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THE ROLE OF THE GLOBAL ECONOMIC CRISIS N THE DYNAMICS OF THE LABOUR MARKET IN SUB-SAHARAN AFRICA

By ***Akpan H. Ekpo++***

ABSTRACT

The global economic crisis resulted in job losses in SSA. Reflecting the combined impact of reduced growth, demand and prices for Africa's commodity exports, the number of people described as working poor (US$1.25 per day) rose from 160 million in 2003 to an estimated 191 million in 2009. Manufacturing, construction and service industries, were hard hit, laying off workers. The extractive industry has been the hardest hit. The unemployment rate in SSA is projected to have edged up from 8 percent in 2005 to 8.2 percent in 2009. The share of vulnerable employment in total, employment, however, declined from 77.2 per cent in 2005 to an estimated 75.8 percent in 2009. Macroeconomic policies must focus on growth-employment outcomes if sustainable development is to be achieved. Given the inevitability of economic crisis, it has become absolutely imperative for government to design and implement social safety nets to cushion the negative effects of economic crisis.

JEL Classification: J21, J45, J64

I. INTRODUCTION

The global economic crisis (GEC) triggered by the collapse of the mortgage sub-sector in the United States of America in 2007 affected Sub-Saharan African (SSA) countries in various forms: (i) decline in GDP growth, (ii) widening of current account deficits, (iii) reduction in foreign direct investment, (iv) reduction in remittances, (v) decline in overseas development assistance, (vi) decline in foreign reserves, (vii) reduced export revenue, (viii) decline in savings rates; and (ix) negative fiscal balances in most countries. These negative effects reversed the increased growth pattern recorded before the crisis. GDP growth in SSA plummeted from 6.0 in 2007 to 1.6 percent in 2009 with projected increase to 4.3 percent in 2010.

Across the entire continent, the GEC resulted in decreased growth in GDP. In Central Africa, real GDP fell from 5.6 percent in 2007 to 0.9 in 2009. In West Africa,

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GDP fell from 5.1 percent in 2007 to 2.4 in 2009. Southern Africa experienced a reduced growth at 6.7 percent in 2007 to -1.6 percent in 2009. The current account and fiscal balance as well as savings and investment rates declined.

What is more disturbing is the immediate impact and expected effect of the crisis on the labour market. Even in periods of satisfactory GDP growth, employment and unemployment were major problems in the continent. It is therefore not surprising that during the crisis, unemployment rates were in double digits in most SSA countries and are projected to worsen except policies are put in place to reverse the crisis. Another disturbing trend is the high rates of unemployment among the youths. The seeming high growth rates of GDP have not generated employment; to a large extent the growth rate have been immiserizing.

The economic crisis in Nigeria resulted in the retrenchment of thousands of bank workers who were unable to find employment due to the cyclical nature of the economic crisis. When the economy recovers, these workers would still find it difficult to find gainful employment. The impact on the economies of these countries includes reduction in aggregate demand in a period in which aggregate demand needs to be stimulated. In SSA, the non-existence of unemployment benefits and other short-term palliative welfare packages further worsened the situation in the labour market. There is the absence of social safety nets in most SSA countries.

The GEC exacerbated the already high unemployment rates and vulnerable employment in Africa. In SSA, unemployment rate increased marginally from 7.8 percent in 2006 to 8.2 in 2009 but remained problematic with the major employment arising from the large increase in informal sector employment and other types of vulnerable employment. The impact of high rates of unemployment manifests itself in increased poverty and backwardness.

In SSA, official unemployment rate remains single-digit but over 75 percent of the labour force was employed in low-productivity informal sector in vulnerable employment. African economies have been unable to create enough jobs to employ the growing labour force partly because the sectors that drive economic growth tend to be capital-intensive enclave sectors – mining, for example.

It is crucial to be concerned about high unemployment rates, especially among young people if social stability is to be maintained – a necessary ingredient for growth and development. "Frustration caused by persistent unemployment and lack of opportunities is likely to prompt young people to gravitate towards a charismatic and opportunist social revolutionary who blames the current structure of society for their problems" (ECA, 2010, p.13).

