THE DYNAMICS OF INFLAITON IN ETHIOPIA

BY

YOHANNES AYALEW

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BY
YOHANNES AYALEW

FACULTY OF BUSINESS AND ECONOMICS
APPROVAL BY BOARD OF EXAMINERS

Dr. Gebrehiwot Ageba Advisor	Signature
Sam-Gr. Cho Examiner	Signature
Haile KeCret Examiner	Signature

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Abstract

Traditional economic theories like keynesianism and monetarism ascribed inflation basically to be a demand side phenomenon. This arises from their basic premeses that there are well-developed and integrated product, labour and financial markets. Policy variables such as interest rates, exchange rates, and money supply could, therefore, be effectively employed to influence policy targets. For keynesians inflation is a disequillibrium in the product market due to the optimistic behavior of investors or government to spend beyond the full employment level. For monetarists, on the other hand, inflation arises due to a disequilibruim in the money market when the money supply goes beyond the demand for it. The Phillips Curve which basis itself on these theories is, therefore, a demand side theory.

Things are, however, different in Ethiopia Production is predominately agrarian. Markets are fragmented and underdeveloped. Productivity is low. And, production is constrained by structural rigidities. Internal and external shocks subjected the supply curve to a repeated contraction. The actual production function is, therefore, well below the potential (steady state) level. Removing structural rigidities, and creating well functioning and integrated markets is urgent to eliminate supply bottlenecks. Each step to remove the bottlenecks is expected to produce a continuous rightward shift in the aggregate supply curve. This means that when unemployment declines inflation also declines. The Phillips Curve is, therefore, positive. This is what is evident in Ethiopia. However, when an efficient market system is established and resources begin to be exposed to a competitive market system, money will finish its business as a producer good and inflation begins to be a demand side phenomenon.

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1. INTRODUCTION

> *"Unemployment in the midst of economic depression (in DCs) was treated synonymously with underdevelopment of resources in LDCs" Coats,and Khatkhate (1983) p.3*

Inflation in Ethiopia averaged about 7.15 percent for the last three decades between 1967/68 and 1997/98. This places the country among the low inflation economies in the region. This period falls in three distinct regimes. The period between 1967/68 – 1973/74 falls in the last part of the imperial regime which could be considered as a period of modest economic growth. Real GDP was growing at an average rate of about 3.8 percent. Particularly, the manufacturing sector registered a rapid rate of growth averaging 10.5 percent per annum between 1967/68 – 1971/72 [Eshetu and Mekonnen, 1992].

Between 1967/68 – 1973/74 government deficit averaged about Birr 83.1 million. Of the latter, about 23 percent (0.5 percent of GDP) was financed by the banking system. During this period money supply, as measured by M2, was growing by 13.8 percent per annum, while prices grew only by about 2.8 percent. One reason for such a low inflation rate might be a strong 'Ethiopian dollar' (now the 'Birr') and the prevailing international monetary discipline. In this period, the international monetary system was under a fixed exchange rate regime in accordance with the Bretton Woods Agreement which lasted between 1946 – 1973. Infact, the 'Ethiopian dollar' was revalued in 1971 and 1973 from 2.48 per USD to 2.30 and then to 2.07 per USD respectively on the wake of the devaluations of US Dollar in these years (Tsegaye, 1993 P.4.).

The rapid transformation of the economy had, however, been impeded by the backward feudalistic agricultural sector which demanded for the transformation of the latter. This instigated a revolutionary movement among the educated. However, the development minded but unorganized student movement was hijacked by organized military junta which proclaimed itself as a Derg (Committee) in 1974 which was a landmark to the stagnated economy.

Following the proclamation of socialism, the Derg began to nationalize the fledgling private businesses irrespective of the type of sectors. It also nationalized urban and rural lands. Nationalized private banks and insurance companies were merged with government ones. Development plans began to be drawn centrally by the Central Planning Authority and, the market system was downplayed. Prices stopped giving the necessary signals on shortages and excesses in the market. Instead, government established wholesale and retail distribution enterprises to the extent of kebele[1] shops and agricultural service co-operatives to facilitate price controls.

The replacement of the price system by a central planning system, however, created an economy characterized by shortage. Industries began to be uncompetitive both internally and externally. Most of them became loss makers requiring government subsidies. This put pressure on budget deficit in two ways. First, government lost revenues from these industries in the form of taxes or residual surplus. Second, it had to subsidize these industries to make them survive. And, the fiscal situation was aggravated by the long-standing civil war in Northern Ethiopia. Government was

[1] A kebele is the lowest tier of the local government.

forced to increase its bank financing. The latter reached as high as 80.6 percent of the deficit in 1991/92.

Despite these worsened situations, government was able to contain domestic inflation on average at about 9.8 percent per annum. This was mainly due to the repressed aggregate demand. A study by Mistry (1991) observed that aggregate demand was infact declining in real terms between 1984/85 – 1988/90 (p. 15). Policies such as a protracted wage control, direct price control on basic commodities, restraints on credit to the private sector (to help finance budget deficit), appreciation of the Birr to the extent of 242 percent [Yohannes, 1994], and other measures employed throughout the period, have contributed a lot to this.

Therefore, the low level of inflation that prevailed was not a sign of healthy economy. Rather, it reflected the recession that the economy had experienced for such a long period. The average annual rate of per capita real GDP growth in the two decades was about 0.2 percent. The industrial sector was most affected. The defunct regime felt the consequence of misguided policies only during the end of its era with the fall of the socialist empire in Eastern Europe. In 1989/90 it proclaimed the end of socialism in Ethiopia and the beginning of capitalism with a mixed economic principle. This, however, ended up in vain. The government was not courageous enough to take practical actions. It hesitated to devalue the exchange rate, decontrol prices, lift up (let alone liberalize), the highly repressed interest rate and others. All these were in one way or another related to the fear of high inflation.

With the take over of the EPRDF government, rather more market oriented program was launched in 1992/93. This time with great vigor and intensity. The program was in fact supported by the IMF and the World Bank. The fear of inflation disappeared or at least not given much weight for the immediate future. This was because the medium to long-run objective has given more emphasis to demand management with increased role of the private sector in the economy. The exchange rate was devalued by about 58.6 percent in dollar terms from Birr2.07 per US Dollar to Birr5.00 per US Dollar [PFP, 1993 p.1]. Price controls were removed from all sectors except in strategic commodities, such as, petroleum and fertilizer.

When the program was agreed with the IMF and World Bank in late 1992, the Ethiopian government and the Bretton Wood institutions feared that the actions taken might push up prices to the tune of 24.2 percent in 1992/93 (PFP: P. 30). The result was in fact surprising. Inflation rather declined from 21 percent in 1991/92 to 10 percent in 1992/93 and 1.2 percent in 1993/94. This provoked some economists to ask themselves that "Is inflation actually a monetary phenomenon in Ethiopia? or, are there other explanations?" In fact, non-economic factors such as the civil war and the resultant blockade of the road leading from grain producing areas to the central market (Addis Ababa) had significant contribution in pushing prices up to such a high level in the years immediately before the end of the civil war. Since the reform program was launched immediately after the war, it is reasonable to expect a decline in prices at least in food items. [Yohannes: 1994]. This paper therefore, tries to address problems like: what drives inflation in Ethiopia? Is there a real trade-off between unemployment and inflation? Should policymakers employ a stabilization first

strategy? Is there a room for accommodative monetary policy? and others. The paper will, therefore, test different models in a search for the appropriate model that could best explain the inflationary process in Ethiopia.

The study will have significant contribution to the literatures on inflation and monetary policy. To begin with, studies on inflation in Ethiopia have been using annual data. This has remained a significant limitation on econometric analysis given the lack of data on most macro-economic variables prior to the 1960s. The maximum data points a macro-econometrician would have is , therefore, 40. The paper therefore tries to tackle this problem by decomposing the annual GDP series into quarterly ones. This will increase the data point to be used for analysis to about 116 for the period between 1971/72 to 1998/99. Secondly, understanding the inflationary process will also have high policy significance. The creation of an independent central bank is top in the current international monetary agenda. And, for an independent central bank, taming inflation would usually be a priority. This requires understanding of the dynamics of inflation and ways to control it. This paper may, therefore, shed some light in this regard.

The remaining part of this paper is organized as follows: The second chapter analyzes trends on inflation in Ethiopia. The period between 1967/68-1998/99 is divided into three regimes: the Imperia, Derg and Post-Derg periods. The effects of trends in aggregate demand and budget deficit on inflation are also analyzed in this chapter. The third chapter provides literature review. In this part various schools of thought on inflation are reviewed. Apart from the conventional economic theories, the views of

structuralist and Mckinnon and Shaw models are also presented. The fourth chapter would make a breakthrough to inflation theories in Ethiopia by testing the existence of trade-off between unemployment and inflation (i.e. the Phillipscurve). The method to estimate the level of unemployment in countries such as Ethiopia is also presented. Models from different economic theories which are used in the paper are presented in Chapter Five. Empirical results obtained by estimating the models are presented in the sixth chapter. The paper would, therefore, conclude by giving brief summary and recommendation in Chapter Seven.

2. *TRENDS IN INFLATION AND MACRO ECONOMIC PERFORMANCE IN ETHIOPIA*

2.1 Trends in Inflation

1967/68 – 1973/74

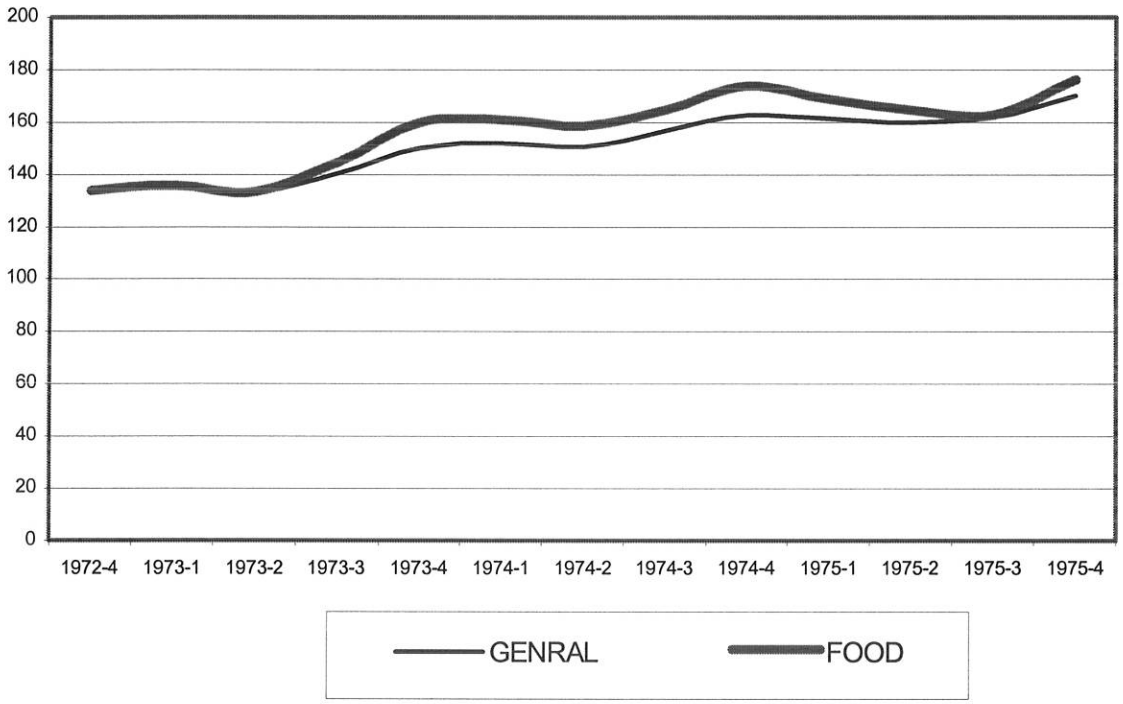
Historically Ethiopia is classified among the low inflation economies in LDCs [PFP, 1992 p.2]. Based on the Addis Ababa consumer price index, the average inflation rate was around 2.5 percent between 1967 - 74 in the Imperial regime. The food prices index, which accounted about 50 percent, was growing at an average rate of 1.5 percent between 1970/71-1974/75.

Some of the possible reasons for such low inflation were the strong exchange rate of the national currency which used to be called the 'Ethiopian Dollar'. Until 1973, the 'dollar standard' was the international monetary order in which countries pegged their national currencies with the dollar with an adjustment allowance of only ± 10 percent. In this regime, all countries in the world had a fixed exchange rate system. Inflation was, therefore, low around the world. In this period the Ethiopian Dollar was such a strong currency that it was forced to be revalued twice in 1971 and 1973 from 2.48 per USD to 2.30, and then to 2.07 per USD, respectively. [Tsegaye, 1993 p.4]. The second reason was the increase in monetization of the unmonetized sector under the

background of a very small share of the monetized sector during the period. The latter increases the demand for money absorbing some of the excess supply.

Figure 2.1

QUARTERLY TRENDS OF GENERAL AND FOOD PRICE INDICES:1971/72(4) - 1974/75(4)



Source: Various issues of the NBE Quarterly Bulletines

Thirdly, monetary and fiscal policies were prudent. The deficit-GDP ratio was such a low that between 1967/68 and 1973/74, it was around 2.2 percent and the bank financing part was only 0.5 percent[1].

[1] Own computation based on the information available in various issues of NBE's Quarterly Bulletines.

