

Determinants of Price Dynamics in Ethiopia¹

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Abstract

Since recent years inflation has become the most important macroeconomic problem in Ethiopia. This study examines the sources of this inflationary pressure using annual data spanning over 1971 - 2014. The study estimates a comprehensive price equation and performs some simulation analysis to uncover the sources of inflationary pressure. The result of the exercise indicates that monetary and fiscal fundamentals are important determinants of price dynamics in the short run. In the long run, output remains to be the most important variable. The result also indicates that the relationship between inflation and foreign prices is rather weak.

JEL Classification: E17, E31, E64, C51

Key Words and Phrases: inflation, macroeconomic policies, money supply, fiscal deficit and real GDP

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1. Introduction

In the last few years Ethiopia has experienced a number of inflationary episodes, which despite several stabilization measures continued to soar. Inflation started to gather a momentum in the late 2005 and early 2006, few months after the national election of the country. General prices rose by more than 43 percent on average and food price inflation reached 60 percent in 2008. Although the picture is relatively less pronounced, non-food price has also been rising over the same period. Although general inflation slowed down to 9 percent annual growth in 2009 and 2010 the figures remained at high level in 2011 steadily increasing to reach average annual rate of 28.1 percent. Despite efforts by monetary authorities, the average rates remained above the target levels in 2012. This shows that inflation has become the most important macroeconomic problem of the Ethiopian economy in recent years.

One salient feature of the recent inflationary pressure in Ethiopia is that it is led by food inflation. On average, food prices increased relatively faster than non-food prices over the recent years except for some years with bumper food harvest and plummeting prices. Furthermore, food inflation is generally more erratic than the non-food inflation. This along with the relatively higher share of food items in the general CPI makes the recent inflationary pressure predominantly food price inflation. This, however, looks puzzling given the fact that the recent growth in Ethiopia is led by agricultural output growth. Between 2003/04 and 2013/14 Ethiopian economy grew by 10.9 percent with good performance of the agricultural sector. Agricultural GDP growth rate specifically averaged 9.0 percent during the same period. Furthermore, world food price increases are believed to have small effects on the domestic food prices given the limited size of food imports (Tadesse, 2008).

The results of the studies on why Ethiopia is experiencing rapid price rises are inconclusive. In fact, apart from few, many of these studies draw mainly on basic descriptive analysis. Ahmed (2007) documented that the current

rampant inflation in Ethiopia is caused by increase in aggregate demand and structural change in agricultural markets. Leoning et al (2009), on the other hand, focuses on the role of international food prices and exchange rate are as the main determinants of domestic prices. Similarly, Duravall and Sjo (2012), using data from Ethiopia and Kenya, conclude that world food prices and exchange rates are key determinants of inflation in the long run. They also report that money growth and agricultural supply shocks drive prices in the short run. World Bank (2010), on the contrary, argues that the increased money supply solely contributed to current inflationary episodes. In sum, there is no consensus on why Ethiopia is facing high and varying episodes of inflation.

Since the early phases of inflationary episodes, government and monetary authorities have implemented various stabilization policies to contain inflation. Government used to subsidize the price of petroleum products until late 2008 when it switched to subsidize food prices. In the late 2008 government started to import food items and supply to domestic market at subsidized prices. When both policies failed to bring inflation to the target level, government switched to place price caps on the retail prices of several commodities in January 2011. However, shortly afterwards it proved that the measure was not working when the intervention in the market created supply shortage of these commodities and inflation jumped to 38.1 percent in June 2011 from 17.7 percent in January 2011, when price regulations were first introduced. In 2012 the National Bank of Ethiopia introduced a directive that required commercial banks to hold 27 percent new loan disbursement in low-yield National Bank of Ethiopia's five-year T-Bills. The National Bank of Ethiopia also implemented a directive that restricted government borrowing through direct lending from the National Bank of Ethiopia. It appears that these measures have finally succeeded to control the inflationary pressures in recent years with inflation rates within the target level.

The failure of the monetary authorities to control the price spikes was partly due to the fact that the sources of the price spikes were not clear.

Consequently, the authorities had to experiment one policy after the other, and only to witness that inflation is yet soaring. This implies that there is a need to identify sources of recent inflation in Ethiopia to inform policy making. The objective of this study is, therefore, to examine the major sources of recent inflation in Ethiopia. In particular, the study intends to show how different policy and structural factors feed in to price dynamics in Ethiopia. In doing so we try to show how monetary and fiscal policy practices may have resulted in such inflationary episodes in recent years. Furthermore, to complement the descriptive analysis, we estimate a comprehensive empirical model and also perform some simulation analysis.