The objective of this paper is to examine the effect of the global economic crisis on the labour market in sub-Saharan Africa economies with a view to drawing the attention of policy-makers to implement strategies and programmes that would enhance employment opportunities. Data limitations have precluded formal econometric impact analysis for the study which has relied largely on descriptive, longitudinal analysis. The paper is structured as follows: Section II briefly discusses the theoretical issues while Section III gives an overview of the global financial crisis in terms of causes and global policy responses. Section IV articulates trends in unemployment rate and characteristics of the labour market. Section V focuses on global economic crisis and the labour market while section VI proffers the basic lessons for policy.

II. THEORETICAL DISCOURSE

The standard text-book treatment of the labour market fits the industrial economies of the world – whether it is classical or Keynesian.

However, the urban employment market in SSA which is very small could mirror with some fine-tuning what takes place in the developed industrial economies labour market. Let us demonstrate the importance of labour:

$$Y = AF(N, K) = \ldots\ldots\ldots\ldots\ldots (1)$$

Where:

Y = Real GDP (output)

A = index of the productivity of resources

N = level of employment

K = capital stock

An increase in A implies that the economy becomes more productive in the sense that more output can be produced with the same amounts of labour and capital services. Since changes in A correspond to changes in the productivity of both factors of production, A is otherwise referred to as an indicator of total factor productivity (TFP).

If we are concerned about the short run, then both K and A are fixed thus real output Y can change when N, level of employment changes. It is interesting to note that even in the long-run when K changes, labour (N) is embedded in K (Ekpo, 2010c). In order to analyse what determines the equilibrium level of employment in the economy, it becomes necessary to construct a model that examines the determination of equilibrium in the labour market.

PMP_L (Nd.....) = w …… (2)

Where

PMP_L = Value of the marginal revenue of labour

W = normal wage rate

N^d = demand for labour

Supply of Labour

$N^s = \left(W/pe\right)$, $N^{1>0}$. ... ... (3)

Where

N^s = labour supply

$\frac{W}{pe}$ =expected real wage rate

Equation (3) can be expressed in terms of the expected real wage that workers must be offered to enable them to supply a given amount of labour. That is

$W/pe = w(N^s); w^1 > {}^0$ .....(4)

Or as nominal wage

$w = p^e w (N^s)$ .....(4[1])

At equilibrium

PMP_L (N... ...) = P_{ew} (N... ...) ... ... (5)

It is necessary to note that NF= full employment level of employment depends on the positions of the labour demand and supply curves. When $P = P^e$, Therefore, it can be written as:

$N_f = N_f$ (A, K……..)

The actual level of employment differs from N_f only when workers' price level expectations are incorrect hence

$N = N \left(P/pe\right) N_p$ .....(5[1])

With N(1) = 1. That is, if $P = P^e$, then $N = N^p$

Equation (5) states that the equilibrium level of employment N is that at which the wage that firms are willing to offer (the demand wage) is equal to the wage that workers require to be paid. It is important to note that other factors may affect full employment.

Substituting the level of employment in equation (5) into the aggregate production function equation (1)

$$Y = AF\left[N\left(P/Pe\right)N_f, K\right] \quad \text{.....(6)}$$

Equation (6) is the economy's aggregate supply function. When $P = P^e$, the economy's output is given by:

$$Y_f = AF\,(N_f, K) \quad \text{.....(7)}$$

In the short-term, full – employment level of employment (labour) determines full – employment/potential out-put. This traditional analysis mirrors to some extent the urban wage sector in SSA countries - aggregate supply is an increasing function of the domestic price level.

Under an open – economy system, Montiel (2003) shows that "when shocks to the economy come as a complete surprise to workers, there is no reason for the arrival of such shocks to have any effect on the price level that workers had expected to prevail when they formulated their labour supply decisions" Considering the GEC as a shock, therefore, implies that under rational expectations full employment output would remain the same. An attempt to apply empirically the traditional labour market model to an African economy is in (Onwioduokit et al, 2009).

III. OVERVIEW OF THE GLOBAL ECONOMIC CRISIS: CAUSES AND GLOBAL POLICY RESPONSES

The global economy is facing its worst crisis in 60 years. In the first half of the 2007, a benign environment led investors, firms, and consumers to expect a permanently bright future and to underestimate risk.

