Issues On The Zambian Economy

Bank *of* Zambia

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Foreword

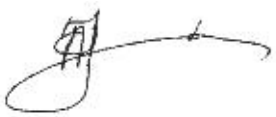
This is the seventh issue of the Bank of Zambia (BoZ) Reader – Issues on the Zambian Economy, a publication that aims at providing national and international readership with analyses by economists and other social scientists in government, business, international agencies, academia and other research institutions.

Additionally, the BoZ Reader continues to contribute towards the creation of economic literature and exchange of views on theoretical, policy and practical issues on the Zambian economy.

This publication has articles on contemporary issues of current debate in the economy including: Core Inflation Measure for Zambia; External Vulnerability Index for Zambia; An Alternative Computation of the Money Multiplier for Zambia; Does the Copper Price Explain the Deviation of the Real Exchange from the Purchasing Power Parity Equilibrium in Zambia?; The Real Effective Exchange Rate and Performance of Non-traditional Exports; Social-Economic Challenges and Coping Strategies of Persons with Disabilities: A Case of Lusaka Urban District; and Oil Prices and Consumer Price Inflation in Zambia.

We naturally wish to express gratitude to the contributors of these articles to the BoZ Reader and it is our sincere hope that this will encourage other economists and social scientists to put their ideas to paper and thereby contribute to the pool of ideas and literature on the Zambian economy through this publication. Additionally, we wish to invite comments or brief notes on the articles in this Reader. Further, articles are invited from researchers and writers on various topics that are relevant to the Zambian economy. In this regard, all correspondence should be channelled to the Director, Economics Department, Bank of Zambia, P. O. Box, 30080, Lusaka Zambia. Comments and articles can also be sent via e-mail to pr@boz.zm.

The views and interpretations expressed in this Reader are those of the authors and do not necessarily represent the views and policies of the Bank of Zambia.



Caleb M. Fundanga

Governor

Bank of Zambia

September 2011

CHAPTER ONE

Core Inflation Measure for Zambia

By

Maxwell C. Musongole

Abstract

Core inflation is meant to distinguish the permanent long run trend of the inflation rate from its transitory movements. This paper makes an attempt to estimate core inflation for Zambia using the exclusion method and the limited influence estimators' method. The prices of the items in the Consumer Price Index (CPI) basket for the period 1986 to 2008 were used to estimate the core inflation. The computed indicators seem to show lower inflation than the headline CPI inflation rate. The results need to be tested for stability and for biasness from the headline inflation. However, the computed core inflation gives a guide to what core inflation for Zambia is.

I Introduction

Several countries measure and publish core inflation rate alongside the headline inflation rate which is computed from the consumer price index (CPI). Core inflation is meant to distinguish the permanent long run trend of the inflation rate from its transitory movements (Guinigundo, 1999). The transitory movements can be influenced by various shocks such as droughts. Core inflation is based on the understanding that a stable rate of inflation provides the best atmosphere for economic growth. It becomes therefore imperative for central banks and monetary authorities to distinguish between movements in price trends and noisy shocks to inflation data. The choice of any particular measure of core inflation depends partly on the behaviour and distribution of price changes, which in turn help isolate those items whose prices are most directly affected by transitory shocks (Tahir, 2006). A good core inflation measure is supposed to be (1) available for use in a timely manner; (2) robust and unbiased, able to remove unwanted distortions and should not have a systematically divergent trend from headline CPI; and (3) readily verifiable by anyone to have credibility (Roger, 1997).

This paper makes an attempt to compute core inflation for Zambia using simple statistical methods. The paper is organized as follows: Section two examines the behaviour and distribution of price changes in the CPI for the period 1986 to 2008. Section three explores the various methods used to compute core inflation. In section four, core inflation for Zambia is estimated using the exclusion method and the limited influence estimators' method. The conclusion is given in section five.

II Distribution of Price Changes in Zambia

In this section, inflation data for Zambia for the periods 1986 to 2008 are described. The moments of the price changes provide a valuable summary about the distribution of price changes. Table 1 gives sample moments for the inflation data from 1986 to 2008.

Table 1: Moments of price changes for the periods 1986 to 2008

Sample Moments	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	1996	1997
Mean	55.90	47.24	51.08	119.13	113.18	99.34	162.25	185.89	61.93	34.81	43.50	24.78
Median	58.80	46.65	49.90	115.95	116.95	100.35	163.15	182.50	44.14	33.41	44.22	22.86
Std.Dev.	7.38	5.61	4.61	46.35	25.68	10.30	25.32	31.36	33.36	7.63	5.90	5.64
Skewness	-1.40	-0.20	0.82	0.03	-0.32	-0.23	-0.73	-0.07	0.76	0.61	-0.58	0.91
kurtosis	0.47	-0.17	-0.30	-2.07	-1.65	-0.88	0.06	-0.25	-1.09	-1.05	-0.91	-0.69

Table 1cont'd: Moments of price changes for the periods 1986 to 2008

Sample Moments	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Mean	24.37	26.96	25.93	21.68	22.19	21.54	17.97	18.34	9.07	10.68	12.40
Median	25.89	26.92	26.07	19.51	23.56	21.50	17.80	18.65	8.55	10.90	12.35
Std.Dev.	4.30	2.82	2.75	5.19	2.95	2.14	0.75	1.05	1.34	1.51	2.53
Skewness	-0.72	-0.61	-0.29	0.72	-0.26	-0.56	0.68	-1.26	1.44	0.01	0.27
kurtosis	-0.41	1.71	-0.43	-1.26	-1.28	-0.12	0.30	1.41	1.41	-1.65	-1.34

Table 1 shows the moments of annual average price changes from 1986 to 2008. The table shows that the mean price change was significantly higher for the periods 1986 to 1993. The year 1993 recorded the highest average inflation of 185.9%. From 1994 average rate of inflation slumped from 61.9% to 9.1% in 2006. Across all the sub-periods median rate of prices change were mixed. In some years the median was below the mean while in others the median was above the mean indicating skewness in the rate of inflation in some time periods. In the earlier years 1986 to 1994 the standard deviations were quite large indicating high degree of noise in the data. In the later years from 1995 through to 2008 standard deviation is quite low indicating relatively low noise in the data for this period.

Although the degree of skewness varies considerably from year to year, it remains negative on average. Over the entire period, the average skewness was -0.04. The overall skewness on the rate of inflation for the period 1986 to 2009 was 1.67. Thus the distribution of price change is skewed to the right indicating high frequency of relatively lower inflation over time.

The kurtosis of the distribution of price change seems to be below zero on average. From 1986 to 2009 the annual average kurtosis of the distribution of price changes was -0.44 indicating some excess kurtosis compared to a normal distribution. Kurtosis computed over the entire series was 1.90. This indicates that the distribution of the price changes deviate from the normal distribution could be attributed to shocks. This means that the mean rate of headline inflation is to some extent distorted by extreme movements in some prices and has fatter tails than usual. The characteristics of the rate of inflation as shown by the moments justify the computation of core inflation for Zambia. Charts 1 to 4 show the paths of the moments for the periods 1986 to 2008.

The graph shows that there has been a significant drop in the yearly average inflation from 1995 to 2008. The drop in the average has been in line with the drop in inflation. The average inflation was high between 1988 and 1994 with 1993 recording an average inflation of 185.9.

Chart 1: Mean rate of inflation

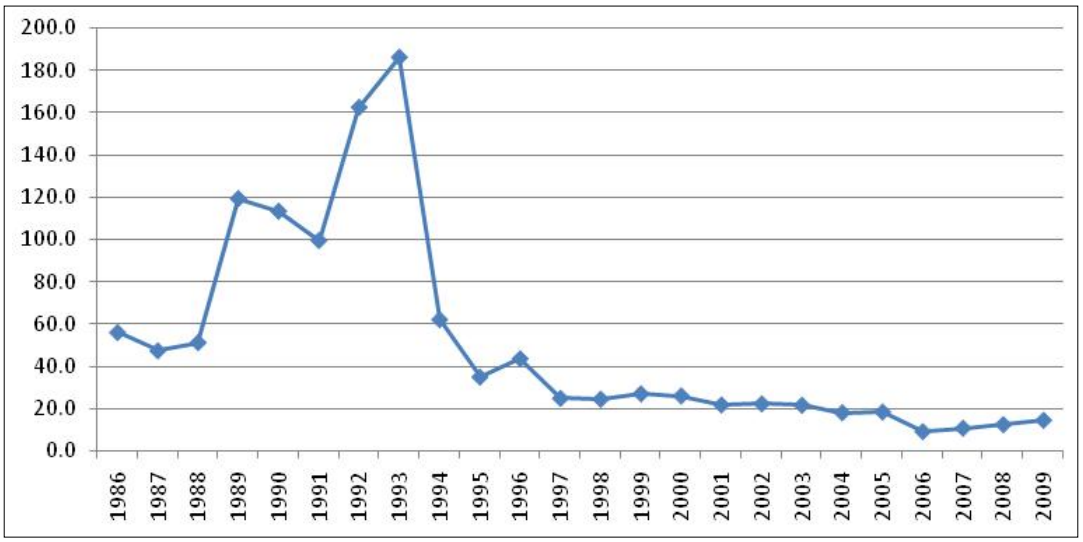
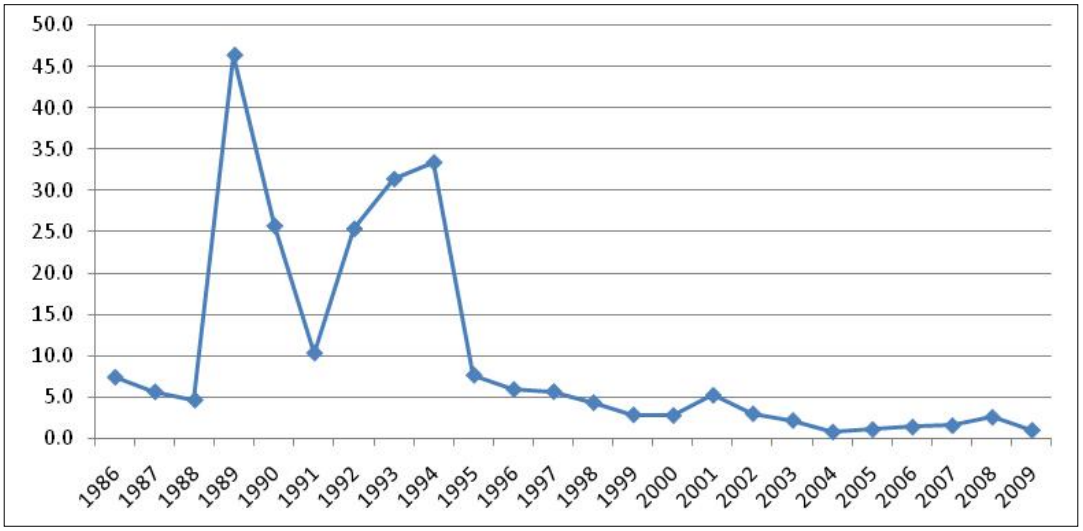


Chart 2: Standard Deviation



Skewness per year of inflation fluctuated between positive and negative indicating left and right skewness on rate of inflation in different years over the period. The overall coefficient of skewness showed positive skewness for inflation for the periods 1986 to 2008. The graph below shows the distribution of inflation for the periods 1986 to 2009 and shows skewness to the right for inflation.

Chart 3: Skewness

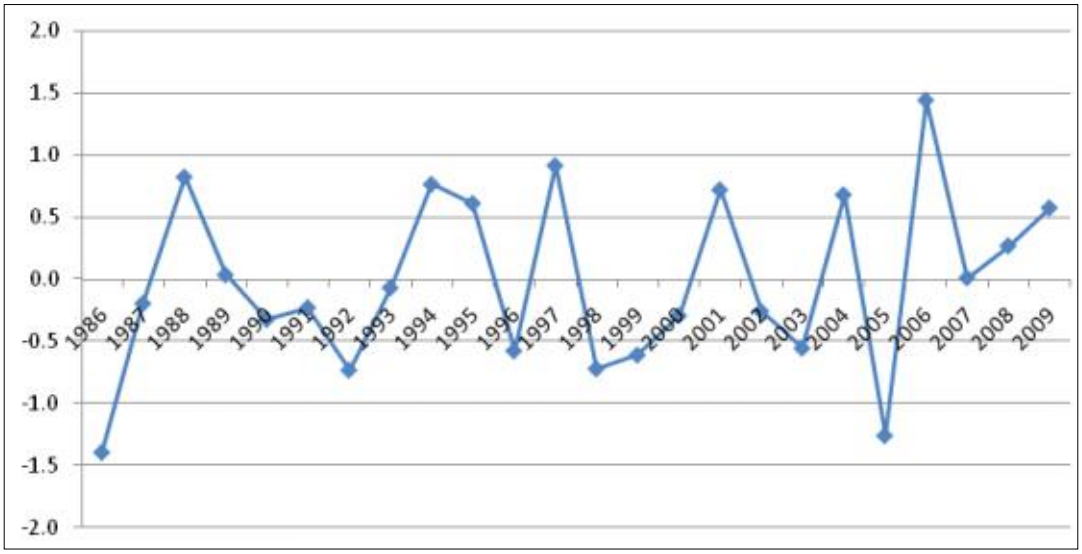
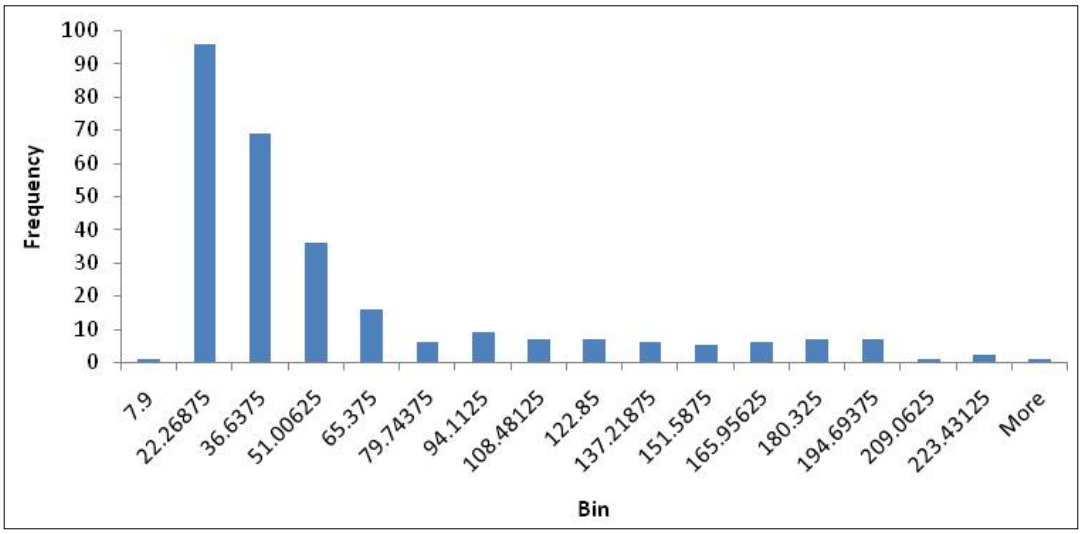


Chart 4: Histogram



III Measuring Core inflation

This section explores the various methods used to compute core inflation. Several methods to measure core inflation have been listed in the literature (Wynne, 1998 and Marches, et al 2000). Some frequently used methods are listed in table 2. However, empirical work has exposed two main methods for computing core inflation namely: the exclusion method and the method based on the limited influence estimators (LIE). The LIE method basically excludes extreme price changes (Tahir, 2006, Figueiredo and Staub (2002)). Some examples of LIE are the trimmed mean and the weighted median.

Table 2: List of methods used in the computation of core inflation

Core Inflation Measures	Brief Descriptions	Advantages	Disadvantages
1. Exclusion-based	Exclude price-volatile energy and food items from the CPI basket Most commonly used measure among central banks	Easy to construct and Compute Easy to communicate	Critics argued that the excluded items may also contain important signals about underlying inflation Excludes items that could represent a large share of the CPI basket (especially if food and energy account for a large share of CPI)
2. Trimmed mean	Items are arranged according to the magnitude of their price change during the month Trims an equal amount (15% for Malaysia) from each end of the distribution of price changes	Easy to construct and compute	The exact percentage that is excluded is still subject to debate
3. Weighted median	Items are arranged according to the magnitude of their price change during the month Core inflation is selected from the 50th percentile inflation rate at which half of the components in the CPI basket have higher inflation and the other half, less	Easy to construct and Compute Easy to communicate	Item with large weights may dominate the median Median can sometimes differ significantly from the mean
4. Principal component analysis	Derives core inflation from the common price trends embedded in the various components of the CPI	Uses disaggregated data from the CPI basket	The technical nature of the technique reduces its usefulness in communications
5. Exponential smoothing	Exponential smoothening of current and past CPI data	Remove seasonality from the data	Works with some lags The technical nature of the technique reduces its usefulness in communications
6. Double-weighted measure	Assigns larger weights to less volatile items and lower weights to the more volatile items	Easy to construct and understand	May minimise important price signals from price volatile items
7. Kalman Filter	Extracts the common price signal that drives price movements in individual CPI components	Optimal use of the disaggregated CPI data	The technical nature of the technique reduces its usefulness in communications

Source: Annual Report Bank Nagara Malaysia 2008

The Exclusion Method

The exclusion method involves excluding from the CPI basket, items whose prices are considered to be volatile in nature. The price changes of such items are perceived to be

transitory and not to have a lasting impact on inflation. The exclusion of such items may pose a risk of information loss (Tahir, 2006). Most countries that compute core inflation employ the exclusion method. The commonly taken out items from the CPI basket in these countries are food and energy since they are considered traditionally to be volatile components of the CPI basket. Countries like Canada, for example, excludes food and energy and the effects of indirect tax, while the US excludes food and energy, Thailand excludes raw food and energy prices, and Peru excludes among other items food, fruits and vegetables in the computation of core inflation. The core inflation is computed by:

$$\bar{x}_g = \frac{1}{\sum_{j=1}^{n_g} w_j} \sum_{j=1}^{n_g} x_j w_j \quad (1)$$

where $\bar{x}_g$ is the average price change for the remaining items in the group g, x_j the *j-th* item in the group with corresponding weight w_j

Trimmed Mean

The trimmed mean consists of the computation of the mean of a distribution where tails portions are removed. In order to calculate the trimmed mean with α% the sample of the CPI components is ordered *{x1,…,xn}* with its respective weights {W1,…wn} The symmetric trimmed mean is obtained from:

$$\bar{x}_\alpha = \frac{1}{1 - 2\frac{\alpha}{100}} \sum_{i \in I_\alpha} w_i x_i \quad (2)$$

$$I_\alpha = \left\{ i \middle| \frac{\alpha}{100} < W_i < \left(1 - \frac{\alpha}{100}\right) \right\}$$

*I*α is the set of the components to be considered in the computation of the trimmed mean with α% and W_i is the actual weight up to *ith*component (Figueiredo and Staub, (2002) and, Brian and Cecchetti, 1993).

The Weighted Median

The weighted median inflation (WMI) is determined by computing the simple monthly rate of change in prices for each component, then ordering the items by their inflation rates, and pairing each with its appropriate weight. WMI is the inflation rate associated with an accumulated weight of 50 percent. That is for any month, half of the components have inflation rates higher than the weighted median, while the other half have lower inflation rate. WMI eliminates components with relatively large (and relatively small) changes in prices, which generally do not persist, while the weighted median more closely reflects the persistent trend in price movements.

IV Computing Core Inflation for Zambia

In this paper core inflation for Zambia is computed using the exclusion method and the LIE (trimmed mean and the weighted median) method.

Computation of Core Inflation Using the Exclusion Method

The items to be removed from the CPI basket to compute core inflation are indentified. The items judged volatile are the ones to be removed from the CPI basket. Although these items are removed from the basket, there is always a possibility that the volatile items may keep shifting over time. Thus excluding certain items on a permanent basis may render the inflation measure less efficient (Tahir, 2006).

To determine the items to be removed, the volatility of price changes is computed. The price changes are for the periods January 1997 to July 2009. There are 357 items under consideration. Volatility is obtained by computing standard deviations for the price changes of the items. A total of 312 items in the basket had standard deviation between 0 and 10. There were 45 items that had standard deviations greater than 10. The highest standard deviation 814.49 was for House rent (medium cost). This was followed by White maize at 135.18 and then White breakfast mealie meal at 105.64. The White Roller mealie meal had a standard deviation of 82.04 and Tomatoes at 67.04. The items with standard deviation greater than 10 were considered to be volatile and thus should be removed from the CPI basket for core inflation computation. The majority of items removed are food items, including white maize, white breakfast mealie meal and white roller mealie meal. The energy items to be excluded include charcoal, petrol and diesel (see Table 3).

Table 3: Items with standard deviation greater than 10

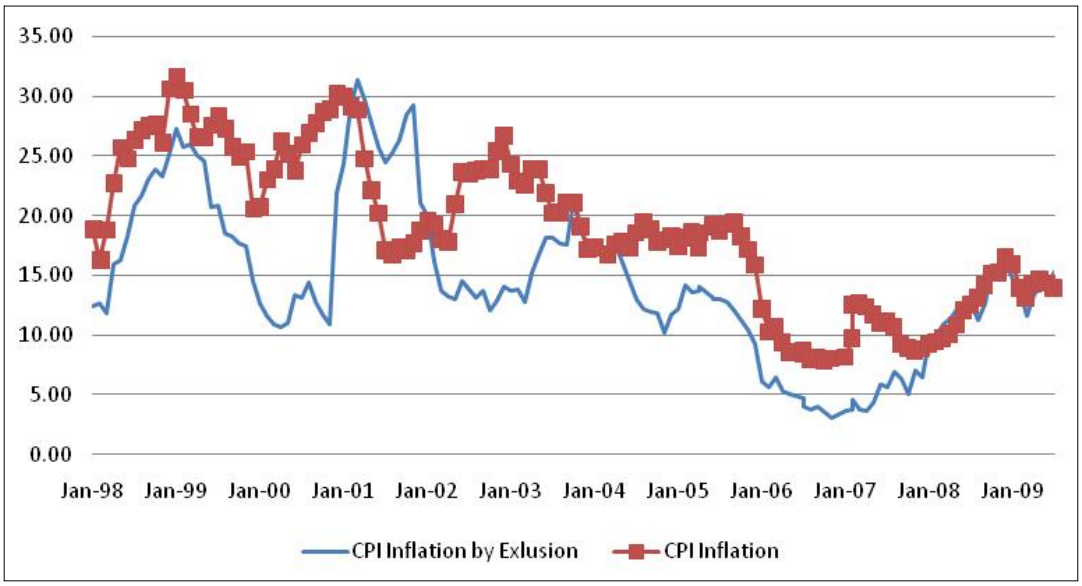
Item	Standard Deviation
Cabbage	10.26
Castle Lager	10.70
Fresh okra	11.16
Car Battery Charging	11.42
Air fare Lusaka/London	11.67
Fresh Kapenta	12.33
Rhino Lager	12.46
Petrol	12.69
Detergent Powder	12.96
Diesel	13.62
School Fees	13.69
Radio cassette Recorder	14.18
School Fees	14.51
Charcoal	14.54
Single Blanket	15.52
Chik	16.23
Bread	16.37
Shake shake	16.66
PTA Contribution	18.10
Television B&W	18.68
Nissan pick_up	21.75
Nissan sunny	22.39
Toyota Hilux	22.68
Toyota corolla	23.54
Mini Bus Fare Town/Chilenje	25.74
Paraffin	26.17
Sweet potatoes	26.37
Dried beans	26.89
Dried Kapenta	27.08
Dried Kapenta	27.38
Coach Fare Lusaka/Kitwe	28.08

Table 3 Cont'd: Items with standard deviation greater than 10

Item	Standard Deviation
Boarding Fees	28.68
Rape	29.38
Bun	31.39
Dressed chicken	34.14
Cooking oil Local	41.25
Cooking oil Imported	42.98
Mixed Cut	46.59
White sugar	47.24
3 piece lounge suit high price	47.83
Tomatoes	67.04
White Roller	82.64
White breakfast	105.64
White Maize	135.18
House rent (medium cost)	814.49

From equation (1), the core inflation is computed for the remaining items. The computed inflation is shown in Appendix A. Chart 5 below shows core inflation by exclusion method and CPI headline inflation. Core inflation (CPI inflation by exclusion) was mostly below the overall inflation.

Chart 5: CPI Inflation and CPI Inflation by Exclusion



Computation of Core Inflation Using the Trimmed Mean Method

The trimmed mean is computed from equation (2). When estimating the trimmed mean, the choice of the section to be trimmed is not a trivial issue. In this paper α was arbitrarily chosen at 15%. In Figueiredo and Staub (2002) and in Brian and Cecchetti (2001) α was chosen in order to minimize the root mean square error relative to a benchmark measure of core inflation the centered moving average of the headline inflation rate. Figueiredo and Staub (2002) use a 13-month centred moving average while Brian and Cecchetti use a 24-month centered moving

average of headline inflation as core inflation benchmark. This paper has computed a 12 month moving average for the CPI headline inflation (Appendix A).

The chosen 15% trim point implies that the inflation figure is computed with 75% of the central section of the price changes distribution for each month. There were 357 basket items considered. The 15% trim point means approximately 54 items were removed from the computation. That is 27 items from the lower tail portion and 27 items from the upper tail portion of the price changes distribution. Appendix B and C show items removed from the trimmed mean computation for each month. The trimmed mean is computed for the period August 2008 and July 2009.