The rest of the paper is organized as follows. Section 2 analyses both fiscal and monetary fundamentals and shows their relationship with inflation figures. Section 3 focuses on econometric analysis and presents the results. Section 4 concludes.

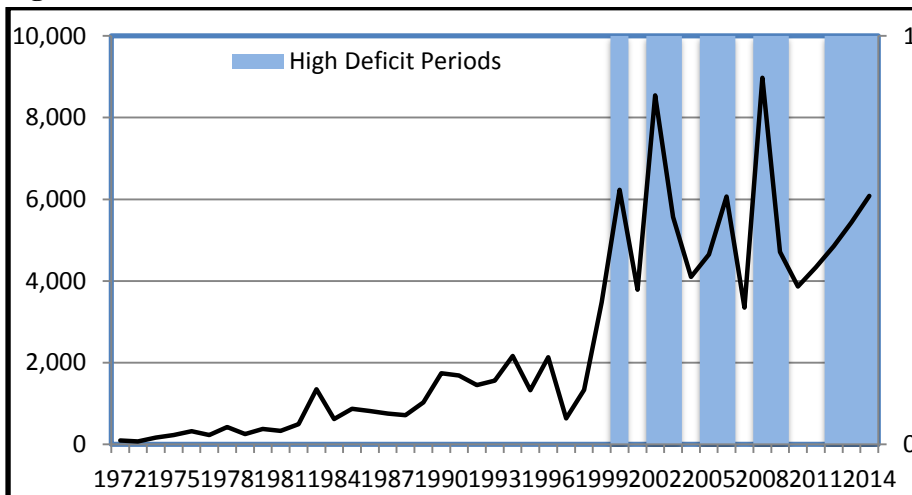
2. Fiscal and Monetary Fundamentals and the Recent Inflation

Historically, Ethiopia has not experienced high inflation. Inflation was associated mainly with a fall in agricultural output and years of higher production were known to witness plummeting prices. Between the periods 1981- 1985, for example, real GDP fell by about 2.05 percent on average and general prices experienced a relatively higher growth rate of about 6 percent. On the other hand, between 1986 and 1990 the average rate of inflation was 2.80 percent because of robust output growth over the same period. In the following five years the average rate of inflation was 13.26. It is important to note here that the real GDP growth rate over the same period was 1.55 percent. The second half of the 1990s witnessed stable prices with an average general inflation rate of 1.03 percent. These periods were again years of good weather conditions and abundant harvest in Ethiopia.

Indeed, this is not the whole story. Before the year 2002/03 government and the National bank of Ethiopia exercised tight monetary and fiscal policy, which in general contributed to the low inflation pressures during these periods. However, in the post 2002/03 years inflation began to appear as a major problem of the economy. This followed the government's move towards less conservative monetary and fiscal policy (Alemayehu and Kibrom, 2008). As argued by Montiel (1989) high inflation in developing countries is often linked to underlying high fiscal imbalances, which may trigger high money growth and set off the balance of payments crisis forcing exchange rate depreciation.

Fiscal deficit as percentage of GDP was less than 6 percent on average during the socialist government. In particular, except in the last years of the regime, deficit as percentage of GDP was less than 4 percent during the period. Although the deficit level was relatively lower, the overall economic mismanagement resulted in a relatively higher inflation level that averaged 8.99 percent. In particular, the early days of the regime had witnessed pronounced level of inflation. With the coming to power of the current government, the deficit level took new paths and the annual fiscal deficit as percentage of GDP over 1991-2014 ascended to 8.45 percent. In the eve of the recent inflationary episodes that started to soar in 2006, the fiscal deficit GDP ratio averaged 9.81 between 2000 and 2005. This in particular is a significant shift in the trend of fiscal deficit given the fact that GDP has also significantly increased over the same period. The fiscal deficit level was even more pronounced after 2005, a period during which inflation was rampant. Although there is no evidence that the change in trends of fiscal deficit was behind the recent inflationary episodes, a closer look at the financing mechanisms points to that direction.