1974/75 - 1991/92

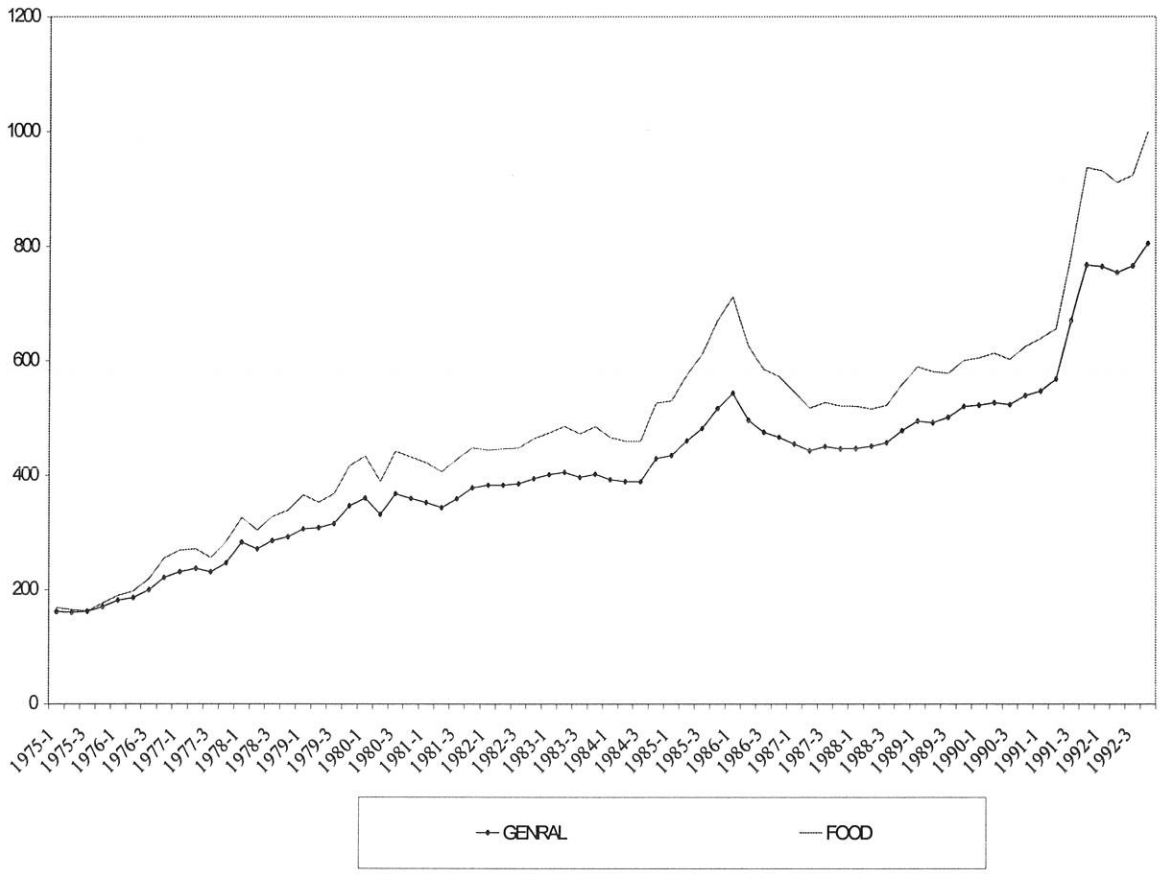
The overtake of the Derg regime under the banner of socialism, however, ended the relatively stable and growing economy that Ethiopia enjoyed until the early 70's. The country entered into a communal ownership of the means of production. Almost all domestic and foreign owned medium and large scale enterprises were nationalized and reorganized in line with a socialist principle. Markets were devoid of the resource allocation roles so that prices of basic commodities were subjected to direct control. Wages and salaries were frozen. Interest rates were fixed. The private sector was practically blocked from access to credit. The capital and money markets which were already at their rudimentary stage were dismantled.

The general behavior and trends of prices did not change during the 17 years of the socialist regime. Inflation was low but volatile. It was trailing along the food price indices (see Figure 2.2). However, the average inflation rate jumped to 9 percent during this period as compared to 2.5 between 1967 - 1974.

Some of the possible factors responsible for such low but volatile inflation were: One, the exchange rate of the 'Birr' (the national currency of Ethiopia) was highly overvalued. Since public enterprises and co-operatives were believed to be the engine of growth, government entered into an intensive investment program and subsidies. And, to avoid the resultant pressure on the budget through huge amount of capital and raw material imports in domestic currency and bloated debt repayments, the

government preferred to maintain a fixed and overvalued exchange rate [Yohannes, 1991].

Figure 2.2
TRENDS OF GENERAL AND FOOD PRICE INDICES:
1974/75(1) - 1991/92(4)



Source: Various issues of the NBE Quarterly Bulletines

Second, since the economy was directed through central planning which set all sorts of physical and financial targets including prices, investment, saving, interest rates, credits and money supply and output, the roles of monetary and fiscal policies were relegated to a secondary importance. Interest rates were set low so that the socialized sector could get cheap credit from the banking system irrespective of its repayment capacity or project viability. On the other hand, the private sector was blocked from

access to credit. The investment policy prohibited private sector investment in most of the medium to large-scale industries, services and commercial farming. Therefore, by blocking all channels of investment, the government succeeded to tap resources from the private sector in the form of financial (bank) savings. During the period the Commercial Bank of Ethiopia remained liquid which offset the liquidity injected into the economy through government's huge deficit financing by the NBE. To put it in other ways, government's excess investment demand which widened the budget deficit did not put inflationary pressure as the private sector was (willingly) forced to rechannel resources to subsidize the former. The aggregate demand was, therefore, lower than it would have been if the private sector had been let free to create additional investment demand in the economy.

1992/93 – 1998/99

Radical reforms in all fronts of the economy were undertaken with the launching of the Economic Reform Program in October 1992. In 1992/93 the first batch of the reform measures were targeted on devaluation of the highly over valued 'Birr' from Birr 2.07 per USD to Birr 5.00 per USD and the consequent introduction of the foreign exchange auction system; removing price controls in agriculture, industry, and services except those on strategic commodities; modest adjustment on wages and salaries of civil servants; upward adjustment in bank deposit and lending rates, abolishing of taxes and duties on exports (except coffee) and also subsidies to the sector liberalizing franco-valuta trade etc [PFP 1992].

Under the background of a prolonged and highly repressed economy, these reforms were expected to aggravate inflation in the short run. Even the IMF and World Bank projected that at the end of 1992/93, average inflation could reach about 24.2 percent [PFP, 1992]. The outcome at the end of the fiscal year however was surprising. Inflation rate subsided to 10.5% from 21% in 1991/92 immediately before the reform. Some of the reasons are: first, the reform was taken one year after the civil war which had blocked the road leading the major grain producing regions to the central market (Addis Ababa)[1] due to which food prices had sky rocketed. As about half the weight of the General Price Index is composed of food prices, the latter went up immediately after the EPRDF controlled the major grain producing regions [Yohannes, 1994]. The end of the war and the restoration of political stability in the major parts of the country, therefore, pushed prices down. The inflation rate computed in Gregorian Calendar might make these things clear.

Table 2.1 Inflation Rates: 1989 - 1992 G.C.

Gregorian Calendar	1989	1990	1991	1992
Inflation rate	7.8	5.1	35.7	10.5

Source: Adopted from Yohannes (1994)

Thirdly, the lion's share of consumer goods were imported either through black market or franco-valuta whose prices had already been quoted at the prevailing parallel market rate. Liberalization of prices did not, therefore, affect the prices of these commodities. Rather prices of some imported commodities declined as the risk

[1] Addis Ababa is the city which the General Price Index is computed for.

premium[1] which was used to be added on domestic prices is eliminated. The fourth reason for reduction in the inflation rate was the rebound in agricultural production due to good weather and price incentives, and increases in industrial output and services. Before the reform most of the public enterprises were operating below capacity due to shortage of foreign exchange. The availability of foreign currencies by donor countries and multi-lateral institutions made these enterprises possible to produce in higher capacities which mitigated the impact of devaluation on per unit production cost. Fifth, inflationary financing through bank borrowing was reduced due to increased inflow of foreign currencies related to the budget [PFP, 1993 and Yohannes, 1994]. Lastly, the demobilization of half-a-million soldiers and the resultant reduction on government expenditure repressed aggregate demand in the economy. Total government expenditure decreased from 45.5 in 1989/90 and 36.9 in 1990/91 to 23.3 in 1992/93 as percentage of GDP [PFP, 1993 and 1994].

Prices continue to be low in the remaining years until 1998/99 except in 1994/95 when the export sector was hit by positive external shock. In this year, world price of coffee increased dramatically. Given the limited capacity of the economy to absorb the shock and unpreperdness[2] of the National Bank of Ethiopia to sterilize the inflow, the increased inflow of foreign exchange feeds into higher domestic prices [Yohannes, 1994].

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1 This refers to the risk for importing commodities through and obtaining foreign exchange in the parallel market.

2 During this time the NBE had no any instrument to mop up the excess liquidity in the economy. Neither treasury bills were introduced nor the NBE had special deposit facility for the private sector to absorb such an excess.

The economic reform program had put emphasis on prudent fiscal and monetary policy. Targets have been set both on the levels and growth rates of money supply, domestic credit and bank financing of the budget deficit. Therefore, the Economic Reform Program continued to repress the already repressed aggregate demand in the economy.

2.2 Aggregate Demand and Aggregate Supply

Inflation results when aggregate demand increases faster than aggregate supply. Suppose that the long-run aggregate supply curve (which defines the productive capacity of the economy) is fixed. Then for the price level to rise, the aggregate demand curve must rise over time. [Abel – Bernanke, 1995]. This argument assumes the existence of market efficiency under the classical conditions. When both the labour, goods, and money markets are efficient or at least well functioning, productive resources find their best (efficient) use according to the allocative power of prices. The long-run supply curve is therefore fixed until technological frontier changes through technological progress. In this situation, unsustainable increase in aggregate demand results in inflationary situation.

In LDC's, however, such condition does not exist. The labour and money markets are either rudimentary or non-existent at all. Even the product market faces various constraints which undermines its efficient operation. Markets are therefore fragmented and inefficient to fulfill the traditional roles expected in the Developed countries. Structural rigidities are prevalent in these economies. For instance, LDC's

are said to be labour abundent economies. However, the type of labour is highly unskilled and (or less educated) so that it remains a constraint to rapid economic industrialization. The vulnerability of output to weather subjects the production possibility frontier to a repeated contraction. In his study Zewdu (1997) observed that out of 28 years since 1967 the rates of growth of cereal production were negative in 50 percent of the cases (1997, p.54). This implies that, the short-run aggregate supply curves shifts frequently. As these constraints are removed step by step, therefore, the productive capacity of the economy improves.

Aggregate demand in Ethiopia was expanding during the Imperial regime. The suppressive measures of the military government, however, forced it to decline constantly. According to a study by Mystery (1991), aggregate demand declined by 3 percent annually in real terms over the period 1984/85 and 1989/90. Among the factor that were responsible for such a down-ward trend were the adamantly fixed wage rates under the situation of rising prices; high tax policies; restraint on credit to the private sector and price controls on agricultural commodities. Compulsory grain deliveries also deprived the grain producing agricultural population from access to increased income [PFP,1993].

With the Economic Reform Program, however, the agricultural sector has benefited from price liberalization. The industrial sector also registered rapid output growth partly attributable to increased capacity utilization due to the availability of foreign exchange, and partly due to increased private investment. However, the aggregate demand is not expected to expand as it would have been. The restraint on money

supply growth as a result of credit ceiling on banks until 1996 and the government repayment program of old debts to the banking system would have explicit effect.

2.3 Government Deficit, Financing and Money Supply

Government deficit is one of the sources of price increases in LDCs. Structuralists argue that government deficit is the result of structural imbalance so that it is unavoidable in an economy whose prime objective is economic growth. Therefore, they consider it is one of the sources of inflation. According to the structuralists, money supply plays a passive role. It only aggravates the inflation. Monetarists on the other hand, argue that budget deficit is not the outcome of the structure of an economy but the attempt of policy makers to actively manage the economy. Therefore, it is avoidable as long as policy makers do not try to manage the economy through fiscal policies. For the latter, the primary cause of inflation is excessive growth of money.

The behavior of budget deficit in Ethiopia could be explained by structural and monetary factors. For instance, during the Derg era, government assumed the lead role in the country's growth strategy. There was a huge investment expenditure on public enterprises. The possibility of reducing expenditure without cutting development projects and infrastructure buildings was, therefore, limited. After the economic reform this situation has been changing. The government is taking its hand off investment in the production sector. However, since Ethiopia has the lowest infrastructure network (both in transport, electricity and telecommunication),

schooling and health care services in Africa, the government would not take off its hand from investment in these sectors implying that government expenditure would remain structural at least in the short to medium run. Hence, this points us that the type and structure of the budget is not the one envisaged by Keynes which is primarily meant to boost aggregate demand in such a way that when one man digs the other man fills the hole.

3. LITERATURE REVIEW

> *"Not much argument is necessary to convince the policy makers that the inflationary expansion of money thwarts rather than promotes growth, that structural transformation of LDC economies is not independent of a stable monetary environment, that the supply of money can be increased without inflationary pressures only if a corresponding demand for it can be generated, and that the basic laws of economics are not time or space-specific "Coats and Khatkhate (1984) P.31.*

3.1 Traditional Theories of Inflation

Inflation is a continuous and sustained increase in the general price level [Mishkin, 1997 and Frisch, 1990]. Occasional variation or sporadic increases in price levels is not inflation. The analysis on inflation began in the 18th century by Devid Hume who asserts that there is a positive relationship between money supply and the general price level. He argues that an increase in the former led to a rise in the latter and vice versa [Vaish, 1989 p. 48]. A systematic treatment of the sources of inflation, however, started with the exposition of the quantity theory of money by Fisher. The latter argued that inflation is purely a monetary phenomenon even in the short-run. The basic tenet of Fisher's proposition is the assumption that the economy operates of full capacity so that the volume of transaction and velocity of circulation are constant even in the short-run [Mishkin, 1997]. This view is also shared by Cambridge School of Economists although the latter approach the problem by analyzing individuals' behavior in the demand for money.

The basic premise of these early economists is based on the famous classical-dichotomy. They argue that the product and the money market are completely independent. Relative prices are determined in the product market by the real variables while the general price level is determined in the money market. Therefore, the demand for money which is a function of real output is assumed to be constant and vertical as the latter is determined in the product market.

Keynes rejected the classical assumption that wages and prices are completely flexible and the economy is always at full employment. He further states that interest rates are determined not in the goods market. For him saving is a function of income rather than interest rate. This helped him to drop the classical dichotomy and present a comprehensive macroeconomic model. According to him, the economy is usually in a dynamic disequilibrium, that is, downward inflexibility of prices and wage rates prevented the economy from reaching full employment level in the short-run. Moreover, he argues that, the transmission is not direct from money supply to prices but through interest rates. Therefore, according to his 'liquidity trap hypothesis' resources might remain unemployed when interest rate gets stack above the market clearing level. For this reason, Kenyes presents his macroeconomic model under a fixed price assumption.