- Housing and other asset prices shot up,
- risky assets were created and sold as being nearly riskless, and
- leverage increased.

So when housing prices turned around, and subprime mortgages and the securities based on them turned sour in July 2007, the stage was set for the crisis.

In the context of rapid global integration and deep and complex interconnections between financial institutions, the crisis quickly moved across assets, markets, and economies.

III.1 2008 Global Financial Crisis: Causative Factors

The crisis was caused by two or three factors amid long-standing structural weaknesses:

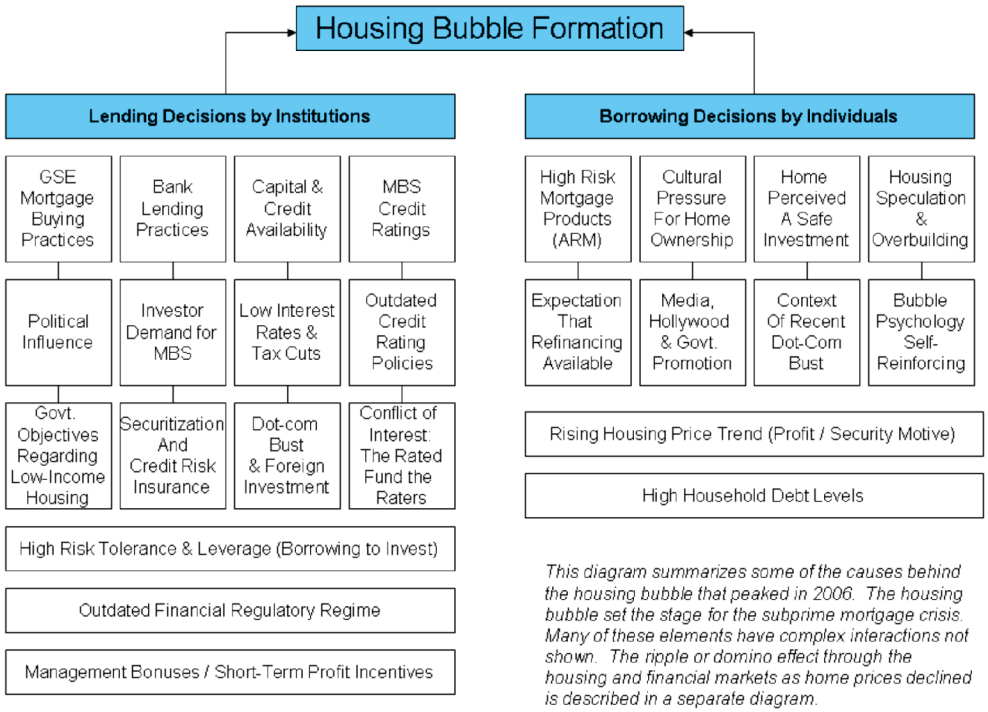
- first, the simultaneous and large deleveraging of three major segments of the global economy, which had been overleveraged during the years preceding crisis:
- ✓ the housing sector, - Boom and burst in the housing market/High-risk mortgage loans and lending/borrowing practices: The high deleveraging of the overleveraged housing sector soon led to the collapse of the housing bubble and worsened the ensuring economic downturn;
- ✓ the financial sector;
- ✓ and consumer demand in the United States;
- second, the inability of both markets and policies to quickly accommodate such intense deleveraging at both the national and the international levels. Disruptions in credit markets made the markets subject to rapid deleveraging, selling their long-term assets at depressed prices.
- The other factors in the realm of long-standing structural weaknesses included Information asymmetries and incentive:
- Regulatory failures
- Executive compensation schemes
- Incentives for accounting /auditing firms to please CEOs -to improve accounts that over stated profits which led to higher share values and greater CEOs compensation
- Securitization Practices
- Rating agencies incentives - Inaccurate credit ratings
- Government policies
- Policies of central banks
- Financial institution debt levels and incentives
- Credit default swaps
- Speculation
- Asset-liability mismatch

The subprime mortgage crisis in the US triggered the ongoing financial crisis as a result of dramatic rise in mortgage delinquencies and foreclosures in the United States. These had major adverse consequences for banks and financial markets around the globe.