Figure 1: The trend of nominal fiscal deficit



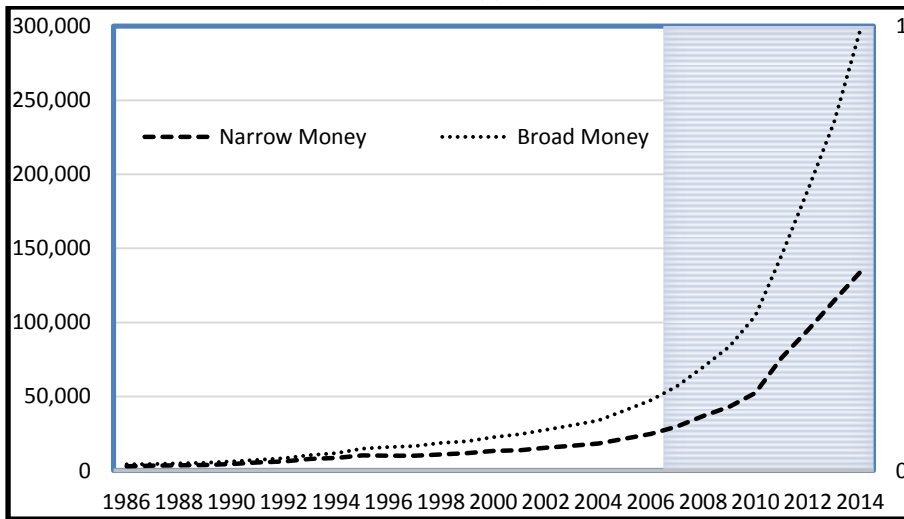
Source: Computed from MoFED data

Ethiopian government finances its fiscal deficit from different sources. Some of these include external grants, privatization proceeds, domestic and foreign borrowing. Prior to the recent inflationary episodes more than 60 percent of the fiscal gap were financed by foreign borrowing and external grants. This along with the low level of the fiscal gap during those periods allowed stable price levels, which usually fluctuates in response to aggregate supply. In the build-up to the recent inflation, however, the level of fiscal gap took new path and the financing mechanism also saw significant shifts. In particular, starting from 2006 the share of fiscal gap that is financed through domestic borrowing from the banking sector has been rising. Similar trend was continued until 2011 when the new directive restricted the money creation capacity of the commercial banks.

Prices dynamics and hence, inflation rates are also significantly determined by the stance of monetary policy. Theoretically, stable price level requires the growth rate of nominal money supply that is at par with the rate of nominal output growth. On average, nominal annual money supply growth lingered about 15.4 over the period 1991-2010. The nominal money supply

growth over the last ten years has even loomed higher. Between 2005 and 2010, during and on the eve of soaring inflationary pressures in Ethiopia, the rate of annual money supply growth climbed to 20.7 percent on average. In 2008 and 2009, a period during which the average rate of inflation reached 30.8 percent, the average rate of money supply growth was close to 21.5 percent. This indicates that there seems to be strong relationship between inflation rate and the money supply growth in Ethiopian economy, although it is difficult to conclude such predictions without formal analysis. Figure 2 below shows the trend of both narrow and broad money since 1986. The trend shows the sharp rise in both narrow and broad money supply since 2006. The growth rate was even more pronounced after 2010.

Figure 2: Trends of some monetary aggregates.