None the less, Keynesian analysis of inflation under full employment situation is not radically different from the classical economists or monetarists. When economic resources are fully employed, (which is a rare case according to the Keynesian framework), inflation could be caused by accommodative monetary policy as the

demand curve continues to shift up [Mishkin (1997) p.664]. The inflationary gap approach however argues that inflationary process begins in the good's market, not in the money market. Assuming a full employment level of income, if investors, out of their optimistic behavior, increase investment, aggregate expenditure increases shifting AD to AD' [Figure 3.1]. This creates an inflationary gap denoted by AB. The excess demand would push prices up. However, to sustain the inflationary

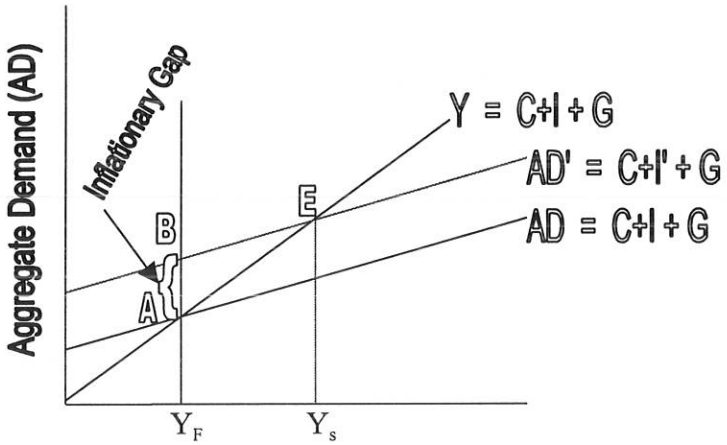


Figure 3.1

pressure, money supply should not necessarily increase. Velocity of money might rather decline. Therefore, Keynesians argue that for inflation to be necessarily a monetary phenomenon, the economy presupposes a stable demand for money.

3.2 The Phillips Curve

The analysis of inflation was greatly influenced by the development of the Phillips curve. A.W.Phillips (1958) found a non linear, negative relation between money wages and the rate of unemployment in Great Britain for the period 1861 - 1913 [H. Frisch, 1990 P.33]

The central tenet of this analysis was Phillips' contention that there is a stable and permanent trade-off between unemployment and the rate of growth of money wages (Frisch, 1990 P.34). In 1960s, Lipsey interpreted the Phillips curve as the neo-Keynesian inflation theory. He identifies the labour market as the source of inflation and led to the notion of a stable trade-off between inflation and unemployment. Policy makers can exploit the trade-off between the two by choosing alternative points on the Phillips curve. [Frisch, 1990 p.31].

In the late 1960s, however, two major criticisms emerged in the analysis of the Phillips curve which was a landmark in the modern theory of inflation. The criticisms concern on the permanent trade-off between inflation and unemployment, and the neglect of inflationary expectation. Quoting Friedman and Phelps, Sachs and Larrian say that "what actually matters for workers is not the nominal wage per se but with the purchasing power of the wage i.e. the real wage. Employers are not also concerned with the nominal wage per se but with the cost of labour relative to the price of output" [Sachs and Larrian, 1993 pp. 453 - 454]. This was supported by studies in the 1970s which confirmed that "for a given level of unemployment, nominal wage inflation was higher in the early 1970s than it had been in the 1960s. Thus, the Phillips curve started to shift up". [Sachs and Larrian, 1993 P.459].

This laid the basis for the emergence of short-run and long run analysis of the Phillips curve. Friedman argues that when money supply increases, spending on goods and services grows in the short-run because producers would find it profitable to produce more, and employment increases. However, the increase in prices erodes real wages

and workers would start to negotiate with their employers to regain the lost purchasing power. The Phillips curve shifts up and the level of employment starts to move back to the original level, as nominal wage increases. Therefore, in the long run, expansionary policy results in higher inflation, while the level of unemployment sticks to its natural rate [Mishkin and Posen, 1997 and Frisch, 1990]. This is what is called the Natural Rate of Unemployment (NRU) hypothesis. [Sachs and Larrian, 1993 and Debelle and Laxton (1997)]. The long-run Phillips curve is, therefore, vertical. Friedman's hypothesis is based on his assumption of adaptive expectation formation of prices. Workers and employers are backward looking. They form their expectation based on the gap between past expected and actual prices and adding (subtracting) some margin to the next period. Wages would, therefore, increase by the rate of the expected rise in prices. These time inconsistency models tell us that policy makers can not actually fool workers and firms for a reasonably long period so that output will not be higher under such a strategy; unfortunately, however, inflation will be. [Sachs and Larrian, 1993 and Mishkin and Posen, 1997].

Disagreement over the formation of expectation and the existence of short-run Phillips curve led to the emergence of Rational Expectationist School. In this school workers and employers are assumed to be forward looking. They use all available information in formulating of their expectation. On average their expectation is correct. Systematic policy measures could not therefore affect output even in the short run.

Along with the monetarists, the structuralist school is the other dominant school in the modern theory of inflation. This school says that the sources of inflation in

developing countries are rooted in the very structures of the economies themselves. They ascribe inflation to the composition of demand for products and services accompanied by inflexiblities in the productive structure [Fischer and Mayer, 1981]. Hence, money supply is not the source of inflation. It only aggravates the inflationary process. In these countries, economic resources could not be sufficiently utilized due to low technical know-how, poor infrastructure, etc. And, because of these structural rigidities, production is not responsive to increases in aggregate demand through higher money supply. Thus, inflation increases. [Tekle Birhan, 1990]. They argue, therefore, that the coefficient of money supply in the inflation model is significant. It only indicate the positive correlation between factors such as structural budget deficits, trade deficits (due to worsening terms of trade etc.) and money supply.

Fischer and Mayer's (1981) exposition of the Latin American structuralist school stresses on two basic causes of inflation: (1) the rigidity of food supply in the face of rapid industrialization and urbanization. " --- under the condition of the dual economy food supply is inelastic and hence prices are very flexible in response to changing demand, while in the industrial sector prices are said to move only upwards and to be rigid downwards" (p 39-40). (2) the inadequacy and instability of the purchasing power of exports. "During the process of industrialization there is a shift of resources from agriculture to the industrial sector. With a stagnant agricultural sector growth in the industrial sector will increase the demand for agricultural products while reducing the supply in agriculture. Because of the rigidity of supply and inadequacy of the purchasing power of exports which prevents sufficient food imports, increased

demand for agricultural products induces higher prices". [Frisch and Mayer, 1981 p.40]

The second group in the structuralist school is the European branch. While the Latin American structuralism stresses on the link between inflation and economic development and points to sectoral bottlenecks as the causes of changes in relative prices, the European branch ascribes inflation to the uniform increases in wages across all sectors in spite of differences in sectoral rates of growth of labour productivity. The latters analysis is, therefore, limited to changes stemming from supply shifts [Canavese, 1982].

The other group of economists emerged in the early 1970s led by McKinnon and Shaw who doubt the relevance of the controversies between these leading schools of economists (Keynesians and mainstream classicals) to the problem of LDCs. They argue that first of all both schools pre-supposed, despite differences in the degrees of efficiency, the existence of well functioning markets. Whereas, McKinnon and Shaw argue that although markets are the only means for an efficient use of resources and sustained growth, they are not well developed or non-existent at all in LDCs [Coats and Khatkate, 1984]. They therefore argue that typical structure of LDCs doesn't allow us to talk about demand management in the way it serves developed countries. LDCs are producers of primary goods. Exports largely consist of primary commodities, the demand for which is determined by world markets. On the other hand, their imports are mostly composed of manufactured and capital goods. Savers and investors tend to be identical (i.e. predominance of self-financing). McKinnon

and Shaw, therefore, argue that sustained increase in money supply produces inflation not because the economic resources are fully employed but because of underdevelopment of markets and imbalanced growth of sectors due to repressive policies in LDCs. So, with financial liberalization and creation of efficient markets, money enhances economic growth rather than aggravating inflation.

The McKinnon and Shaw hypothesis resembles the structuralist theory of inflation except that the former emphasizes on market inefficiency and it largely ascribes to internal policy problem while structuralists say that both internal and external policy and non-policy factors are responsible to the unsustainable inflationary pressures in LDCs.

3.3 Inflation in Developing Countries

The desperate need of growth and high level of employment and the lack of appropriate model to explain the economies of developing countries lend for monetarist-strucuralist controversy over the sources of inflation. Betancourt (1976) criticized Robert Vogel's (1974) paper on "Dynamics of Inflation in Latin America which concludes that "... a purely monetarist model, with no structuralist variables, reveals little heterogeneity among Latin American countries, in spite of their extreme diversity". Betancourt argues that infact the sources of inflation in these countries are different. While monetarist model seem more appropriate to high inflation countries such as Uruguay, Brazil, Chile and Bolivia, money supply has less explanatory power in low inflation countries such as Nicaragua, Ecuador, Honduras, Costa Rica,

Guatemala, Venezuela and El Salvador. He said that it would also be good to study the roles played by income growth, favorable external circumstances, conscious design, or the nature of the social, political, and economic environment prevailing in these countries to the differences in policies. [Betancourt, 1976 p. 689-690.]

The under development of labor and financial markets complicated the analysis of inflation in developing countries. Nugent and Glazakas [1982] argue that the institutional conditions of LDCs are sufficiently different from those of developed countries that the newly emerged consensus rationale for the Phillips curve's existence, even if perfectly valid for developed countries (DCs) should not be expected to apply to LDCs. They went on saying that" indeed, we shall argue that the institutional conditions of agriculture dominated LDCs would be likely to lead to exactly the opposite relationship between inflation and unemployment (or growth) in LDCs than that expected for DCs" [p. 322].

Fischer and Mayer (1981) tested the structuralist model on seven developing countries (all Latin American). The result confirmed that food and export prices react more rapidly to excess demand than other prices in all countries except Brazil. And, a stepwise regression analysis proved that a monetarist view of inflation is superior to the structuralist hypothesis only in the case of Ecuador. Therefore, they concluded that "first, inflationary impulses from bottlnecks in the agricultural sector are dependent on the food supply elasticity. In the case of a developed agricultural sector we would expect a flexible supply response to an increased demand for food and hence no basic inflationary pressure ---- Secondly, an excess demand on exports does

not induce price increases if exchange rates are flexible. In that case there are no major spill overs from varying prices on world markets to the domestic prices. --- Finally, as already mentioned, the strength of monetary control is a crucial factor for structural factors to become important in the inflationary process". [Fischer and Mayer, 1981 p.43-44].

When we came to Africa, a study by London (1989) also proves the diversity of African countries interms of explaining the inflationary process. "Although the simple monetarist model appears to hold when tested in cross-section data covering several countries and averaged over several years, the same is generally not true for individual countries in time series or in cross-section studies covering shorter time periods. In fact, the result strongly suggests that factors other than the rate of monetary expansion have played an important role in determining short-run inflation trends in Africa". [London, 1989 p.87].

On the other hand, there are also studies who argue in favour of monetary explanation of inflation in Africa. Applying the Harberger (1963) model, Abebayehu (1989) studied six African countries for the period 1960 - 1983. The model doesn't reject the monetarist view of inflation. Mwega (1990) also arrived at the conclusion that money matters for inflation and balance of payments problem in Africa. He says that central banks in Africa are likely to have limited ability to control high-powered money, to utilize the money multiplier model if the income of velocity is unstable, that is a close positive correlation between changes in the budget and the monetary aggregate, that the public sector is likely to crowd-out the private sector if budget

deficits are not kept in check etc. It therefore seems that there is a fairly limited scope for the active use of monetary policy to fine-tune the economy in these countries. On the other hand, Aghevli (1997) argue that one cannot deny the existence of inflation-output trade-off and the role of money in increasing output. He said that money supply could increase output along with moderate inflation in LDCs.

3.4 The Case of Ethiopia

For many years inflation has not been considered as a major threat to Ethiopia unlike the case in many developing countries in Africa and Latin America. And, this was one reason for too few studies on the area. Of the few studies I found, a detailed study on inflation was done by Mistry (1991) in his paper "Inflation in Ethiopia". Although Mistry didn't apply econometric models, he tried to have a detailed look into factors that are expected to contribute to the country's inflation. He presented his approach as follows: (a) rural and urban aggregate demand; (b) aggregate supply of key goods and services along with the bottlenecks which are inhibiting an immediate supply response to changing market/price signals; and (c) monetary and fiscal phenomena and other likely effects on money demand and on prices. The thrust of the paper was to find ways and means to stabilize prices on the wake of the 1989/90 liberalization and avoiding the classical devaluation - cost push - wage pull- further devaluation etc" spiral (p.6).

The study found that real aggregate demand virtually stagnated in the pre-1989/90 period. Thus could not be the driving force behind inflation. Rather, removal of

supply bottlenecks such as integration of fragmented rural regional markets, the revival of agricultural production might have played crucial role in determining prices. Mistry has therefore reached the conclusion that the inflationary pressure in Ethiopia will remain a supply side phenomenon at least for some years to come.

On the other hand, a study by Tekle Birhan (1990) for the period 1973/94 - 1989/90, concluded that aggregate demand is also one force behind inflation in Ethiopia. According to him, 13 percent annual average rate of growth in broad money is responsible for the country's inflation. Supply constraints such as drought though not the sources of sustained inflation accelerated inflationary pressure with some lag. The study used annual series and it is subjected to the limitation of applying regression analysis on time series data without testing for integration and co-integration.

Zewdu Belete (1997) has also analyzed the dynamics of inflation in Ethiopia. The paper is relatively comprehensive. Monetarist and structuralist inflation models have been estimated using Error Correction Approach for the period covering 1967 - 1994. The study found that the structuralist model is well fit to explain inflationary process in Ethiopia. He, therefore, concluded, like Mistry [1991], that inflation in Ethiopia is a supply side phenomenon. One important limitation of the paper however is that, since annual data are used, the application of a general auto-regressive distributive lag model on the few data points reduces the degree of freedom putting a question mark on the reliability of the estimates.

4. IS THERE A PHILLIPS CURVE FOR ETHIOPIA?

> *"... indeed, we shall argue that the institutional conditions of agriculture dominated LDCs would be likely to lead to exactly the opposite relationship between inflation and unemployment (or growth) in LDCs than that expected for DCs". Nugent and Glazakos (1982) p. 322.*
>
> *"When physical capital is accumulated, labour skills are formed and resources are reallocated, the stage is set for an efficient utilization of the accumulated capital and skills, which is possible only if the system is opened up to competitive forces. With such a shift in emphasis, money immediately comes into the picture" Coats and Khatkhate (1984) P.32.*

The existence of the Phillips curve for developing countries especially LDCs has been the subject of controversy. Until the early 1960's policy makers in industrialized countries accepted the theory that there is a permanent trade-off between unemployment and the level of inflation so that they can sacrifice one in order to attain a permanent change on the other. This is basically based on conventional economic theories, which assume the existence of well functioning goods, labour and money markets. A disturbance in one market would affect the equilibrium situations in the other markets so that new series of equilibrium points would be attained in all markets. For instance, if the government with the objective of boosting economic growth enters into excessive expenditure and force the central bank to print money (accommodative monetary policy), output would increase as the increased aggregate demand would absorb some of the unemployed labour. The shift in the demand for labour in the labour market would settle at higher wage rates which, on aggregate, increases the general price level permanently.