The 15% trimmed mean for the CPI from August 2008 to July 2009 was mostly below the overall inflation for the same period as shown in the Table 4 below (Table 4 also shows the CPI inflation and inflation computed from various methods). The result is consistent with the results obtained by Lafleche (1997), Rodger (1998) and Marques et al. (2000) when the tail cuts are symmetric. The result also signals positive asymmetry in the distribution of the changes of the price components. This leads to a systematic exclusion of certain prices (items) from the computation of the trimmed mean, causing a downward bias in the core measure. Brian and Cecchetti (2001) and Picchetti and Toledo (2001) suggest methods to deal with bias in the core measure.

Table 4: Comparison of inflation from various methods

Date	CPI Inflation by Exclusion	CPI Inflation	Trimmed mean	Weighted Median	12 Month CPI Inflation MA
Jul-08	12.7	12.6	2.8	0.4	12.4
Aug-08	11.3	13.2	2.4	0.4	13.0
Sep-08	12.6	14.2	3.3	0.4	13.3
Oct-08	15.6	15.2	4.5	0.6	13.6
Nov-08	15.7	15.3	5.6	0.5	14.0
Dec-08	16.1	16.6	4.6	0.6	14.3
Jan-09	14.6	16.0	4.1	0.6	14.5
Feb-09	13.7	14.0	4.7	0.6	14.6
Mar-09	11.6	13.1	3.4	0.5	14.8
Apr-09	13.3	14.3	3.4	0.6	14.8
May-09	14.2	14.7	3.7	0.6	14.8
Jun-09	14.4	14.4	3.5	0.6	14.7
Jul-09	15.4	14.0	4.0	0.7	14.4

Table 4 above shows core inflation computed from various methods for the period July 2008 – July 2009. It is meant to give a comparison of the methods in the given period.

Computation of Core Inflation Using the Weighed Median

The weighted median is computed and shown in Appendix A.

V Conclusion

In this paper, a set of core inflation indicators for Zambia have been estimated. All the indicators seem to show lower inflation than the headline CPI inflation rate. However, the results need to be tested for stability and for biasness from the headline inflation. For the exclusion estimator detailed attention is required in determining which items on the basis of their volatility need to be removed from the CPI basket. Further analysis is required in the choice of the trim in the trimmed mean method. The weighted median seems to be biased and is persistently lower than the CPI headline inflation. The bias issues need to be dealt with. Further work on core inflation

computation requires comparing of the three indicators and choosing a better estimator for prediction of direction of underlying inflation.

References

1. Guinigundo, D. C (1999): An Official Core Inflation Measure for the Philippine, Central Bank of Philippine website
2. Bank Nagara Malaysia: Annual Report 2008
3. Brian, M. and Cecchetti, S. G. (2001): A note on Efficient Estimation of Inflation in Brazil. Working Paper Series 11, Banco Central do Brasil.
4. Brian, M. and Cecchetti, S. G. (1999): The monthly measurement of core inflation in Japan. Discussion Paper No. 99-E-4. Institute of Monetary and Economic Studies, Bank of Japan.
5. Lafleche, T. (1997): Statistical Measures of trend rate of inflation. Bank of Canada Review.
6. Picchetti, P. and Toledo, C. (2001): How much to trim? A methodology for calculating core inflation, with an application for Brazil. Revista de Economia Aplicada
7. Tahir, S. (2006): Core Inflation Measure for Pakistan. SBP Research Bulletin, Vol. 2. No.2.
8. Should Bangladesh Monitor Core Inflation for Conducting Monetary Policy? Policy Analysis Unit, Bank of Bangladesh, 2008
9. Roger, S. (1998): Core Inflation: Concepts, uses and measurement. Central Bank of New Zealand Working Paper 98/9.
10. Consumer Price Index – Weighted Median and Trimmed Mean. Reserve Bank of Australia 1994
11. Marches, C. R.; Nerves, P. D. and Sarmento, L. M. (2000): Evaluating Core Inflation indicators. Working Paper 3-00, Economics Research Department, Banco de Portugal.
12. Wynne, M. A. (1999): Core Inflation: a review of some conceptual issues. European Central Bank Working Paper No.5
13. Figueiredo, F. M. R. and Staub, R. B. (2002): Evaluation and Combination of Core Inflation for Brazil. Money Affairs. Vol.15, no.1, January-June, pp.1-20. Working paper
14. Figueiredo, F. R. (2001). "Evaluating Core Inflation Measures for Brazil," Working Paper No.03-2001, Banco Central do Brasil.

Appendices

Appendix A: Inflation by exclusion method, CPI Inflation, Weighted Median, and 12 Month MA

Date	CPI Inflation by Exclusion	CPI Inflation	Weighted Median	12 Month CPI Inflation MA
Jan-98	12.5	18.9	0.6	20.9
Feb-98	12.7	16.3	0.5	21.2
Mar-98	11.9	18.8	0.5	21.8
Apr-98	16.0	22.8	0.6	22.4
May-98	16.4	25.7	0.7	23.0
Jun-98	18.3	24.8	0.9	23.4
Jul-98	20.9	26.3	1.3	24.4
Aug-98	21.7	27.1	1.2	25.4
Sep-98	23.1	27.5	1.2	26.6
Oct-98	24.0	27.6	1.3	27.4
Nov-98	23.4	26.1	1.3	27.7
Dec-98	25.2	30.6	1.4	27.8
Jan-99	27.3	31.6	1.5	28.0
Feb-99	25.8	30.5	1.4	28.2
Mar-99	26.1	28.5	1.6	28.2
Apr-99	25.0	26.6	1.4	28.1
May-99	24.7	26.6	1.4	27.9
Jun-99	20.7	27.5	1.2	27.8
Jul-99	20.9	28.4	1.1	27.0
Aug-99	18.5	27.2	0.9	26.1
Sep-99	18.3	25.8	1.0	25.4
Oct-99	17.7	25.0	0.9	25.1
Nov-99	17.4	25.3	0.9	25.0
Dec-99	14.6	20.6	0.7	24.9
Jan-00	12.6	20.7	0.6	24.6
Feb-00	11.7	23.0	0.4	24.4
Mar-00	10.9	23.9	0.4	24.4
Apr-00	10.7	26.2	0.5	24.5
May-00	11.1	25.2	0.5	24.8
Jun-00	13.4	23.8	0.5	25.1
Jul-00	13.1	25.9	0.5	25.9
Aug-00	14.5	27.0	0.8	26.7
Sep-00	12.9	27.7	0.6	27.2
Oct-00	11.8	28.6	0.5	27.6
Nov-00	10.9	28.9	0.5	27.5
Dec-00	21.9	30.1	1.3	27.3
Jan-01	24.4	30.0	1.3	27.0
Feb-01	29.2	29.2	1.7	26.2
Mar-01	31.4	28.8	1.8	25.4
Apr-01	29.8	24.8	1.7	24.5
May-01	27.8	22.2	1.7	23.6
Jun-01	25.7	20.2	1.4	22.6
Jul-01	24.5	17.1	1.2	21.7
Aug-01	25.3	16.8	1.2	20.8
Sep-01	26.4	17.4	1.2	20.0
Oct-01	28.5	17.1	1.4	19.1
Nov-01	29.3	17.7	1.6	18.5
Dec-01	21.1	18.8	0.9	18.4
Jan-02	20.0	19.6	0.9	18.7
Feb-02	16.2	19.2	0.5	19.2
Mar-02	13.7	18.0	0.4	19.8
Apr-02	13.2	17.8	0.4	20.3
May-02	13.0	20.9	0.4	20.9
Jun-02	14.6	23.6	0.5	21.5
Jul-02	13.8	23.5	0.6	22.2
Aug-02	13.1	23.8	0.6	22.6
Sep-02	13.7	23.9	0.6	22.9
Oct-02	12.1	23.9	0.5	23.3
Nov-02	13.0	25.4	0.6	23.8
Dec-02	14.1	26.7	0.6	24.0
Jan-03	13.8	24.3	0.5	23.9
Feb-03	13.8	22.9	0.6	23.6
Mar-03	12.8	22.6	0.5	23.3
Apr-03	15.3	23.9	0.6	23.1
May-03	16.7	23.9	0.8	22.9
Jun-03	18.2	21.9	0.8	22.3
Jul-03	18.1	20.2	0.8	21.5
Aug-03	17.7	20.3	0.8	21.0
Sep-03	17.6	21.1	0.8	20.5
Oct-03	21.5	21.1	0.9	20.0
Nov-03	19.1	19.1	0.9	19.5
Dec-03	17.2	17.2	0.8	19.0
Jan-04	17.4	17.4	0.8	18.7
Feb-04	16.9	16.8	0.7	18.7
Mar-04	17.6	17.6	0.8	18.5
Apr-04	16.0	17.8	0.6	18.3
May-04	14.5	17.4	0.5	18.0
Jun-04	13.0	18.6	0.6	17.9
Jul-04	12.2	19.5	0.6	18.0
Aug-04	12.0	18.9	0.7	18.0
Sep-04	11.9	17.8	0.5	18.2
Oct-04	10.3	18.0	0.4	18.2
Nov-04	11.8	18.3	0.6	18.2
Dec-04	12.3	17.5	0.6	18.4
Jan-05	14.2	18.2	0.7	18.4
Feb-05	13.7	18.7	0.6	18.4
Mar-05	13.7	17.4	0.8	18.4
Apr-05	14.0	18.6	0.8	18.5
May-05	13.2	19.1	0.7	18.6
Jun-05	13.1	19.2	0.7	18.5
Jul-05	13.0	18.7	0.6	18.3
Aug-05	12.8	19.3	0.6	17.8
Sep-05	12.1	19.5	0.7	17.1
Oct-05	11.3	18.3	0.6	16.6
Nov-05	10.5	17.2	0.3	15.8
Dec-05	9.2	15.9	0.3	14.9
Jan-06	6.2	12.2	0.2	14.1
Feb-06	5.7	10.3	0.2	13.2
Mar-06	6.5	10.7	0.2	12.3
Apr-06	5.3	9.4	0.1	11.3
May-06	5.0	8.6	0.0	10.5
Jun-06	4.7	8.5	0.0	9.7
Jul-06	4.0	8.7	0.0	9.1
Aug-06	3.8	8.0	0.0	8.9
Sep-06	4.1	8.2	0.0	9.1
Oct-06	3.5	7.9	-0.1	9.2
Nov-06	3.1	8.1	0.0	9.5
Dec-06	3.7	8.2	0.0	9.7
Jan-07	3.8	9.8	0.0	10.0
Feb-07	4.6	12.6	0.0	10.2
Mar-07	3.8	12.7	0.0	10.4
Apr-07	3.7	12.4	0.0	10.5
May-07	4.4	11.8	0.0	10.6
Jun-07	5.9	11.1	0.1	10.6
Jul-07	5.7	11.2	0.1	10.7
Aug-07	7.0	10.7	0.2	10.6
Sep-07	6.3	9.3	0.2	10.4
Oct-07	5.0	9.0	0.2	10.1
Nov-07	7.1	8.7	0.2	10.0
Dec-07	6.5	8.9	0.3	9.9
Jan-08	9.7	9.3	0.3	10.0
Feb-08	10.0	9.5	0.3	10.1
Mar-08	10.9	9.8	0.3	10.3
Apr-08	11.4	10.1	0.3	10.7
May-08	12.2	10.9	0.4	11.2
Jun-08	12.8	12.1	0.5	11.8
Jul-08	12.7	12.6	0.4	12.4
Aug-08	11.3	13.2	0.4	13.0
Sep-08	12.6	14.2	0.4	13.3
Oct-08	15.6	15.2	0.6	13.6
Nov-08	15.7	15.3	0.5	14.0
Dec-08	16.1	16.6	0.6	14.3
Jan-09	14.6	16.0	0.6	14.5
Feb-09	13.7	14.0	0.6	14.6
Mar-09	11.6	13.1	0.5	14.8
Apr-09	13.3	14.3	0.6	14.8
May-09	14.2	14.7	0.6	14.8
Jun-09	14.4	14.4	0.6	14.7
Jul-09	15.4	14.0	0.7	14.4

Appendix B: Trimmed mean - commodities removed from the lower tail of the price changes distribution

Jul-08	Weights	Aug-08	Weights	Sep-08	Weights
Toyota hilux	0.96	Car Battery Charging	0.52	Car Battery Charging	0.52
Car Battery Charging	0.52	Nissan sunny	0.96	Shake shake	1.22
Ladies Dress Imported	0.35	Ladies Dress Imported	0.35	Ladies Dress Imported	0.35
Baby suit (coat)	0.35	Shake shake	1.22	Pipe tobacco	0.13
Shake shake	1.22	Pipe tobacco	0.13	Toyota hilux	0.96
Detergent Powder	0.86	Water & Sewerage charges	0.38	Baby suit (coat)	0.35
Toyota corolla	0.96	Toyota hilux	0.96	Toyota corolla	0.96
Nissan sunny	0.96	Television Colour	0.52	Refrigerator	0.30
Air Fare Lusaka/Kitwe	0.34	Air Fare Lusaka/Kitwe	0.34	Nissan sunny	0.96
Refrigerator	0.30	Refrigerator	0.30	Television Colour	0.52
Green hosepipe	0.03	Baby suit (coat)	0.35	Magazine	0.06
Magazine	0.06	Nissan pick_up	0.96	Ordinary plate	0.18
Air fare Lusaka/London	0.34	Toyota corolla	0.96	Men's Skipper local	0.16
Water & Sewerage charges	0.38	Magazine	0.06	Green hosepipe	0.03
Video Recorder	0.18	Green hosepipe	0.03	Photocoping	0.49
Television Colour	0.52	Gents'Two Piece Suit	0.25	Pair of Trousers Imported	0.26
Display cabinet	0.04	Pair of Trousers Imported	0.26	Terry Nappy	0.07
Ginger Ale	0.04	Ordinary plate	0.18	Baby Lotion	0.17
Lexington	0.23	Water & Sewerage charges	0.38	Onion	0.14
Photocoping	0.49	Bed & continental Breakfast	0.03	Electrical cooker	0.12
Ordinary plate	0.18	Ladies skirt imported	0.17	Bed & continental Breakfast	0.03
Ice cream	0.02	Electrical cooker	0.12	Girls school Sweater	0.02
Bed & continental Breakfast	0.03	Detergent Powder	0.86	Spark plugs	0.11
Boys shirt	0.10	Colour Film	0.07	Raw cassava tubers	0.05
Coffee table	0.10	Men's Skipper local	0.16	Boys shirt	0.10
Long Sleeved Shirt local	0.20	Lexington	0.23	Pineapples	0.02
Men's Sweater local	0.04	Photocoping	0.49	Boys Trousers	0.06
Total Weights	9.81	Total Weight	11.25	Total Weight	8.33
Oct-08	Weights	Nov-08	Weights	Dec-08	Weights
Shake shake	1.22	Single Blanket	0.80	Single Blanket	0.80
Ladies Dress Imported	0.35	Car Battery Charging	0.52	Car Battery Charging	0.52
Water & Sewerage charges	0.38	Shake shake	1.22	Shake shake	1.22
Pipe tobacco	0.13	Ladies Dress Imported	0.35	Ladies Dress Imported	0.35
Ordinary plate	0.18	Building sand	0.10	Pipe tobacco	0.13
Ladies skirt imported	0.17	Pipe tobacco	0.13	Magazine	0.06
Refrigerator	0.30	Television Colour	0.52	Girls Dress	0.13
Ladies Leather shoes	0.30	Mens Leather Shoes (imported)	0.36	Video Recorder	0.18
Magazine	0.06	Girls Dress	0.13	Mens Leather Shoes (imported)	0.36
PTA Contribution	0.26	Refrigerator	0.30	Ordinary plate	0.18
Gents'Two Piece Suit	0.25	Magazine	0.06	Refrigerator	0.30
Men's Skipper local	0.16	Pair of Trousers Imported	0.26	Coffee table	0.10
Coffee table	0.10	Ordinary plate	0.18	Pair of Trousers Imported	0.26
Baby Lotion	0.17	PTA Contribution	0.26	Baby Lotion	0.17
Girls Dress	0.13	Ladies skirt imported	0.17	Men's Skipper local	0.16
Pair of Trousers Imported	0.26	Coffee table	0.10	Terry Nappy	0.07
Foam mattress	0.08	Terry Nappy	0.07	Television Colour	0.52
Electrical cooker	0.12	Baby Lotion	0.17	Ladies skirt imported	0.17
Girls school Sweater	0.02	Video Recorder	0.18	Long Sleeved Shirt Imported	0.20
Ladies sweater	0.02	Men's Skipper local	0.16	Watermelon	0.02
Onion	0.14	Ladies Leather shoes	0.30	Concrete Block	0.06
Floor tiles	0.06	Dry Clean	0.40	Medix cough syrup	0.03
Bed & continental Breakfast	0.03	Long Sleeved Shirt Imported	0.20	Corned beef	0.15
Anti diarrhoea mixture	0.02	Girls school Sweater	0.02	Mug	0.07
Dry Clean	0.40	Electrical cooker	0.12	Men's Sweater local	0.04
Mug	0.07	Boys Underpants	0.02	Electrical cooker	0.12
Boys School Socks Grey	0.02	Medix cough syrup	0.03	Boys Underpants	0.02
Total weight	5.41	Total weight	7.13	Total weight	6.38

Appendix B: Trimmed mean - commodities removed from the lower tail of the price changes distribution (Cont'd)

Jan-09	Weights	Feb-09	Weights	Mar-09	Weights
Single Blanket	0.80	Tomatoes	2.27	Tomatoes	2.27
Car Battery Charging	0.52	Car Battery Charging	0.52	Car Battery Charging	0.52
Paraffin	0.83	Paraffin	0.83	Paraffin	0.83
Pipe tobacco	0.13	Pipe tobacco	0.13	Pipe tobacco	0.13
Petrol	0.45	Petrol	0.45	Petrol	0.45
Ladies Dress Imported	0.35	School Fees	0.50	Baby suit (coat)	0.35
Shake shake	1.22	Mens Leather Shoes (imported)	0.36	Shake shake	1.22
School Fees	0.50	Shake shake	1.22	Radio cassette Recorder	0.60
Mens Leather Shoes (imported)	0.36	Diesel	0.45	Mens Leather Shoes (imported)	0.36
Baby suit (coat)	0.35	Boys school uniform	0.33	Taxi Fare Town/Mtendere	0.19
Diesel	0.45	Ladies Dress Imported	0.35	School Fees	0.50
Magazine	0.06	Baby suit (coat)	0.35	Diesel	0.45
Spring onion	0.14	Magazine	0.06	Ladies Dress Imported	0.35
Girls Dress	0.13	Gents'Two Piece Suit	0.25	Bream Fresh/Frozen	0.54
Video Recorder	0.18	Pair of Trousers Imported	0.26	Long Sleeved Shirt local	0.20
Men's Skipper local	0.16	Ladies skirt imported	0.17	Girls School Uniform	0.30
Boys shorts	0.16	Girls Dress	0.13	Spring onion	0.14
Ladies skirt imported	0.17	Baby Lotion	0.17	Fresh okra	0.39
Baby Lotion	0.17	Yorghart	0.18	Ladies skirt imported	0.17
Apple	0.07	Coffee table	0.10	Boys school uniform	0.33
Watermelon	0.02	Oranges	0.08	Dried bream	0.47
Pair of Trousers Imported	0.26	Watermelon	0.02	Magazine	0.06
Gents'Two Piece Suit	0.25	Electric Kettle	0.03	Butter	0.19
Electric Kettle	0.03	Unrecorded Tape Cassette	0.07	Watermelon	0.02
Unrecorded Tape Cassette	0.07	Concrete Block	0.06	Yorghart	0.18
Coffee table	0.10	Bandages	0.02	Coffee table	0.10
Terry Nappy	0.07	Butter	0.19	Men's Skipper local	0.16
Total Weight	8.01	Total Weight	9.56	Total Weight	11.46

Apr-09	Weight	May-09	Weight	Jun-09	Weight	Jul-09	Weight
Car Battery Charging	0.52	Car Battery Charging	0.52	White sugar	3.81	Paraffin	0.83
Paraffin	0.83	Paraffin	0.83	Paraffin	0.83	Petrol	0.45
Pipe tobacco	0.13	Petrol	0.45	Radio cassette Recorder	0.60	Diesel	0.45
Radio cassette Recorder	0.60	Diesel	0.45	Petrol	0.45	Mini Bus Fare Town/Chilenje	1.44
Petrol	0.45	Radio cassette Recorder	0.60	Car Battery Charging	0.52	Sweet potatoes	0.43
Ladies Dress Imported	0.35	Baby suit (coat)	0.35	Diesel	0.45	Spring onion	0.14
Shake shake	1.22	Taxi Fare Town/Mtendere	0.19	Taxi Fare Town/Mtendere	0.19	Taxi Fare Town/Mtendere	0.19
Girls School Uniform	0.30	Boys school uniform	0.33	Cafenol	0.09	Cafenol	0.09
Taxi Fare Town/Mtendere	0.19	Cement Portland	0.20	Castle Lager	0.91	Ladies suit local	0.16
Diesel	0.45	Castle Lager	0.91	Spring onion	0.14	3 piece lounge suit high price	0.37
School Fees	0.50	Coffee table	0.10	Television B&W	0.52	Roofing nails 10 cm	0.05
Castle Lager	0.91	Girls School Uniform	0.30	Building sand	0.10	Cement Portland	0.20
Baby suit (coat)	0.35	Gents'Two Piece Suit	0.25	Ladies suit local	0.16	Boys school uniform	0.33
Boys school uniform	0.33	Ladies skirt imported	0.17	Samp	0.18	Television B&W	0.52
Coffee table	0.10	Rhino Lager	0.91	Cement Portland	0.20	Mutton	0.16
Cement Portland	0.20	Fresh okra	0.39	Boys school uniform	0.33	Photocoping	0.49
Mens Leather Shoes (imported)	0.36	Pipe tobacco	0.13	Mutton	0.16	Samp	0.18
Ladies skirt imported	0.17	Raw cassava tubers	0.05	Gents'Two Piece Suit	0.25	Castle Lager	0.91
Colour Film	0.07	Peas	0.02	Mince Meat	0.18	Beef Sausages	0.53
Aspirin	0.09	Men's Sweater local	0.04	Video Recorder	0.18	Pipe tobacco	0.13
Girls Dress	0.13	Lettuce	0.02	Pipe tobacco	0.13	Radio cassette Recorder	0.60
Plasters	0.01	Building sand	0.10	Coffee table	0.10	Kettle non electrical	0.03
Mince Meat	0.18	Mince Meat	0.18	Butter	0.19	Raw cassava tubers	0.05
Oranges	0.08	Plasters	0.01	Lettuce	0.02	Men's Skipper local	0.16
Lettuce	0.02	Ice cream	0.02	Ladies skirt imported	0.17	Peas	0.02
Girls school Sweater	0.02	Yorghart	0.18	Concrete Block	0.06	Chewingum	0.11
Spring onion	0.14	Ladies sweater	0.02	Ice cream	0.02	Mince Meat	0.18
Total Weight	8.72	Total Weight	7.75	Total Weight	10.94	Total Weight	9.21

Appendix C: Commodities removed from the upper tail of the price changes distribution