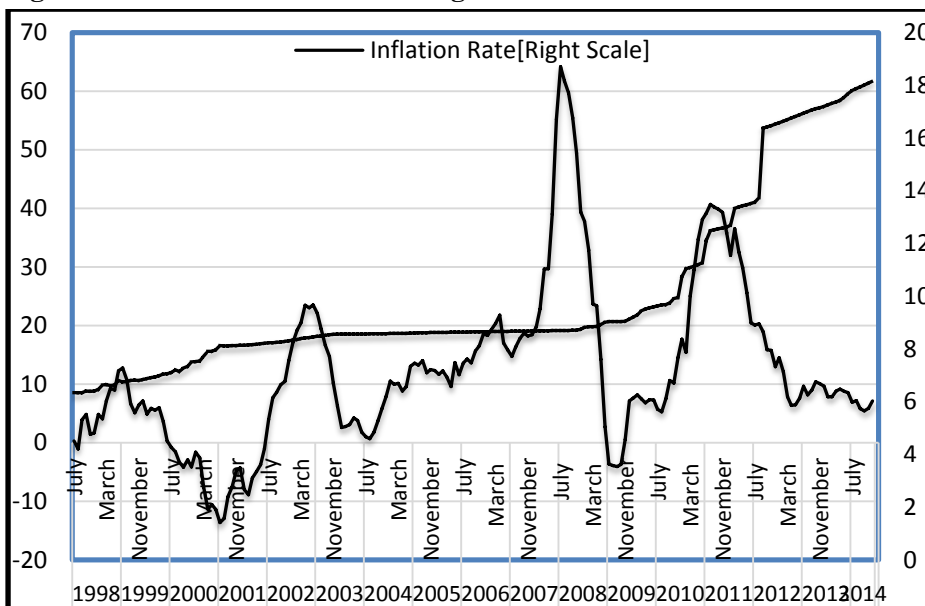


Source: Computed from NBE data

Ethiopia follows what is called more like a crawling peg exchange rate system where the exchange rate between Ethiopian Birr and USD is depreciating steadily since the early 1990s. The National Bank of Ethiopia closely monitors the exchange rate and allows only small percentage change in exchange rate over a given period. Consequently, it is not clear whether the National Bank of Ethiopia controls the exchange rate or the money

supply³. During the recent inflationary episodes, the trend of the exchange rate has also significantly changed leading to sharp depreciation. Since 2005 the exchange rate depreciated by more than 110 percent including the onetime 20 percent depreciation in the aftermath of the 2011 price hike. In 2008 general inflation reached more than 60 percent. This sharply deteriorated the trade balance forcing the reserve assets to less than two months of import bill. Consequently, the rate sharply depreciated during 2009-2011. After a relief in 2009, inflationary pressure relapsed in 2011 intensifying the BOP crisis. This forced the National Bank of Ethiopia to depreciate the currency by 20 percent over-night in September 2012.

Figure 3: Inflation rate and exchange rate trends



Source: Computed from CSA and NBE data

³ Practically, it is difficult to control both because fixed exchange rate requires central bank intervention in the foreign exchange market, which in-turn affects the money supply level in the economy.

In general, trends of exchange rate in the recent past can be considered both as a cause and effect of the inflation trends. Before the recent inflation episodes, exchange rate and trade balances were stable. With the rising inflation level in 2007/8 Ethiopia's export products were made less-competitive leading to huge trade balance deficit. This forced the monetary authorities to let the higher depreciation rate of the currency in 2009/10. But then the rising import price and increase in aggregate demand due to cheap export intensified the already relapsing inflation momentum requiring further depreciation in the years to come.

3. Theoretical Framework and Econometric Analysis

This paper adopted the approaches followed by Moser (1995) and Olubusoye and Oyaromade (2008) to model the inflationary process in Ethiopia. Following Moser (1995) it is assumed that the overall price level (P) is a weighted average of the price of tradable goods (P^t) and non-tradable goods (P^n), and can be represented in log-linear form as

$$\log P = \alpha \log P^n + (1 - \alpha) \log P^t \quad (1)$$

Where α represents the share of non-tradable goods in total expenditure.

The price of tradable goods (P^t) is determined exogenously in the world market and, in domestic currency terms, can be represented by foreign prices (P^f) and the exchange rate (e):

$$\log P^t = \log e + \log P^f \quad 2$$

From the above expression both an increase in the exchange rate (in domestic currency terms) and an increase in foreign prices will lead to an increase in price in the tradable sector and hence overall price level.

Assuming that the demand for non-tradable goods moves in line with the overall demand in the economy, the price for non-tradable sector is set by the money market equilibrium where real money supply equals the real money demand. Log-linear form of such condition yields the following expression for non-tradable goods prices:

$$\log P^n = \beta \log M^s - \log m^d \quad 3$$

where M^s represents the nominal stock of money, m^d is the demand for real money balances, and, β is a scale factor representing the relationship between economy-wide demand and demand for non-tradable goods.