In this analysis, structural rigidities in the product and labour markets are not considered. Meaning that in the traditional theories, when government increases its expenditure, unemployment declines. There is a readily available skilled labour to meet the demand. That is labor is assumed to be homogenous (or close substitute). The possibility of its unsubstitutability is ruled out. This is where the fallacy is. Labour is not only heterogeneous but also less substitutable in most LDCs. In these countries, the primary sector, especially agriculture, constitute more than two-third of the labour force. It is unskilled and predominantly uneducated. Since, it is a backward sector, productivity is very low. It therefore needs structural transformation, and the introduction of modern inputs and technology. Moreover, lack of roads and modern means of transport constrains the sector from benefiting the market system. This means that markets are segmented and fragmented in rural areas.

The modern sector, which is fast growing, is therefore constrained by the laggard agricultural sector. Agriculture, although the primary source to avail cheap labour, basically supplies unskilled ones. The fragmentation of markets also insulated the industrial and service sectors from reaching the lions share of the population in the country. Hence, removing these bottlenecks has also this benefit. Productivity, therefore, improves both in agriculture, industry and service sectors. And each step to remove the latter causes a continuous shift in the aggregate supply curve absorbing (in most times more than offsetting) the resultant increase in aggregate demand. The shift halts when the economy reaches the steady state level.

In Ethiopia these points are evident. Markets are fragmented and under developed [Mistry 1991]. Moreover, the type of unemployment is not the one that industrial countries claim to exist. It is unskill, unqualified and largely outside the spectrum of demands of the modern sector. According to a study by the Ministry of Education (1999), of the total school age population only 9.7 percent are enrolled in senior secondary school (i.e.9-12 grades) and of the total age group of 15 to 55 only 0.1 percent is enrolled in higher education [MOF, 1999 and CSA, 1999]. Therefore one can say that the basic problem here in Ethiopia is underdevelopment of resources. Hence, we should not expect the type of Phillips Curve that industrial countries claim to exist.

In the following paragraphs the paper tries to measure the trade-off between inflation and unemployment in the way Phillips (1958) tried to estimate for England. Applying the usual procedure is however not possible as the data on the actual level of unemployment is unavailable in Ethiopia. Therefore, a different technique is applied. That is, first, to estimate potential output and then take the deviation between potential and actual output series (i.e. output gap) a proxy for unemployment. This actually measures unemployment of factors of production (i.e. labour, capital, land and enterpreneurship), not labour alone. The procedure is described below.

First, specify the usual output trend model.

$$Y_t = Y_o e^{bt} u \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad [4.1]$$

where Y = real GDP
Y_o = initial output
t = time
u = error term

Taking the log of equation [1], we get

$$\ln Y_t = \ln Y_o + bt + \ln u \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad [4.2]$$

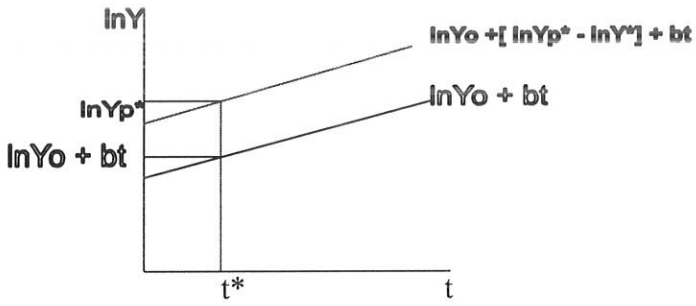
Some studies use the fitted values of Equation [4.2] as a proxy four capacity output. The paper by Khan and Haque (1991), for example, estimated normal capacity output applying this technique. This could be applicable in industrial countries which most of the years produce at their potential level. Supply shocks are not so frequent and markets are co-ordinate and well functioning.

The situation is, however, different in LDCs. They face with a number of structural problems. They are also vulnerable to external and internal shocks such as export and import prices, drought and war. Hence, in most of the years they produce below capacity. The fitted output applying the trend line does not, therefore, represent potential (capacity) output. It is way below that as the data used to fit the equation is dominated by under capacity output levels. Taking this into account, the paper would try to estimate potential output by drifting the trend output estimated using Equation [4.2] by the highest positive difference between the actual output and trended output in a particular year. The year chosen in this way should be a normal year i.e. no positive or negative exogenous shocks.

The next step is, therefore, to drift the estimated regression Equation [4.2] by the deviation between the maximum output and the fitted output at that particular year. Adding the deviation to the constant (lnYo) drifts the trend output upwards without changing the slope[1].

$$\mathbf{lnYp = lnYo + [lnYp^* - lnY^*] + bt} \quad \text{.....[4.3]}$$

[1] Researchers in industry use this technique to estimate firms' level of capacity utilization.



Drifting the line to the point considered to be a relative maxima is on the assumption that if the structural rigidities has been removed and market efficiencies had been ensured, output would have oscillated around the potential output line in the same manner as it did around the estimated trend line. Assuming that the slope of the line remains unchanged, the basic OLS assumptions will not be affected by drifting the line by the some magnitude throughout the period. Unemployment is, therefore, derived by taking the difference between the actual and potential output series, and taking antilog of the difference.

Antilog of [lnYp* – lnY*] .....[4.4]

This technique infact has several limitations. First, it only uses local maxima to drift the line so that the potential output series estimated in such a way is limited to the history of the data in that given period. Second, the quality of the data and the econometrics technique employed determine the accuracy of estimates. Third, the slopes of the potential and fitted output trend are assumed to be the same throughout the period. Fourth, the way the potential output year is chosen is subjective. With all this limitations, however, the technique is superior to that of Khan and Knight (1991).

The significances are, first, it gives a better proxy for unemployment of resources for the economy in LDCs than just using labour input whose information is scant and unreliable in most cases. Second, even though it uses local maxima, it can still show the minimum level of unemployment in the economy in a given period. In fact, the rate of growth of unemployment would not have significantly whether a local or absolute maxima is used.

The 'Phillips Curve' for Ethiopia

Having obtained unemployment series using Equation [4.4], the actual rate of inflation is plotted against the rate of unemployment in a scatter diagram shown below:

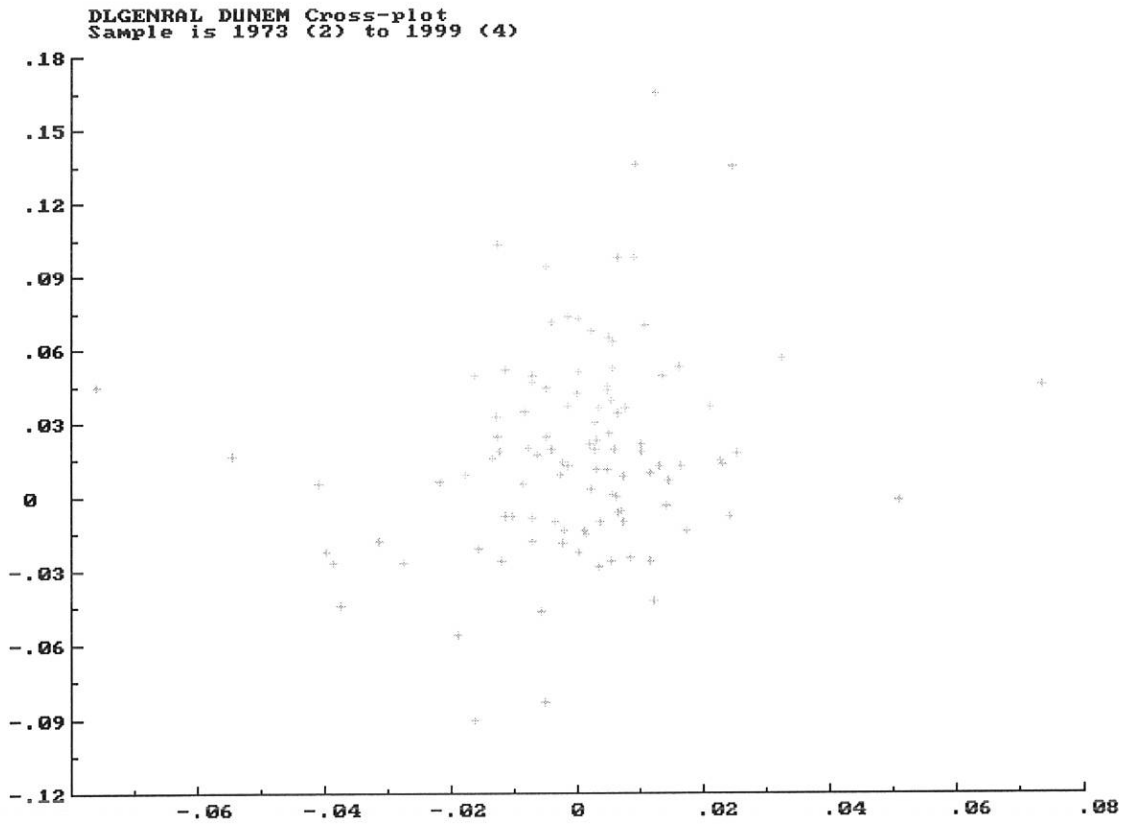


Figure 4.1: Plots Of Inflation Against Changes in Unemployment: 1972/73 (2)-1998/99 (4)

From Figure [4.1] one can observe that the higher the unemployment is the higher the inflation. The slope of the curve seems to be positive. The estimated equation, Equation (4.6), supports the visual inspection above.

$\Delta P_t = f(\Delta unemployment)$ ---------- [4.5]

The estimation result from Equation [4.5] is:

$$\Delta P_t = 0.028226 + 0.47333\ \Delta UNEMP - 0.36573 S_2 \quad \text{.....[4.6]}$$
$$\qquad (6.562) \qquad (2.376) \qquad\qquad (-4.251)$$

$R^2 = 0.19$ $F(2,101) = 12.03$ [0.000], $a' = 0.03799$ $DW = 1.81$

Diagnostic Test: AR 1-5 F(5,96) = 0.36761 (0.8696); ARCH 4 F(4,93) = 2.1915 (0.0759); Narmality Chiy'(2) = 8.9798 (0.0112) *; Xiy' F (3,97) = 0.36992 (0.7749); Xi*Xj F (4,96) = 0.34142 (0.8494); RESET F(1,100) = 0.38494 (0.5364)

The diagnostic tests on Equation [4.6] show that there is no evidence of auto-correlation (AR) problem (i.e. the error terms are not serially correlated). The error terms do not exhibit clusters of small and large forecast errors through time as shown by the ARCH Test. These two tests indicate that the estimators in Equation [4.6] are BLUE. There is, however, a normality problem at 5% level of significance. This might indicate the existence of outliners in the data that should be accounted using dummies. The RESET test however indicates that there is no specification error.

The estimation result clearly indicates that inflation and unemployment have positive relation. There is no trade-off between the two. The Phillips Curve is not therefore applicable in Ethiopia. Inflation actually increases by 47 percent when unemployment

rate increases by 100 percent. The negative seasonality coefficient of the, variable(S_2) indicates that prices decline at quarter two. The policy implications of this result is that government could not choose high unemployment in order to get low inflation or vis versa. If it chooses higher unemployment it may end up in higher inflation. Since the economy is dominantly agrarian, characterized by rigidities and fragmentation, government policy to manage the economy from the demand side would not be effective. The only solution to fight against inflation is therefore to support the workings of the supply side and remove structural bottlenecks. Next the fitted value of Equation [4.6] above is saved in PC-give and plotted against the actual rate of growth of unemployment. The result is shown in Figure [4.2] below.

From the graph one can easily observe that the short run unemployment - inflation graph is shifting. Therefore, there is no long-run positive relationship between unemployment and inflation. Therefore, the estimated long run function using Pt = f(UNEMP) becomes insignificant.

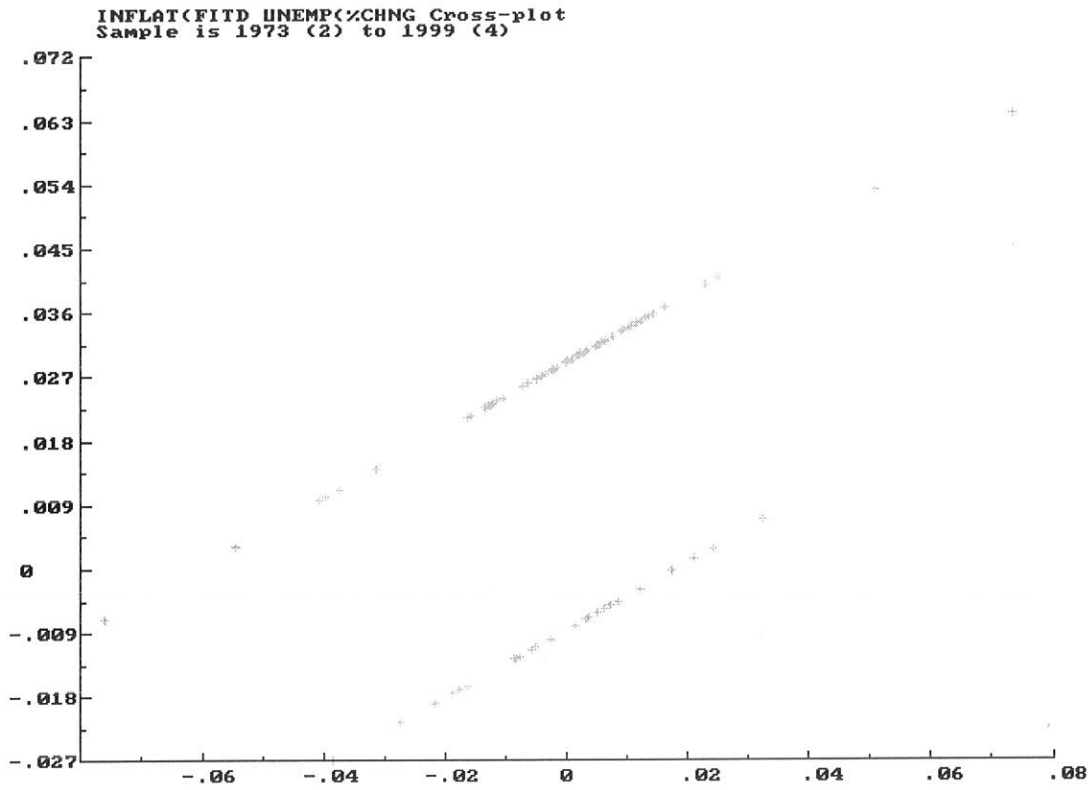


Figure 4.2: Plots of Inflation (fitted) (Y-axis) Against Actual Changes in Unemployment (X-axis)

The positive relationship between unemployment and inflation is revealed in Figure (4.2). Two parallel positively sloped plotted lines are shown. The shift in the line is due to a seasonality. Inflation declines in the second quarter (i.e October-December) and takes the lower line, whereas in the other quarters, it falls at the upper trend line.