Jul-08	Weights	Aug-08	Weights	Sep-08	Weights
Boarding Fees	0.50	Radio cassette Recorder	0.60	Diesel	0.45
Toilet Soap	0.43	Paraffin	0.83	Paraffin	0.83
Rice Imported	0.30	Beef Sausages	0.53	Electricity Tariff	0.50
Ladies suit local	0.16	Dried Kapenta	1.89	Dried Kapenta	1.89
Dried Kapenta	1.89	Dressed chicken	2.78	House rent (low cost)	0.84
Dressed chicken	2.78	Charcoal	1.28	Tomatoes	2.27
Dried Kapenta	1.89	Electricity Tariff	0.50	Charcoal	1.28
Sweet potatoes	0.43	House rent (low cost)	0.84	Rape	1.71
Electricity Tariff	0.50	Dried Kapenta	1.89	Electricity Tariff	0.50
House rent (low cost)	0.84	Electricity Tariff	0.50	Mini Bus Fare Town/Chilenje	1.44
House rent (medium cost)	2.01	Mini Bus Fare Town/Chilenje	1.44	Dried Kapenta	1.89
Electricity Tariff	0.50	House rent (medium cost)	2.01	Dressed chicken	2.78
Charcoal	1.28	Chik	1.23	Coach Fare Lusaka/Kitwe	1.44
Chik	1.23	Rape	1.71	House rent (medium cost)	2.01
Mini Bus Fare Town/Chilenje	1.44	Tomatoes	2.27	Chik	1.23
Dried beans	1.82	Sweet potatoes	0.43	Dried beans	1.82
Bread	2.02	Dried beans	1.82	White sugar	3.81
Television B&W	0.52	Bread	2.02	Bread	2.02
White sugar	3.81	White sugar	3.81	Mixed Cut	3.57
Bun	2.16	Mixed Cut	3.57	Sweet potatoes	0.43
Mixed Cut	3.57	Television B&W	0.52	Television B&W	0.52
White Roller	2.28	Cooking oil Imported	2.20	Cooking oil Imported	2.20
Tomatoes	2.27	Bun	2.16	Cooking oil Local	2.20
Cooking oil Local	2.20	Cooking oil Local	2.20	Bun	2.16
Cooking oil Imported	2.20	White Maize	2.59	White Roller	2.28
White Maize	2.59	White Roller	2.28	White Maize	2.59
White breakfast	3.58	White breakfast	3.58	White breakfast	3.58
Total Weight	45.18	Total Weight	47.46	Total Weight	48.22
Oct-08	Weights	Nov-08	Weights	Dec-08	Weights
Electricity Tariff	0.50	Electricity Tariff	0.50	Mixed Cut	3.57
Coach Fare Lusaka/Kitwe	1.44	Coach Fare Lusaka/Kitwe	1.44	Electricity Tariff	0.50
Charcoal	1.28	Dried Kapenta	1.89	Coach Fare Lusaka/Kitwe	1.44
House rent (medium cost)	2.01	House rent (medium cost)	2.01	House rent (medium cost)	2.01
House rent (low cost)	0.84	Charcoal	1.28	House rent (low cost)	0.84
Nissan pick_up	0.96	Tomatoes	2.27	Nissan sunny	0.96
Dried Kapenta	1.89	Sweet potatoes	0.43	Sweet potatoes	0.43
Rape	1.71	Baby suit (coat)	0.35	Rice Imported	0.30
Nissan sunny	0.96	Nissan sunny	0.96	Charcoal	1.28
Electricity Tariff	0.50	Electricity Tariff	0.50	Electricity Tariff	0.50
Mini Bus Fare Town/Chilenje	1.44	Mini Bus Fare Town/Chilenje	1.44	Dried Kapenta	1.89
Tomatoes	2.27	Chik	1.23	Nissan pick_up	0.96
Chik	1.23	Nissan pick_up	0.96	Chik	1.23
Rice Imported	0.30	Dried Kapenta	1.89	Dressed chicken	2.78
Mixed Cut	3.57	Rape	1.71	Bread	2.02
Dried beans	1.82	White sugar	3.81	Tomatoes	2.27
Bread	2.02	Rice Imported	0.30	Dried Kapenta	1.89
White sugar	3.81	Dried beans	1.82	White sugar	3.81
Sweet potatoes	0.43	Bread	2.02	Dried beans	1.82
Dressed chicken	2.78	Dressed chicken	2.78	Rape	1.71
Television B&W	0.52	Television B&W	0.52	Television B&W	0.52
Cooking oil Imported	2.20	Cooking oil Imported	2.20	Cooking oil Imported	2.20
Cooking oil Local	2.20	Cooking oil Local	2.20	Cooking oil Local	2.20
Bun	2.16	Bun	2.16	Bun	2.16
White Maize	2.59	White Maize	2.59	White Maize	2.59
White Roller	2.28	White Roller	2.28	White Roller	2.28
White breakfast	3.58	White breakfast	3.58	White breakfast	3.58
Total Weight	47.26	Total Weight	45.10	Total Weight	47.72

Apr-09	Weight	May-09	Weight	Jun-09	Weight	Jul-09	Weight
Car Battery Charging	0.52	Car Battery Charging	0.52	White sugar	3.81	Paraffin	0.83
Paraffin	0.83	Paraffin	0.83	Paraffin	0.83	Petrol	0.45
Pipe tobacco	0.13	Petrol	0.45	Radio cassette Recorder	0.60	Diesel	0.45
Radio cassette Recorder	0.60	Diesel	0.45	Petrol	0.45	Mini Bus Fare Town/Chilenje	1.44
Petrol	0.45	Radio cassette Recorder	0.60	Car Battery Charging	0.52	Sweet potatoes	0.43
Ladies Dress Imported	0.35	Baby suit (coat)	0.35	Diesel	0.45	Spring onion	0.14
Shake shake	1.22	Taxi Fare Town/Mtendere	0.19	Taxi Fare Town/Mtendere	0.19	Taxi Fare Town/Mtendere	0.19
Girls School Uniform	0.30	Boys school uniform	0.33	Cafenol	0.09	Cafenol	0.09
Taxi Fare Town/Mtendere	0.19	Cement Portland	0.20	Castle Lager	0.91	Ladies suit local	0.16
Diesel	0.45	Castle Lager	0.91	Spring onion	0.14	3 piece lounge suit high price	0.37
School Fees	0.50	Coffee table	0.10	Television B&W	0.52	Roofing nails 10 cm	0.05
Castle Lager	0.91	Girls School Uniform	0.30	Building sand	0.10	Cement Portland	0.20
Baby suit (coat)	0.35	Gents'Two Piece Suit	0.25	Ladies suit local	0.16	Boys school uniform	0.33
Boys school uniform	0.33	Ladies skirt imported	0.17	Samp	0.18	Television B&W	0.52
Coffee table	0.10	Rhino Lager	0.91	Cement Portland	0.20	Mutton	0.16
Cement Portland	0.20	Fresh okra	0.39	Boys school uniform	0.33	Photocoping	0.49
Mens Leather Shoes (imported)	0.36	Pipe tobacco	0.13	Mutton	0.16	Samp	0.18
Ladies skirt imported	0.17	Raw cassava tubers	0.05	Gents'Two Piece Suit	0.25	Castle Lager	0.91
Colour Film	0.07	Peas	0.02	Mince Meat	0.18	Beef Sausages	0.53
Aspirin	0.09	Men's Sweater local	0.04	Video Recorder	0.18	Pipe tobacco	0.13
Girls Dress	0.13	Lettuce	0.02	Pipe tobacco	0.13	Radio cassette Recorder	0.60
Plasters	0.01	Building sand	0.10	Coffee table	0.10	Kettle non electrical	0.03
Mince Meat	0.18	Mince Meat	0.18	Butter	0.19	Raw cassava tubers	0.05
Oranges	0.08	Plasters	0.01	Lettuce	0.02	Men's Skipper local	0.16
Lettuce	0.02	Ice cream	0.02	Ladies skirt imported	0.17	Peas	0.02
Girls school Sweater	0.02	Yorghart	0.18	Concrete Block	0.06	Chewingum	0.11
Spring onion	0.14	Ladies sweater	0.02	Ice cream	0.02	Mince Meat	0.18
Total Weight	8.72	Total Weight	7.75	Total Weight	10.94	Total Weight	9.21

Apr-09	Weight	May-09	Weight	Jun-09	Weight	Jul-09	Weight
Charcoal	1.28	Sweet potatoes	0.43	Toilet Soap	0.43	Buka Buka	0.64
Toilet Soap	0.43	Tomatoes	2.27	Charcoal	1.28	Toilet Soap	0.43
Television B&W	0.52	Green hosepipe	0.03	Dried Kapenta	0.50	Gents' bicycle	0.40
Tomatoes	2.27	Air fare Lusaka/London	0.34	House rent (low cost)	0.84	Charcoal	1.28
Detergent Paste	0.56	Charcoal	1.28	Rice Imported	0.30	Dried Kapenta	0.50
Table salt	0.68	Detergent Paste	0.56	Detergent Paste	0.56	Toilet Soap	0.43
Mixed Cut	3.57	Rice Imported	0.30	Toilet Soap	0.43	Detergent Paste	0.56
House rent (low cost)	0.84	Toilet Soap	0.43	Green hosepipe	0.03	Air fare Lusaka/London	0.34
Air fare Lusaka/London	0.34	House rent (low cost)	0.84	Air fare Lusaka/London	0.34	Rice Imported	0.30
Green hosepipe	0.03	Dried beans	1.82	Dried Kapenta	1.89	Bread	2.02
Dried beans	1.82	Table salt	0.68	Table salt	0.68	Dried Kapenta	1.89
Dried Kapenta	1.89	Nissan sunny	0.96	Bread	2.02	Dried beans	1.82
Bread	2.02	Bread	2.02	Rape	1.71	Nissan pick_up	0.96
Dried Kapenta	1.89	White sugar	3.81	Dried beans	1.82	Nissan sunny	0.96
Nissan sunny	0.96	Nissan pick_up	0.96	Chik	1.23	Table salt	0.68
Toyota corolla	0.96	Dried Kapenta	1.89	Toyota corolla	0.96	Chik	1.23
Chik	1.23	Rape	1.71	Nissan pick_up	0.96	Dressed chicken	2.78
Toyota hilux	0.96	Toyota hilux	0.96	Toyota hilux	0.96	Toyota hilux	0.96
Rape	1.71	Toyota corolla	0.96	Nissan sunny	0.96	Toyota corolla	0.96
Nissan pick_up	0.96	Chik	1.23	Tomatoes	2.27	Dried Kapenta	1.89
Dressed chicken	2.78	Dried Kapenta	1.89	Dried Kapenta	1.89	Rape	1.71
White sugar	3.81	Dressed chicken	2.78	Dressed chicken	2.78	White Maize	2.59
White Maize	2.59	Bun	2.16	White Roller	2.28	White Roller	2.28
Bun	2.16	White Maize	2.59	White Maize	2.59	Bun	2.16
White Roller	2.28	White Roller	2.28	Bun	2.16	Tomatoes	2.27
White breakfast	3.58	White breakfast	3.58	White breakfast	3.58	White breakfast	3.58
House rent (medium cost)	2.01	House rent (medium cost)	2.01	House rent (medium cost)	2.01	House rent (medium cost)	2.01
Total Weight	44.14	Total Weight	40.78	Total Weight	37.47	Total Weight	37.64

CHAPTER TWO

External Vulnerability Index for Zambia

By

Noah Mutoti and Peter Zgambo

Abstract

External vulnerability is simply the country's risks to economic development emanating from external shocks.These risks are generally trade and exchange rate related, which leads to instability in the terms of trade (TOT). Within the broadcategory of an economic vulnerability index, we construct an external Vulnerability Index (EVI) for Zambia taking into consideration the TOT, export growth, money supply relative to official reserves, dollarization, domestic credit and trade deficit. Using regression analysis of the exchange rate on the selected variables, TOT was found to dominate the determination of the exchange rate followed by exports growth and foreign liabilities to foreign reserves. The dollarization ratio and domestic credit growth were found to be the least in terms of explaining the exchange rate. The results suggest that Zambia's external vulnerability has been increasing in the recent past, particularly from about the end of 2007. The situation seems to have worsened from about mid-2008 to the end of the period covered. However, the period of reduced external vulnerability was between January 2005 and December 2007. During this period, the index remained largely about or above 100, indicating on average favourable developments in the individual components of the index.

I Introduction

The commodity boom and the recent global financial crisis have reminded us that, in an integrated global economy, among the causes of macroeconomic volatility, are the incidence of external shocks and in particular fluctuations in the terms of trade (TOT). Easterly et al.(1993) as well as Hnatkovska and Loayza (2005) document that across countries, about 10% of the variation in gross domestic product (GDP) growth could be explained by the TOT volatility. Caballero (2001) argues that the Chilean business cycle is, by and large, triggered by external shocks and thus her external vulnerability is primarily a financial problem. It is shown that a decline in the Chilean TOT is associated to a decline in real GDP that is many times larger than one would predict in the presence of developed financial markets. In Zambia, it is suggested that a positive TOT that induces a 10% increase in the price of copper, the country's main export earner, leads to a 2 % increase in GDP and a fall in inflation (Mutoti (2007).

While increased integration of developing countries into the global economy, which has been brought up by liberalization of both the current and capital account, accompanied by a shift from fixed to flexible exchange rates, have the benefit of higher economic growth, there are risks of exposure to adverse developments in developed markets, which are transmitted through, inter alia, the TOT, current account and exchange rates.

Cognizant of this fact, some measures of external vulnerability aimed at assessing or evaluating the impact of external factors on the domestic economy and guiding the appropriate policy measures to mitigate the adverse effects have been developed.These measures also take into account the inherent domestic economic fundamentals that have the potential of exacerbating the impact of external shocks. While some measures (of external vulnerability) tend to be

narrow, others are comprehensive, including a range of deemed indicators, both structural and policy-related.

What sort of indicator should be used to assess the degree to which Zambia is vulnerable externally? Specifically, what is the plausible measure of the extent this COMESA founder member's debt, foreign reserves, TOT, monetary policy stance and export performance makes it vulnerable externally? Addressing these questions, and many others, complements the current BOZ efforts of assessing this former British colony's external vulnerability by means of a simple external vulnerability ratio (EVR), computed as the ratio of foreign investments in Government securities to gross international reserves. To this end, Section II discusses the methodology. This is followed by the empirical approach. We conclude, with some recommendations in Section IV.

II Conceptual and Methodological Issues

In line with Guillaumont (2007), external vulnerability refers to a country's risks to economic development originating from external shocks. Simply, it is the risk of external factors impacting negatively on the domestic economy. These risks are generally trade and exchange rate related, such as a slump in external demand and world commodity price instability (which leads to instability in TOT). Such risks are especially profound in small open economies, reflected in the currency crisis in the initial stages and ultimately in dismal economic performance. Evidence of this is the East Asian financial crisis of the late 1990s, which spread from Thailand to Malaysia, Indonesia, the Philippines, then to South Korea, and the current global financial crisis that emanated from the United States, that have been characterized by rapid depreciation of exchange rates in most developing economies.

A country's external vulnerability could be structural or/and policy-induced. While the latter has a hallmark of governments pursuit of imprudent policies, such as loose monetary policies (Berg et al.(1999), the former is associated with high dependence on the exploitation and exportation of raw materials, highly likely for African economies.

Within the broad category of an economic vulnerability index---which captures the economic vulnerability of a particular economy or groups of economies to internal or external shocks---Briguglio (2003) assess external vulnerability through an external vulnerability index (EVI), taking into account some aspects of structural and policy factors. The variables considered (in the EVI) include terms-of-trade (TOT), export growth, money supply relative to official reserves and dollarization, besides domestic credit and trade deficit. The growth of exports indicates the economy's capacity in earning foreign exchange required in the payment of foreign liabilities. Especially in most developing countries, export instability could be a source of external vulnerability as it has significant negative effect on growth and the country's capacity in earning foreign exchange.

The ratio of money supply to official foreign reserves indicates the part of domestic money supply that is in foreign currency or is backed by the foreign currency (Kaminsky et al.(1998)). The higher the foreign currency part in broad money, the more vulnerable the economy would be to external shocks. The dollarization ratio, simply measured as foreign currency deposits relative to total deposits indirectly signals the distrust economic agents have in domestic currency. Because a higher dollarization ratio is indicative of low confidence in the domestic currency, it has the potential of increasing the economy's external risks. A wider trade deficit relative to GDP is indicative of a country's lessened capacity to pay for foreign goods (as export receipts fall short of payments for imports). Inclusion of the short-term foreign debt to foreign reserves ratio in the EVI is aimed at capturing the amount of foreign debt owed by residents to foreign reserves, including non-residents holdings of domestic currency denominated debt issued by the Government and the private sector. In particular, the maturity structure of

external liabilities can also be a source of vulnerability in an open economy. The higher the amount of external liabilities, especially of a short-term nature, the more vulnerable the economy would be in a case of a mis-match between a country's short-term obligations denominated in foreign currency and the actual amount of foreign currency (Caballero et al.(2006)

Particularly in monetary targeting regimes, domestic credit is usually considered a policy-induced variable in the EVI. A rapid domestic credit growth fuels inflationary pressures, leading to the weakening of the domestic currency and thereby increasing external vulnerability. Other indicators in the EVI are trade openness and export concentration. While the former captures the degree to which an economy is susceptible to economic conditions in the rest of the world, the latter explains the extent to which a country lacks export diversification.

We end this section with a caveat on indices. In general, indices are important inputs in policy and decision making, partly because they represent complex economic, financial, social or other phenomena in a simplified manner. To this end a number of methods have been used in the construction of indices. These methods include the, mapping along a numerical scale, regression and normalisation procedure (Briguglio, 2003). Here we focus on the last two methods (see Appendix for the normalisation procedure method).

III Empirical Approach

Data

Taking the notion of external vulnerability as being the possibility of experiencing a currency crisis, the components of the EVI considered are those which have the potential of impacting the external value of the domestic currency, i.e. the exchange rate. Monthly data from 2000 to 2008 is used.

Chart 1 depicts the TOT and the K/US$ exchange rate. Unsurprisingly, the TOT computed as the ratio of copper prices to crude oil prices constitutes an important factor in assessing Zambia's external vulnerability. In particular, an adverse TOT would increase the country's external vulnerability as foreign exchange earnings decline while the import bill rises or remains relatively unchanged. It is for this reason, the country has recently witnessed a rapid weakening of the external value of the Kwacha following decline in TOT, brought about by the collapse in the price of copper.

A general upward trend in exports (of both copper and non-traditional exports) was observed until 2008, when the price of copper declined (Chart 2). Developments in exchange rate have by and large mirrored export growth performance. It is with no doubt that higher foreign exchange earnings would support the country's exchange rate, thereby making the economy less vulnerable to external shocks.

Chart 1: Terms of Trade and Exchange Rate

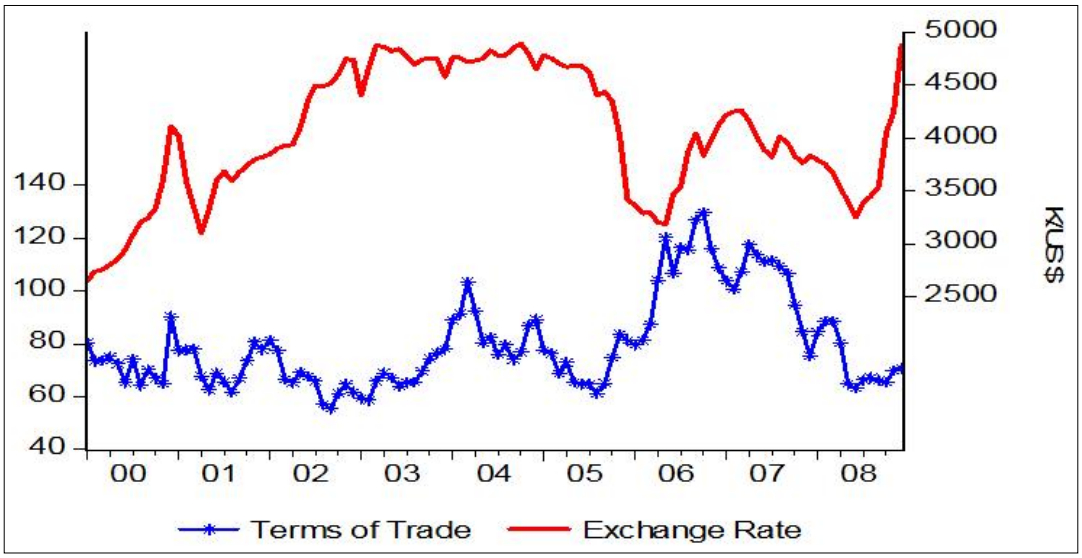
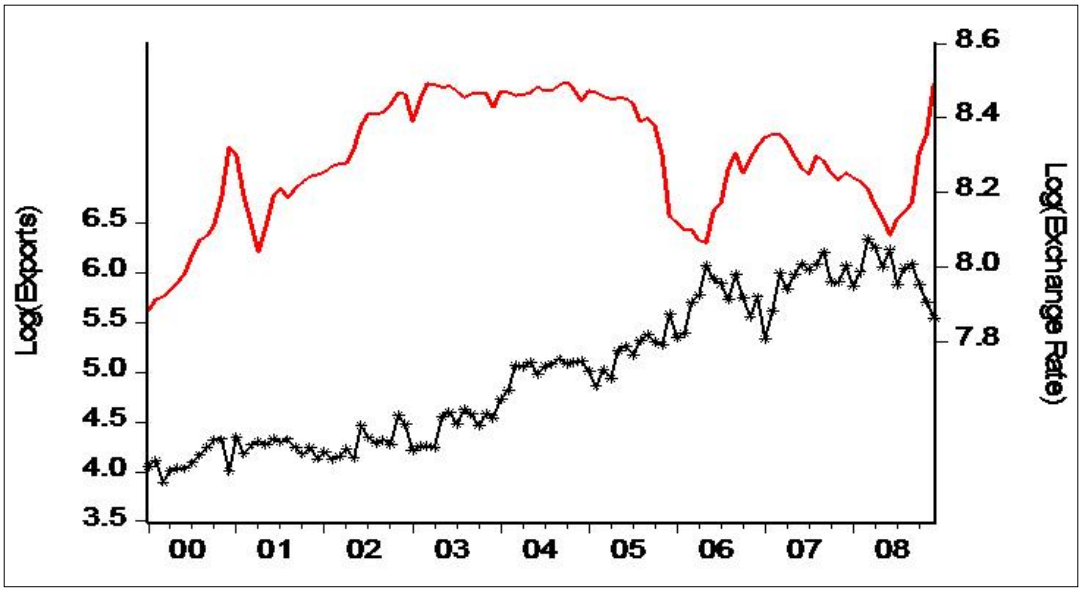
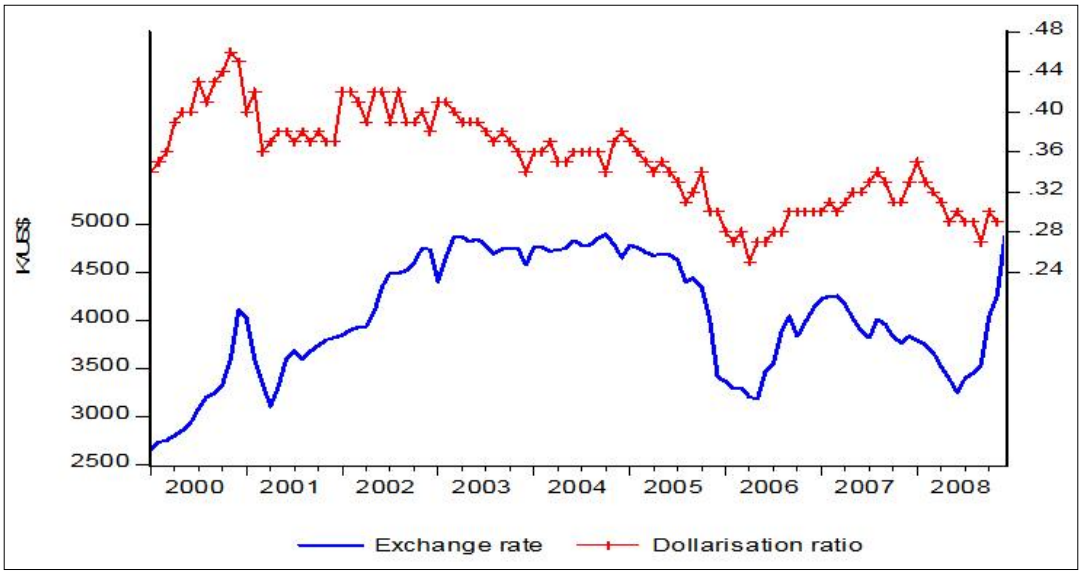


Chart 2: Export and Exchange Rate



The holding of foreign currency deposits was allowed in the early 1990s as an integral part of financial reforms. Over the period of analysis, the dollarization ratio, simply computed as the ratio of foreign currency deposits to total deposits increased to an average of 51% over the last four months of 2000 from around 47% during early part of the year. Since then, it has been below 45% and recently it has declined to about 35%. As already noted, the exchange rate has exhibited both rapid depreciation and appreciation during some periods, making the causal effects between dollarization and exchange rate unclear (Chart 3).

Chart 3: Dollarization and Exchange Rate



Because of the difficulties involved in identifying short-term private sector foreign liabilities, we use the sum of private sector foreign debt and foreign holdings of Government securities to gross international reserves to capture foreign liabilities to foreign reserves. The visiual inspection suggests a likely less weight attached to this ratio vis-a-vis exchange rate movement (Chart 4).

Domestic credit is used as a proxy of the monetary policy stance. On the one hand, Chart 5 suggests an upward trend in credit growth and on the other hand that monetary policy stance could not be a strong source of exchange rate movement.