The demand for real money balances is assumed to be a function of income (transaction demand for money), expected inflation and interest rate. Explicitly writing,

$$m^d = \tau_1 y - \tau_2 p^e - \tau_3 i \quad 4$$

According to money demand theory, an increase in the stock variable (real income) will stimulate money demand, whereas an increase in the domestic opportunity cost variable (expected inflation) will lead to a fall in demand (Moser, 1995). Based on adaptive expectations the expected rate of inflation in period t is assumed depend on actual inflation in period $t-1$ and expected rate of inflation in period $t-1$.

$$P^e_t = d \Delta \log P_{t-1} + 1 - d P^e_{t-1} \quad 5$$

Setting d to unity, and using the reduced-form equation in 4 above, equation 3 can be written as follows:

$$\log P^n = \beta \log M^s - \tau_1 \log y + \tau_2 \Delta \log P_{t-1} + \tau_3 i \quad 6$$

Finally using equation 2 and 6 in equation (1) yields

$$\log P = \alpha\beta \log M^s - \tau_1 \log y + \tau_2 \Delta \log P_{t-1} + \tau_3 i + 1 - \alpha \log e + \log P^f \quad (7)$$

In developing countries where deficit-financing mechanisms vary from domestic and foreign borrowing to monetary finance, the level of fiscal gap also remains to be one of the most important factors influencing the price dynamics. Therefore, the above model will be augmented by including the level of fiscal deficit. Furthermore, we include a measure of monopoly mark-up to test for the claim by government that the inflationary pressure is due to artificial price hike by monopoly firms. In particular, we use Bain's monopoly mark-up index, which is computed from operating surplus data of large and medium scale industries in Ethiopia. Given its importance in discussions around policy circles, we estimate the model by including international petroleum price index.

With all these arguments the empirical model to be estimated in this study is:

$$P_t = f \quad M_t^s, Y_t, P_t^e, i_t, e_t, D_t, P_t^{petr}, B_t \quad 8$$

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Where:

P_t – is general consumer price index compiled by the Central Statistics Authority (CSA) of Ethiopia. Food accounts about 57 percent of the general index with the remaining accounted for by the non-food items.

P^e – is expected inflation. Following the works of Olubusoye and Oyaromade (2008), we calculated expected inflation as a first difference of the logarithm of the current price level. This approach is consistent with both the rational and adaptive expectation hypotheses.

Y_t – is real Gross Domestic Product.

i_t – is nominal average annual deposit interest rate

e_t – is average annual exchange rate

D_t – is fiscal deficit excluding grants

P^{petro} – is international petroleum price index

B_t – is Bain's monopoly mark-up index

While increase in output is expected to decrease inflation in the long run, increase in money supply, increase in fiscal deficit and devaluation of domestic currency are expected to intensify inflationary pressure. Similarly, higher inflation expectation, higher petroleum price and monopoly mark-up are also anticipated to increase inflation. Furthermore, we expect that increase in interest rate decrease inflationary pressure.

4. Analysis and Results

Most macroeconomic variables exhibit strong trends and hence, are not amenable to econometric analyses pertaining to stationary series. Therefore, to apply standard estimation or testing procedures in a dynamic time series model, it is typically required that the variables are stationary (Verbeek, 2008). There are several ways of testing for stationarity of a variable. The results of the tests are presented in Table 1 below. The ADF test result shows that all variables are non-stationary at level and stationary at first difference. KPSS test for unit root also rejects the null of stationary series at level for all variables and fails to reject the null of stationary series at first difference for all variables. Therefore, we conclude that all variables are integrated of order one.

Table 1: The Unit Root Test Results

| Variables | ADF | | KPSS | |
|-----------------------|---------|---------|--------|--------|
| | I(0) | I(1) | I(0) | I(1) |
| <i>lnCPI</i> | -0.6685 | -3.7874 | 0.7289 | 0.1240 |
| <i>lnECPI</i> | -0.0190 | -6.5394 | 0.1420 | 0.0185 |
| <i>LnRGDP</i> | 1.1511 | -4.6915 | 0.9236 | 0.5922 |
| <i>lnMONEY</i> | 1.4199 | -5.2562 | 0.7194 | 0.1847 |
| <i>LnDEFICIT</i> | -0.9258 | -7.7254 | 0.3657 | 0.0826 |
| <i>INTEREST RATE</i> | -1.4042 | -5.3805 | 0.1580 | 0.0812 |
| <i>lnPETROLEUM</i> | -1.2964 | -5.7845 | 0.4777 | 0.1089 |
| <i>EXCHANGE RATE</i> | -0.9309 | -4.5605 | 0.6830 | 0.1450 |
| <i>lnBain's Index</i> | -1.3730 | -3.9831 | 0.4923 | 0.1324 |

In such cases where all the variables are found to be non-stationary, OLS may lead to spurious results. However, it is possible to have valid estimates with non-stationary series if the linear combination of these non-stationary series is found to be stationary. Therefore, it is important to test for the co-integration of the series. To test for co-integration and number of co-integrating vectors the model is first estimated using the VAR estimation procedure. This is due to the fact that most macroeconomic variables are endogenous in nature, which makes a model that describes the dynamic evolution of variables from their common history more appropriate.