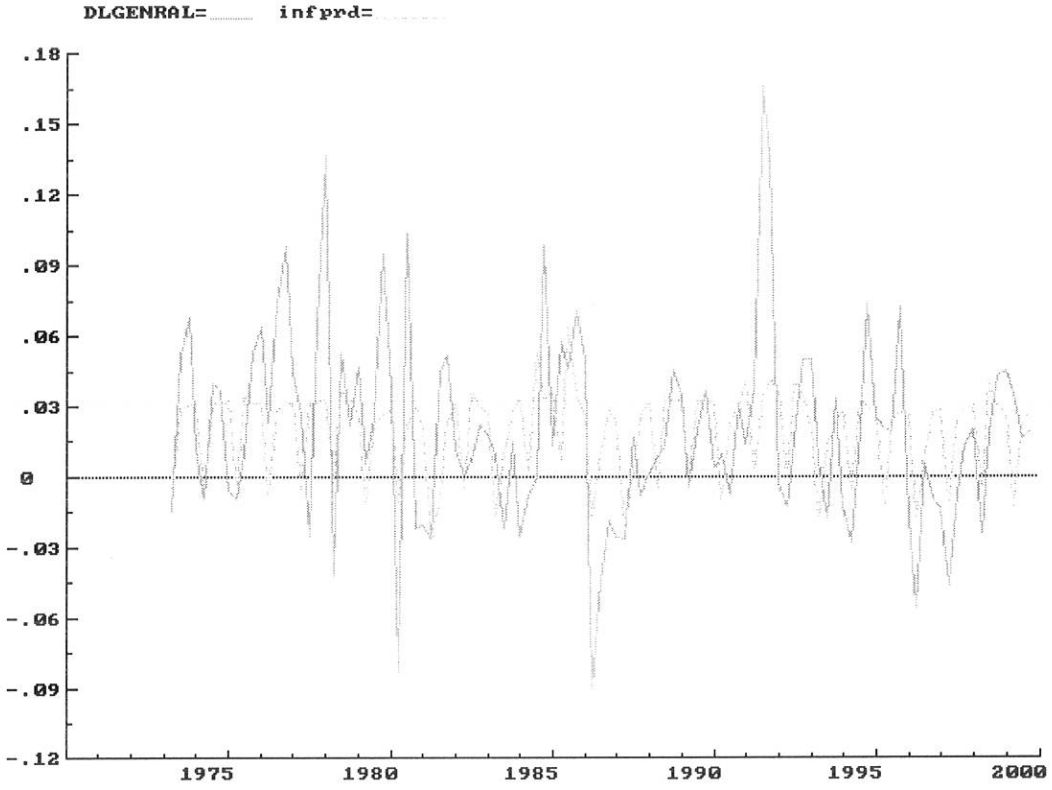


Figure 4.3: Actual and fitted inflation: 1972/73 (1) - 1998/99 (4)

5. MODELING INFLATION

In this section the paper tries to model inflation based on economic theories and recent developments in econometrics. Basically, the paper will try to test three models. First, a monetarist model which deals only with the demand side of the economy. Second, a model which incorporates both the demand and supply side forces. And, the structuralist model is the third one. This doesn't mean that all models are applicable to Ethiopia. But estimating alternative models help to identify which one best fits to the Ethiopian data. It also helps to evaluate and criticize the current government policy stance.

5.1 Monetarist Model

The main thrust of a monetarist model is the presumption that inflation always and everywhere is a monetary phenomenon [Mishkin, 1997 p. 658]. It is said to be caused by money market dis-equillibrium. i.e. the excessive growth of real money supply over that of real money demand. Equilibrium in the money market requires [Abebayehu, 1989]

$$\frac{M^s}{P} = \left(\frac{M}{P}\right)^d \quad \text{---------- [5.1]}$$

Where $\left(\frac{M}{P}\right)^d$ is the real demand for money, P is the price level and M^s is the nominal money supply. Where:

$$\left(\frac{M}{P_t}\right)^d = f(RY_t, P^e, r^e) \quad \text{---------- [5.2]}$$

RY is the measure of real income as a measure of scale variable, P^e denotes expected price measuring the cost of holding cash, r^e denotes expected interest rate to measure the yield foregone financial assets. Substituting Equation (5.2) in (5.1), taking the log, and rearranging in an inverted demand form, we get Herberger's original model.

$$Pt = C_oMS_t - C_1\, RY_t + C_2P^e{}_t \text{ ---------- [5.3]}$$

In the long run, the price level depends on nominal money supply (MS), real income (RY), and expected price (P^e) The expected sign of the variables are already shown in the equation Ndung'u (1997), however, uses interest rate (TR) instead of expected prices as a measure of the yield foregone on financial assets. This paper, however, prefers to use expected prices as a measure of the cost holding Costa as interest rates in Ethiopia used to be fixed for about two decades. Re-stating equation (5.3) in a general auto-regressive dynamic distributive lag form, we get:

$$P_t = \sum^m{}_{i=1}\ a_{1i}P_{t-1} + \sum^m{}_{i=0}\ a_{2i}M_{t-i} + \sum^m{}_{i=0}\ a_{3i}\, RY_{t-i} + \sum^m{}_{i=0}\ a_{4i}\, P^e{}_{t-i} + \varepsilon_t \text{ -- [5.4]}$$

Where P^e is expected price measuring the cost of holding money and ε_t represents a white noise residual term.

Reparameterizing equation (5.4) and specifying in a short run dynamic error correction form we obtain:

$$\Delta P_t = \sum^{m-1}{}_{i=1}\ b_o\ \Delta P_{t-i} + \sum^{m-1}{}_{i=0}\ b_{1i}\Delta M_{t-i} + \sum^{m-1}{}_{i=0}b_{2i}\ \Delta RY_{t-i} + \sum^{m-1}{}_{i=0}\ b_{3i}$$
$$\Delta P^e{}_{t-i} + b_{4I}\,[M\text{-}B_1P\text{-}\ B_2RY + B_3\ P^e]\ t\text{-}m + \varepsilon_{1t} \text{ ---------- [5.5]}$$

Where $\varepsilon_{1t} \sim$ iid $(0,\Omega)$

The short-run movements (dynamism) of the equation are captured by changes in P_t, M_t, RY_t and P^e_t where as the error correction term is represented by the term $[M-B_1p-B_2RY + B_3P^e]$. Short-run variables show serieses of disequilibrias in the money market while the error correction term indicates the speed of adjustment of the error towards the steady state path.

5.2 A Demand and Supply Side Inflation Model

This model augments the monetarist model presented above by adding supply side factors [Ndundgu's, 1997]. It begins with the argument that inflation is both a demand and supply side phenomenon. The demand side is represented by the demand for money relation which has been used in a number of studies on inflation in developing countries under the name of the Harberger Model. The supply side is made up of the foreign sector. This framework is consistent with a model with non-traded and traded goods, where the price of a non-traded good responds to disequillibria in the money market and the price of traded goods is governed by the movement in the exchange rate and foreign prices[1]. Ndung'u (1997) applied this model to study price and exchange rate dynamics in Kenya.

The demand side is already presented by Equation (5.4). The analysis of inflation emanating from the foreign sector can be splited into transmission effect coming from imported input prices in foreign currency terms and inflation following the depreciation of the exchange rate [Ndung'u, 1997]. We specify this relationship as:

---

[1] Infact there are indirect effects of exchange rate movements on non-traded goods through the costs of inputs such as raw materials and machineries.

$$P_t = C_1 EX_t + C_2 WP_t \text{ ---------- (7)}$$

Where EX_t is the log of the multilateral nominal exchange rate index and WP_t is the log of foreign price index. From the way equation (5.6) is presented it resembles Klein's (1990) exchange rate post through equation [Ndungu's, 1997]. We restate equation (5.6) in an autoregressive distributed lag model.

$$P_t = \sum^{m}_{i=1} \alpha_{1i} P_{t-i} + \sum^{m}_{i=0} \alpha_{2i} E_{t-i} + \sum^{m}_{i=0} \alpha_{3i} Wp_{t-i} + \varepsilon_{2t} \text{ ---------- [5.7]}$$

Reparameterizing Equation (5.7) and specifying it in an error correction form, we get:

$$\Delta P = \sum^{m-1}_{i-1} \psi_1 \Delta P_{t-i} + \sum^{m-1}_{i=0} \psi_2 \Delta EX_{t-1} + \sum^{m-1}_{i=0} \psi_3 \Delta WP_{t-i} + \psi_4 [EX - \beta_4 P + \beta_5 WP]_{t-m} + \varepsilon_{4t} \text{ ---------- [5.8]}$$

Applying the equilibrium condition of demand is equal to supply, it is possible to merge equation(5.5)(the demand side model) with equation (5.8) (the supply side model). This gives the following general model:

$$\Delta P = \sum^{m-1}_{i=1} \alpha_{1i} \Delta_{Pt-i} + \sum^{m-1}_{i=0} \alpha_{2i} \Delta M_{t-i} + \sum^{m-1}_{i=0} \alpha_{3i} \Delta RY_{t-i} + \sum^{m-1} \alpha_{4i} \Delta C_{t-i} + \alpha_{5i}$$

$$[M - B_1 P - B_2 RY + B_3 P^e]_{t-m} + \sum^{m-1}_{i=0} \alpha_{6i} \Delta EX_{t-i} + \sum^{m-1}_{i=0} \alpha_{7i} \Delta WP_{t-i} + \alpha_{8i}$$

$$[EX - B_4 P + B_5 WP]_{t-m} + \varepsilon_{2t} \text{ ---------- [5.9]}$$

Where $\varepsilon_{2t} \sim iid\ (0, \Omega)$

As in Equation (5.5) short-run dynamics are represented by changes in variables in the model while the long run information is captured by the error correction terms. In this model there are two error correction terms i.e., $[M - B_1P - B_2RY + B_3 P^e]$ and $[Ex - B_4P + B_5 WP]$. The first term, as described in section 5.2, stands for the speed of adjustment in the money market while the second term represents the speed of adjustment in the foreign sector.

5.3 <u>The Structuralist Model</u>

The structuralists who argue that the sources of inflation lies on the basic structure of the economy, modify the monetarist model by adding variables such as budget deficit, world inflation, real exchange rate and rainfall. The inclusion of money supply as an additional variable in the model is not because it is believed to be the source of inflation but because it is unavoidable, as structural factors like budget deficit would pump money in. The latter aggravates inflation in the economy. Due to lack of data on rainfall, however a dummy variable will instead be used in this paper. The general autoregressive dynamic model is stated in Equation (5.10), below.

$$P_t = \sum^m_{i=0} \alpha_{1c} P_{t-i} + \sum^m_{i=0} \alpha_{2I} M_{t-i} + \sum^m_{i=0} \alpha_{3i} RY_{t-i} + \sum^m_{i=0} \alpha_{4I} DF + \sum^m_{i=0} \alpha_{5i} WP_t$$

$$+ \sum^m_{i=0} \alpha_{6i} RER_{t-i} + \sum^m_{i=0} \alpha_{7i} RAINF \quad \ldots\ldots\ldots\ldots \quad [5.10]$$

Where DF is government deficit, RER is real exchange rate, RAINF is rainfall. The expected signs of RY and RAINF are negative while the other variables are expected

affect inflation directly. This model can be respecified in the following short run dynamic error correction form.

$$\Delta P_t = \Sigma^m_{i=1} c_{0c} \Delta P_{t-i} + \Sigma^m_{i=1} C_{1i} \Delta M_{t-i} + \Sigma^m_{i=1} C_{2i} \Delta RY_{t-i} + \Sigma^m_{i=0} C_{3i} \Delta DF_{t-I}$$

$$+ \Sigma^m_{i=0} C_{4i} \Delta WP_{t-i} + \Sigma^m_{i=0} C_{5i} \Delta RER_{t-I} + \Sigma^m_{i=0} \Delta RAINF_{t-i} +$$

$$C_4 [P_t - \alpha_1 M_t - \alpha_2 RY_t - \alpha_3 DF_t - \alpha_4 WP_t - \alpha_5 RER_t - \alpha_6 RAINF_t]_{t-i} + E_{1t} \ldots\ldots\ldots [5.11]$$

Where $E_{1t} \sim iid\ (0, \Omega)$

As models in Section 5.1 and 5.2, disequilibrias in the model are denoted by changes (Δ) while the ECM in the bracket carries the long-run information.

6. *EMPIRICAL ANALYSIS*

6.1 Monetarist Model

This section reports estimation results of the monetarist model stated in Chapter 5. A unit root test conducted on the variables in Equation 5.3 and the alternative definitions of money show that the Addis Ababa General Price Index (Pt), base money (MO), narrow money (M1), broad money (M2), and real GDP (Yt) are non-stationary at levels but stationary at their first differences (see Annex 8). A cointegration analysis is therefore necessary to determine the existence of a long-run (equilibrium) relationship, which ties the variables together. The variables in the model are all in logarithms.

The Johanson test on Equation (5.3) rejected the hypothesis for the existence of a steady state path. The hypothesis that 'the rank of Π is Zero' is not rejected even after taking care of the exogenous factors such as war and drought (see Table 6.1 below). This implies that a disequillbrium in the demand for and supply of money is not corrected in the money market. That is when the supply of money exceeds the demand for it in the money market, the excess supply that will feed itself into prices would not be corrected through time by the steady state (equilibrium) relationship that ties the variables together. Therefore, only short run movements affect inflation on the demand side of the economy. The test results are shown in Table 6.1 below.

Table 6.1: Test for the Rank of the Π matrix using Johanson Procedure

HO:Rank=P	λtrace	95%	λmax	95%
P= = 0	26.7	27.1	45.77	47.2
P<=1	12.89	21.0	19.07	29.7
P<=2	5.823	14.1	6.181	15.4
P<=3	0.3589	3.8	0.3589	3.8

The λmax and λtrace are two test statistics provided by Johansen (1988). We compare the critical values with the computed maximum and trace eight values (λmax and trace) to identify the rank of contigration. If the calculated λmax and λtrace values exceed the critical values reject the null hypothesis at the chosen level of significance.

The null hypothesis is given in terms of the cointegrating rank, P. For instance the null hypothesis, P= =0 implies that there is no cointegration between the variables of interest. Thus if we reject the above null hypothesis, it would mean that there is one or more cointegrating relationships. In Table 6.1, however, the null hypothesis for P= = 0, is not rejected at 1 percent level of significance. Similarly, the hypothesis that $P \leq 1$, $P \leq 2$ and $P \leq 3$ are not rejected. These imply that there are no cointegrating variables in the model. It is possible only to estimate short run dynamics.

An over-parameterized short-run dynamic model at four lags is, therefore, specified below. To marginalize the effect of droughts and war on the slopes of the variables and the normality of the error terms, drought and war dummies are also introduced to the model.