Chart 4: Foreign Liability to Reserves Ratio and Exchange Rate

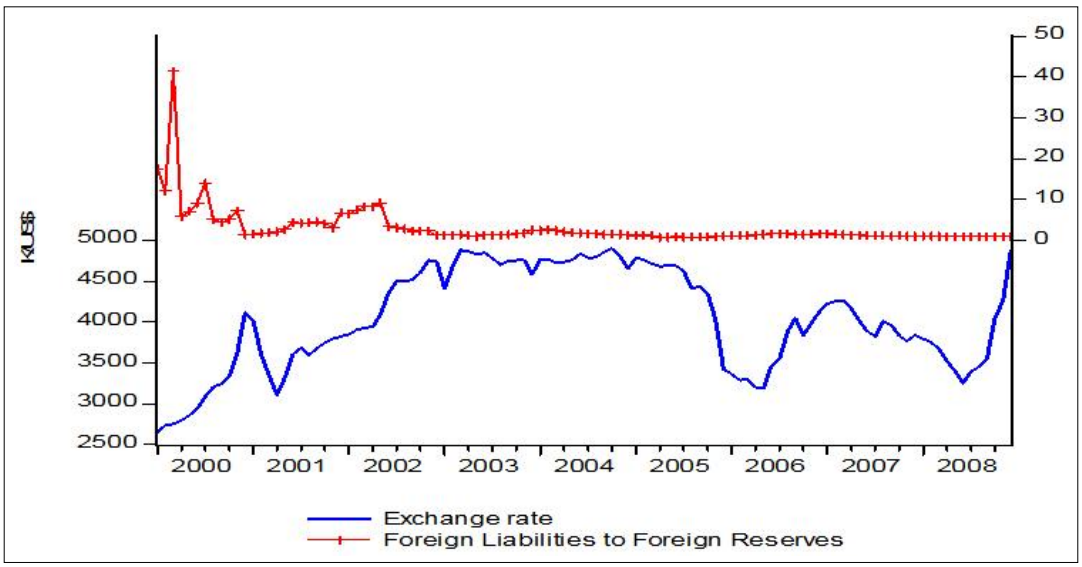
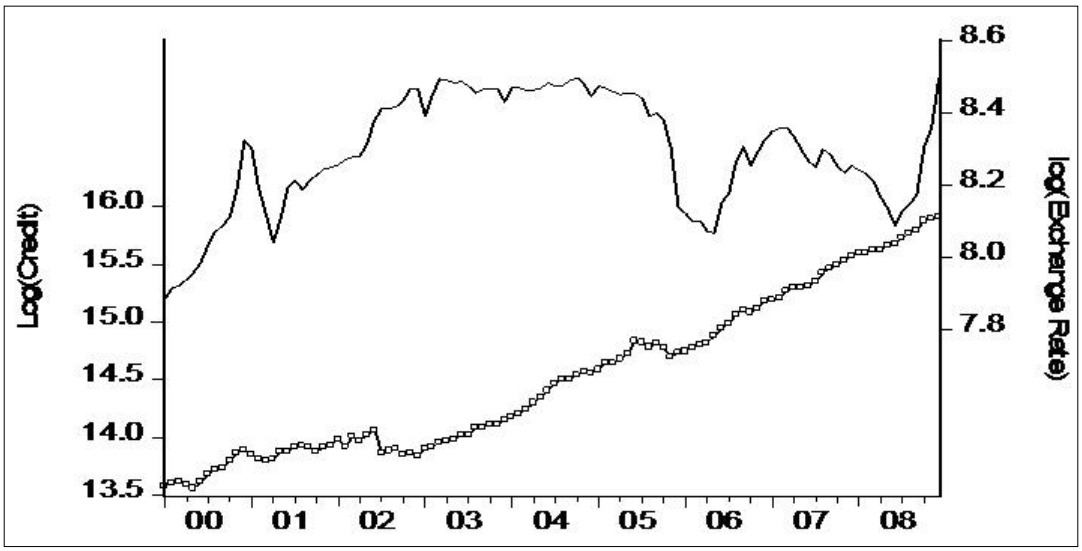


Chart 5: Domestic Credit and Exchange Rate



The EVI

The EVI is constructed using arithmetic averaging. The varying weights attached to each of the components were identified using regression analysis. TOT was found to dominate the determination of the exchange rate, followed by exports growth and foreign liabilities to foreign reserves. The dollarization ratio and domestic credit growth were considered the least factors. Hence, the weights attached to the variables were 0.58, 0.22, 0.14, 0.04 and 0.01 for TOT, exports growth, foreign liabilities to foreign reserves, dollarization ratio and domestic credit growth, respectively. This EVI is depicted in Chart 6 (see also EVI with equal weights Appendix)

A low value of the EVI is indicative of increased external vulnerability and vice versa. With reference to the base number of 100, an index number below 100 indicates increased external vulnerability while a number above 100 may be taken to signal reduced external vulnerability. Chart 6 thus suggests that Zambia's external vulnerability has been increasing in the recent past. The situation seems to have worsened from about mid-2008 to the end of the period covered. However, the period of reduced external vulnerability was between January 2006 and December 2007. During this period, the index remained largely about or above 100, indicating on average favourable developments in the individual components of the index.

By construction, episodes of increased vulnerability were associated with a weaker exchange rate. For example, between June 2001 to March 2003, characterised as one of increased external vulnerability (with the index remaining mainly below 100) and the exchange rate depreciated sharply. Conversely, the period running from January 2005 to May 2006 can be characterised as one of reduced external vulnerability as reflected by rising trend in the index and a significant appreciation of the exchange rate. In the latter part of the period covered, external vulnerability seems to have increased in the economy and this is clearly reflected in the sharp depreciation of the exchange rate.

Chart 6: EVI

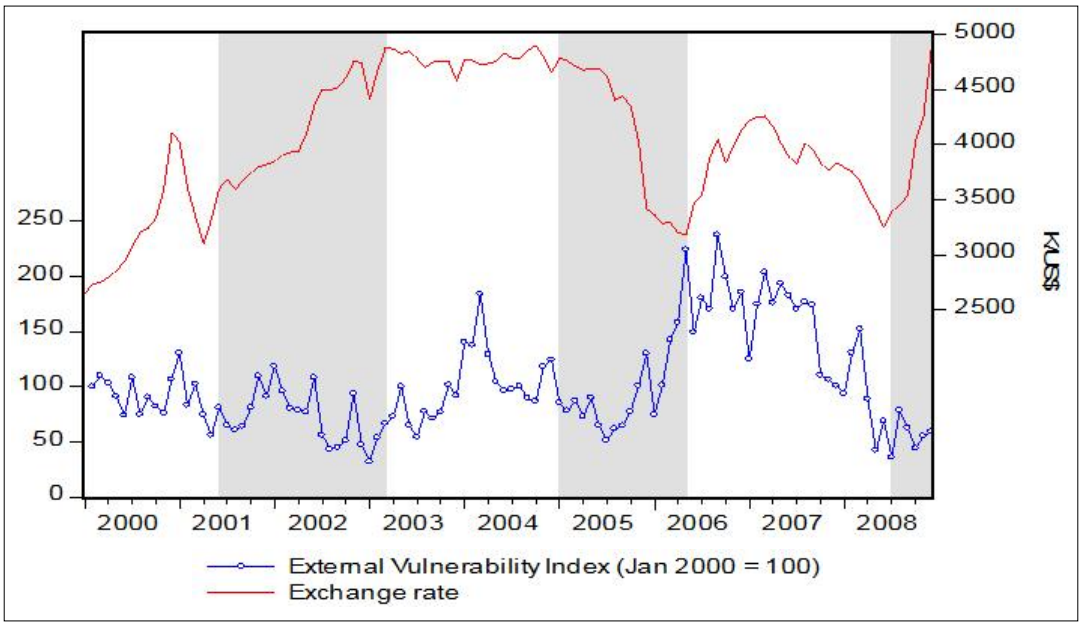
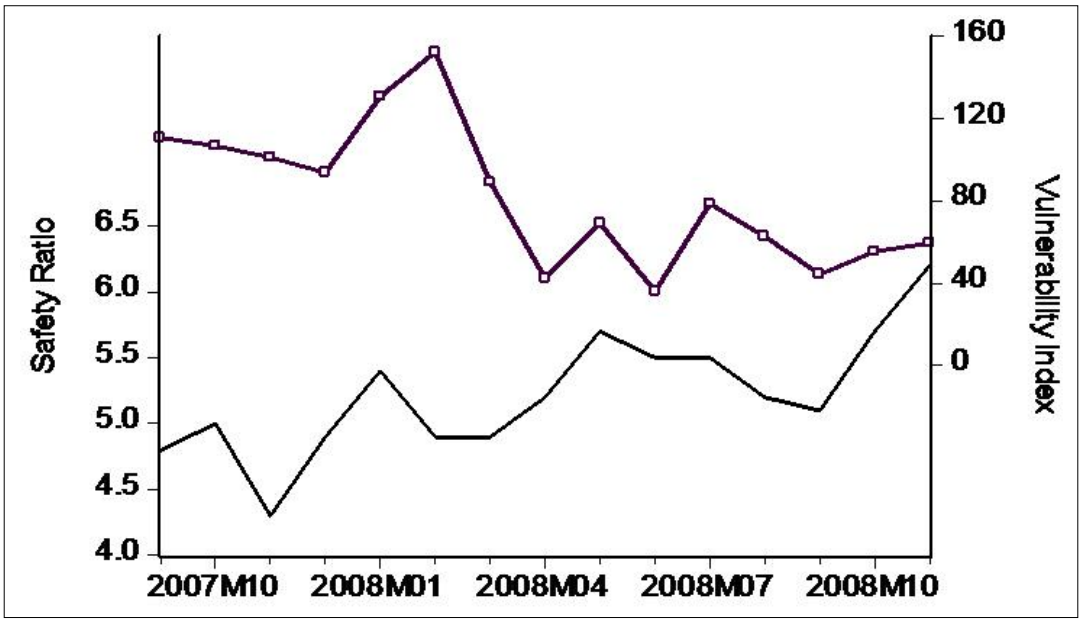


Chart 7 compared the EVI and the simple safety ratio computed as foreign investments in Government securities relative to gross international reserves, over a 12-month period from September 2007. While the simple ratio suggests improvements in Zambia's safety ratio, the EVI suggests the country's increased vulnerability.

Chart 7: EVI and Safety Ratio



IV Conclusion

External vulnerability is the country's risks to economic development originating from external shocks. Simply, it is the risk of external factors impacting negatively on the domestic economy. These risks are generally trade and exchange rate related, such as a slump in external demand and world commodity price instability (which leads to instability in TOT). Within the broadcategory of an economic vulnerability index, which is aimed at capturing the economic vulnerability of a particular economy or groups of economies to internal or external shocks, we construct an EVI for Zambia taking the terms-of-trade (TOT), export growth, money supply relative to official reserves and dollarization, besides domestic credit and trade deficit. Using regression analysis of the exchange rate on the selected variables, TOT were found to dominate the determination of the exchange rate followed by exports growth and foreign liabilities to foreign reserves. The dollarization ratio and domestic credit growth were found to be the least in terms of explaining the exchange rate.

The results suggest that Zambia's external vulnerability has been increasing in the recent past, particularly from about the end of 2007. The situation seems to have worsened from about mid-2008 to the end of the period covered. However, the period of reduced external vulnerability was between January 2005 and December 2007. During this period, the index remained largely about or above 100, indicating on average favourable developments in the individual components of the index.

This assertion is reflected in the exchange rate. The K/US $ exchange rate shows episodes of increased vulnerability which were associated with a weaker exchange rate. In particular, the period from June 2001 to March 2003 may be characterised as one of increased external vulnerability as the index remained mainly below 100 and the exchange rate depreciated sharply. Conversely, the period running from January 2005 to May 2006 can be characterised as one of reduced external vulnerability as reflected by rising trend in the index and a significant appreciation of the exchange rate. In the latter part of the period covered, external vulnerability seems to have increased in the economy and this is clearly reflected in the sharp depreciation of the exchange rate.

References

Berg, A., and Patillo, C. (1999). 'Are Currency Crisis Predicatble: A Test'. IMF Staff Papers, 46 (2).

Briguglio, L. (1992). “Preliminary Study on the Construction of an Index for ranking Countries According to their Economic Vulnerability”, UNCTAD/LDC/ Misc. 4 1994

_____(1995). “Small Island States and their Economic Vulnerabilities”, World Development Vol. 23 (9), 1615 – 1632.

_____(1997). “Alternative Economic Vulnerability Indices for Developing Countries”, Report prepared for the Expert Group on Vulnerability Index, United Nations Department of Economic and Social Affairs-UN(DESA), December 1997

_____ (2003). 'The Vulnerability Index and Small Island Developing States: A Review of Conceptual and Methodological Issues'. Paper prepared for AIMS Regional Preparatory Meeting on the Ten Year Review of the Barbados Programme of Action, 1 – 5 September. Praia, Cape Verde.

Chandler, R. (1996), “Measurement of Vulnerability of Small States”, Report prepared for the Commonwealth Secretariat, April 1996.

Crowards, T. (1999), “An Economic Vulnerability Index, with Special Reference to the Caribbean”, Caribbean Development Bank

Goldstein, M., G.L. Kaminski, and C.M. Reinhart (2000). Assessing Financial Vulnerability. An Early Warning System for Emerging Markets. Washington, DC: Institute for International Economics

Guillaumont, P. (2007). 'EVI and its Use: Design of an Economic Vulnerability Index and its Use for International Development Policy'.

Kaminsky, G., Lizondo, S., and Reinhart, C.M. (1998). 'Leading Indicators of Currency Crisis'. IMF Staff Papers, 45 (1)

Mutoti, N. (2007). 'Managing and Challenges of Commodity Booms: the Case of Zambia.' AERC Senior Policy Seminar IX on Managing Commodity Booms in Sub-Saharan Africa.

Thiessen, H. (1997), Measuring the Real World: A Textbook of Applied Statistical Methods, (John Wiley & Sons, Chichester, pp 13, 142)

1 (b) Normalisation procedure:

This is based on the notion of standardising the components of the measures that are to be included in the composite index. Standardisation arises from the fact that since individual components of the index tend to be measured in different units, a straight forward summation of the components of the index would be invalid (Briguglio 2003). Hence, for the composite index to have some kind of uniform units of measurement the individual components must be standardised or normalised in order to allow for multiplicative or additive averaging.

A commonly used normalisation procedure is one that adjusts observations so that they take a value of between 0 and 1, using the following formula:

$$V_i = (X_i - Min\,X_i)/(Max\,X_i - Min\,X_i) \qquad (1)$$

Where: V_i is the standardised vulnerability score with regard to vulnerability component *i*;

X_i is the observed value of the vulnerability component *i*; $Max\ X_i$ and $Min\ X_i$ are the maximum and minimum values of vulnerability component i, respectively.

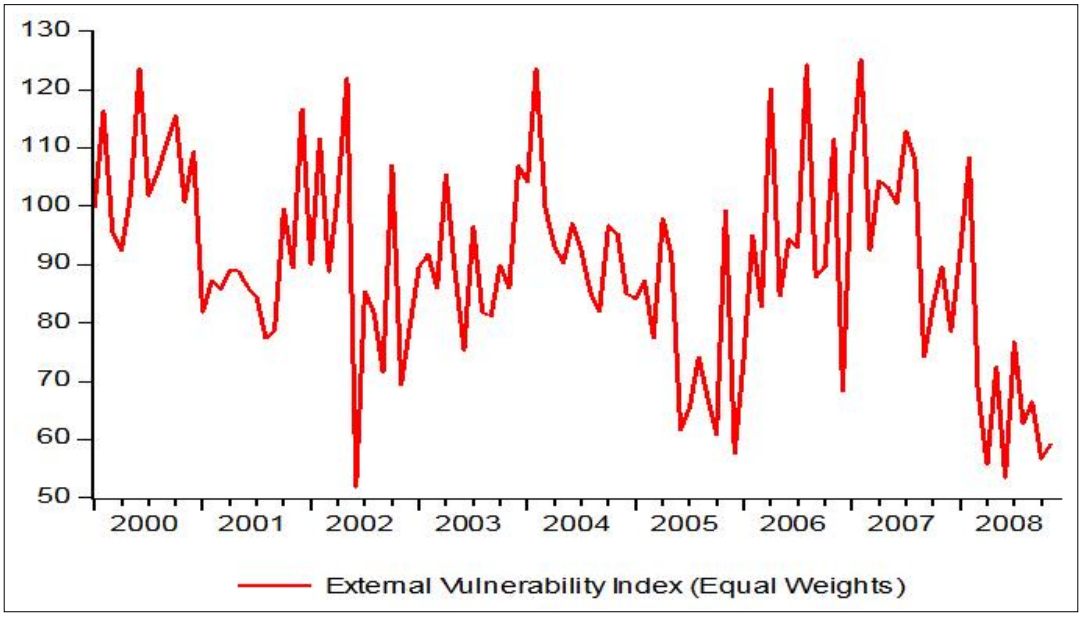
As noted above, the use of this approach results in values of the vulnerability component that will take the values of between 0 and 1. If X_i (observed value) is the minimum in the range of values, V_i would be close to zero; and if X_i is the maximum in the range of values, V_i would take the value of 1. This method has been used by several authors in the computation of vulnerability indices, including Briguglio (1992; 1995; 1997), Chandler (1996) and Crowads (1997).

Once the components to be included in the composite vulnerability index have been normalised, they can be summed up on the basis of equal or varying weights being assigned to each of the components. However, Briguglio (2003) notes that one of the important weaknesses of this approach is that the weights for averaging the components of vulnerability are arbitrarily chosen, and that the distribution of the normalised variables tend to be heavily influenced by outlier observations.

In terms of the steps followed in the construction of the index, the first step involved the normalisation of individual components of the index using the normalisation procedure discussed above. Normalisation or standardisation is aimed at ensuring that the components of the composite index are scale free in order to have some kind of uniform units of measurement for the individual components of the index. Using the normalisation procedure (also referred to as the range equalisation method), the minimum and maximum values of each of the variables are identified and the component scores are obtained by "...subtracting the minimum value of the particular variable from its actual values and dividing by the difference between the selected maximum and minimum values" (Thiessen, 1997).

Following the derivation of the component scores for each of the variables included in the composite index, the next step was to obtain the average of the component scores, taking into account the weights attached to each of the components. The average of the component scores are then converted to an index number. In this regard, the resultant composite index is taken to be EVI which is the weighted average of the standardised components that are intended to capture the economy's exposure to external shocks. The EVI is then considered to be a proxy for measuring external vulnerability (see Chart 8).

Chart 8 EVI


130
120
110
100
90
80
70
60
50
2000
2001
2002
2003
2004
2005
2006
2007
2008
External Vulnerability Index (Equal Weights)

CHAPTER THREE

An Alternative Computation of the Money Multiplier for Zambia

By

Francis Z. Mbao

Abstract

In Zambia, the money multiplier is computed as a ratio of broad money to reserve money. This formulation of the money multiplier deprives the monetary authorities' understanding of the underlying economic factors influencing the dynamics of the money multiplier. This paper proposes an alternative money multiplier that can contribute to understanding changes in the behaviour of economic agents in terms of how it influences the dynamics of the money multiplier. When fitted with the data, the new measure of the money multiplier appears to largely move in the same direction as the old one. Further, it shows that different factors - among them time deposits, Government deposits, and currency in circulation- have played different roles in the changes of the money multiplier over the period analysed in this paper.

I Introduction

A multiplier in economics is a factor of proportionality that measures how much an endogenous variable changes in response to a change in some exogenous variable. The money multiplier in this context is basically a mathematical relationship between broad money supply (BM) taken to be an exogenous variable and the monetary base or reserve money (RM), which is taken to be an endogenous counterpart. The money multiplier is meant to illustrate the increase in the amount of cash in circulation generated by the banks' ability to lend money out of their depositors' funds. This money-creating ability by banks is however, a function of the fractional reserve system under which banks are required to set aside a portion of the depositors' funds. It is also constrained by the core liquid asset ratio system as well as the risk-return considerations for investing in government securities and central bank open market operations instruments. The investment decisions related to these actions may reduce/increase the banks' current account balances at a particular time. The surplus funds that will be available to the banks subject to the measures above may be converted into loans, thereby increasing the available cash by a factor that is a multiple of the initial deposit.

Although there are many approaches to the process of determining the stock of money in the economy, the money multiplier is widely used for this purpose. This is because the changes in the money multipliers reflect the portfolio decisions of commercial banks, non-bank public and the monetary authorities. Thus the money multiplier is useful to all central banks whether they are inflation targeters or they target monetary aggregates in their quest to deliver on their mandate of price stability.

Currently in Zambia, the money multiplier is computed as a ratio of BM to RM. While this expression does not violet the definition of the money multiplier, it deprives the monetary

authorities of an understanding on the underlying economic factors that are causing its changes. This paper proposes an alternative money multiplier that will contribute to the understanding of the changes in the behaviour of economic agents and their impact on the money multiplier and consequently money supply.

The paper presents the literature review in section two and discusses some measures of the money multiplier in section three. It presents the proposed (alternative) measure of the money multiplier for Zambia in section four and it concludes in section five.

II Literature Review

Developments in the theoretical and empirical works on the money multiplier in the early years are associated with Freidman and Schwartz (1960), Bruner and Meltzer (1964), Hosek (1970), Bomhoff (1977) and others. In recent years, literature on the money multiplier largely depends on empirical issues about the subject matter for both developed and developing countries. These include, among others, Bilquees (1993), Gökbudak (1995), Anderson and Rasche (2000), Carpenter and Demiralp (2010), Yong (undated),

Gökbudak (1995) argues that provided the monetary base (RM) is under the control of the monetary authority, the determination of the reasons behind the changes in the money multiplier becomes important in the implementation of monetary policy. In this regard he postulates that central banks that have chosen the money stock as nominal anchor to provide price stability must first choose a monetary aggregate which incorporates all the instruments it uses to implement the monetary policy. Second, the relationship between the monetary aggregate and the money supply; i.e., the money multiplier must be stable and predictable. He further argues that given that RM is under the control of the Central Bank, it could only achieve its primary objective of providing the price stability by controlling the money multiplier as much as possible.

Yong (2010) remind us that RM consists of currency and reserves. Currency as supplied by the central bank on demand reflects the preference of liquidity from the public in holding currency rather than the impact of monetary policy. Reserves are associated with financial institutions and include both required reserves as well as excess reserves. The central bank has influence over the required reserves through the reserve requirement ratio, which is a specific percentage of total deposit and it is one of the determinants of the money multiplier. However, the central bank has no influence over the excess reserve and this is the buffer managed by commercial banks to adjust their positions in credit expansion or contraction in the short-run and this dynamic development has implications on the money multiplier.

Gökbudak (1995) identifies some more factors that cause variations in the money multiplier such as changes in the composition of deposits between demand and time deposits, changes in the composition of money between currency and deposits and the commercial banks' behaviour in holding excess reserves. These factors are all said to be outside the control of the monetary authority.

A study by Carpenter and Demiralp (2010), notwithstanding, casts doubts on the existence of the money multiplier. By exploring the institutional structure of the transmission mechanism beginning with open market operations through to money and loans, they undertook an empirical analysis of the relationship among reserve balances, money, and bank lending using the aggregate as well as bank-level data in a VAR framework. They have concluded that the mechanism does not work through the standard multiplier model or the bank lending channel. They particularly argue that if the level of reserve balances is expected to have an impact on the economy, then a standard money multiplier (a simple one that is) will not explain the effect.

III Measures of the Money Multiplier

There are many forms of money multipliers.They range from basic to the so called complex ones. The following are some of the examples.

Basic Money Multipliers

One of the basic money multipliers is the ratio of MS to RM, defined as;

$$money multiplier = \frac{MS}{RM}, \ldots\ldots\ldots\ldots\ldots \quad (1)$$

The advantage with this identity is its simplicity in computation. However, it does not help one to decipher the economic behaviour of various economic agents with regard to their portfolio decision making during a particular time.

Another example of the simple money multiplier is one which is the reciprocal of the reserve ratio. To generate this, we need to consider the mechanical theories of money supply. These theories are mechanical in the sense that they are identities, that is, they are not behavioural equations that may be used to compute money supply.

Let us assume that commercial banks hold a certain reserve (R) of demand deposits (D) influenced by the central bank determined reserve ratio (r) for the purpose of onward lending, then R will be defined as

$$R = rD \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (2)$$

The stock of money supply to be created out of R through lending by the banking system will be influenced by the reciprocal of 'r'. That is,

$$money\ multiplier = \frac{1}{r} = \frac{D}{R} \ldots\ldots\ldots\ldots\ldots \quad (3)$$

This multiplier does not show the banks, government and members of the public's behaviour in the process of money creation through deposits multiplier because all forms of deposits are lumped together.

In the formulation above, money increases by 1/r and lending increases by (1-r)/r. Open market operations (OMO) related to purchases of securities held by banks (or if related to net OMO maturities) increases the quantity of reserves. But because of fractional reserve accounting, banks can lend out extra funds and the extra lending capacity so created increases both lending and the money supply since loans are created as demand deposits. The situation is symmetric and consequently contractionary monetary policy works in the opposite direction.

Complex Money Multipliers

Using the Freidman and Schwartz (1963) money supply equations that incorporate the reserve/deposit ratio of banks as well as the currency/deposit ratio that reflects the public economic behaviour, the complex money multiplier ratios derivation is detailed below.

$$MS=C+D,\ldots\ldots\ldots\ldots\ldots \quad (4)$$

$$RM=R+C\ldots\ldots\ldots\ldots\ldots\ldots \quad (5)$$

$$\text{and } MS=(moneymultiplier)RM\ldots\ldots\ldots \quad (6)$$

where,

MS=Money Supply

C=currency in circulation

R=Commercial banks reserves

D=Demand deposits

RM=Reserve Money

Incorporating equations (4) and (5) into equation (6), we obtain;

$$C+D=(moneymultiplier)R+C$$

or

$$moneymultiplier=\frac{(C+D)}{(R+C)}$$

The expression above can be rewritten as,

$$moneymultiplier=\frac{(1+D/C)}{(R/C+1)}$$

Dividing both sides by (D/R), we obtain;

$$moneymultiplier=\frac{((1+D/C)(D/R)}{((R/C+1)(D/R)}$$

Therefore,

$$money\ multiplier=\frac{((1+D/C\ )(D/R))}{((D/R+D/C)\ )}\ \ldots\ldots\ldots \quad (7)$$

The money multiplier in equation (7) is determined by two factors, the reserve ratio (D/R) and the currency ratio (D/C). The reserve ratio reflects the commercial banks required reserve deposits at the central bank and their demand for free reserves for credit creation purposes. The currency ratio depicts members of the public's demand for money in the economy.

The disadvantage with this measure of money multiplier is that it does not distinguish deposits into various forms that include time, government and demand deposits. The money multiplier with such features is formulated through the process depicted below,

$$R=r(D+T+G)\ldots\ldots\ldots\ldots \quad (8)$$

where,

r=Average weighted reserve

T=tD,Time deposits

G=gD,Government deposits

In the expression above, R and D are as defined before while the average weighted reserve ratio is computed by dividing total commercial banks reserve deposits by total deposits in the entire banking system.