The Johansen (1986) procedure uses the maximum likelihood estimation method, which enables us to test the number of co-integrating vectors. In the procedure there are two distinct tests. These tests are the maximum eigenvalue test (λ_{max}) and the trace test (λ trace), which are likelihood ratio tests with no usual Chi-squared distributions. In this study we use trace test to test for the number of co-integrating vectors. Trace test reject the null hypothesis of at most one co-integrating vector ($r=1$) at one percent (see Table 2 below). On the other hand, it fails to reject the null of at most two ($r=2$) co-integrating vectors against the alternative of three vectors ($r=3$). This implies that the model has two co-integrating vector.

Table 2: Cointegration Tests Result: The Trace Test

| Maximum Rank | LL | Eigenvalue | Trace Statistic | Critical Value (5%) |
|--------------|---------|------------|-----------------|---------------------|
| 0 | 54.218 | . | 152.981 | 94.15 |
| 1 | 89.462 | 0.813 | 82.493 | 68.52 |
| 2 | 109.116 | 0.607 | 43.186* | 47.21 |
| 3 | 118.355 | 0.355 | 24.707 | 29.68 |
| 4 | 124.172 | 0.241 | 13.073 | 15.41 |
| 5 | 129.137 | 0.210 | 3.144 | 3.76 |

Diagnostic tests on error terms indicate that the errors are white noise. The JB test of normality of error terms from the VAR model indicates that the

error terms are normal. Furthermore, the VAR residual serial correlation test shows that we fail to reject the null hypothesis of no serial correlation at standard significance level indicating that the errors are not serially correlated. The errors are also homoskedastic. The joint Chi-squared residual heteroskedasticity test statistic fails to reject the null of homoskedastic errors. Therefore, in general, the error terms behave in such a way that the Johansen procedure is valid. Co-integration analysis is also sensitive to the lag structure of the model specified. The standard model selection criteria of LR and SC indicate that lag order of two is appropriate for the model. The model is, therefore, estimated with lag order two.

Restriction tests show that the two co-integrating vectors are price and expected inflation equations. Therefore, the two co-integrating vectors are normalized with respect to the logarithm of consumer price index and expected inflation. Estimates of long-run relationship of the model are presented in Table 3 below. The long run model indicates that increase in output leads to price stability. On the other hand, money supply doesn't have significant impact on price dynamics. This result is consistent with theoretical predictions and the results from other similar studies (see Leoning et al 2009). Monetary aggregates affect inflation only in the short-run. Similarly, widened budget deficit tend to set-off higher inflation in the long run. Theoretically, fiscal deficits could have positive or negative impact on inflation in the long run. Increased fiscal expenditure on infrastructure increases output and market integration, leading to stable prices in the long run. However, increased government expenditure that goes to finance current consumption may result in inflationary pressures in the short to long run. Furthermore, real exchange rate depreciation tends to be inflationary in the long run. Yet, its economic significance is less robust. On the other hand, international petroleum prices, nominal deposit interest rate and index of monopoly mark-up are not significant determinants of inflation in the long run.

Table 3: The long-run model (normalized on CPI and Expected Inflation)

| Variables | CE1: Normalized on lnCPI | | | CE2: Normalized on lnECPI | | |
|-----------------------|--------------------------|---------------|----------|---------------------------|---------------|----------|
| | Coefficients | Stand. Errors | Z-Values | Coefficients | Stand. Errors | Z-Values |
| lnCPI | 1 | -- | -- | 0 | -- | -- |
| lnECPI | 0 | -- | -- | 1 | -- | -- |
| lnRGDP | 1.375 | 0.278 | 4.93 | 1.215 | 0.348 | 3.49 |
| lnMONEY | -0.135 | 0.191 | -0.71 | -1.291 | 0.239 | -5.4 |
| lnDEFICIT | -0.108 | 0.046 | -2.34 | -0.395 | 0.057 | -6.83 |
| EXCH. RATE | -0.012 | 0.003 | -3.99 | -0.005 | 0.038 | -0.15 |
| lnPETROLEUM | -0.281 | 0.260 | -1.07 | 0.210 | 0.176 | 1.23 |
| INTER. RATE | -0.139 | 0.119 | -1.16 | -0.091 | 0.023 | -3.83 |
| lnBain's Index | 0.065 | 0.059 | 1.10 | 0.472 | 0.518 | 0.911 |
| Constant | 9.736 | -- | -- | 1.610 | -- | -- |