Table 6.2: Over Parameterized Error Correction Mechanism of the Monetarist Model: 1971/72 (4)-1998/99(4)

Lags	0	1	2	3	4
Δpt		0.2631 (1.284)	0.1038 (1.116)	0.0863 (0.923)	-0.1659 (-1.912)
ΔM2t	0.00718 (0.103)	0.16569 (2.306)*	0.0643 (0.847)	-0.0697 (-0.972)	-0.18875 (-2.771)**
ΔRYt	0.25702 (1.097)	-0.2475 (-0.886)	-0.5014 (-2.031)**	-0.0303 (-0.124)	0.09564 (0.427)
DDrought	-0.018736 (-0.751)	0.07683 (2.625)*	-0.027089 (-0.880)	-0.028192 (-0.824)	-0.03584 (-1.269)
DWar	0.0456 (2.858)**				
Seasonal	-0.03661 (-3.691)**				
Seasonal 1	-0.06849 (-5915)**				
Seasonal 2	-0.0249 (-2.382)*				
Constant	0.048387 (4.22)**				
R2 a' DW	0.64 0.02855 2.02				

** Significant at 1% level of significance
* Significant at 5% level of significance

Diagnostic Test; AR 1-5 F(5,22) = 1.4774(0.2056); ARCH F (4,83) = 1.5188 (0.2042); Normality Chiy' (2) = 2.4493 (0.2939); RESET F(1,90)=2.3127(0.1318)

Looking at the diagnostic tests, there is no evidence of serial correlation as shown by AR test, i.e., the errors in the model are not serially correlated. There is no also evidence of autoregressive conditional hoteroschedasticity (ARCH test). This proves that the model does not have clusters of large and small errors. The proof that the model does not have evidence of AR and ARCH problems indicates that the

estimators are BLUE. As shown by the Normality Chiy'(2) and RESET Tests, the model does not also have evidences of normality and specification or missed variables problems.

To arrive at a parsimonious model, Equation [5.5], in Chapter Five, is estimated iteratively by dropping variables hieraricially from highly to barely insignificant variables. The preferred model so arrived is, therefore, presented in Equation (6.1) below:

$$\Delta P_t = 0.03618 + 0.18414\ \Delta M2_{t-1} - 0.16791\ \Delta M2_{t-4} - 0.61895\ \Delta RY_{t-2} + 0.033798\ DDrought_{t-1}$$
$$(6.458)^1 \quad (3.021)^1 \quad (-2.725)^1 \quad (-3.735)^1 \quad (-4.131)^1$$

$$- 0.063041\ DDrought_{t-4} + 0.060185\ DWar - 0.019808\ S^0 - 0.042354\ S^1 \ldots. \textbf{[6.1]}$$
$$(-5.246)^1 \quad (2.099)^2 \quad (-2.723)^1 \quad (-5.890)^2$$

1. Significant at 1% level of significance
2. Significant at 5% level of significance

$R^2 = 56$ $F(8,95)=15.059$ (0.0000) $a' = 0.028941$ $DW = 2.19$

Diagnostic test: AR 1-5 F(5,90) = 1.3368 (0.2560);ARCH 4 F(4,87) = 2.3858(0.0573); Normality Chiy' (2) = 4.3668 (0.1127) Xiy' F(11,83) = 0.47414(0.9143) Xi*xj F(30,64) = 0.35115 (0.9988), RESET F(1,94)=1.1404 (0.2883)

As the result on the diagnostic test shows, the model passes all the diagnostic tests. The test for functional mis-specification (i.e., Xi * Xj test) is also rejected. Money supply affects inflation with one and four lags. The possible interpretation is that the immediate effect of increase in money supply is aggravating inflation whereas after four quarter lags money's productive role begins take effect and starts to dampen the

latter. Real income affects inflation after two lag in the short-run. Inflation inertia, on the other hand, does not appear in the short-run model. It has been dropped for insignificant coefficients at all lags. Drought and war dummies, on the other hand, enter significantly. As expected the immediate impact of drought is to push up domestic prices. This is shown by the positive drought coefficient at the first lag. After four quarter lags, however, drought seems to dampen inflation. This might be related to food aid that usually enter the country with some quarter lags. And, the latter has a dampening effect on the prices of food in Addis. Moreover, inflation is found to have seasonality pattern as shown by significant negative coefficients of S_2 and S_2. This indicates that prices decline in the first and second quarters of every fiscal year.

To conclude: the monetarist model provides only the short run explanations of inflation in Ethiopia. And the model shows that the rate of inflation is explained by changes in money supply and output with different lags. Exogenous factors like war and drought also affect the short-run dynamics of inflation significantly. As the Ethiopian economy is predominantly agrarian, inflation is subjected to seasonal effects as shown by significant seasonality coefficients.

6.2 Incorporating the Supply in the Demand Side Model of Inflation

The purchasing power parity (exchange rate pass through) Equation (5.7) is used here to estimate the supply side model on the believe that for an open economy, like Ethiopia, movements in exchange rates and foreign prices affects movements in the

prices of traded goods. Unit root tests on world price and multilateral nominal effective exchange rate indices confirm that the variables are non-stationary at their levels. The test on their first differences, however, proves their stationarity. The co-integration test on the variables in the model fail to confirm long-run relationship. The result is expected because the exchange rate had been controlled for about two decades between 1974 and 1992 G.C. And, most of the prices of traded goods were under state control in this period. Therefore, a short-run dynamic model is estimated which is presented in Table 6.3 below.

Table 6.3 The General Model on Short-run Dynamics of 'Exchange Rate Pass Through Equations'

	0	1	2	3	4	5
Δpt		0.16566 (1.669)	0.12685 (1.27)	0.01264 (0.121)	-0.1377 (-1.336)	-0.0022 (-021)
ΔEXt	0.02432 (0.612)	-0.0117 (-0.295)	0.0102 (0.255)	0.01705 (0.428)	0.0369 (0.925)	-0.00348 (-0.088)
ΔWPt	0.3724 (0.419)	0.5328 (0.566)	-0.7695 (-1.174)	-0.0278 (-0.043)	-0.64165 (-0.694)	1.3526 (1.586)
DWar	0.06234 (4.352)**					
Constant	-0.000574 (-0.068)					
R2 F(18,84)	0.4158 3.322 (0.0001)					
a' DW	0.035423 2.02					

** Significant at 1% level of significance

Diagnostic test: AR 1-5 F(5,79) = 0.28745 (0.9186) ARCH 4 F(4,76) = 2.0329 (0.0982); Normality Chiy'(2) = 2.0539 (0.3581); RESET F(1,83) = 0.034889 (0.8523)

The over parameterized general model presented in Table 6.3 shows that the overall test of the model is statistically significant at 1% level of significance. And there are no evidences of serial correlation, auto-regressive heteroscedasticity, normality problems and also model specification errors as shown by AR, ARCH, Normality and RESET tests respectively. The procedure to arrive at a parsimonious equation is conducted in repeated estimation by dropping insignificant variable hierarchically from highest to the lowest insignificant variables. The preferred (parsimonious) model so arrived is therefore presented below:

$$\Delta P_t = \underset{(2.117)}{0.18679}\,\Delta P_{t-1} - \underset{(-2.316)}{0.60192}\,\Delta WP_{t-2} + \underset{(6.045)}{1.376}\,\Delta WP_{t-5} + \underset{(4.574)}{0.06124}\,DWar..... \quad \textbf{[6.2]}$$

1. Significant at 1% level of significance
2. Significant at 5% level of significance.

R2 = 0.48 a' = 0.03384 DW = 2.06

Diagnostic test: AR1-5 F(5,94) = 0.67721 (0.6418); ARCH 4F (4,91) = 2.063 (0.0921); Normality Chiy' (2) = 2.5979 (0.2728); RESET F(13,85) = 0.96769 (0.4894)

The estimation result in Equation (6.2) shows that, unlike in the monetarist model, inflation inertia explains the significant part of short run variation in inflation. Changes in world prices also affect domestic inflation with two and five quarters lags. The strong inflationary effect of world price appears after a five-quarter lag while its immediate consequence is to dampen domestic inflation. This might indicate that domestic inflation is not affected by expected world inflation but actual inflation when the goods imported at high prices have entered the domestic market.

The conclusion from the supply side model using the exchange rate pass through equation indicates that nominal exchange rate have had insignificant role in explaining price variation both in the short and long run. This is evident from the consistent drop in inflation rates since 1992/93 even to the extent of -6% in 1995/96 while the Birr exchange rate were depreciating consistently from Birr 2.07 per USD Sept. 1992 to Birr 8.12 per USD June 1999. On the other hand, world inflation rate affects domestic inflation at various lags in the short run. Exogenous factors such as war enters significantly in the model.

The next step is to merge the Harberger demand side Equation (6.1) with the supply side model represented by the Exchange Rate Pass Through Equations (6.2) using equilibrium conditions as specified in Chapter (5), Equation (5.9) .

The preferred model is:

$$\Delta Pt = \underset{(2.074)^2}{0.14375\ \Delta M2_{t-1}} - \underset{(-3.685)^1}{0.63831\ \Delta RY_{t-2}} + \underset{(4.474)^1}{1.4701\ \Delta WP_{t-2}} - \underset{(-4.069)^1}{1.2290\ \Delta WP_{t-3}} \ldots\ldots [6.3]$$

$$\underset{(4.480)^1}{0.05889\ DWar} + \underset{(5.020)^1}{0.045322\ S_2}$$

1 Significant at 1% level of significance
2 Significant at 5% level of significance

$R^2 = 0.5085$ $\quad a' = 0.03307$ $\quad DW = 1.87$

Diagnostic test: AR 1-5 (5,93) = 0.87605 (0.5004); ARCH 4 F (4,90) = 1.804 (0.1350); Normality Chiy'(2) = 0.85418 (0.6524) ; Xi * Xj F(25,72) = 0.89513 (0.6100); RESET F (1,97) = 0.80215 (0.3727)

The variables in the model have the expected signs. However, world price (WP) seems to have opposite effects with a quarter difference which is not easy to motivate here.

6.3 The structuralist Model

The Johanson (1988) test for the number of co-integrating victors is conducted on the Structuralist Model. The result is depicted in Table 6.4 below.

Table 6.4: Contigration Analysis Of The Structuralist Model

HO: Rank=P	Δtrace	95%	ΔMax	95%
P= = 0	25.56**	17.9	42.62**	24.3
P<=1	17.65**	11.4	20.06**	12.5
P<=2	2.409	3.8	2.409	3.8

Standardized B' eigen vectors

P	UNEM	EX	WP
1	-0.981	0.3458	-0.7396
-1.753	1.000	0.5212	1.628
-1.878	6.327	1.000	1.095

Standardized ∝ Coefficient

P	-0.01514	0.07514	-0.006008
UNEM	0.009518	0.003743	-0.002693
EX	-0.03102	-0.1911	-0.01880

The vector auto regression in Table 6.4 includes five lags on each variable (Pt, UNEMP, EX & WP). Money supply and government deficit variables are dropped for wrong signs. WP entered the model restrictedly because world price is purely exogenous to Ethiopia whereas the constant term and the war dummy entered the vector auto regression unrestrictedly.

The null hypothesis of at most two cointegrating vectors (P<=2) is not rejected at 1 percent of significance implying that there are actually two cointegrating vectors in the model.

Identifying those co-integrating variable is, therefore, conducted applying both statistical techniques and economic theory. Accordingly, the first vector is identified to be the long run price equation (P_t = 0.981 $UNEMP_t$ + 0.3458 EX_t + 0.7396 WP_t). The test for weak exogeniety also confirms that P_t is weakly exogenous. The second vector is the 'exchange pass through equation' ($P_t = EX_t * WP_t$). The equation which was found to be not cointegrated when tested independently in Section 6.2 has proved to be cointegrating when looked at the structuralist point of view. This indicates that simultaneity bias (i.e. restriction of variables with endogeniety behavior as exogenous) might restrict the error terms to behave in a non-stationary manner. The steady state 'exchange rate pass through equation' is, therefore, P_t = 0.2941EX_t + 0.9414 WP_t.

A vector error correction model is specified using two vector error correction terms (VECMs) generated from the two vectors identified above. Using the latter the paper arrived at the preferred model presented in Equation 6.4 below.

$$\Delta P_t = \underset{(-2.405)^*}{0.20514\Delta P_{t-4}} - \underset{3.145)^{**}}{0.222\,\Delta M_{t-1}} + \underset{(-2.583)^*}{0.17025\,\Delta M_{t-4}} + \underset{(2.837)^{**}}{0.9842\Delta WP_{t-1}} - \underset{(-2.415)^*}{0.7808\Delta W}$$

$$+ \underset{(2.412)^*}{0.7221\Delta WP_{t-4}} + \underset{(3.031)^{**}}{0.03836\,\Delta UNEMP_{t-2}} - \underset{(-2.063)^*}{0.0127\,VECM1_{t-1}} + \underset{(2.503)^*}{0.038362DDrought_{t-1}}$$

$$-0.05537\,DDrought_{t-4} + \underset{(4.764)^{**}}{0.0615\,DWAR} - \underset{(-1.328)}{0.01424Se} \quad \text{[6.4]}$$
$$(-3.739)^{**}$$

** Significant at 1% level of significance
* Significant at 5% level of significance

$R^2 = 0.68$ $a' = 0.027362$ $DW = 2.36$

Diagnostic test: AR 1-5 F(5,64) = 1.6813 (0.1519);ARCH 4 F (4,61) = 5.9151(0.0004)**; Normality Chiy'(2) = 2.9681 (0.2267) ; XiX' F(20,48) = 1.78 (0.0522); RESET F (1,68) = 1.7402 (0.1915)

The model passes all the diagnostic tests except the ARCH test, which becomes significant at 1%. The final estimation result as stated by Equation (6.4) above drops the second vector carrying long-run information on purchasing power parity. The price equation remains the only long run information in the model. To avoid the simultaneity bias, the paper has applied a recursive least square procedure.

The conclusion from the structuralist model is that Ethiopia's inflation could be explained by supply side (structural) variables both in the short and long run. Inflation inertia, money supply, world inflation and unemployment of resources explain short-run variation in prices. World inflation seems to have significant effect as shown by the sum of the coefficient of WP_{t-i}. Unemployment aggravates inflation even in the short-run as proved by its positive coefficient. There is also a weak but significant VECM coefficient which signifies that disequilibrium in the model is corrected slowly at 1.3 percent.