Further, currency in circulation is expressed as indicated in equation (9) below.

$$C=cD \ldots\ldots\ldots\ldots\ldots \quad (9)$$

Substituting equations (8) and (9) into equation (5) we obtain;

$$RM = r(D + T + G) + c(D)$$
$$RM = r(D + tD + gD) + c(D)$$
$$RM = [r(1 + t + g) + c]D$$

or,

$$D=\frac{1}{[(r(1+t+g)+c)]}\,RM \ldots\ldots\ldots\ldots \quad (10)$$

Substituting equation (10) into (9), we obtain;

$$C=c\,\frac{1}{[(r(1+t+g)+c)]}\,RM$$

$$C = \frac{c}{[(r(1 + t + g) + c)]}\,RM \ldots\ldots\ldots\ldots \quad (11)$$

Substituting equations (10) and (11) into (4), we obtain;

$$MS = [\frac{c}{(r(1 + t + g) + c)}]RM + [\frac{1}{(r(1 + t + g) + c)}]RM \ldots\ldots\ldots\ldots \quad (12)$$

or,

$$MS = \frac{1 + c}{[r(1 + t + g) + c)]}RM \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \quad (13)$$

Equation (13) conforms to equation (6), where

$$money\ multiplier = \frac{1+c}{r(1+t+g)+c)} \ldots\ldots\ldots \quad (14)$$

The advantage with this measure of the money multiplier is that it distinguishes deposits into various forms that include time, government and demand deposits whose influence on the changes in the money multiplier at a particular time can make one draw some economic meaning. Other advantages with this measure are that, it reflects the public's desired ratio of time deposits to demand deposits, Government's deposits in commercial banks to total demand

deposits. The disadvantage with this measure, however, is that it depends on the availability and quality of data.

Another known complex money multiplier is the Hosek's money multiplier presented in equation (15).

$$money\ multiplier = \frac{(1+K+T)}{(r+TR\text{-}B)(1+T)+K)} \ldots\ldots\ldots \quad (15)$$

K = Currency to demand deposit ratio

T = Time deposits to demand deposit ratio

TR = Total reserves of banks to total deposits

B = Ratio of borrowing from the central bank to total deposits

r = reserve ratio

This measure is fundamentally the same as the one in equation (14). The only difference is that it incorporates the central bank lending to commercial banks. Other than this difference, the two measures have similar advantages and disadvantages.

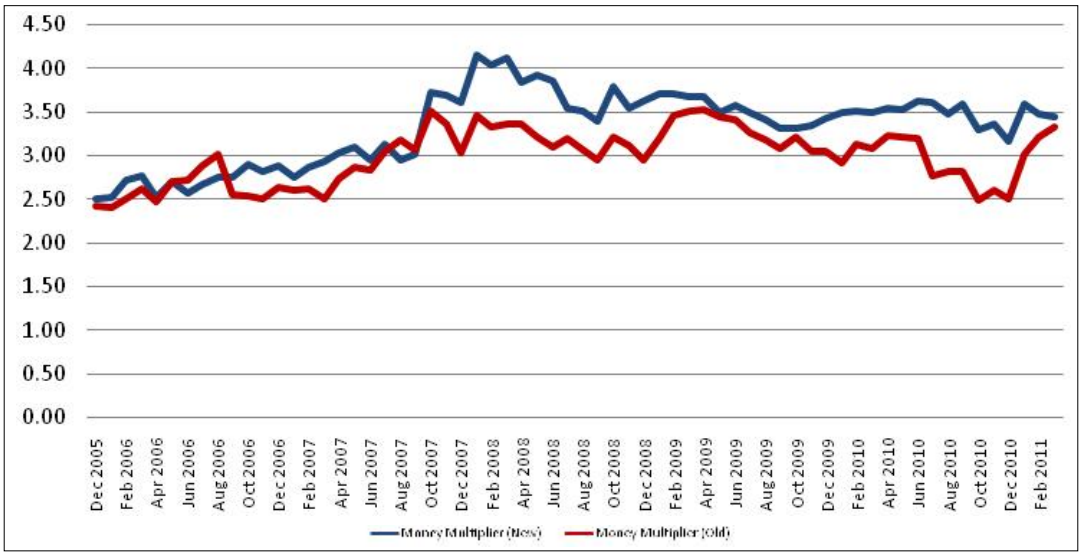
IV The Alternative Money Multiplier for Zambia

The alternative measure of the money multiplier being proposed for Zambia is the one presented in equation (14). The rationale for this choice lies in the advantages associated with it. Also when compared to the Hosek's formulation, borrowing from the central bank by commercial banks in Zambia is minimal by frequency at least for the time being although a window, the overnight lending facility, has been made available to commercial banks since December 2009.

When fitted with data, the series of the proposed money multiplier (new) appears as shown in the chart below and is compared with the old money multiplier. The money multiplier series shows a significant rise after October 2007. This rise is in response to the lowering of the statutory reserve ratio on both Kwacha and foreign currency deposit liabilities to 8.0% from 14.0% in October 2007. A comparison between the alternative measure of the money multiplier and the old one shows the two generally moving in the same direction.

The series of the two money multipliers are not exactly the same in terms of magnitude. This is for the reason being that, as in the words of Cressie and Laslett (1997), "…theoretical models are not expected to represent the data exactly but at the very least they act as a sorting device that directs a data analyst to efficient ways of extracting information." This whole thing can be explained by randomness in the data set and the fact is two realisations of the same random phenomenon will not be exactly the same.

Chart: Money Multiplier Developments, Dec 2005 - Feb 2011



Interpretation of the new Measure of the Money Multiplier

The interpretation of the money multiplier should be done in the context of the changes in its determinants, namely the Average Weighted Reserve Ratio (r), the Time-Demand Deposit Ratio (t), and the Government Deposits-Demand Deposit Ratio (g). The mathematical intuition of the influence of the determinants on the money multiplier postulated above is detailed below:

Recall equation (14),

$$\text{money multiplier} = \frac{1+c}{r(1+t+g)+c)}$$

Differentiating partially the money multiplier in the equation above with respect to each of its determinants yield negative relationships as shown below,

$$\frac{\partial(moneymultiplier, mm)}{\partial r} < 0$$

$$\frac{\partial(mm)}{\partial t} < 0$$

$$\frac{\partial(mm)}{\partial g} < 0$$

From the expressions above, r, t and g have a negative influence on mm given the signing after the natural logarithm. This is an indication that a rise in each of these influencing factors causes mm to decline and the opposite is true.

To generate the relevant information that can help in the analysis of the money multiplier with the view of extracting economic intuitions, one should organise the relevant information as presented in Table 1.

Table 1: Developments in the Money Multiplier and its Determinants, November 2010 – February 2011

Description	Nov 2010	Dec 2010	%Δ	Jan 2011	%Δ	Feb 2011	%Δ
Money Multiplier (MM)	3.4	3.2	-6.0	3.6	13.9	3.5	-3.4
Average Weighted Reserve Ratio (r)	0.097	0.115	18.4	0.104	-9.8	0.100	-3.2
Currency /Demand Deposit Ratio (c)	0.190	0.196	3.2	0.158	-19.6	0.171	8.3
Time Deposits/Demand Deposit Ratio(t)	0.203	0.211	4.1	0.183	-13.4	0.207	13.3
Govt Deposits/ Demand Deposit Ratio (g)	0.349	0.274	-21.5	0.286	4.3	0.300	5.0
Excess Reserves/Demand Deposit Ratio	0.404	0.406	0.5	0.319	-21.4	0.327	2.4

With the help of the Table above, the changes in the money multiplier can be interpreted in light of the changes in the Average Weighted Reserve Ratio (r), the Time/Demand Deposit Ratio (t) and the Government Deposit/ Demand Deposit Ratio (g). A detailed explanation of the developments in the money multiplier follows:

December 2010

The money multiplier declined in December to 3.2 from the 3.4 recorded in November 2010, representing a 6.0% change, mainly as a result of the rise in the currency to demand deposit ratio. The other contributing factor was the increase in the average weighted reserve ratio and the time deposits to demand deposit ratio. However, the fall in the Government deposits to demand deposit ratio moderated the decline in the money multiplier.

The currency/demand deposit ratio rose by 3.2% to 0.196 from the 0.190 recorded at end-November 2010. The average weighted reserve ratio expanded by 18.4% to 0.115 from the 0.097 at end-November 2010 while the time deposits/demand deposit ratio increased to 0.211 (end-November 2010 the ratio was 0.203), reflecting a 4.1% increase. The Government deposits/demand deposit ratio declined by 21.5% to 0.274 from the 0.349 recorded at end-November 2010.

The economic intuition that can be drawn from this is that the portfolio decisions by various economic agents were such that commercial banks' ability to create money through loans reduced in the month of December 2010. This was due to members of the public increasing their holdings of cash as reflected in the increase in the currency/demand deposit ratio and commercial banks increasing the funds set aside for reserve requirement owing to the increase in the average weighted reserve ratio.

January 2011

In January 2011, the money multiplier increased by 13.9% to 3.6 from the 3.2 recorded in December 2010. This was largely on account of the fall in the time deposit to demand deposit and the currency to demand deposit ratios as well as the decline in average weighted reserve ratio. All the same, the rise in the Government deposits to demand deposit ratio moderated the expansion in the money multiplier.

The time deposits/demand deposit ratio declined by 13.4% to 0.183 from the 0.211 recorded the previous month while the currency/demand deposit ratio fell by 19.6% to 0.158 from 0.196 at end-December 2010. Government deposits to demand deposit ratio increased to 0.286 from the 0.274 at end-December 2010, representing a 4.3% change.

The implication of these developments is that commercial banks portfolio decisions resulted into the creation of more money in the month of January 2011 as the excess reserves fell to 0.319 (December 2010, the ratio was 0.406). This was reflected in the declines recorded in

respect of the time deposits as indicated above and it means that the stock of loans on the commercial banks' balance sheet increased on a net basis. The public's portfolio decision in the month of January was to hold less money outside the banking system and this resulted into the fall in currency in circulation and consequently part of this found itself in the banking system and in turn enhanced the banks' ability to undertake more credit creation resulting into the increase in the money multiplier.

February 2011

The money multiplier declined by 3.4% to 3.5 from the 3.6 recorded in January 2011 mainly as a result of the increase in the ratio of time deposits to demand deposits by 13.3% to 0.207 from 0.183 the previous month. The rise in the currency to demand deposit ratio, which increased by 8.3% to (0.171) from the 0.158 recorded in January 2011, also contributed to the reduction in the money multiplier. Equally, the increase in the ratio of Government deposits to demand deposits by 5% to 0.30 from 0.286 accounted for the decline in the money multiplier. Even so, the fall in the average weighted reserve ratio moderated the decrease in the money multiplier as it fell by 3.2% to 0.10 from the 0.104 recorded in the previous month.

The implications of the developments described above means that commercial banks' ability to create money in February 2011 slowed down as reflected in the 2.4% expansion in their excess reserves to demand deposit ratio to 0.327 compared with the 0.319 in January 2011. This is as a result of the unutilised time deposits that increased as a ratio of demand deposits. During the same month, members of the public's portfolio decision was that of increasing its holding of currency and this further deprived the commercial banks' money creation ability.

V Conclusion

Currently in Zambia, the money multiplier is computed as a ratio of BM to RM and is a basic formulation of the money multiplier, which deprives the monetary authorities of an understanding on the underlying economic factors influencing its dynamics. It is for this reason that this paper has proposed an alternative approach to computing the money multiplier that can contribute to understanding changes in the behaviour of economic agents.

The proposed money multiplier for Zambia when fitted with the data shows that the proposed money multiplier and the old one generally moved in the same direction. The analysis of the developments among the determinants of the money multiplier shows that different factors- among the time deposits, government deposits and currency in circulation- have played different roles in influencing the changes in the money multiplier and thereby provide some economic intuitions to the changes in the money multiplier.

References

Anderson, R.G and Rasche, R.H. (2000), The Domestic Adjusted Monetary Base, Working Paper 2000-002A, Federal Reserve Bank of St. Louis.

Bilquees, F. (1993), Determinants of Money Multipliers, The Pakistan Development Review (winter edition).

Carpenter, S. and Demiralp, S. (2010), Money, Reserves, and the Transmission of Monetary Policy: Does the Money Multiplier Exist? Finance and Economics Discussion Series, Divisions of Research & Statistics and Monetary Affairs - Federal Reserve Board, Washington, D.C.

Cressie, N. and Laslett, G.M. (1987), "Random Set Theory and Problems of Modelling", SIAM[1] Review, Vol. 29. No 4.

Freidman, M., and Schawrtz, A. (1960), AMonetary History of the United States: 1957-1960, NBER Princeton University Press.

Gökbudak, N (1995), Money Multiplier and Monetary Control, Türkiye Cumhuriyet Merkez Bankasi- Tartışma Tebliği No: 9505.

Handa, J. (2000), Monetary Economics, New York, Routledge.

Hosek, W. R. (1970), Determinants of Money Multiplier, Quarterly Review of Economics and Business.

Mishikin, F. (2004), The Economics of Money, Banking, and Financial Markets, (7th Edition), Pearson Addison Wesley.

Yong, C. (2010),The Endogenous Money Supply Growth and the Limitation of China's Monetary Policy , School of Economics, Nanjing University, China (aycao@nju.edu.cn).

[1]Society for Industrial Applied Mathematics

CHAPTER FOUR

Does the Copper Price Explain the Deviation of the Real Exchange Rate from the Purchasing Power Parity Equilibrium in Zambia?

By

Emmanuel Mulenga Pamu

Abstract

In an effort to enhance understanding of the dynamics of the equilibrium exchange rate in Zambia, this paper provides an empirical investigation of the relationship between the international price of copper and the real exchange rate. A casual observation reveals causal relationship between the copper price and the real exchange rate, including the nominal exchange rate. This is particularly important for a country such as Zambia, which is heavily dependent on copper. However, empirical evidence in other countries shows strong cointegration between commodity prices and the real exchange rate, this is not the case for Zambia's copper. These results suggest that there are other factors that may explain this relationship. The result may also suggest the increasingly important role of non-traditional exports in explaining the real exchange rate dynamics. However, the results do support the view that an increase in the international copper price is associated with an appreciated real exchange rate despite this not being strong.

I Introduction

During the 2000s, the real exchange rate in Zambia appreciated sharply. An appreciation of this magnitude raises the question as to what extent can it be considered an equilibrium phenomenon (that is, consistent with the movement in economic variables that fundamentally affect the real exchange rate) rather than a temporary deviation from equilibrium. If the latter is the case, then the question is, how long does it take for this temporary deviation to dissipate? Figure 1, shows that between 2004 – 6 a persistent appreciation in the REER was associated with a rise in the international copper price. A casual inspection of figures 1 and 2 clearly suggests a close relationship between the real exchange rate and copper price. It is important to note that during the same period, Zambia benefited from substantial debt reductions under the Heavily Indebted Poor Countries Initiative (HIPC) and the Multilateral Debt Relief Initiatives (MDRI).

However, Pamu (2002), found a negative relationship between the copper price and the real exchange rate in Zambia. However, this relationship was statistically insignificant, a phenomenon which was attributed to the heavy external debt. When an economy is heavily indebted, the windfall arising from the positive copper price shock is used for debt repayments rather than for increasing domestic consumption and investment. Following the debt reductions, therefore, one would expect a stronger relationship between the real exchange rate and the copper price. This paper seeks to determine whether indeed this is the case. Section II

provides a brief review of the literature on the equilibrium real exchange rate. Section III presents a test for purchasing power equilibrium in Zambia, while section IV concludes.

Figure : Real Exchange Rate Index

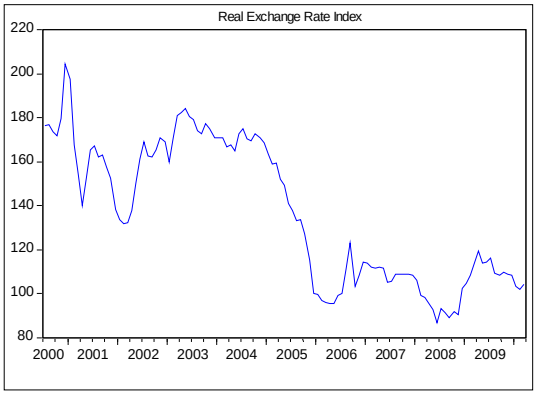
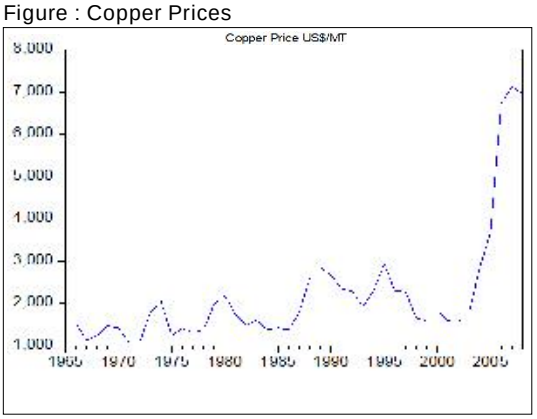


Figure : Copper Prices



II Literature

The current literature on the equilibrium real exchange rate indicates that Purchasing Power Parity (PPP) is not an appropriate model for the determination of the equilibrium exchange rate because of the slow mean reversion of the real exchange rates to a constant level (which is the long run equilibrium implied by the PPP assumption). As a result, there has been a shift away from the PPP based measures to ones based on the link between the real exchange rate and real determinants, such as productivity, the terms of trade, and net foreign assets.

The Purchasing Power Parity is a theory of exchange rate determination, which asserts that the exchange rate changes between two currencies over any period of time is determined by the change in the two countries relative price levels. Because the theory singles out the changes in the price level as the overriding determinant of exchange rate movements, it has also been called the “inflation theory of exchange rate determination”

The PPP theory is flawed by the implicit assumption that the equilibrium exchange rate is a static phenomenon. Recent literature has acknowledged changes in the equilibrium exchange rate as fundamentals change. According to MacDonald and Ricci (2003), “The main explanatory variables identified in the literature for developing countries include commodity price movements or terms of trade, productivity and real interest differentials compared with trading partners, measures of openness of trade and exchange system, the size of the fiscal balance, and the extent of net foreign assets. The rationale for most variables is based on a simple neoclassical framework that assumes the prices of tradable goods are equalised across countries and investigates how changes in the real exchange rate arise mainly as a result of the movements in the price of non-tradables across countries.”

The classic example of an equilibrium deviation from PPP is the Balassa–Samuelson effect. If a country experiences an increase in the productivity of the tradable sector (relative to its trading partners), its real exchange rate would tend to appreciate. Higher productivity raises incomes which lead to an increase in the price of non- tradables relative to trading partners. An increase in the world price of commodities which a country exports would also lead to an appreciation of the real exchange rate. Many researchers find strong cointegration between commodity prices and the real exchange rate. However, this does not seem to be the case between the real exchange rate in Zambia and the international price of copper.

The real interest rate differential could represent several factors - aggregate demand, productivity and persistent monetary policy - all point to positive relationship with the real exchange rate, meaning that a positive real interest rate differential is associated with an appreciation of the real exchange rate. First an increase in absorption relative to savings would put upward pressure on interest rates in an economy with less than perfect capital mobility. At the same time, the demand for both tradable and non-tradable goods would increase, inducing an increase in the relative price of non-tradable goods and thus appreciating the real exchange rate. Second, real interest rate differential could also reflect productivity differentials: to the extent that the measure employed to proxy for the Balassa-Samuelson effect is not perfect, the real interest differential may help capture this empirically. Similarly, if productivity rises relative to trading partners, capital will flow to the home country and appreciate the real exchange rate. Third, a tightening of monetary policy would raise real interest rates- an outcome that would need to be associated with an expected currency depreciation given the interest parity condition. Hence, the nominal exchange rate would have to appreciate beyond its long run value so as to allow the expected depreciation to occur once the monetary shock has disappeared, a phenomenon described as 'overshooting effect' (Dornbusch,1976). In the presence of price rigidities, the real exchange rate could be appreciated relative to its long run value. This effect could be persistent if the monetary shock - that is the rise in interest rates is persistent. In this sense, the cointegration analysis would capture this effect as part of the long run relation.

An improvement in the fiscal balance will have an ambiguous effect on the real exchange rate. On the one hand, depreciation would tend to occur because the improved fiscal balance would normally induce less than proportional reduction in private savings, so that total domestic demand falls and overall savings would increase. As part of the decline in spending falls on non-tradables, their prices would tend to drop, bringing about a depreciation of the real exchange rate. The effect is likely to be stronger if the fiscal improvement comes from a reduction in government consumption, as opposed to an increase in taxes, to the extent that government consumption falls more intensively on non-tradable goods than private spending. On the other hand, a further effect would operate on the relative price of traded goods in a model which features stock-flow consistency (such as the portfolio balance model). In such a model, the current account surplus generated by the initial real depreciation would have to be annihilated in the long run by a real appreciation which ensures a sufficient trade deficit to offset the positive net foreign assets.

A more open economy is likely to be associated with a more depreciated real exchange rate. Trade restrictions increase the domestic price of tradable goods, thereby raising the overall price level and the real exchange rate. In most empirical work, openness is proxied by the ratio of exports plus imports to GDP.

The size of net foreign assets is likely to be associated with a more appreciated exchange rate in the long run. Higher net foreign assets induce larger expenditure on domestic goods, thus raising the price of non-tradables, and appreciating the real exchange rate. An alternative mechanism is based on the price equalisation of tradables: a country that reaches a higher level of net foreign assets can afford to finance a worse current account balance and can thus sustain a loss in competitiveness associated with a more appreciated real exchange rate.

Due to the difficulty in measuring most of these variables, this paper attempts to isolate the significance of the international price of copper as a starting point. A casual observation reveals some causal relationship between the copper price and the real exchange rate, including the nominal exchange rate. This is particularly important for a country heavily dependent on copper such as Zambia. This paper therefore seeks to determine the statistical significance of this relationship in the sections that follow.

III Testing for Purchasing Power Equilibrium in Zambia

Data and Methodology

We start our analysis by determining the time series characteristics of the variables that go into the computation of the real exchange rate in Zambia. Thus, we carry out unit root tests for the real exchange rate (reer), the nominal effective exchange rate (neer), the foreign consumer price index (cpif) and the domestic price index (cpid). The results presented in Table 1 show that all the variables have a unit root and are integrated of order 1.

Table 1 Augmented Dickey Fuller Test Results

Variable	neer	cpid	cpif	reer
Order of Integration	1	1	1	1

According to Rogoff (1996), real exchange rates tend to move towards purchasing power parity in the very long run. However, the speed of convergence is extremely slow with deviations dampening out at a rate of approximately 15% per year. In Zambia, however, the fact that the real exchange rate itself has a unit root implies that the combination of the nominal effective exchange rate, the foreign consumer price index and the domestic consumer price index defined by the real exchange does not define a cointegrating relationship. The non-stationarity of the real exchange rate also defines the dynamic nature of the real exchange rate as a variable that is not mean reverting but changing all the time, driven by a set of fundamentals. As indicated earlier, the most obvious of these from the literature are the terms of trade, productivity, government expenditure and net foreign assets.

Cointegration

By definition, one would expect the equilibrium exchange rate to be stationary under a flexible exchange rate regime, such as we have in Zambia, in the absence of shocks that affect the equilibrium exchange rate itself. In the real world, the equilibrium exchange rate is not static. Rather it is dynamic and changes continuously as the fundamentals change. It is expected that the nominal exchange rate continuously responds to the changes in the equilibrium exchange rate as the fundaments are changing. However, it is also true that in the short term, the behaviour of speculators can drive the exchange rate in a direction not warranted by movements in economic fundamentals. Nonetheless, it could also be argued that rational speculators make use of fundamental information in forming their expectations.

The results of cointegration tests in Table1 between the nominal effective exchange rate, the domestic CPI and the foreign CPI indicate that there is no cointegration equation at the 5 percent level of significance. The absence of a cointegrating relationship between these variables is consistent with the non-stationarity of the real exchange rate determined earlier.

Table 2: Cointegration Results Based on the Maximum Eigen Value Statistic

Rank	Trace Statistic	5% Critical Value
None	24	29
At most 1	9	15
At most 2	2	4

Despite the non-existence of a long run equilibrium relationship among the variables of interest, it is informative to present the results of the normalised cointegrating coefficients in Table 3.

Table 3: Normalized cointegrating coefficients (Standard errors in parenthesis)

neer	cpid	cpif
1	-102.2	407
	(27.1)	(105.97)

The results are consistent with the inflation theory of exchange rate determination with the nominal exchange rate depreciating as domestic inflation increases and appreciating as foreign inflation rises relative to domestic prices. These results suggest that the behaviour of the nominal exchange rate in Zambia is consistent with relative purchasing power parity (as opposed to absolute power parity).

The fundamental assumption of the PPP is that the equilibrium exchange rate is constant and the nominal effective rate will change to revert to the equilibrium exchange rate as relative prices change. However, the equilibrium real exchange rate changes as key fundamentals change. We now look at the dynamics of the real exchange rate in the following subsection.

Dynamics of the Real Exchange Rate in Zambia

Both, the Phillips-Perron and Augmented Dickey Fuller test statistics indicate that the real exchange rate has a unit root implying that it is not stationary and changes as economic fundamentals are changing. Anecdotal evidence suggests that a key variable that influences exchange rate developments in Zambia is the copper price. We therefore determine the relationship between the real exchange rate and copper prices using cointegration.

The results in Table 3 indicate that there is no cointegration between the real exchange rate and the international price of copper. This is an interesting result as it has been quite common recently to assume a strong association of the real exchange rate with the copper price. In view of this, we also present the results of the normalized cointegrating coefficients despite the absence of cointegration.