Three Diagrams to depict the dynamics of the sub-prime mortgage crises and securitization practices are presented as follows:

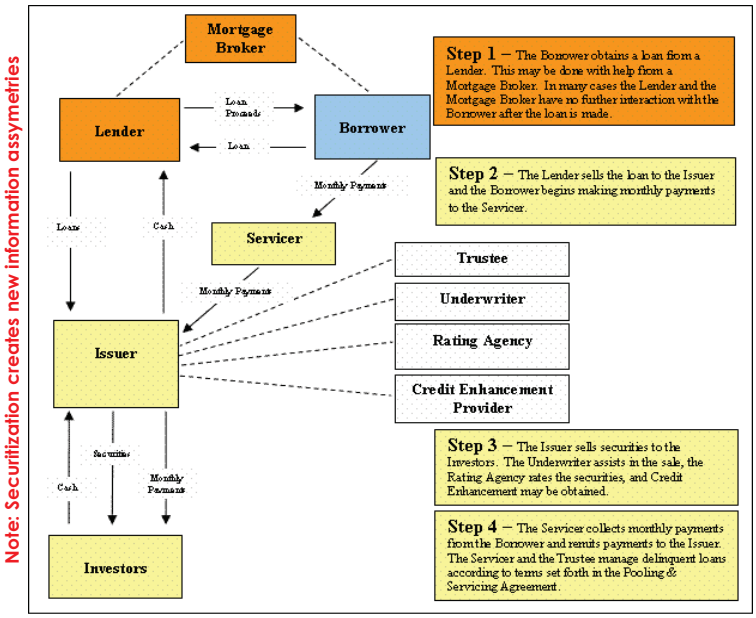
I.1.1

Subprime Mortgage Crisis
Diagram 1 of 2



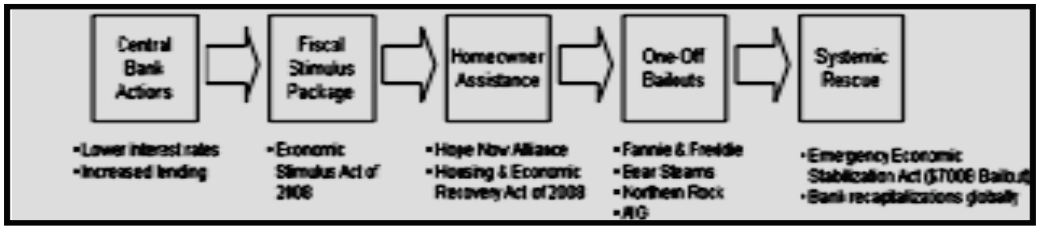
This diagram summarizes some of the causes behind the housing bubble that peaked in 2006. The housing bubble set the stage for the subprime mortgage crisis. Many of these elements have complex interactions not shown. The ripple or domino effect through the housing and financial markets as home prices declined is described in a separate diagram.

Securitization, a form of structured finance, involves the pooling of financial assets, especially those for which there is no ready secondary market, such as mortgages, credit card receivables, student loans. The pooled assets serve as collateral for new financial assets issued by the entity (mostly GSEs and investment banks) owning the underlying assets



I.1.3

Government and Industry Responses



(a) Financial rescue; (b) monetary stimulation; and (c) fiscal policy.

- ✓Legislative and regulatory responses
- ✓e.g. in US Federal Reserve Bank
- ✓Regulation
- ✓Economic Stimulus Act of 2008 of 13 February 2008
- ✓Housing and Economic Recovery Act of 2008
- ✓Lending industry action
- ✓Bank capital replenishment from private sources
- ✓Litigation
- ✓Law enforcement and Ethics investigation

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IV. TRENDS IN THE UNEMPLOYMENT RATE AND CHARACTERISTICS OF THE LABOUR MARKET IN SSA, 2003 - 2009

The analysis of the labour market in the sub-Saharan Africa has been made difficult by lack of adequate and up-to-date labour market information. Recourse has often been made to the use of administrative data and qualitative information from interviews as incidence of labour force surveys, until recently, is underwhelming in the region. Even so, some trends are discernible.