To summarize estimation results in the Chapter, the monetarist and foreign sector models explain only short run variations in prices. In the long run, therefore, prices remain structural. When the unemployment variable is added in the model, the role of money supply in explaining variations in prices declines dramatically. And, the positive unemployment coefficient signifies that inflation decline as unemployment is reduced. This connotes that when structural problems such as production rigidities and market fragmentation are removed, output increases so that absorbing aggregate demand in the economy. Increases in output might not however necessarily be due to an increase in labour employment alone. In fact as the economy is way below the production possibility frontier, it could primarily be due to improvements in labour productivity and /or efficient utilization of other resources such as land, capital and enterprenuership. Therefore, in this context, increases in employment would not push up wage costs, which is at the center of inflation-unemployment trade-off in the traditional theories. The latter emphasizes in reducing the number of unemployed labour forces while the analyses in this paper centers on the efficient employment of underemployed resources.

7. CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

Inflation has been low for years since economic data began to be compiled in Ethiopia. This is good news to policy makers. The lower inflation during the major part of the Imperial region is obvious. World inflation was low due to the fixed exchange rate system adopted as an international monetary order. As the country was also undergoing a major industrialization with its attendant urbanization program, it accelerates the monetization process which, inturn, absorbed some of the increase in money supply.

The Derg, on the other hand, was a suppressive regime. It used to suppress aggregate demand by applying various direct and indirect control measures on financial and real variables. Wages and salaries, interest income, profit were all suppressed. The tax system were so harsh that in some cases close to 300%. On the supply side, the economy was faced with a lot of structural problems. The labour market (especially markets for educated people) were controlled by the government and it was vertually non-existent in the agricultrual sector. Security markets such as T-bills and shares were discontinued and private banks were nationalized. This makes the money market shallow and limited only to government owned single commercial bank (Commercial Bank of Ethiopia). Investment had to be financed by borrowing from the then Agricultural and Industrial Bank (AIDB) and Housing and Saving Bank (HSB). Generally, the economy was short of liquidity. Under this background,

inflation was low but volatile. The take over of the EPRDF and the launching of the Economic Reform Program in 1992/93 has not changed the situation regarding inflation. Despite the major achievements in the supply side of the economy, suppressing aggregate demand continued to be the main instrument for controlling inflation. Besides the huge demobilization of the military force and restructuring of inefficient public enterprises which suppresses aggregate demand, the government has decided to pursue prudent fiscal and monetary policies.

The test for existence of a trade-off between inflation and unemployment proves that there is no such trade of in Ethiopia. At least in the short run, the relationship between inflation and unemployment is positive. The implication of this result is that policy makers in Ethiopia should strive to tackle supply side problems first. That is, structural rigidities should be removed, various markets should be created and developed before Ethiopia starts to claim that inflation is a monetary phenomena. Emphasizing on suppressing aggregate demand, however, aggravates the situation. Aggregate production would remain below capacity and unemployment would continue to be the headache of the economy.

Econometric analysis using the monetarist, the structralist, and supply and demand side models supports the above conclusion. The Herberger type monetarist model shows that inflation is not a monetary phenomena in the long-run. In the short run, however, money market dis-equillibrium had some contribution to inflation. The demand and supply side model also indicates that the augmentation of the foreign trade effect of the supply side model to the monetarist demand side model does not

bring significant change regarding the long-run (steady state) path. In the short-run, however, there seems to be a strong positive correlation between changes in world prices vis-à-vis domestic inflation.

The structuralist model, on the other hand, seems to explain the short-run and long-run path of inflation in Ethiopia. Inflation, as confirmed by the positive inflation - unemployment correlation in Chapter 4, is positively related to the rate of change in unemployment. When the unemployment variable is added to the model, money supply's role in determining variations in prices goes down dramatically.

To conclude, inflation is basically structural in Ethiopia. Monetary factors play a limited role. This doesn't mean that given the existing market and production structure, increase in money supply would not create inflationary pressure. This is something like pouring water on a clothed empty can on the assumption that the water will flow in and be ready for use. In this case the water overflows. If the can is opened or a hole is created on the top, however, the water will begin to get in and fill it. Then, it is only when the can is full that it starts to overflow again. Likewise, increases in money supply would obviously aggravate inflation in the short-run as long as the increased money does not get its way into the various sectors in the economy so that it could be used productivity. This assumes improvements in the functioning and inter-linkage of labour, capital, and money markets, and reduction in structural rigidities. Increases in money supply without the latter would, however, aggravate inflation in the economy.

Exchange rates have not played any role in determining inflation both in the short and long run. Inflation inertia, on the other hand, has significant effect on the price level in the long run. The latter is partly related to the government price fixation mechanism adopted during the Derg period which dominates the data, and partly to the lack of competition in manufacturing, and service sectors. Agriculture, despite its vulnerability to shocks, is competitive in terms of price setting.

7.2 Recommendation

The paper forwards the following policy recommentdations:

1. Since production is way below the potential, the primary concern of policy makers should not be to control inflation. Rather, they should pay due priority to the supply side. Markets for labour, capital and money should be developed and interconnected. During this process, money is expected to play a productive role and the production function will continue to shift up until the economy reaches its 'potential' or steady state level.

2. Inflation is found to be a positive function of unemployment in the short run (i.e. reducing unemployment would reduce inflation). This works, however, when the recommendation under number (1) has got due attention. Otherwise, money would still remain inflationary as rigidities in markets and the production sector prohibit its productive role.

3. Government expenditure aimed at creating markets and improving production efficiency such as road, transport, telecommunication, electricity, irrigation systems may not be inflationary in the short run, as argued in (1) and (2) above, the process of creating efficient and well functioning markets and removing rigidities in the production sector enables the production function to shift up and up. If these targets are not meet, however, its inflationary role is unavoidable by the same analogy in number 2.

4. One thing to note, however, is that Ethiopia's economic problem will remain structural only until the various markets are created and structural rigidities are removed. Once, these are achieved and the production function shifts enough to reach the steady state level of the economy, inflation will begin to be a demand management issue. Until then however structural problems would continue to dominate. Demand side factors should not be ignored but must be relegated to a secondary importance.

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Annex 1:

Source and Definitions of Data

Most of the data used for analysis and graph are obtained from publications by MEDAC, MOF, MOI&T, NBE and IFS. Personal interviews have also been conducted on the seasonality and quality of data.

Methodology of Deriving Quarterly Figures from Annual Series

The quarterly data is derived using the moving average technique is taken from Ichero Otani as applied by Ibrahim and Teklewold [1991] in their paper on "The Monetarist Explanation of Inflation: The Experience of Ethiopia". The methodology is more flexible for adjustment. Therefore, I took advantage of this flexibility to take care of seasonality in the GDP components. For instance, agriculture which accounts about 40 percent of Ethiopian GDP is highly seasonal so that it is corrected for the latter based on the information from CSA Agriculture Department. For manufacturing output, the seasonality is obtained by taking the eight years average quarterly output data obtained from the Ministry of Industry and Trade. Banking and Insurance is adjusted for seasonality based on value added method. The seasonality of transport communication and trade, are estimated using proxies.

Income

Ry = Real Income. The annual real GDP series for the period between 1971/72 to 1998/99 is decomposed into a quarterly series. The technique applied to arrive at the latter is taken from Ichero Otani.

For the year Y_t

Quarter I:	$0.75\ Y_{t-1} + 0.25\ Y_t$
Quarter II:	$0.5\ Y_{t-1} + 0.5\ Y_t$
Quarter III:	$0.25\ Y_{t-1} + 0.75\ Y_t$
Quarter IV:	Yt

This is basically a moving average technique. Since the Ethiopia production data is subjected to wide seasonally, the coefficients in each quarter are adjusted to seasonal behaviors in agriculture, manufacturing, trade, transport and communication, banking and insurance and others.

Monetary Aggregates

M0 = Base money. This is the reserve money of the National Bank of Ethiopia which includes currency in circulation and commercial banks reserves at the NBE.

M1 = Narrow Money. This is the sum of currency outside banks and demand deposits of commercial banks.

M2 = Broad Money. This is the sum of narrow money (M1), savings and time deposits at commercial banks.

Exchange Rates

REER = Real Effective Exchange Rate Index. This computed by taking quarterly data on consumer price indices and exchange rates (period average), of 14 top major trading countries (excluding Djibouti for lack of data), and applying the import and export share of each country at the base year 1980.

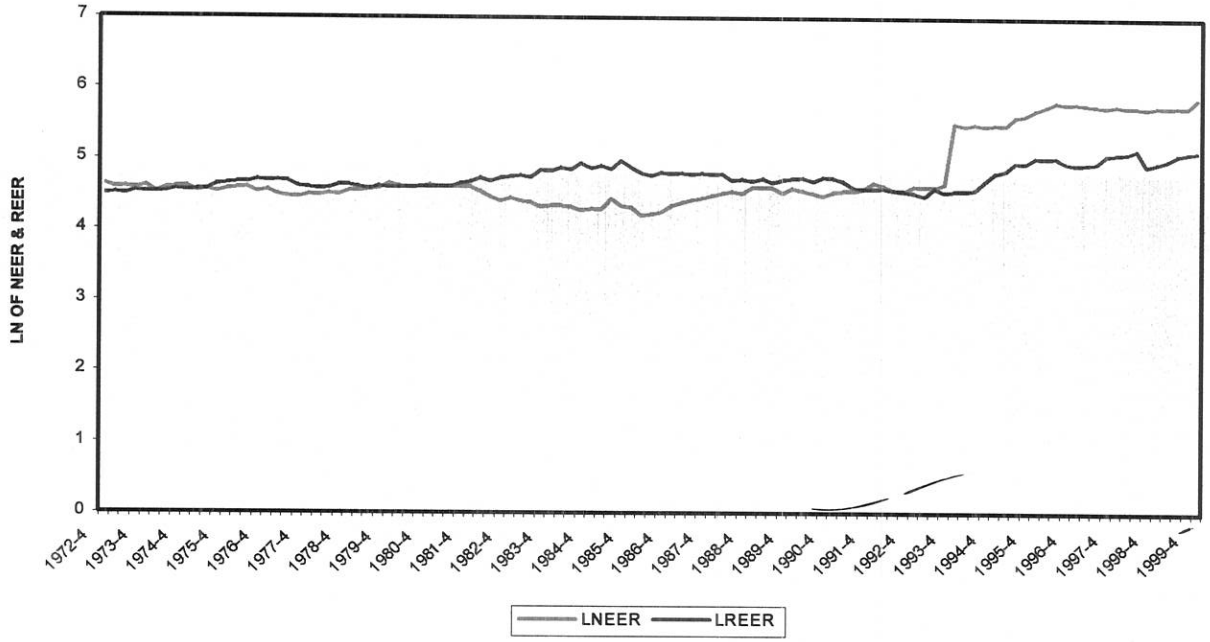
NEER = Nominal Effective Exchange Rate Index. This differs from the REER by excluding the effects of relative prices.

Prices

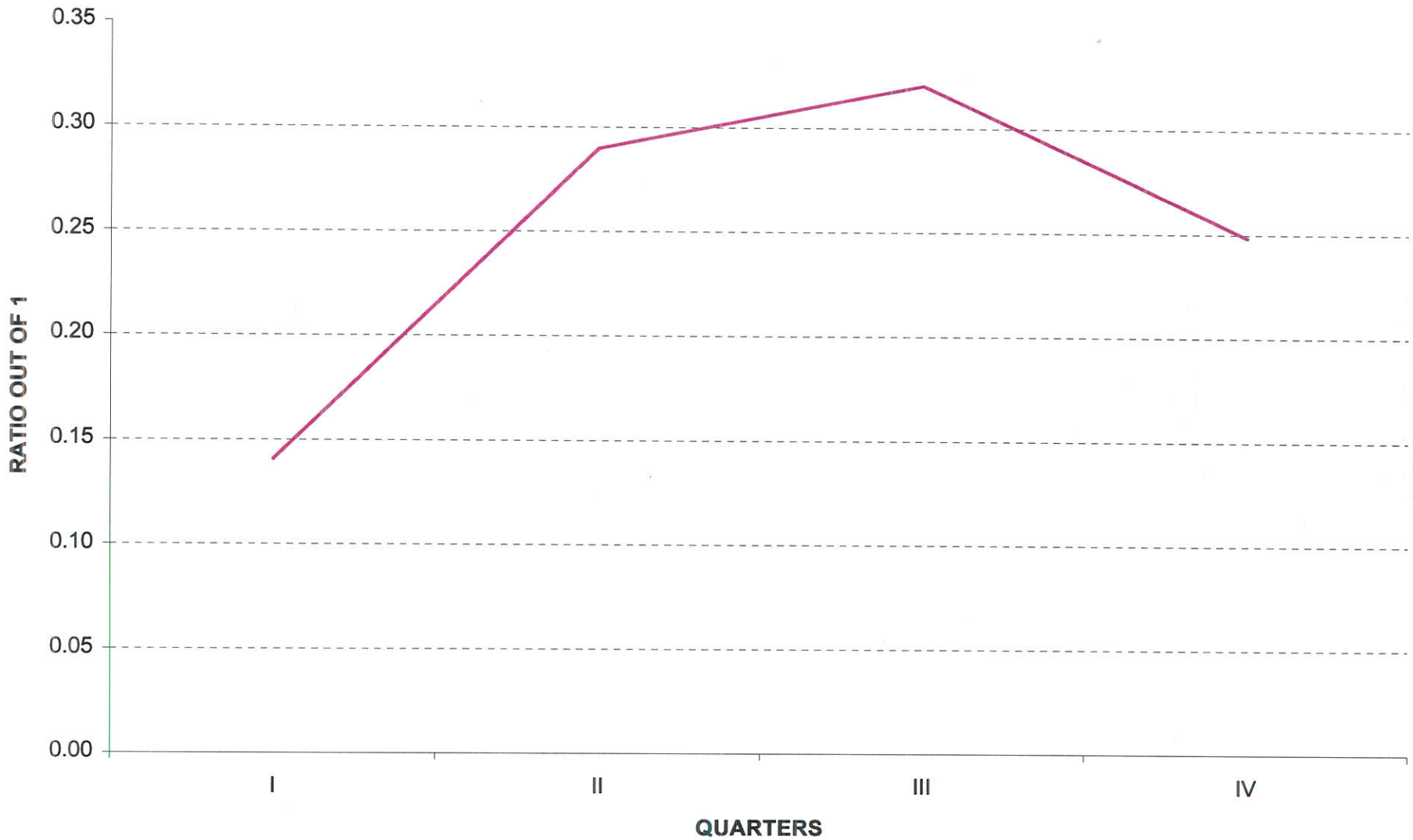
Pt = The consumer price index for Addis Ababa. The series between 1963 to 1995 uses base 1963. Indices of the remaining years is, therefore, arrived by extrapolating base 1995 to base 1963.

Wp = World price Index. This is computed by taking consumer price indices of eight major European trading partners and weighting by their import shares at the base year (1980).