Table 4: Cointegration Results Based on the Trace Statistic (Copper price and reer)

Rank	Trace Statistic	5% Critical Value
None	11	15
At most 1	1.45	3.8

The normalised cointegrating coefficients indicate a negative relationship between the copper price and the real exchange rate implying that an increase in the international price of copper is associated with an appreciation of the real exchange rate. The absence of an equilibrium relationship signifies the importance of other variables in the determination of the equilibrium real exchange rate in Zambia.

Table 5: Normalized cointegrating coefficients

reeri	cup
1	0.014277
Standard error	(0.00241)

Before we can draw any formal conclusion on the significance of the copper price in explaining real exchange rate dynamics, we use variance decompositions from a vector autoregression (VAR) model to determine the significance of the copper price. The structural shocks are identified using the Cholesky decomposition which is implemented by ordering the variables with the copper price (exogenous variable) coming first. The results of variance decompositions are shown in Table 5.

Table 6: Variance Decomposition of the Real Exchange Rate

Period	Copper Price	Real Exchange Rate
10	2	98

The results show that only 2 percent of the variation in the real exchange rate is explained by variations in the international price of copper. We do a similar exercise for the relationship between the nominal exchange rate and the copper price and the results are presented in Table 6.

Table 7: Variance Decomposition of the Real Exchange Rate

Period	Copper Price	Nominal Exchange Rate
10	6	94

The above results show that only 6 percent of the variation in the Kwacha/US dollar nominal exchange rate is explained by the variation in the copper price.

IV Conclusion

The results of cointegration tests suggest that the copper price alone does not have a long run equilibrium relationship with the real exchange rate, symptomatic of the importance of other factors in determining movements in the real exchange rate and the nominal exchange rate. The main explanatory variables identified in the literature for developing countries include the terms of trade, productivity and real interest differentials compared with trading partners, measures of openness of trade and exchange system, the size of the fiscal balance, and the extent of net foreign assets. This result may also suggest the increasingly important role of non-traditional exports in explaining the real exchange rate dynamics. However, the results do support the view that an increase in the international copper rise is associated with an appreciated real exchange rate.

References

Agenor, Pierre-Richard.1998. Capital inflows, External Shocks, and the Real Exchange Rate. Journal of International Money and Finance 17:713-740.

Balassa, Bela. 1986. Developing Country Policy Respionses to Exogenous Shocks.AER 76, NO.2:75-78.

Bevan, David, Paul.J Collier, and Willem Gunning.1994. Controlled Open Economies. A Neo-classical Approach ro Structuralism: Clarendon Press. Oxford.

Bleaney, Michael and David Greenaway.2001. The impact of terms of trade and real exchange rate volatility on investment in sub-Saharan Africa. Journal of development Economics 32:315-335.

Corden, W.M.1984. Booming Sector and Dutch Disease Economics. Survey and Consolidation. Oxford Economic Papers 36:359-380.

Devarajan, Shantayanan, Jeffrey D. Lewis, and Sherman Robinson. 1993. External Shocks, Purchasing Power, and the Equilibrium Real Exchange rate. World Bank Economic Review 7, no.1:45-63.

Kayizzi-Mugerwa, Steve.1991.External Shocks and Adjustment in a Mineral Dependent Economy: A Short Run Model for Zambia. World Development 19, no.7: 851-865.

Neary, J. Peter.1983. Real and Monetary Aspects of the Dutch Disease. In AUTE meetings. Oxford.

Pamu Emmanuel, 2002. Effects of External Shocks, External Debt and Stabilizations Policies on the Zambian Economy, PhD Dissertation.

Younger, Stephen D. 1992. Aid and the Dutch Disease: Macroeconomic Management When Everyone Loves You. World Development Vo.20, no.11:1587-1597.

CHAPTER FIVE

The Real Effective Exchange Rate and the Performance of the NTEs

By

Francis Z. Mbao

Abstract

This paper looks at how the real effective exchange rate (REER) and its volatility affect the performance of the non- traditional exports (NTEs) using monthly data for the period July 2000 to December 2009. An econometric model is used in the analysis and the results show that the REER and its measure of volatility have some adverse effect on the NTEs performance in the short run. The policy implication is that an appreciation in the REER is likely to adversely affect the competitiveness of Zambia's NTEs. In addition, the volatility of the exchange rate may make it difficult to plan production for the export market. In this regard, stability in the exchange rate is important in supporting the growth of the NTEs.

I Introduction

Since 2005, the exchange rate of the Kwacha against major currencies has been relatively volatile. Prior to this, the exchange rate of the Kwacha was largely characterised by a sustained depreciation since the liberalisation of the exchange rate.

The appreciation of the exchange rate of the Kwacha has prompted debate among the exporters particularly those involved in the non-traditional exports (NTEs)[1]. The debate rages on whether it is the nominal exchange rate or the effective exchange rate or indeed whether it is the volatility of the exchange rate that matters in Zambia's NTEs performance. An appreciation of the exchange rate tends to make domestic exports expensive in that importers will need additional resources to purchase the same volume of goods and services. This makes exports uncompetitive and thereby hampering exports. The impact of the exchange rate affects export earnings. The opposite is true in the case of depreciation.

The primary objective of this paper is to establish the influence of the real effective exchange rate (REER) and the volatility of the REER on the performance of NTEs using monthly data. From the survey of literature there seem to be no study on the relationship between the REER and the NTEs performance in Zambia using data on a monthly frequency. The paper is organised as follows: section two presents the literature survey on the export function, while section three outlines the export model. Empirical issues are presented in section four and section five offers concluding remarks.

[1]Non-traditional exports are those commodities exported from Zambia which are non-metal. This includes, among others, primary and processed agricultural products; cement and lime; sugar; floriculture and horticulture products; engineering products; yarn, lint , garments and other textile products; precious stones; and electricity

II Literature Survey

There is substantial empirical literature on export functions in general, as well as on the relationship between the real effective exchange rate (REER) and exports – both at aggregated and disaggregated levels. Furthermore, various studies (Siregar and Rajan, 2002; Egert and Zumaquero, 2008; Musonda, 2008) have shown that the relationship between exchange rate volatility and exports is of equal importance. Until recently, most of the literature has focused primarily on developed countries and, according to Egert and Zumaquero (2008), no conclusive link was found between the REER, exchange rate volatility and exports.

On the other hand, studies on less developed countries have found that in some cases, there is a statistically significant relationship between the REER and exports – if not at the aggregate level, then at the disaggregate level (Siregar and Rajan, 2002; Monfort, 2008; Musonda 2008; Egert and Zumaquero, 2008; Petreski and Kostoska, (2009). In a study on the export and import functions in Macedonia, Petreski and Kostoska(2009) found a statistically significant relationship between the REER and aggregate exports. Sahinbeyoglu and Ulasan (1999) also found a significant relationship between the REER and export demand and supply, albeit in the short run.

Conversely, Monfort (2008) found that in Chile, the elasticity of non-mining exports to the REER was insignificant at the aggregate level, although at the disaggregate level, the REER was significant and correctly signed for the industrial sector. The inclusion of variables for trade liberalization, lagged REER and supply factors into the aggregate export function did not improve results as expected. However, once a variable for exchange rate volatility was included, the coefficients on the REER and the volatility variable became significant and correctly signed.

Musonda (2008) in the study on the relationship between exchange rate volatility and non-traditional exports (NTEs) in Zambia yielded significant results for both the REER and exchange rate volatility using annual data. Siregar and Rajan (2002) also found a significant negative relationship between exchange rate volatility and exports in Indonesia. At the disaggregate level, exchange rate volatility was found to be significant for the manufacturing and chemical industries in Central and Eastern Europe (Egert and Zumaquero, 2008).

Other determinants that have been found to significantly explain export performance include foreign demand, terms of trade (TOT) and Foreign Direct Investment (FDI) (Monfort, 2008; Egert and Zumaquero, 2008; Musonda, 2008). Overall, the empirical literature suggests that there may be a significant relationship between the REER and exports.

III The Model

In modelling the impact of the REER on non-traditional exports (nte), this paper considers the standard export function from both the demand and supply sides. Real export supply (rxs) is taken to be a function of real domestic income (rdy), real effective exchange rate (REER) and exchange rate volatility (erv). This is augmented by foreign direct investment (fdi) as in Egert and Zumaquero (2008). Real export demand (rxd) on the other side is considered to be a function of real foreign income (rfy), the reer and the erv. Formally, the functions above are defined as follows:

$$rx^d = f(rfy, reer, erv) \quad \ldots\ldots\ldots \tag{1}$$

$$rx^s = f(rdy, reer, fdi, erv) \quad \ldots\ldots\ldots\ldots \tag{2}$$

In linear form, the models above are expressed and considered as follows:

a. Export supply function

$$rx^d = f(rfy, reer, erv) \quad \ldots\ldots\ldots\ldots\ldots \tag{3}$$

b. Export demand function

$$rx^d = \beta_2 + \beta_{21} rfy + \beta_{22} reer + \beta_{23} erv \quad \ldots\ldots\ldots\ldots \tag{4}$$

We assume there is equilibrium in the export market such that $rx^s = rx^d = rx$ (export function) so that

$$\mathrm{rx} = \beta_2 + \beta_{21} rfy + \beta_{22} reer + \beta_{23} erv - (\beta_1 + \beta_{11} rdy + \beta_{12} reer + \beta_{13} fdi + \beta_{14} erv)$$

$$\therefore rx = (\beta_2 - \beta_1) + \beta_{21} rfy + (\beta_{22} - \beta_{12}) reer - \beta_{11} rdy - \beta_{13} fdi + (\beta_{23} - \beta_{14}) erv \ldots \tag{5}$$

Equation (5) above is expressed as a regression equation (6) below.

$$nte = \alpha_1 + \alpha_2 rfy + \alpha_3 reer + \alpha_4 rdy + \alpha_5 fdi + \alpha_6 vrer + \theta \ldots\ldots\ldots\ldots \tag{6}$$

Where,

$$\mathrm{nte} = rx$$

$$\alpha_1 = \beta_2 - \beta_1$$
$$\alpha_2 = \beta_{21}$$
$$\alpha_3 = \beta_{22} - \beta_{12}$$
$$\alpha_4 = \beta_{11}$$
$$\alpha_5 = \beta_{13}$$
$$\alpha_6 = \beta_{23} - \beta_{14}$$

The coefficients for rfy, rdy and fdi are expected to carry a positive sign meaning an increase in each of these variables will lead to an increase in the earnings from the exports (the NTEs earnings in the case of this study).The signing for the (REER) is expected to be negative. This is because the computation of the REER in this study is such that an appreciation is indicative of the increase in the REER while depreciation is characterised by the decline in the REER. The signing for vrer can be either way (Musonda, 2008).

The estimation procedure for equation (6) takes the following data generating process given a vector z_t of n potentially endogenous variables with up to k lags:

$$\Delta z_t = \Gamma_1 \Delta z_{t-1} + \Gamma_2 \Delta z_{t-2} + \ldots\ldots + \Gamma_{k-1} \Delta z_{t-k+1} + \Pi z_{t-k} + \varepsilon_t, \; \varepsilon_t \sim IN(0, \Sigma) \ldots\ldots \tag{7}$$

Where,

$$\Gamma_i = -(I - A_1 - \cdots - A_i), (i = 1,2,..,k-1) \text{ and}$$

$$\Pi = -(I - A_1 - \cdots - A_k), \ \Pi = \alpha\beta'$$

Where, α represents the speed of adjustment towards the equilibrium and β is a matrix of long-run coefficients of the cointegrating relationships between the variables in the model. In the model above, information on both the short and long-run adjustments to changes in z_t is contained in Γ and Π, the estimates of Γ and Π, respectively.

IV Empirical Approach

Data Used

The study covers the period from July 2000 to December 2009. The choice was largely influenced by the availability of data particularly for the REER. In 2005, the REER was rebased and the new series goes back to July 2000.

The volatility of the REER was measured as the difference between the long run trend and the actual REER. The long run trend of the REER was obtained using the HP filter. The data for the foreign and domestic real incomes were interpolated into monthly frequency from the annual frequency. The real foreign income is a weighted average of the real GDP of Zambia's major trading partners. The data used was obtained from the Bank of Zambia and the Central Statistical Office. Other sources included the IMF's IFS figures, the Eurostat web page and SADC-CCBG web page.

The Results

Before undertaking estimations we tested the data to establish its status with regard to stationarity using the Augmented Dickey-Fuller (ADF) test. The results show a series to have unit root under the assumption of intercept but no trend (see Table 1).

Table 1: ADF Unit Root Test Results

Description	Levels	First Difference	Second Difference	Order of Integration
Log(NTEs)	-2.078186	-11.16778	-	I(1)
Log(REER)	-1.245103	-8.495976	-	I(1)
Log(FDI)	-2.386026	-9.556877	-	I(1)
VRER	-2.436765	-8.182116	-	I(1)
Log(RFY)	-2.430446	1.267710	-11.04413	I(2)
Log (RDY)	-1.270262	-0.492184	-2.833054	I(2)

Critical Values: 1% = -3.489117, 5% = -2.887190, 10% = -2.580525

Given the presence of the unit root in the series, a cointegration test is undertaken based on the Johansen test procedure involving all the variables that are I(1) and the results are presented in Table 2. The results for both Trace and Maximum- Eigenvalue indicate an existence of a cointegrating equation (CE) based on three (3) lags under the assumption of intercept but no trend in the CE.

Table 2: Cointegration Rank Test Summary Results

Hypothesized Number of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value
		Trace Test	
None*	0.237350	52.56584	47.85613
At most 1	0.125527	23.03160	29.79707
At most 2	0.066501	8.411063	15.49471
At most 3	0.008316	0.910213	3.841466
		Maximum Eigenvalue Test	
None*	0.237350	29.53424	27.58434
At most 1	0.125527	14.62053	21.13162
At most 2	0.066501	7.500850	14.26460
At most 3	0.008316	0.910213	3.841466

With cointegration established among the variables Log(NTEs), Log(REER), Log(FDI) and VRER, a long run equation is estimated whose outcome is summarised in Table 3. All the variables were correctly signed and only Log(FDI) was not significant.

Table 3: Long Run Equation

Description	Coefficients	t-Values
Log(NTEs)	1.000000	-
Constant	18.68665	-
Log(REER)	-0.207765	-9.81361
Log(FDI)	0.047943	0.54703
VRER	0.002422	8.12389

Based on the long run results, a short run behaviour of the export function of the form presented in equation 8 is estimated, where the variable (D) represent seasonal factors, ECM means error correction mechanism and the rest are as defined before.

$$\Delta \ln(ntes)_t = \alpha + \sum_{i=1}^{n} \beta \Delta \ln (ntes)_{t-i} + \sum_{i=1}^{n} \gamma \Delta \ln (reer)_{t-i} + \sum_{i=1}^{n} \psi \Delta \ln (fdi)_{t-i} + \sum_{i=1}^{n} \varphi \Delta \ln (vrer)_{t-i} + \sum_{i=1}^{12} \zeta (D)_{t-i} + \varsigma ECM_{t-i} + \varepsilon \quad --- \; 8$$

Using the general to specific approach, equation (8) was estimated whose parsimonious results are presented in Table 4. During the estimation process, the lagged differenced variables for non-traditional export were wrongly signed and do not, in this vein, form part of the analysis. The variable for foreign direct investment was found to be insignificant individually but critical to the joint significance of the variables in the equation. However, it was correctly signed. The rest of the variables including seasonalities (1), (2), (3) and (12) were significant with the error correction term and the REER being correctly signed. The variable for the volatility of the REER was negatively signed in the short run.

The variables in the model account for just above 30% of the variations in the dependent variable and this low explanatory power is normal in the case of models which have differenced variables. The diagnostic tests give satisfactory results generally.

Table 4: Parsimonious ECM of the NTEs

		Dependent Variable:		
Variable	Coefficient	Std. error	t-statistic	Probability
Constant	0.062891	0.015883	3.959624	0.0001
ΔLog(REER)t-2	-0.758958	0.280358	-2.707107	0.0080
ΔVRERt-1	-0.000569	0.000193	-2.946421	0.0040
ΔLog(FDI)t-4	0.068198	0.067299	1.013356	0.3133
ECMt-1	-0.301801	0.057032	-5.291790	0.0000
D(1)	-0.214324	0.048155	-4.450731	0.0000
D(2)	-0.084477	0.049512	-1.706190	0.0911
D(3)	-0.132664	0.048984	-2.708285	0.0080
D(12)	-0.210567	0.044903	-4.689418	0.0000
R2 = 0.373952		SE=0.132488	SSR=1.755304	F-Stat=7.47(0.000)
Adj. R2 = 0.323868		D-W=2.205611	AIC=1.125691	SIC=0.903469
Diagnostic tests				
Normality = 0.105075 (0.924)		LM(2)=0.50(0.68)		
ARCH = 1.65 (0.18)		RESET(1)=0.74(0.46)		

With regard to our variables of interest, the results show that the REER and its measure of volatility have some adverse effect on the NTEs performance in the short run. This is consistent with the findings on Zambia in Musonda (2008). However, the variations in each of these variables have a less than proportionate effect on the variations in the NTEs.

The results also show that the performance of NTEs is poor in the first quarter and the last month of the year. This is because of the seasonal effect of agriculture production, which normally happens in the period represented by the seasonal dummies.

The results further show that 30.2% of the adjustment to equilibrium condition happens within the first period. The insignificance of the variable for foreign direct investment may be due to the fact that most of the FDI has gone into the mining sector.

V Conclusion and Policy Implications

The paper looked at how the real effective exchange rate (REER) and the volatility of the REER have been affecting the performance of NTEs and used monthly data from July 2000 to December 2009. The other variable used in modelling the NTEs function was the foreign direct investment, which tends to expand the supply capacity of the NTEs.

The results from the ECM show that the REER and its measure of volatility have some adverse effect on the NTEs performance in the short run. This is consistent with the findings on Zambia in Musonda (2008). However, the variations in each of these variables have a less than proportionate effect on the variations in the NTEs.

The policy implications with these results are that an appreciation in the REER is likely to adversely affect the competitiveness of our NTEs and that the volatility of the exchange rate may make it difficult to plan production for the export market. This will eventually adversely affect exports of the NTEs. In this regard, exchange rate stability through appropriate interventions should be the policy option to pursue in order to render support to the NTE subsector in Zambia.

References

Egert, B. and Zumaquero, A .M (2008) “Exchange Rate Regimes, Foreign Exchange Volatility and Export Performance in Central and Eastern Europe” Review of Development Economics, Vol. 12, Issue 3, pp. 577-593,

Fidan, H (2006) “Impact of the Real Effective Exchange Rate (REER) on Turkish Agricultural Trade” International Journal of Social Sciences 1:2, pp 70-82.

Monfort, B. (2008) “Chile: Trade Performance, Trade Liberalisation, and Competitiveness” IMF Working Paper, WP/08/128.

Musonda, A (2008) “Exchange Rate Volatility and Non-Traditional Exports Performance: Zambia, 1965-1999” AERC Research Paper 185.

Petreski, G. and Kostoska, O. (2009) “Modelling the determinants of exports and Imports: assessment of the Macedonian Competitive performances” -- Source

Phiri, W. (2007) “Re-basing and Re-weighting of Zambia's Real Effective Exchange Rate Index” A paper presented to the Bank of Zambia Monetary Policy Committee.

Sahinbeyoglu, G and Ulasan, B (1999) “An Empirical Examination of the Structural Stability of Export Function: A Case of Turkey” Central Bank of the Republic of Turkey Discussion Paper 9907.

Siregar, R. and Rajan, R. (2002) “Impact of Exchange Rate Volatility on Indonesia's Trade Performance in the 1990s”

CHAPTER SIX

Social-Economic Challenges and Coping Strategies of Persons with Disabilities: A Case of Lusaka Urban District

By

Dr. Daniel Ndhlovu and Dr Sophie Kasonde-Ng'andu

Abstract

Persons with disabilities face a number of social-economic challenges. They have families and responsibilities towards their respective families. Most of them are unemployed, vulnerable and their general social-economic life condition is poor. This is evidenced by the fact that 87% of them were not in employment. Failure by teachers to effectively communicate to persons with visual and hearing impairment also pose a challenge. Little is known however, about the social-economic coping strategies they use to survive amid challenges due to disability. This study found that persons with hearing, visual and physical impairments use several coping strategies to earn their living. These include begging and selling on streets. In addition, they do piece works, and in very rare cases are in full-time jobs. The study concluded with the following recommendations: (i) The government through the Social Welfare Department needs to scale-up its support to persons with disabilities; (ii) Non-governmental organisations, the government and families need to create income generating activities in which persons with disabilities can be employed or do business on their own; and (iii) Financial institutions and indeed any other sponsor need to support awareness campaigns on abilities of persons with disabilities and short term trainings in braille and sign language.

I INTRODUCTION

This paper reports on a study conducted in March 2011 to determine the social-economic challenges and coping strategies of persons with visual, hearing and physical disabilities in Lusaka Urban District. Unless in specific instances, the study describes these people as persons with disabilities.

World Health Organisation (2005) reports that six hundred million (600,000,000) people in the world have various types of disabilities. Of these, 80% live in low income countries and the majority of them tend to be poor and do not have access to basic services such as education, health, employment and descent accommodation. In addition, they are discriminated against on the basis of their disability. This situation is consistent with the findings of Brow (1997) who found that due to poverty, persons with disability had a substandard social, physical and material well-being. In addition, their rights were more violated than those of their "normal" counterparts.

Additionally, traditional beliefs negatively compounded the situation. Thus, before the introduction of Christianity in Zambia, most traditional cultures had strong belief in spirits. Having a disability was therefore, perceived to be a curse or punishment from the ancestral spirits. Similar views were alluded to by (Ndhlovu, 2010:24), who pointed out that,

"In Eastern Province, it was believed that an evil spirit lived in a child born with a disability or whose mother died in child-birth. Children who survived after their mothers died in child-birth

were either starved to death or buried alive with their mothers. This was due to the belief that if a mother died in child-birth, her death was due to an evil spirit which lived in the baby."

The implication of such negative beliefs and attitudes towards those with disabilities was that such persons were relegated to the role of the cursed rather than that of active and productive participants of society. Cursed people were not expected to be successful and prosperous in life. If anything, they were expected to lead a rejected and miserable life.

Concerning the prevalence of disabilities in Zambia, the consensus of expert opinion is that 10-15% of people are exceptional and require active intervention and specialised services. This means that in Zambia with a projected population of 13.5 million, about one million and three hundred people have disabilities including physical, visual and hearing impairments. Of this number most of them have not attained school education. For instance, the Central Statistical Office (2003) reports that 57% of the blind people, 39.6% of the people with partial sight, 62.3% of the dumb and deaf, 48.9% of those with hard of hearing and 39.4% of the people with physical disabilities do not have school education (see Table 1).

Table 1: Population of persons with disability by type of disability and level of education in Zambia

Type of disability	Level of education completed						
	Total number	Total percent	No Education	Primary	Secondary	A Levels	Higher level
Blind	12,754	100.0	57.0	29.8	11.0	0.8	1.3
Partially sighted	74,882	100.0	39.6	40.7	15.6	2.2	1.8
Deaf/dumb	14,233	100.0	62.3	28.1	8.2	0.4	1.0
Hard of hearing	29,886	100.0	48.9	40.1	9.4	0.6	1.0
Physically handicapped	94,085	100.0	39.4	42.8	15.5	1.1	1.2

Source: Central Statistics Office (2003). Note: the source did not have aggregated data by gender.

Exclusion from education leads to exclusion from labour markets and this, in turn, leads to greater poverty and dependency on others for income and support. Similar views were also expressed by Roggero, et al. (2005) who observed that poverty and impairment have close link in a cycle of exclusion and marginalisation. Such exclusion has led persons with disabilities to lack the means of paying for their basic services and facilities. However, little is known about the social-economic coping strategies that these people use to survive amid challenges due to disability and their perception about the Zambian economy.

Statement of the problem

Persons with disabilities face social-economic challenges. Most of them are unemployed, vulnerable and their general social-economic life condition is poor. Little is known, however, about the social-economic coping strategies they use to survive amid challenges due to disability. It was necessary therefore, to conduct a study of this nature in order to determine the social-economic initiatives that persons with disabilities use to earn a living and their perception about the Zambian economy.

Purpose of the study

The purpose of this study was to determine the social-economic coping strategies that persons with disabilities use to earn a living and their perception about the Zambian economy.

Study objectives

The following objectives guided the study:

1. To determine the economic challenges faced by persons with disabilities in Lusaka Urban District.
2. To determine the perception of persons with disabilities in Lusaka about the Zambian economy.
3. To identify coping strategies persons with disabilities use to earn a living.

Study Questions

The following questions were used to guide the study:

1. What economic challenges do persons with disabilities face in Lusaka Urban District?
2. How do persons with disabilities in Lusaka perceive the Zambian economy?
3. How do persons with disabilities in Lusaka Province survive amid economic challenges?

II LITERATURE REVIEW

Employer biasness and stereo-typed attitude towards persons with disabilities contributes to their poor quality of life. Goffman (1983) alluded to this point and reported that, most employers continued to be biased and negative towards employing persons with disabilities even if they had the qualifications. Some employers even refused to accept that a graduate with a disability had competence in certain skills. As a result, they avoided employing them thereby adding to the opinion that persons with disabilities were dependants.

Shezongo-Macmillan et al. (2008) found that low literacy levels among persons with disabilities especially women contributed to their living condition being poorer than that of men. In addition, due to low literacy levels among them, they were often hired at the bottom levels of the employment structure.