At 8.5 percent in 2003, unemployment rate in SSA decreased to some 8 percent in 2005, by 0.5 percentage points. It is reckoned to have risen to 8.2 percent in 2009. The limited increase, however, is not reflective of the true impact of the global economic crisis in Sub-Saharan Africa and should be seen in conjunction with indicators such as vulnerable employment and working poverty.

The share of vulnerable employment in total employment, however, declined from 77.2 percent in 2005 to an estimated 75.8 percent in 2009. The number of people described as working poor (US dollars 1.25 a day) rose from 160 million in 2003 to an estimated 191 million in 2009. In the same period, 2003 – 2009, the employment to population ratio rose from 65.3 percent in 2003 to 65.8 percent in 2009, 0.5 percent increases over the period.

Labour markets in Sub-Saharan Africa differ from those in developed industrialized countries. In Sub-Saharan Africa and similar developing economies, the study of

labour markets focuses on the determinants of rural-to-urban migration, the growth in the urban labour force and the rise in unemployment as well as the effects of education on levels of earnings. Labour market in Sub-Saharan Africa also plays an important role in the transmission of macroeconomic policy shocks. Whether, for example, nominal wages are rigid or flexible in most Sub-Saharan Africa countries is an empirical matter.

The distinguishing features of labour markets in Sub-Saharan Africa include:

- the importance of the agricultural sector in economic activity; this sector contributes about 45 percent to GDP and employs about 70 percent of the labour force;
- the importance of self-employment and irregular work activities – the rural sector is characterized by a large number of self-employed persons and unpaid family worker;
- informal urban sector featuring self-owned enterprises producing mainly services and other non-tradables;
- job insecurity in small private enterprises; wages are highly flexible, workers get very few benefits from their employers and legal minimum wage laws are not enforced. Labour unions play a very limited role, if any;
- the existence of a formal urban sector consisting of medium and large firms (some state-owned); they have workers on the basis of formal contracts. Both workers and employers are subject to various labour market regulations. Employers provide benefits such as health insurance, pension plan and relative job security to workers. Labour unions play an active and important role in the determination of wages. Legal minimum wage laws not only exist but are enforced;
- unreliable data on employment and unemployment when they are available; it is difficult to compare available data across countries;
- high rates of open and disguised unemployment (about 70% in some countries);
- existence of indexation and wage rigidity;
- rising rate of unemployment of young people in recent times; and
- absence of social safety nets.

V. GLOBAL ECONOMIC CRISIS (GEC) AND THE LABOUR MARKET

Africa's GDP growth rate rose from 1.3 percent in 1990 – 1994 to 5.6 percent in 2005 – 2007. The corresponding growth rates of per capita output were -1.34 and 3.2 percent, respectively. Gross domestic investment as a percentage of GDP increased marginally from 19.7 percent in 1990 – 1994 to about 21 percent in 2007 – 2009. Real GDP growth declined in all the regions of the continent, reflecting the impact of the global economic crisis. In East Africa, real GDP fell from 7.4 percent in 2005 to 3.9 percent in 2009. The Southern African region was worse hit; real GDP plummeted from 6.0 percent in 2005 to -1.6 percent in 2009 (see Table 1 and Table A1 in the appendix).

Table 1: Real GDP Growth in Africa (%)

	2005	2006	2007	2008	2009*	2010**
Africa	5.9	5.9	6.0	4.9	1.6	4.3
Central Africa	5.0	2.6	5.6	4.5	0.9	3.8
East Africa	7.4	6.8	7.5	6.4	3.9	5.3
North Africa	6.0	5.9	5.3	4.7	3.5	4.1
Southern Africa	6.0	6.6	6.7	4.6	-1.6	4.1
West Africa	5.1	5.3	5.9	5.3	2.4	4.7
Oil-exporting countries	6.8	6.0	6.9	5.6	2.5	4.9
Oil-importing countries	4.9	5.9	5.1	4.2	0.5	3.6