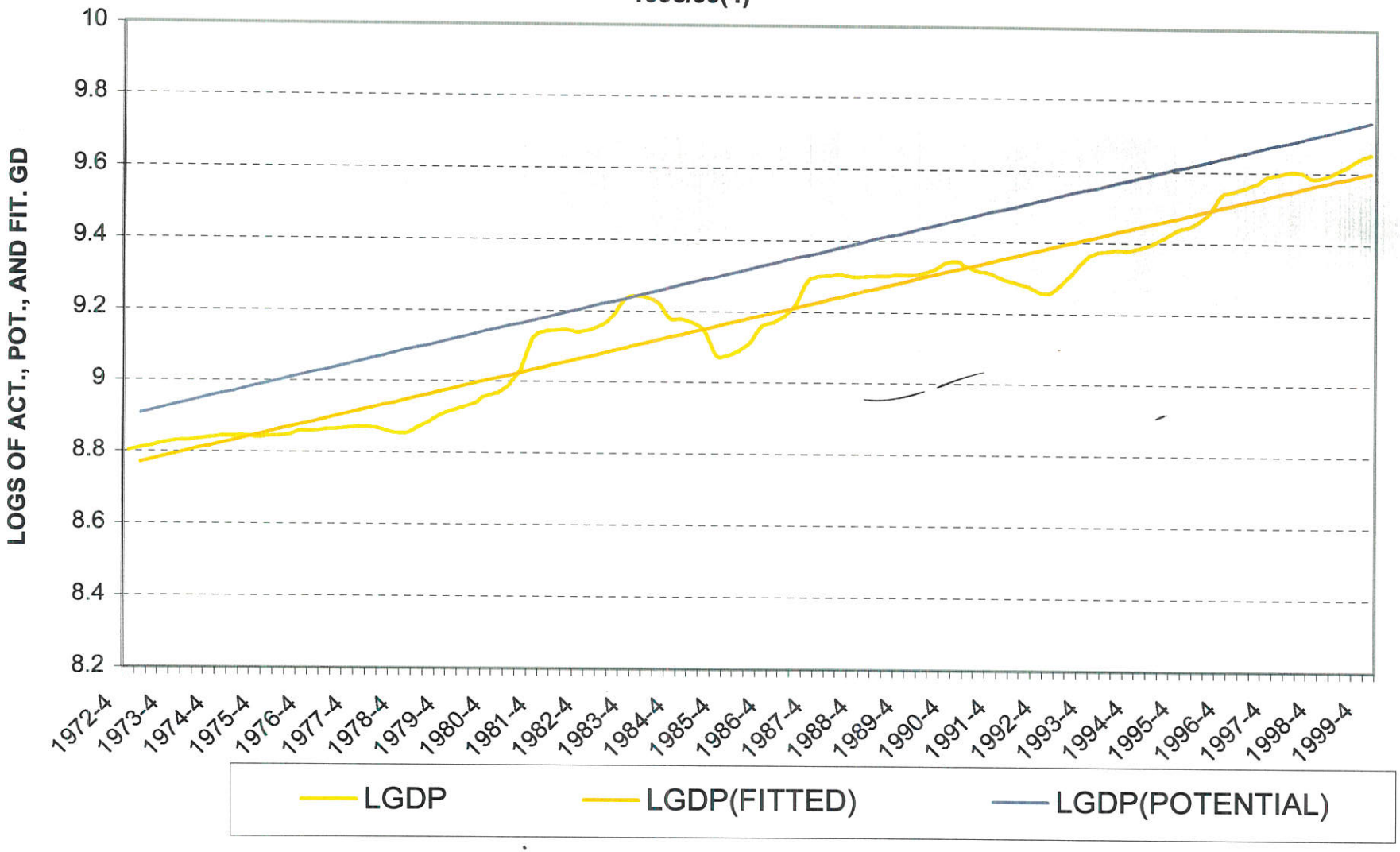
ANNEX 2: NOMINAL AND REEL EXCHANGE RATE INDICES: 1971/72(4) - 1998/99(4)



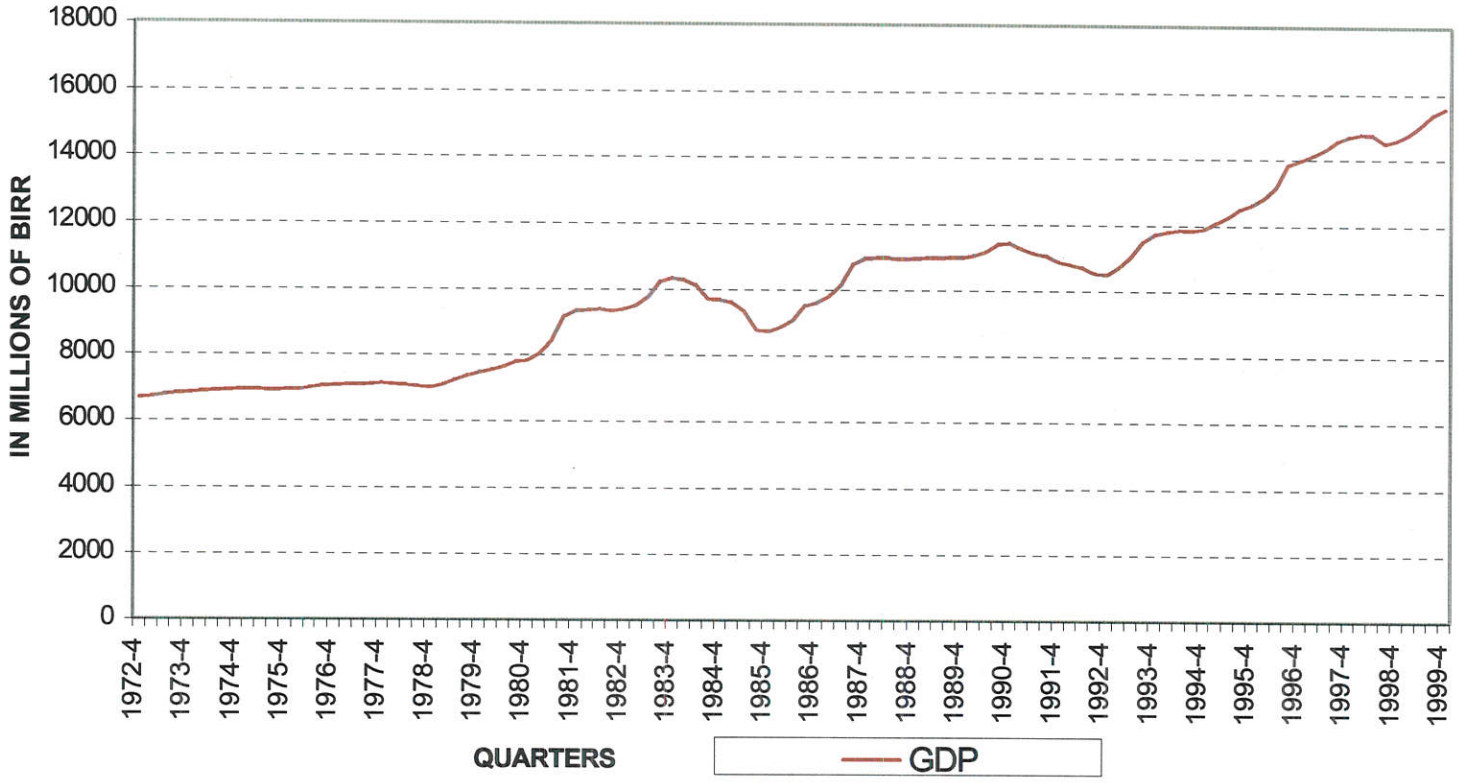
ANNEX 3: DOM. & INT'L TRADE CREDIT FROM THE CBE: QUARTERLY AVERAGE



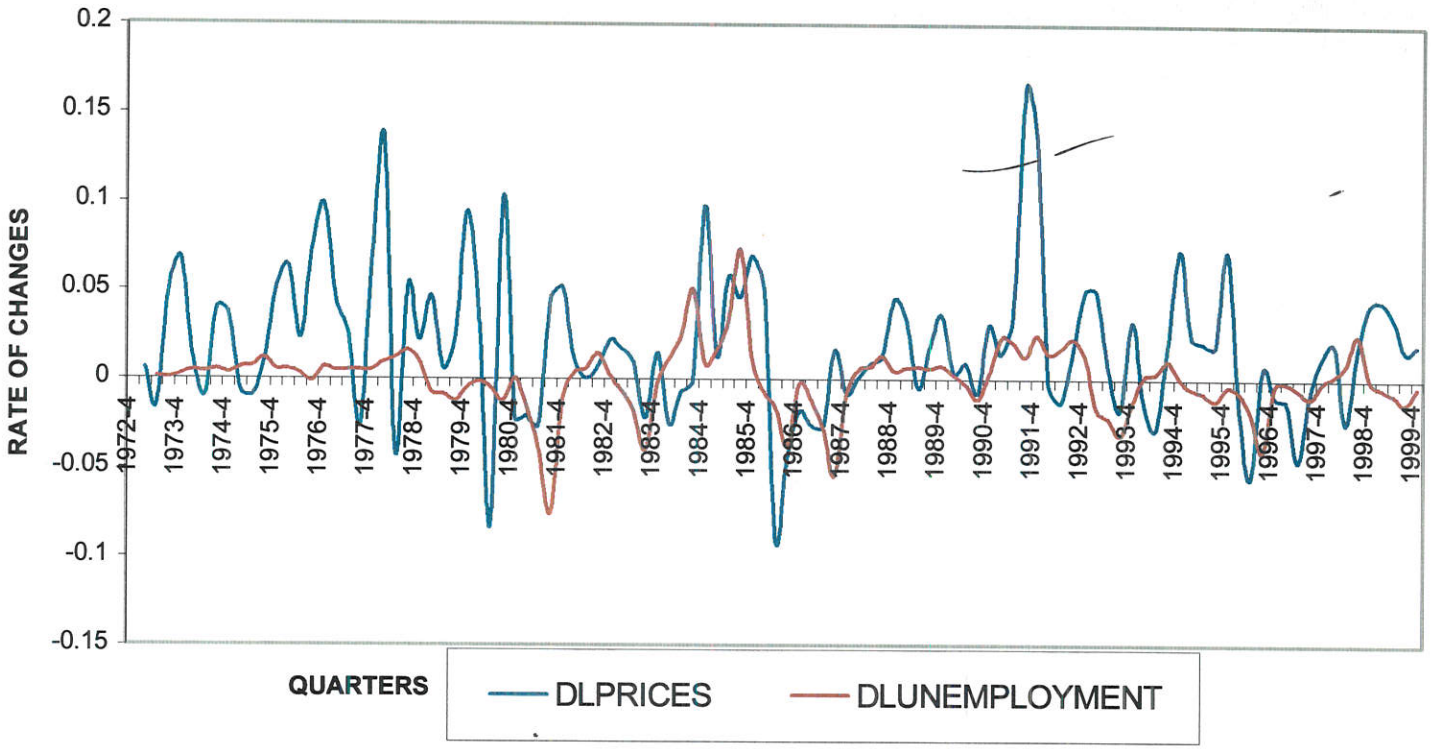
ANNEX 4: ACTUAL, POTENTIAL AND FITTED QUARTERLY GDP SERIES: 1972/73(1) - 1998/99(4)



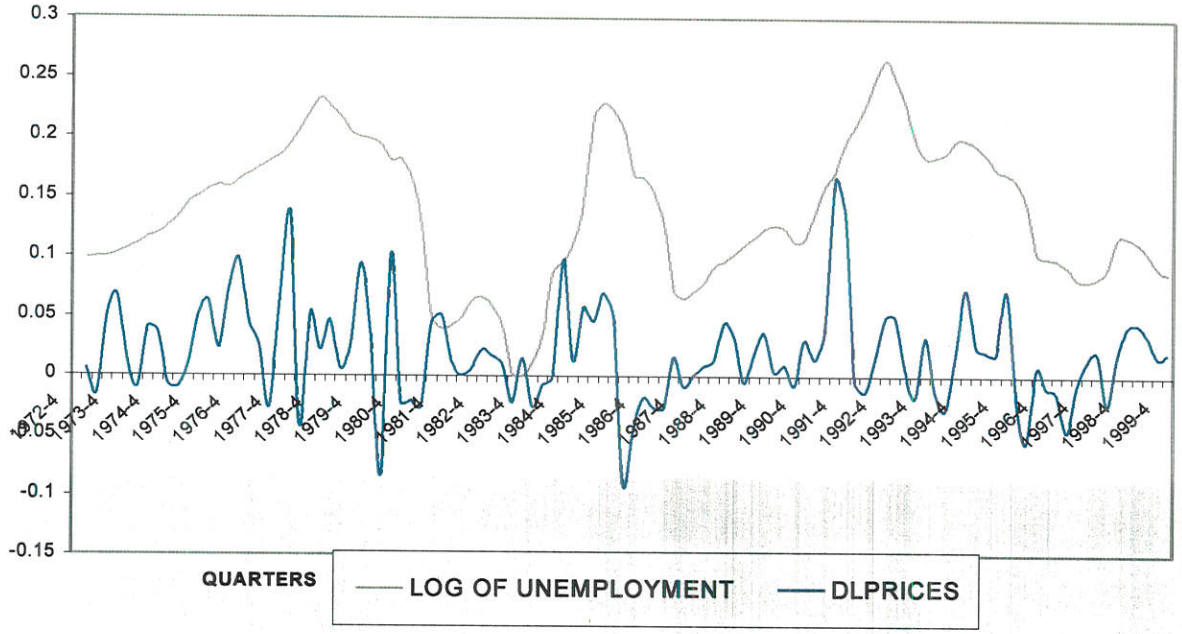
ANNEX 5: QUARTERLY GDP SERIES AT 1980/81 CONSTANT PRICE: 1971/72(4) - 1998/99(4)



ANNEX 6: QUARTERLY RATES OF CHANGE IN CPI AND UNEMPLOYMENT: 1972/73(2) - 1998/99(4)



ANNEX 7: INFLATION AND THE LEVEL OF UNEMPLOYMENT: 1972/73(1) - 1998/99(4)



Annex 8 An Unit Root Tests Both of Level and First Differences (with 5 lags)

Variable	Without Trend		With trend	
	t - Values	95%	t - Values	95%
P	0.28997	-2.889	-2.0978	-3.453
RY	0.46218	-2.889	-2.3733	-3.453
M2	2.8843	-2.889	0.3736	-3.453
ΔPt	-4.3846**	-2.89	-4.5893**	-3.454
ΔRY	-5.0498**	-2.89	-3.8647**	-3.454
ΔML	-3.8500**	-2.89	-5.0693**	-3.454

DECLARASION

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

Name: *Yohannes Ayalew*

Signature: 

Confirmed by Adviser:

Name: *Gebrehiwot Ageba (PhD)*

Signature: 

Place and Date of Submission: Addis Ababa University, June 2000.