Some parents and society, to a greater extent, regard deviant developments, with suspicion. In other words, being deviant or having a disability is still negatively perceived by parents and society. Similar views were alluded to by Ndhlovu, (2010), who pointed out that in the Eastern Province, it was believed that an evil spirit lived in a child born with a disability or whose mother died in child-birth. Similarly, Manion and Bersani (1987) noted that in ancient Greek and Roman societies, persons with disabilities were regarded as objects of scorn and persecutions. In the ancient Rome for example, parents of children who were blind, deaf or with physical disabilities relieved themselves of the responsibilities of custodian care by drowning these children in the Tiber river.

III METHODOLOGY

A descriptive design was used in the study. This design was consistent with that of Kombo and Tromp (2006) who pointed out that, descriptive research design can be used when collecting information about people's attitudes, opinions, habits or any of the variety of education or social issues. The study used both qualitative and quantitative research methods. Qualitative methodology relied on focused interviews and non-participant observations while quantitative methodology made use of questionnaires.

Fifty eight (58) persons with disabilities participated in this study. This number consisted of eleven (11) persons with hearing impairment, twenty (20) with visual impairment and 27 with physical disabilities. Gender balance was considered within the sample. The variations in the numbers of the disability categories was due to some participants that refused to participate in the study and others with hearing impairment that were not found.

Purposive sampling procedure was used to select the sample. This procedure was chosen because the participants available were the only ones with information needed for this study.

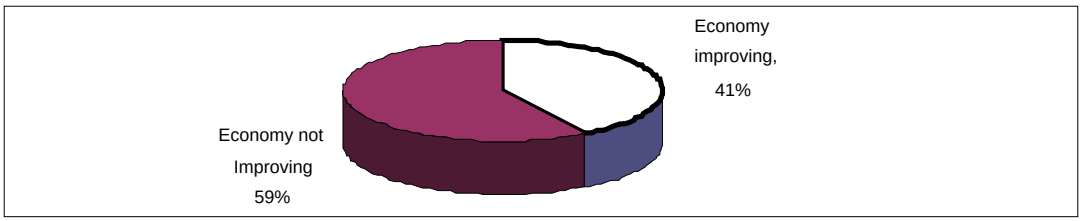
Interview schedules and non-participants' observations were used to collect data from the 58 participants. This procedure helped the researcher to make follow-up questions to explore some concepts which needed further explanations. Non-participants' observations of persons with disabilities were done. As rightly noted by Kombo and Tromp (2006), observation is one of the most effective means of validating data collected by interviews. Observations helped the researchers to compare expressed opinions with actual performance or behaviour of participants.

Thematic analysis was used to analyse qualitative data while quantitative data was analysed using Statistical Package for Social Sciences in order to obtain frequencies and graphs.

IV PRESENTATION AND DISCUSSION OF FINDINGS

Concerning perception of persons with disabilities about the Zambian economy, it was found that most of the respondents' view was that the economy was not improving (see Figure 1)

Figure 1: Perception of persons with Disabilities in Lusaka about the economy of Zambia (N=58)



The reasons highlighted for the economy not improving included: inadequate and inappropriate learning facilities and materials for persons with disabilities especially for the deaf and visual impairments, lack of capital to start income generating activities that could help them stop begging on the streets. For instance, one participant with visual impairment lamented that:

> *"Surely, can I say the economy is improving when I spend all my time begging on the streets of Lusaka?"*

Additional reasons given were that, it was difficult to find employment in Lusaka. This view is consistent with the findings of this study which shows that 87% of the participants were not in employment. It can be said that the participants felt the economy had not improved because some of their needs were not met. For instance, some of the participants who felt Government through the Social Welfare Department could not help them with wheel chairs is touching because it affects their mobility.

However, others felt the economy had improved because they had received crutches and wheel chairs. Others had received bursaries to support education for their children. In addition,

mealie-meal prices had been reduced, more schools and other infrastructure were being built by the government. For instance, one of them said:

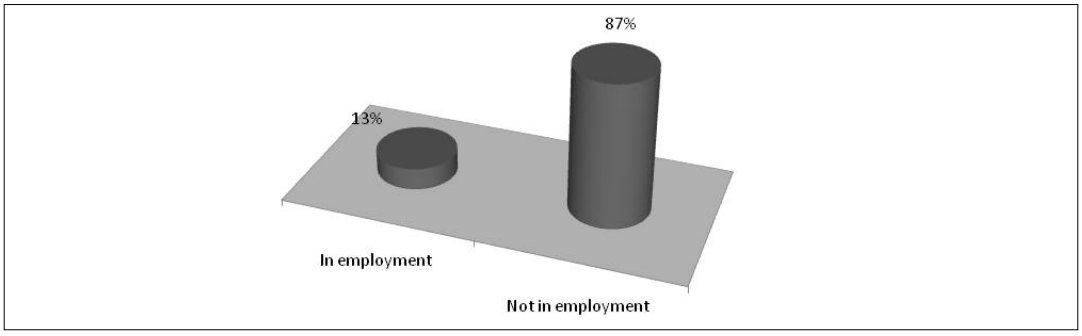
> *"If the government is able to build the Kulima Tower Bus Station in Lusaka, then the economy is improving and we are happy because we also benefit from it."*

Others felt that by the fact that some people with disabilities owned cars, the economy of Zambia had improved.

Concerning social-economic challenges, participants indicated that generally society had a negative attitude towards them. Further, participants had a view that in most cases, they were not accepted in employment. Additionally, the respondents noted that most employers doubted that they could do any productive activities. Instead, they thought that persons with disabilities must be poor. The participants also felt that some people do not respect them as human beings, schools for the blind and deaf are not many. In addition, not much awareness campaigns have been conducted on causes and types of disabilities to the public.

As regards unemployment, this was a big challenge. For instance, out of 58 persons with disabilities who participated in this study, 87% were not in employment (see Figure 2)

Figure 2: Employment status of persons with disabilities in Lusaka (N=58)



These findings are consistent with those of Goffman (1983) who found that most employers continued to be biased and negative towards employing persons with disabilities even if they had the qualifications. Some employers even refused to accept that a graduate with a disability had competence in certain skills. As a result, they avoided employing them thereby adding to the opinion that persons with disabilities were dependants.

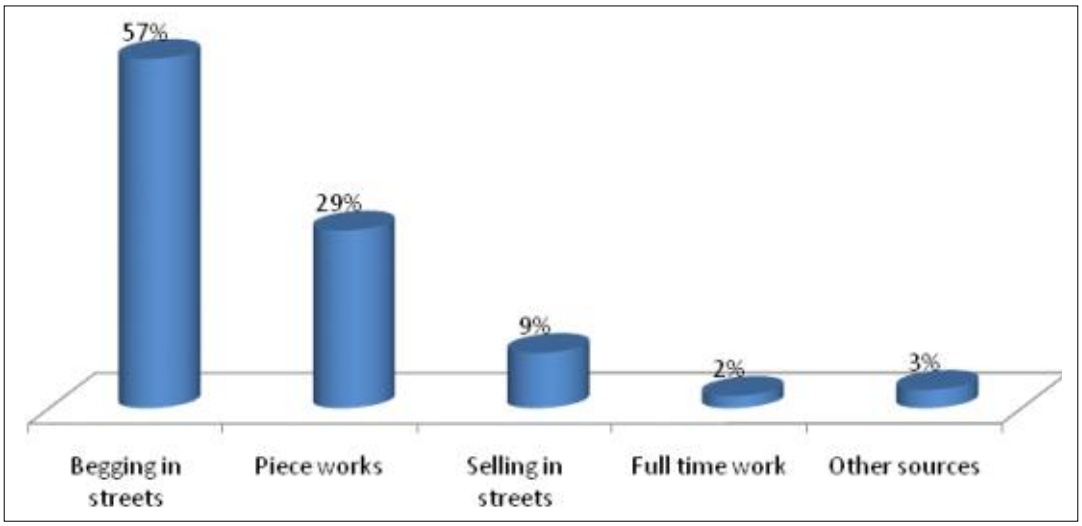
The implications of such negative attitudes on the life condition of persons with disabilities could be detrimental. For instance, based on these beliefs and attitudes, persons with disabilities were discriminated against, because no employer or any person in society wanted to be associated with a person believed to be cursed or of below desirable standard.

Another challenge faced by persons with disabilities is that most teachers do not have skills in braille and sign language making it very difficult to communicate with pupils with visual and hearing impairment when teaching. In addition, the problem of mathematics and science subjects not written in braille contributed to persons with visual impairment performing poorly in school. This implies that more and more persons with disabilities drop out of school. Similarly, Shezongo-Macmillan et al. (2008) reported that low literacy levels among persons with disabilities were found to contribute to their living condition being poorer than their ordinary counterparts. It is necessary therefore, that the government and non- governmental

organisations consider addressing these challenges so that lives of persons with disabilities are improved.

Among the coping strategies used by persons with disabilities to earn their living include, begging in streets, piece work, selling in streets, full-time employment and other sources which included receiving gifts and donations (see Figure 3).

Figure 3: Coping strategies used by persons with disabilities to find money to support families (N=58)



The study revealed that 57% of the respondents were involved in begging on the streets to earn a living. Although these coping strategies helped persons with disabilities to earn a living, the government, non-governmental organisation and families can also initiate income generating activities to help improve the lives of persons with disabilities. Elsewhere, this initiative has worked well. For instance, Mattika (1996) reported that the Employment Horizon International Project, the European Union Initiative created income generating activities for 276 persons with disabilities in Scotland, England, Finland and Italy.

V Conclusion

Based on the findings, the study concludes that persons with hearing, visual and physical impairments face a lot of social-economic challenges to earn a living. For instance, the participants felt that most of the people in the community had negative attitude towards them and that unemployment was very high among them. This is evidenced by the fact that 87% of participants in this study were not in employment. Failure by teachers to effectively communicate to persons with visual and hearing impairment also posed a challenge. This failure was due to the fact that most teachers do not have skill in braille and sign language. However, amid these challenges, they still have to survive. As a result, they beg on the streets, do piece works, sell on streets and some of them are engaged in full-time jobs.

These challenges greatly influenced the respondents' perceptions about the Zambian economy. To this effect, persons with disabilities indicated that the Zambian economy was not improving. Several reasons were given to justify their views, which included; failure by the government to provide crutches and wheelchairs to persons with physical disabilities. While those with visual and hearing impairments felt that they could not find employment to help them earn a living.

This study has revealed several issues. However, it had limitations such as inadequate financial resources to conduct a detailed study. In this regard, there is need to undertake a much detailed study in order to understand the plight of persons with disabilities.

VI Recommendations

Based on the findings, the following recommendations may be considered:

1. The government through the Social Welfare Department needs to scale up its support to persons with disabilities;
2. Non-governmental organisations, the Government and families need to create income generating activities in which persons with disabilities can be employed or conduct on their own; and
3. Financial institutions and any sponsor need to support short term trainings in Braille, sign language and awareness campaign on causes and types of disabilities.

Brow, R. (1997) Quality of life in persons with disabilities: Issues in Development of services. New York: Croom Helm.

Central Statistical Office (2003) 2000 Census of Population and Housing Report. Lusaka: Central Statistical Office

Coleridge, P. (2001) Disability, Liberation and Development. London: Oxfam.

Goffman, E. (1983) Stigma.Harmondsworth: Penguin.

Kombo, D.K. and Tromp, D.L.A. (2006) Proposal and Thesis Writing.Nairobi: Paulines

Publications Africa.

Manion,M.L. and Bersani, H.A. (1987) Mental Retardation as a Western Sociological Construct: a cross-cultural analysis. Disability, Handicap and Society, 2 (3), 231-247

Matikka, L. (1996) Life after Vocational Training. Norway: Norwegian Academic Press.

Ndhlovu, D. (2010) Life Condition of Females with Mental Retardation: A Case of Graduates from Vocational Training Institutions in Zambia. PhD thesis, University of Zambia

Roggero, P, Tarricone, R., Nicoli, M. and Magniaterra, V. (2005) Employment and Youth with Disabilities.Millan: Word Bank.

Shezongo-Macmillan, J. and Kasese-Kumalo, H. (2008) A Rapid Assessment of Trafficking of Zambian Girls and women. Lusaka: Women and Law in Southern Africa Research and Educational Trust-Zambia

World Health Organisation (2005) “Disability and Rehabilitation.” Retrieved on June 30, 2007, from http://www.who.int/disabilities

CHAPTER SEVEN

Oil Prices and Consumer Price Inflation in Zambia

By

Noah Mutoti, Peter Zgambo, Francis Z. Mbao, Chungu Kapembwa, Emmanuel Chokwe and Nomsa Kachingwe

Abstract

The paper has modelled the relationship between oil prices and the three types of consumer inflation-overall, food and non-food. The results show that the impact of domestic oil prices on overall consumer price inflation is mainly through the non-food inflation component. In the long-run, oil prices affect non-food inflation through both the direct and indirect channels. Domestic oil prices have only an indirect effect on non-food inflation in the long-run, through the supply side, as they affect the cost of production. However, in the short-run, oil prices impact overall inflation through both food and non-food inflation. Since the effect of petrol prices on overall inflation occurs primarily through non-food inflation, policy measures aimed at stabilising the prices of petroleum products should be enhanced. In addition, ensuring stability in the exchange rate would help in the stabilisation of petrol prices given that the exchange rate is an important factor in the determination of domestic petroleum prices. Further, monetary policy should be aimed at mitigating the second-round effects of the increases in petroleum prices by containing other factors that influence non-food inflation, such as money supply.

I Introduction

Theoretically, the causal relationship between oil prices and inflation is fairly clear. An increase in the oil price is known to cause a reduction in aggregate supply in the short run; thus placing upward pressure on the general price level. Simply, an increase in the price of oil causes inflationary pressures. The impact of higher energy prices on inflation, however, depends on the importance of energy to an economy. That is, the higher a country's energy intensity – as measured by the energy consumption to GDP ratio – the greater the impact on inflation. Additionally, increasing oil prices will have a greater inflationary impact in countries that are net-importers of oil. Depending also on wage-setting behaviour, and in countries with powerful labour unions, oil price increases are more likely to trigger a wage-price spiral, as rising inflation causes unions to bargain for higher wages, which then place further upward pressure on inflation.

Empirically, the impact of the oil price on inflation is mixed. Many researchers, including Cavallo (2008), have found that the extent to which rising oil prices leads to higher overall inflation depends on the persistence of oil price increases. That is, the longer the period of continuous oil price rises, the greater the impact on inflation. On the other hand, Blanchard and Gali (2007) indicate that in recent times, oil price shocks have had mild effects on inflation and economic activity. This has been attributed to the lack of concurrent adverse shocks, the smaller share of oil in production, more flexible labour markets and improved monetary policy.

With regard to monetary policy, oil price shocks pose a policy dilemma for central banks. An

increase in the oil price causes supply-side inflationary pressures, which may have an adverse effect on economic growth. As the central bank cannot stabilize inflation and the real economy simultaneously, it faces a trade-off between contractionary monetary policy to fight inflation and expansionary monetary policy to stimulate growth. It is thus important that policymakers gain a thorough understanding of the relationship between oil prices and inflation, as this will inform the policy decision-making process in response to oil price shocks.

While there are a number of studies on inflation in Zambia, Mwansa (1998) and Pamu and Simuchile (2003), the impact of oil prices on inflation has not, to our knowledge, been analysed in depth. Making a contribution, this paper aims to ascertain the impact of oil prices on food, non-food and overall consumer price inflation in Zambia.

In what follows, a trend analysis of consumer price inflation and the domestic oil price is presented in Section 2, while Section 3 reviews the literature. Section 4 outlines the conceptual framework and the empirical approach is detailed in Section 5. Section 6 concludes the paper.

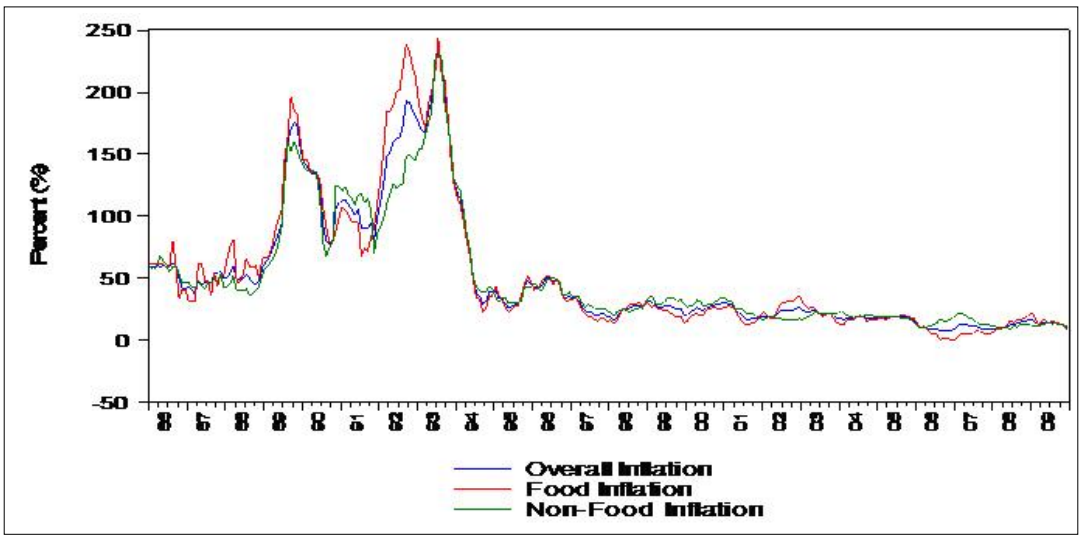
II Trend Analysis

This section of the paper aims firstly, to shed light on the developments in overall, food and non-food inflation in Zambia from 1993 to 2009; secondly, to analyse the developments in global and domestic oil prices; and finally, to examine the trend in consumer price inflation and domestic oil prices, for the period 1993 to 2009.

Overall, Food and Non-Food Inflation

In Zambia's CPI, the food component is the largest, accounting for 57% of the basket, and includes cereals, vegetables, fish, meat products and beverages. The non-food counterpart comprises transport and communication; clothing and footwear; furniture and household goods; rent, fuel and lighting; medical care; and recreation and education, among others.

Chart 1: Annual overall, Food and Non-Food Inflation, 1986 – 2009

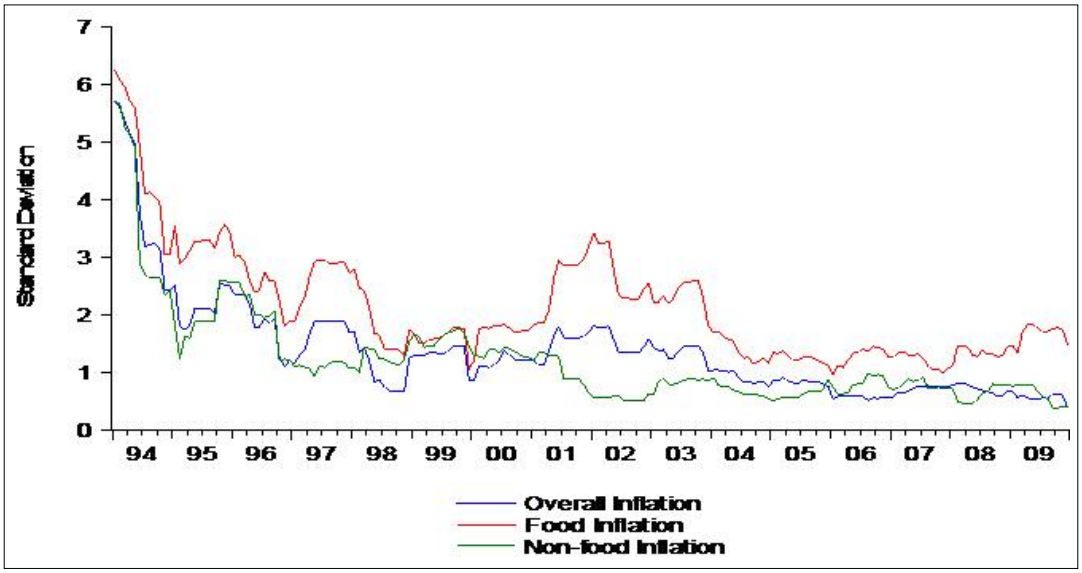


Generally, food inflation has been more volatile than non-food inflation over the period, with movements in overall inflation closely matching those in food inflation. In particular, food inflation soared to 243% in July 1993, while overall inflation peaked at 237%. The overall

inflation was moderated by the lower non-food inflation of 229%, in the same period.

While the early 1990s experienced very high inflation, mainly as a result of widespread economic reforms and liberalisation, domestic inflation has since improved considerably (see Chart 1). From 2000 onwards, inflation levels have remained below 30%, and have occasionally reached single-digit levels between 2007 and 2009.

Chart 2: 12-Month Volatility in Overall, Food and Non-food Inflation, 1993 – 2009



In the period 2003 – 2009, the volatility of overall inflation was relatively low, largely due to the decline in food inflation volatility, reflecting improvements in the supply of food following favourable weather conditions. This was besides the stability in the exchange rate that fed favourably into the inflationary process.

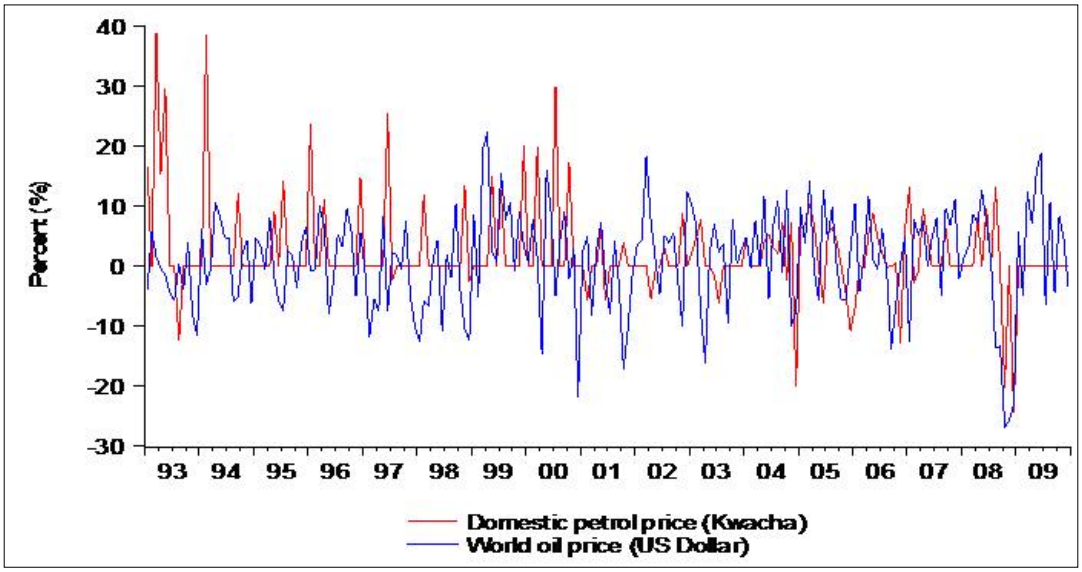
World Oil Prices and Domestic Oil Prices

Prior to the enactment of the Energy Regulation Act Chapter 436 of the Laws of Zambia in 1995, the entities[1] charged with the importation of crude oil were also responsible for setting up prices of refined oil products. The Energy Regulation Board (ERB) became operational in 1997 and determines the wholesale price of the petroleum products, taking into account exchange rate and global oil price movements.

Over the period under review, both global and domestic oil prices have been significantly volatile, with domestic oil prices exhibiting greater volatility. As suggested in Chart 3, changes in domestic oil prices do not always move in tandem with changes in the global oil price. For example, while global oil prices declined by 4% in January 1993, domestic oil prices rose by 16% in the same period. Further, as global prices continued to decline in 1993, domestic prices rose substantially, rising by 39% in March, and again by 29% in May 1993. The disparity in changes in domestic petrol prices and changes in global prices, especially during the early 1990s, can be attributed to the economic liberalisation policies introduced in 1992, which resulted in the deregulation of prices in the economy. Further, the steep depreciation in the Kwacha/US$ exchange rate, from K92.30/US$ at the beginning of 1992, to K551.00/US$ in June 1993, placed even more pressure on domestic oil prices.

[1]ZIMCO, Zambia National Oil Company and INDENI

Chart 3: Monthly Change in Domestic and Global Oil prices, 1993 – 2009.