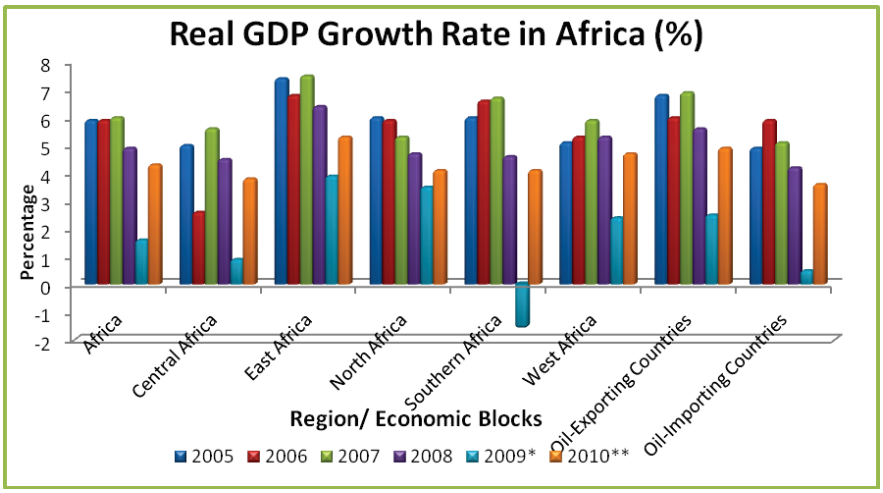
Source: *ECA, Economic Report on Africa 2010*
Notes: **estimated **Projections*

The GEC adversely affected labour markets in Africa. The graphical analysis is presented in Appendix 2. The period of the crisis is not long enough to allow for a formal testing of the impact of the crisis on SSA. Globally, it was estimated that an additional 53 million people in developing countries will fall into poverty added to the figure of 130 – 155 million generated by the food and oil crisis. The crisis reversed many of the gains made by African countries and may truncate the realization of the MDGs by the year 2015.

The reduced growth in SSA countries has been reckoned to cost the 390 million living in extreme poverty about 20 percent of their per capita income (or US$46 per person). This was attributable to reduced demand and prices for Africa's commodity exports implying lower incomes for domestic products and cuts in government services. The extractive industry has been the hardest – hit because of the global economic crisis. "In the Democratic Republic of the Congo, the closure of 40 mines resulted in the loss of 300,000 jobs in the province of Katanga alone. In Zambia, 3,000 jobs were lost by December 2008 as copper mines and smelters ceased operations" (ECA, 2010, p.174). The situation was similar in Swaziland, South African Mines, Botswana, Zimbabwe and the Central African Republic.

Manufacturing, construction and service industries were also hard hit by the GEC. The manufacturing sector was affected by declining global demand and increase in the cost of imported input, reflecting in part to currency depreciation. Factories ran at lower capacity and jobs were lost. In Uganda, 15 factories closed in 2008 due to the high cost of doing business (ECA, p.174).

Figure 1.



As was stated in the theoretical section, trends in employment are determined by the structure of an economy. Unemployment is ascertained by the interaction between the demand for and the supply of labour. Labour supply depends essentially on changes in the economically active population determined by the size of the working – age population and the extent to which that population decides to participate in the labour market.

Table 2 below presents unemployment rates for North Africa and SSA among males, females and young people. The unemployment rates for males and females in SSA remained single –digit for the period 1998 – 2009. These rates, however, are higher than 6 per cent, the current economic benchmark for full employment. However, the unemployment rates for young people are quite high; from 11.6 percent in 2005, it increased to almost 13 percent in 2009. The share of vulnerable employment in total employment in SSA is higher among females when compared to males. The share of vulnerable employment averaged 72 percent for males in 2005 – 2009 and about 82 percent for females during the same period (see Table 3).

