
DLm	-2.669	-4.486
DLm_1	-0.869	-1.317
DLp	0.200	0.322
DLp_1	-0.425	-0.688
DLRER	0.668	0.808
DLRER_1	-0.464	-0.521
DLRGDP	-0.779	-2.395
DLRGDP_1	-0.073	-0.245
VLNFA_1	0.020	0.102
Constant	0.023	0.424

$\hat{\alpha} = 0.502245$ RSS = 28.75646374

AR 1-1 F(1,113) = 15.042 [0.00]**

Normality Chi(2) = 73.219 [0.00]**

Hetro F(1, 112) = 6.768 [0.0105]**

Vector AR 1-5 F(45,288) = 21598 [0] **

Vector Normality = 26.32 [0] **

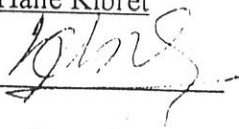
Vector Xiy F(144,498) = 1.5073 [0] **

DECLARATION

I, the undersigned, declare that this thesis is my own original work and it has never been presented in any other university. All sources of materials for this thesis have been dully cited and acknowledged.

Name: Haile Kibret

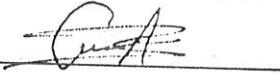
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Confirmed by advisor:

Name: Gebrehiwot Ageba (PHD)

Signature



Place and Date of Submission: Addis Ababa University, June 2001