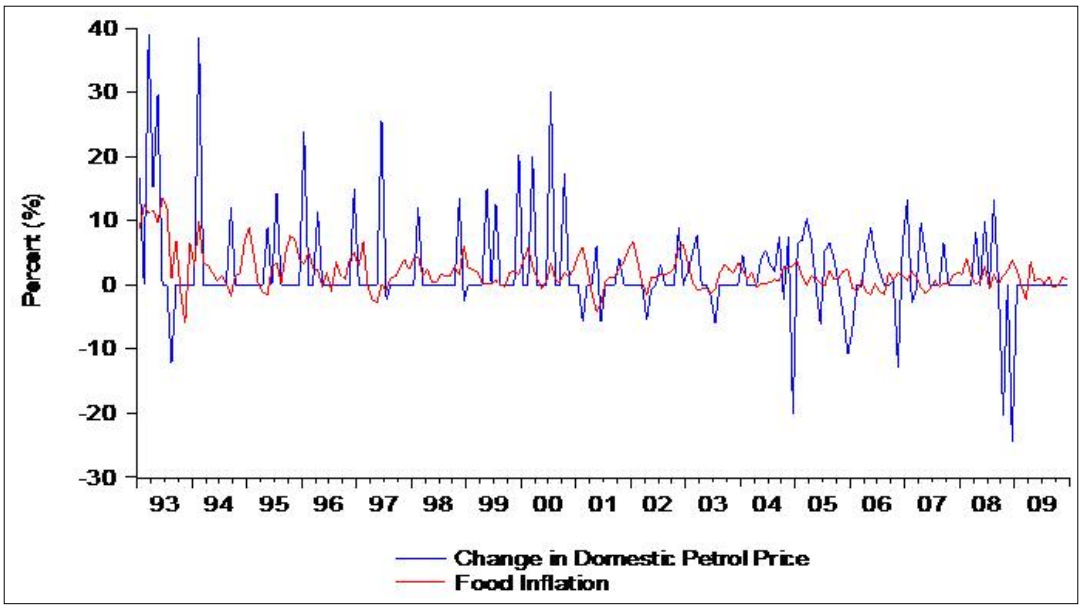
It can also be argued that the divergence in changes in the global oil price and changes in the domestic oil price, especially in recent years, may be due to the taxes and levies placed on petroleum products (petrol, diesel and kerosene) in Zambia. These include an excise duty, import duty, fuel levy and Value Added Tax (VAT). These are adjusted, along with government subsidies, as part of the ERB's mandate to regulate petrol prices in the domestic economy. In particular, recent adjustments to the domestic petrol price have, to some extent, mitigated the effects of sharp rises in the global oil price. For example, in November 2007, global oil prices grew considerably by 11.1% yet domestic petrol prices remained unchanged, as the Government had introduced a fuel subsidy in October 2007.

Moreover, following the 12.6% increase in global oil prices in May 2008, domestic prices grew by only 9.7% in June 2008, before rising by 13.2%, in August 2008. It is worth noting that the appreciation of the Kwacha, by an average of 2.7% from January to June 2008, played a role in moderating the increase in the domestic oil price in the first half of 2008. Domestic prices did, however, decline significantly by 20.3% in October 2008, partly as a result of the reduction in the excise duty, from 45% to 36%, and the removal of the road levy in September 2008.

Domestic Oil Price and Food Inflation

Although food inflation has been somewhat volatile over the period under review, fluctuations have eased in recent years, while monthly domestic petrol prices have remained volatile (see Chart 4). In the early 1990s, sharp movements in the petrol price were accompanied by movements in food inflation. For example, as petrol prices declined by 12.3% in August 1993, food CPI declined by 6.0% in November, of the same year. These comparable movements in food inflation and petrol prices could be attributed to the macroeconomic reforms that were put in place at the time.

Chart 4: Monthly Change in Domestic Petrol Price and Food Inflation, 1993 – 2009.



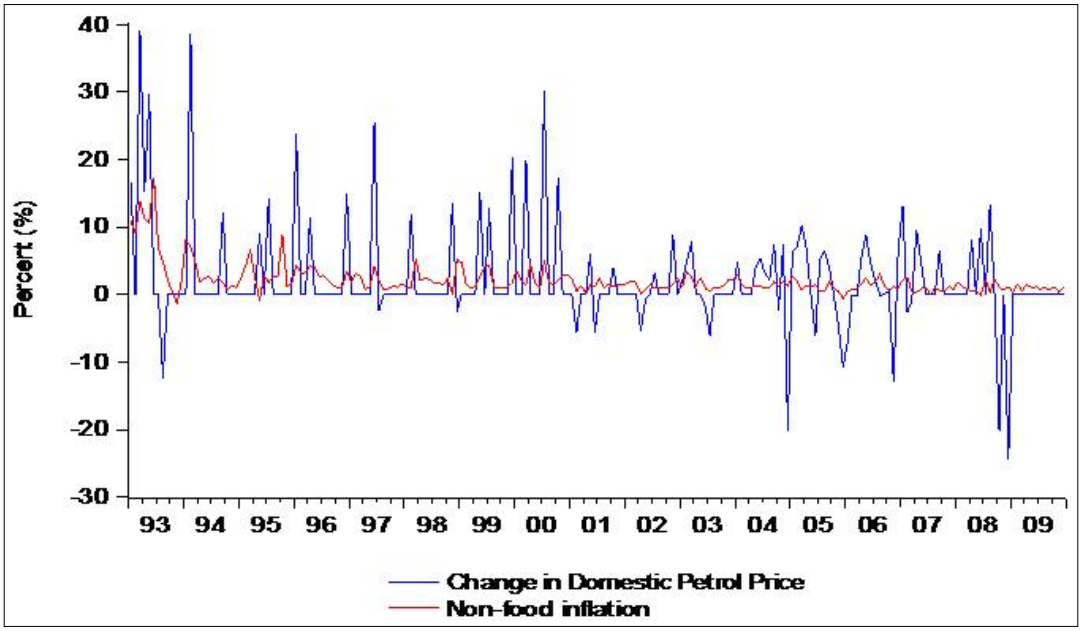
We observe that recently, the volatility in petrol prices has not translated into significant volatility in food inflation. Specifically, petrol price volatility has remained fairly high compared to the the volatility in food inflation, which has on average declined steadily from 1993to 2009. Correlation analysis provides further insight into the relationship between domestic petrol prices and food inflation. Over the period 1993 – 1999, monthly changes in the domestic petrol price and food inflation were 30% correlated. For the period 2000 to 2009, however, the correlation coefficient declined to -4%, suggesting a negative relationship between food inflation and domestic petrol prices. This reduction in correlation indicates that there are other factors that influence food inflation in Zambia, such as weather conditions.

Domestic Oil Price and Non-food Inflation

Similar to food inflation, the correlation between petrol price and non food inflation has declined over time (Chart 5). In particular, the correlation coefficient for non-food inflation and monthly changes in petrol prices declined from 39% between 1993 and 1999 to 27% between 2000 and 2009. This imformation suggests that the influence of petrol prices on non-food inflation has been dampened over the years.

With regard to volatility, non-food inflation has become particularly stable, while petrol prices have remained volatile. Specifically, non-food inflation volatility has declined from 5 standard deviations in early 1994, to an average of 0.61 standard deviations in 2009.

Chart 5: Monthly Change in Domestic Petrol Price and Non-food Inflation, 1993 – 2009



III Literature Review

While there appears to be a general consensus that rising oil prices affect consumer prices, the literature provides no consensus regarding the significance and magnitude of this impact, especially in recent years.

Cavallo (2008) suggests that oil prices have both direct and indirect effects on consumer price inflation. Higher oil prices tend to affect consumer prices, directly, by raising the cost of energy-related items (household fuels, motor fuels, gas and electricity), and indirectly, by raising production costs. However, the extent to which rising oil prices translate into higher inflation depends on the persistence of oil price increases (Cavallo, 2008; Hunt et al, 2001). Further, Hamilton (1996) and Schneider (2004) argue that oil price shocks affect the macro-economy primarily by depressing demand for key consumption and investment goods through three channels: the demand side, the supply side and the terms of trade.

In particular, Cavallo (2008) notes that the indirect impact of rising oil prices inflation depends primarily on how much rising oil prices feed into the inflation expectations of those who set prices and wages. The greater the bargaining power of labour unions, the greater the impact of oil price increases on inflation. In Turkey for instance, Berument and Tapcy (2000) find that the inflationary effects of crude oil prices are particularly significant when wages are adjusted upwards.

The International Energy Agency (2004) indicates that the impact of rising oil prices varies significantly among oil-importing countries; with a marked increase in oil prices having the greatest adverse effect macroeconomic activity in developing countries, followed by the Euro-zone countries, other OECD economies, and lastly, the United States. The IMF (2000) add that that Heavily Indebted Poor Countries (HIPC) are particularly affected by rising oil prices, as they are usually net importers of oil.

On the other hand, several authors, including Blanchard and Gali (2007), Le Blanc and Chinn (2004), and Hooker (1999) argue that rising oil prices have had mild effects on inflation and economic activity in recent years. In particular, Hooker (1999) finds that since 1980, oil price

changes seem to influence inflation outcomes only through their direct share in the consumer price index, with little or no pass through into core measures of inflation. This is in contrast to the years before 1980, where rising oil prices contributed substantially to rising inflation.

These observations are due to a number of reasons, including the lack of concurrent adverse shocks in recent years (as compared to the 1970s and 1980s); the smaller share of oil in production (due to increased use of technology in production); more flexible labour markets; increased global competition in product markets and improved monetary policy. This has been the case in most developed countries, such as the United States, United Kingdom, France, Germany and Japan. In developing countries, however, rising oil prices still pose a threat to domestic inflation and macroeconomic activity (IMF, 2000).

IV Conceptual Framework

The conceptual framework employed in this paper is premised on the notion that the overall domestic consumer price index (CPI), denoted by P_t, is a weighted average of the prices of traded (p_t^T) and non-traded (p_t^N) goods[2].

$$p_t = \gamma p_t^T + (1-\gamma) p_t^N \quad , \tag{1}$$

Where: $0 < \gamma < 1$ is the share of imported goods in the domestic CPI. (p_t^N) originates from the domestic sector and is set in the money market, where demand for non-traded goods is assumed, for simplicity, to move in line with aggregate demand. In this sense, (p_t^N) is determined by money market conditions:

$$p_t^N = \phi\left[(m_t^s - p) - (m_t^d - p)\right] \tag{2}$$

Here, $(m_t^s - p)$ and $(m_t^d - p)$ are real money supply and real money demand, respectively. Demand for real balances, underlying money market equilibrium, takes the form:

$$m_t^d - p = a_1 y_t - a_2 R_t + \varepsilon_t^{md} \quad , \tag{3}$$

Where: y_t is output (capturing the transaction motive), R_t nominal interest rate (characterizing the speculative motive) and ε_t^{md} is a money demand shock (e.g. velocity shock). Adams (1995) and others, however, question whether the inclusion of interest rates is relevant for developing countries. They argue that in such economies, the relatively thin markets for financial securities make substitution between money and goods, or real assets, quantitatively more important, and that expected inflation (π^e) is a better opportunity cost of holding money in such economies. We thus modify equation (3) to

$$m_t^d - p = a_1 y_t - a_2 \pi_t^e + \varepsilon_t^{md} \tag{4}$$

[2]All variables are in log except interest rates. All coefficients are positive

Substituting (4) into (2) gives

$$p_t^N = \phi(m_t^s \quad p \quad a_1 y_t + a_2 \pi_t^e) + \varepsilon_t^{md} \tag{5}$$

arguing that prices of non-traded goods are influenced by disequilibrium in the money market. That is, money supply in excess of what is demanded fuels non-traded goods inflation.

The price of traded goods is determined in world markets where an individual country acts as a price taker. This follows from the assumption of a small open economy and perfect price arbitrage for homogenous tradable commodities. By implications, p_t^T originates from the foreign sector, taking the form

$$p_t^T = c_1 s_t + c_2 p_t^* \tag{6}$$

Where: s_t is nominal exchange rate and p_t^* is foreign CPI. Currency depreciation and an increase in foreign price leading to higher prices of traded goods, is the argument in (6). Substituting (5) and (6) into (1) and after some simplifications, yields a price equation (7)

$$p_t = d_1 m_t^s \quad d_2 y_t + d_3 \pi_t^e + d_4 s_t + d_5 p_t^* + \varepsilon_t^{md} \tag{7}$$

predicting that developments in domestic consumer prices are associated with both monetary and non-monetary factors.

Following Olubusoye and Oyaromade (2008), the influence of oil prices on consumer prices is introduced in the model through the augmentation of equation (7) by domestic oil prices, the price of petrol in this case. In this regard, the augmented consumer price equation is specified as in equation (8)

$$p_t = d_1 m_t^s \quad d_2 y_t + d_3 \pi_t^e + d_4 s_t + d_5 p_t^* + d_6 p_t^o + \varepsilon_t \tag{8}$$

Where: p_t^o is the domestic price of oil.

V Empirical Approach

Data

Monthly data is used, covering the period from January 1993 to December 2009 for the variables listed below. All variables are in log-form.

- Overall consumer prices *(p)*, defined as the consumer price index (CPI);
- Food prices (p^f), defined as food CPI;
- Non-food prices (p^{nf}), defined as non-food CPI;
- Domestic oil price (p^o), defined as the domestic petrol price;
- Exchange rate *(s)*, defined as the Kwacha/US dollar exchange rate;

- Output *(y)*, defined as real GDP;
- Foreign price (p^*), defined as the US CPI;
- Money *(m)*, defined as broad money (M2).

The empirical investigation commenced by testing the integration properties of the data by means of the augmented Dickey-Fuller (ADF) test. All the variables were found to be I(1) series (see Table 1 in Appendix).

Cointegration Analysis

In what follows, we analyse the impact of oil price on food, non-food and overall inflation, within a cointegration framework.

Food Inflation

The Engel Granger cointegration approach yielded the long-run relationship presented as equation (9), which does not include the oil price as it was incorrectly signed. The results suggest that the key determinants of food inflation, in the long-run, are output and the exchange rate. In particular, a 1% increase in real GDP causes food inflation to decline by at least 1.4% over time. Further, a 1% depreciation in the nominal exchange rate would result in a 0.4% increase in food inflation in the long-run, reflecting the impact of imported inputs, such as fertiliser and chemicals, on the cost of food production.

$$\underset{}{p_t^f} = \underset{(4.14)}{12.34} - \underset{(-4.12)}{1.41}\, y_t + \underset{(6.11)}{0.40}\, s_t + \underset{(9.38)}{0.02}@trend \qquad (9)$$

The estimated dynamic food inflation model is presented in equation (10). All the estimated parameters are correctly signed.

$$\begin{aligned}\Delta p_t^f = {} & \underset{(4.48)}{0.006} + \underset{(5.83)}{0.41}\Delta p_{t-1}^f + \underset{(1.29)}{0.12}\Delta p_{t-2}^f - \underset{(-3.71)}{0.51}\Delta y_{t-1} + \underset{(1.73)}{0.04}\Delta s_t + \\ & \underset{(1.96)}{0.03}\Delta p_t^n + \underset{(4.21)}{0.07}\Delta p_{t-2}^n - \underset{(-1.82)}{0.01}\, ECMf_{t-1} + \underset{(1.21)}{0.007}\, S_1 + \underset{(2.46)}{0.01}\, S_2 - \underset{(-2.14)}{0.009}\, S_4 - \underset{(-3.83)}{0.01}\, S_5 + \underset{(3.59)}{0.02}\, S_{12}\end{aligned} \qquad (10)$$

Adjusted R-squared = 0.53

Equation standard error = 0.02

F-statistic = 17.7 (0.00)

Serial Correlation = $X^2(2) = 4.29$ (0.12)

Sample size = 204 (1993M01– 2009M12)

Where, $ECMf_{t-1}$ is the error correction term for food inflation; and S1, S2, S4, S5 and S12 are the seasonalities for January, February, April, May and December, respectively.

Equation (10) suggests that developments in oil prices have a significant impact on food inflation in the short run. A 10% upward adjustment in petrol prices is likely to cause food inflation to rise contemporaneously, by 0.3%, and by 0.7% after two months. This is partly due

to the adjustment in the freight tariffs that are passed on to consumers almost immediately. As transporters realise the real impact of the increase in the petrol price on their running costs, and consequently their bottom line, they respond with another tariff increase. Freight charges in Zambia are not administratively controlled, as the case is with bus fares.

Further, output is the most critical determinant of food inflation in the short-run. Specifically, a 10% rise in output would induce a 5% reduction in food inflation, after one month. The exchange rate has an immediate impact on food inflation, with a 10% depreciation in the nominal exchange rate resulting in food inflation adjusting upwards by 0.4%. The contemporaneous effect of the exchange rate on food inflation is due to the high content of imported food in the country, whose import price responds immediately to exchange rate movements.

Seasonal factors associated with January, February and December also tend to positively feed into the inflationary process. This is mainly due to seasonal low supply of food items including fish, as a result of annual fish ban covering the period December to end February; tomato and rape, which are costly to grow in the rainy season; and maize grain whose marketing season closes before December and whose early supply coincides with the early harvest starting end-March.

On the other hand, seasonal factors for April and May have a negative effect on food inflation. This is expected, as during this period food inflationary pressures usually subside due to the early harvest of food items such as cereals, groundnuts and vegetables coming onto the market. It also coincides with the time when the seasonal fish ban is lifted.

Non-Food Inflation

The Johansen cointegration procedure was employed to establish the determinants of non-food inflation in the long-run. Using a six-variable VAR of three lags, two cointegration vectors identified in equations 11 and 12, were estimated. These resemble an open-economy IS relationship.

$$p_t^{nf} = \underset{}{-0.37}\, y_t + \underset{(3.81)}{0.32}\, s_t + \underset{(9.11)}{0.43} m_t \qquad (11)$$

$$y_t = \underset{(0.99)}{1.68}(\underset{}{0.02} s_t + \underset{(78.4)}{1}\, p_t^{*} - \underset{(-11.99)}{0.02}\, p_t^{nf}) - \underset{(7.58)}{0.15}\, p_t^{o} \qquad (12)$$

These results indicate that the long-run determinants of non-food inflation are: output, exchange rate, money supply and the oil price. Domestic oil prices have an indirect effect on non-food inflation through the supply side, as they affect the cost of production. Specifically, a 10% increase in oil prices will reduce output by 1.5%. This, in turn, will cause non-food inflation to rise by 0.6% in the long run. Output and the exchange rate have both a direct and indirect impact on non-food inflation. The estimated dynamic non-food inflation model is presented in equation (13). All the estimated parameters are correctly signed.

$$\Delta p_t^{nf} = \underset{(-1.15)}{-0.004} + \underset{(4.90)}{0.29}\Delta p_{t-1}^{nf} + \underset{(4.36)}{0.07}\Delta s_t + \underset{(1.81)}{0.04}\Delta s_{t-1} +$$
$$\underset{(5.63)}{0.05}\Delta p_t^{o} + \underset{(3.90)}{0.05}\Delta p_{t-1}^{o} + \underset{(2.12)}{0.03}\Delta m_{t-6} - \underset{(-4.51)}{0.04} ECMnf_{t-1} + \underset{(4.47)}{0.10} ECMy_{t-1} \qquad (13)$$

Adjusted R-squared = 0.68

Equation standard error = 0.012

F-statistic = 53.72 (0.00)

Serial Correlation $X^2(2) = 9.47$ (0.15)

Sample size = 204 (1993M01 – 2009M12)

Where, $ECMnf_{t-1}$ and $ECMv_{t-1}$ are the error correction terms for non-food inflation and real output, respectively.

The results presented above suggest that in the short-run, non-food consumer price inflation is influenced by the lag of itself, contemporaneous and lagged values of the exchange rate and petrol prices, as well as lagged growth in money supply. Following a 10% increase in domestic oil prices, non-food inflation increases by 0.5% immediately, and by the same magnitude one month later, bringing the total short-run impact to 1%. An appreciation of 10% in the exchange rate is likely to reduce non-food inflation by 0.7% contemporaneously and by 0.4%, after one month. On the other hand, the impact of money supply is only felt after a period of six months, with a 10% growth in money supply resulting in an increase of 0.3%.These results further confirm that non-food inflation will increase in the presence of excess demand, depicted by the positive sign on the error correction term.

Overall Inflation

The long-run relationship between overall inflation and domestic oil prices was estimated using the Engel Granger cointegration approach, as presented in equation (14). All the signs for the variables were in line with a priori.

$$p_t = \underset{(-2.46)}{-0.43}\, y_t + \underset{(2.45)}{0.16}\, s_t + \underset{(2.09)}{0.13}\, p_t^o + \underset{(10.11)}{0.68}\, m_t \qquad (14)$$

From Equation (14), a 10% increase in domestic oil prices will lead to a 1.3% increase in overall inflation in the long-run. Further, the results indicate that money supply appears to have the strongest influence on overall inflation in the long-run, with a 10% increase in money supply resulting in a 6.8% increase in overall inflation. Equation (15) depicts the dynamic model for overall inflation.

$$\Delta p_t = \underset{(2.97)}{0.004} + \underset{(15.5)}{0.54}\,\Delta p_{t-1} - \underset{(-1.64)}{0.16}\,\Delta y_{t-1} + \underset{(4.84)}{0.08}\,\Delta s_t + \underset{(2.52)}{0.04}\,\Delta s_{t-2} + \underset{(2.80)}{0.05}\,\Delta s_{t-6} + \underset{(3.69)}{0.04}\,\Delta p_t^o +$$
$$\underset{(1.94)}{0.02}\,\Delta p_{t-2}^o + \underset{(3.12)}{0.06}\,\Delta m_{t-2} + \underset{(1.66)}{0.04}\,\Delta m_{t-6} - \underset{(15.5)}{0.02}\,ECMov_{t-1} - \underset{(-2.48)}{0.005}\,S_4 \qquad (15)$$

Adjusted R-squared = 0.68

Equation standard error = 0.013

F-statistic = 41.08 (0.00)

Serial Correlation = $X^2(2) = 22.69$ (0.00)

Sample size = 204 (1993M01 – 2009M12)

Where, $ECMov_{t-1}$ is the error correction term for overall inflation equation, and S4 is the seasonality factor for April.

In the short run, the main factors that influence overall inflation are: the inflation persistence, shown by the one-month lag in overall inflation, the exchange rate, output, money supply and the domestic oil price. A 10% upward adjustment in domestic oil prices results in a 0.4% increase in overall inflation, contemporaneously, and a 0.3% increase after two months.

VI Conclusion and Policy Implications

We observed that the impact of domestic oil prices on overall consumer price inflation is mainly through the non-food inflation component. In the long-run, oil prices affect non-food inflation through both the direct and indirect channels. Domestic oil prices have only an indirect effect on non-food inflation in the long-run, through the supply side, as they affect the cost of production. Specifically, a 10% increase in oil prices will reduce output by 1.5%. This, in turn, will cause food inflation to rise by 1.9% in the long run. However, in the short-run, oil prices impact overall inflation through both food and non-food inflation.

Given that the effect of petrol prices on overall inflation occurs primarily through non-food inflation, policy measures aimed at stabilising the prices of petroleum products should be enhanced. In addition, ensuring stability in the exchange rate would help in the stabilisation of petrol prices given that the exchange rate is an important factor in the determination of domestic petroleum prices. Further, monetary policy should be aimed at mitigating the second-round effects of the increases in petroleum prices by containing other factors that influence non-food inflation, such as money supply.

It is important to note that further research is required in order to enhance understanding of the impact of oil prices on consumer price inflation, and of the inflationary process itself. In this regard, there is need to investigate the effects of the various taxes imposed on petroleum products, the impact of diesel prices (or of a weighted average of diesel and petrol prices), as well as the impact of electricity tariffs on consumer price inflation.

References

Adams, C. (1995), Fiscal Adjustments, Financial Liberalization and Dynamics of Inflation: Some Evidence from Zambia, World Development, Vol. 23. No. 5.

Berument, H. and Taþçý, H. (2000),Inflationary Effect of Crude OilPrices in Turkey, Departmental Working Papers, Department of Economics, Bilkent University

Blanchard, O. and Gali, J. (2007), The Macroeconomic Effects of Oil Price Shocks: Why are the 2000s so different from the 1970s?MIT Department of Economics Working Paper No. 07-21

Cavallo, M. (2008) Oil Prices and Inflation, FRBSF Economic Letter, Number 2008-31, 2008

Gregorio, J., Landerretche, O. and Neilson, C. (2007) Another Pass-Through Bites The Dust? Oil Prices and Inflation, Central Bank of Chile Working Papers N° 417

Hamilton (1996a), "This is what happened to the Oil Price-Macroeconomy Relationship", Journal of Monetary Economics 1996, vol. 38, issue 2, pages 195-213.

Hooker, M. (1999) Are Oil Shocks Inflationary?,FEDS Working Paper No. 99-65

Hunt, B., Isard, P., Laxton, D. (2001),The Macroeconomic Effects of Higher Oil Prices, IMF Working Paper, WP/01/14

IMF (2000), The Impact of Higher Oil Prices on the Global Economy, Research Department

International Energy Agency (2004), Analysis of the Impact of High Oil Prices on the Global Economy, IEA Publications and Papers

LeBlanc, M. and Chinn, D. (2004) Do High Oil Prices Presage Inflation? Evidence from G-5 Countries, UC Santa Cruz Economics Working Paper No. 561; SCCIE Working Paper No. 04-04

Mwansa, L. (1998) Determinants of Inflation in Zambia. Ph.D. Thesis, University Of Gothenburg, Gothenburg.

Olubusoye, O. and Oyaromade, R. (2008), Modelling the Inflation Process in Nigeria, AERC paper 182

Pamu, E. and Simuchile Hobby (2003): Dynamic model of inflation determination in Zambia, Issues on the Zambian economy, 1(2) 2004.

Schneider, M. (2004), The Impact of Oil Price Changes on Growth and Inflation, Monetary Policy and the Economy Q2/04.

Appendix

Table 1: Unit Root Tests (ADF Test)

Variable	Level		1st Difference		I(d)
p	t-Statistic	p-Value	t-Statistic	p-Value	
	-0.91	0.95	-8.53	0.00	I(1)
p^f	-1.82	0.69	-9.98	0.00	I(1)
p^{nf}	0.85	0.99	-13.35	0.00	I(1)
p^o	-3.14	0.09	-14.51	0.00	I(1)
p^*	-2.94	0.15	-9.39	0.00	I(1)
y	-1.85	0.68	-4.65	0.00	I(1)
s	-2.07	0.56	-10.19	0.00	I(1)
m	2.21	1.00	-14.95	0.00	I(1)

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