Consumers and firms form inflation expectations based on past and current macroeconomic fundamentals. To study how inflation expectation responds to other macroeconomic policy variables, we normalized the second co-integrating vector around expected inflation. The result from this long run equation gives intuitive implications. Output growth leads to downward adjustment in inflation expectation. On the other hand, monetary expansion and higher fiscal deficit leads to higher inflation expectation. Real exchange rate and petroleum prices have no significant impact on expectation formations. However, it is too optimistic to rely on this result given the shaky nature of the way inflation expectation is computed in this study.

The short run dynamics of the model as revealed by the Vector Error Correction Model (VECM) is presented below in Table 4. The co-integrating terms bear expected signs and are significant. Both terms carry negative signs, implying that the system adjusts back to its equilibrium values after a

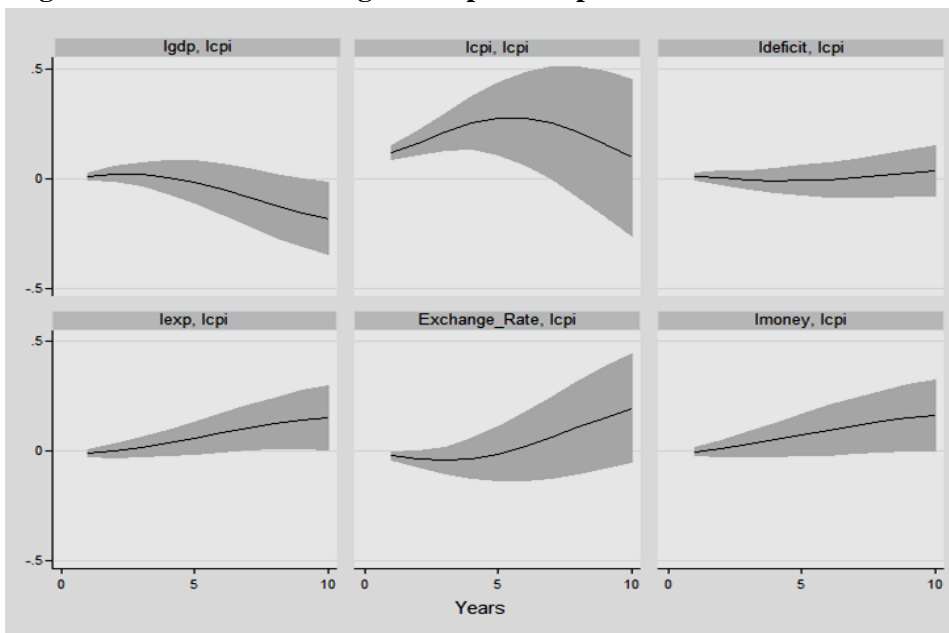
shock. However, it takes relatively longer periods for the system to fully adjust towards its equilibrium. In particular, VECM result indicates that inflation and expected inflation adjust to previous period's disequilibrium at rate of 5.0 and 3.6 percent per annum respectively. Another key result from the short run analysis is that output is insignificant in inflation equation. Money supply, on the other hand, significantly and positively affects inflation. This result along with the long-run analysis above shows the relative importance of moneys supply in the short run than long run. Similar to the long run result, fiscal deficits triggers inflationary pressure in the short run. Furthermore, exchange rate depreciation leads to higher inflation. On the other hand, nominal domestic interest rate is statistically insignificant. In fact, the nominal domestic interest rate is closely monitored and regulated by National Bank of Ethiopia and vary, if any, only marginally in the short run. Despite the claim in the policy circles that petroleum price and monopoly mark-up are key determinant of price, they are insignificant in short run inflation equation.

Table 4: The short-run model

| Dependent: D(lnCPI) | | | |
|------------------------------|---------------------|------------------------|-----------------|
| Variables | Coefficients | Standard Errors | Z-Values |
| ce(1)(-1) | -0.050 | 0.021 | -2.38 |
| ce(2)(-1) | -0.036 | 0.014 | -2.57 |
| D(lnCPI)(-1) | 0.323 | 0.216 | 1.50 |
| D(lnECPI)(-1) | -0.049 | 0.027 | -1.83 |
| D(lnGDP)(-1) | -0.321 | 0.265 | -1.21 |
| D(lnMONEY)(-1) | 0.192 | 0.058 | 3.81 |
| D(lnDEFICIT)(-1) | 0.040 | 0.017 | 2.36 |
| D(EXCH.RATE)(-1) | 0.024 | 0.011 | 2.18 |
| D(lnPETROLEUM)(-1) | 0.013 | 0.050 | 0.25 |
| D(INTEREST RATE)(-1) | 0.000 | 0.016 | 0.01 |
| D(lnBain's Index)(-1) | 0.021 | 0.014 | 1.50 |
| Constant | 0.021 | 0.043 | 0.50 |

So far we modeled the direct effects of endogenous variables on price dynamics. However, a shock to the one variable not only directly affects that specific variable but also transmitted to all other endogenous variables through the dynamic (lag) structure of the model. Therefore, the indirect effects of a variable to which a shock is introduced are also important information that deserves analysis on its own. In time series analysis such indirect impacts are very well captured by the impulse response analysis. An impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables (Verbeek, 2005). Yet, the validity of the forecasts from the impulse response function strictly depends on the stability of the VECM model. The stability test of VECM model indicates that none of the characteristic polynomial roots lie outside the unit circle (see appendix), which implies that we can safely base our forecast on the estimated model. The result of the simulation exercise is presented in Figure 4 below.

Figure 4: Cumulative orthogonal impulse response function of lnCPI



The cumulative impulse response function is estimated for a shock to consumer price index, broad money, expected inflation, fiscal deficit, real effective exchange rate and real GDP for 10 years. The result indicates that one standard deviation shock to consumer price leads to persistently high price over the following years. On the other hand, one standard deviation shock to real GDP leads to a significant deflation in the long run. This is consistent with the short-run and long run results above. A shock to expected inflation and money supply on the other hand leads to higher prices in the long run. Shocks to exchange rate and fiscal deficits on the other hand have only marginal long-run impacts on price dynamics.

5. Conclusion

In this study it is tried to uncover the determinants of recent inflationary pressures in Ethiopia. In particular, the study used both simple descriptive analysis as well as rigorous parametric analysis to trace the relationship between inflation and other macroeconomic trends in Ethiopia. From the analysis the following conclusions (and policy implications) can be drawn.

First, fiscal deficit is a key determinant of inflation both in the long run and in short run. This result seems plausible given the fact that government finances significant percentage of the deficit through domestic borrowing from the banking sector. It is also to be noted that government had access to monetary finance through direct borrowing from the National Bank of Ethiopia until recently. This probably also explains how the monetary authorities managed to contain inflation to a target level only after closing this direct lending arrangement. Second, money supply is important determinant of price dynamics only in the short-run. On the other hand, output remains to be a principal driver of price dynamics in the long run. In particular, we have shown that in the long run inflation rate is more elastic to output than any other variable in the model. This result goes along with the predictions of Ahmed (2007), which puts structural and demand factors at the forefront.

Third, despite the claims around the policy circles, petroleum prices and monopoly mark-ups have no significant relationship with price dynamics. This is also at odds with the results of Leonings et al (2009) who showed that external factors account for significant amount of the current price escalation in Ethiopia. Fourth, in the short run, monetary and fiscal fundamentals are more important determinants of price dynamics than output. Furthermore, the role of price expectation in determining inflation is very marginal. Finally, from the simulation exercise, prices are more sensitive to a shock to price and a shock to money supply growth than a shock to any other variable. It also shows that the shock to real GDP tends to stabilize the inflation pressures both in immediate years and long run. On the other hand, a shock to fiscal deficit increases inflation only moderately while a shock to money supply intensifies inflation in the long run. All these results add-up to imply that the short-term solution to inflation in Ethiopia lays both in the monetary and fiscal policy practices. Structural factors of the economy are key in the long run. In particular, increasing output and addressing the structural constraints remain to be the most important areas where a potential policy should focus. However, a detailed policy prescription requires more rigorous study than this study dealt with.

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Appendix A: Inverse roots of VECM: Stability test