Table 2: Unemployment Rates in Africa, 1998 – 2009 (%)

	Total		Males	
Year	North Africa	Sub-Saharan Africa	North Africa	Sub-Saharan
1998	12.8	7.4	11.0	7.2
1999	13.3	7.9	11.6	7.3
2000	14.1	7.9	12.3	7.5
2001	13.6	8.1	11.6	7.6
2002	13.4	8.1	11.4	7.6
2003	13.1	8.2	11.0	7.7
2004	12.3	7.9	10.1	7.5
2005	11.5	7.9	9.2	7.5
2006	10.5	7.8	8.4	7.4
2007	10.6	7.7	8.6	7.3
2008	10.0	7.6	8.1	7.2
2009	10.5	8.2	8.6	7.8

Source: *Global Employment Trends, January 2010, ILO*

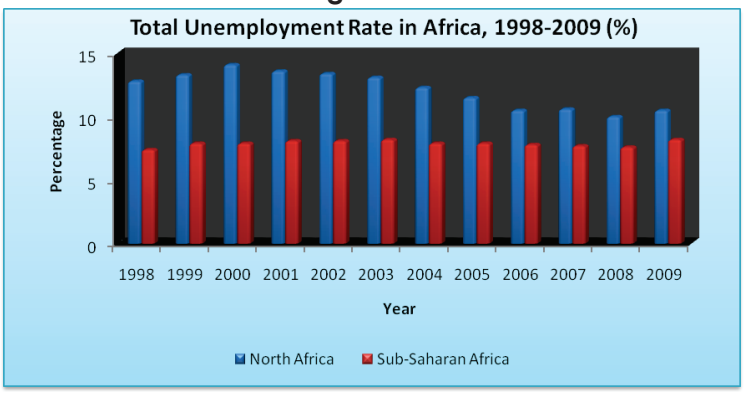
Table: Unemployment Rates in Africa 1998 – 2009 (%)

Year	Females		Adults		Young people	
	North Africa	Sub-Saharan Africa	North Africa	Sub-Saharan Africa	North Africa	Sub-Saharan Africa
1998	18.0	7.7	8.3	5.9	26.3	11.2
1999	18.2	8.6	8.8	6.2	26.4	11.8
2000	19.5	8.4	9.4	6.3	28.8	11.7
2001	19.3	8.6	8.8	6.5	29.2	11.9
2002	19.3	8.8	8.9	6.5	28.1	12.1
2003	19.0	8.8	8.6	6.6	27.7	12.1
2004	18.2	8.5	7.7	6.4	27.5	11.8
2005	17.7	8.4	6.7	6.4	27.9	11.6
2006	16.0	8.4	6.4	6.4	25.0	11.5
2007	15.8	8.2	6.6	6.2	25.2	11.4
2008	15.0	8.2	6.3	6.2	24.1	11.3
2009	15.6	8.8	6.5	6.5	24.7	12.6

Table 3: Share of Vulnerable Employment in Total Employment (%)

Year	Total		Males		Females	
	North Africa	Sub-Saharan Africa	North Africa	Sub-Saharan Africa	North Africa	Sub-Saharan Africa
1997	42.9	80.9	39.3	76.2	55.0	86.9
2002	40.3	79.3	38.4	74.0	46.2	56.2
2003	39.8	79.0	36.9	73.4	48.8	86.4
2004	41.1	77.3	36.7	70.7	54.2	85.8
2005	40.9	77.7	37.2	71.7	52.0	85.3
2006	38.6	78.3	34.5	73.0	50.3	85.1
2007	37.1	77.4	33.1	72.0	48.5	84.4
2008	37.9	75.5	31.8	69.6	55.8	83.5
2009	40.4	76.9	33.4	71.2	61.2	84.2

Figure 2.



[1] *Vulnerable employment is characterized by inadequate earnings, low productivity and difficult conditions of work that undermine workers' fundamental human rights.*

3.1 SECTORAL SHARES IN EMPLOYMENT

The overall employment situation in Africa has not changed dramatically over the last decade. The majority of the population are employed in the agriculture sector rather than services and industry. In 1998, about 68 percent of SSA's population was employed in agricultural sector while 9.5 percent was employed in industry and about 2.3 percent in services. By 2007, the share of employment in agriculture declined slightly to about 63 percent; 10 percent in industry and 27 percent in services.

This shows that the structure of production is still largely primitive, given the high share of agriculture in employment and even its contribution to the growth of GDP. When compared to the rest of the world and North Africa, SSA lags behind in modernization. The high exposure of the agricultural sector to natural incidents such as droughts and other environmental hazards increases the vulnerability of employees in the sector.

Figure 3.

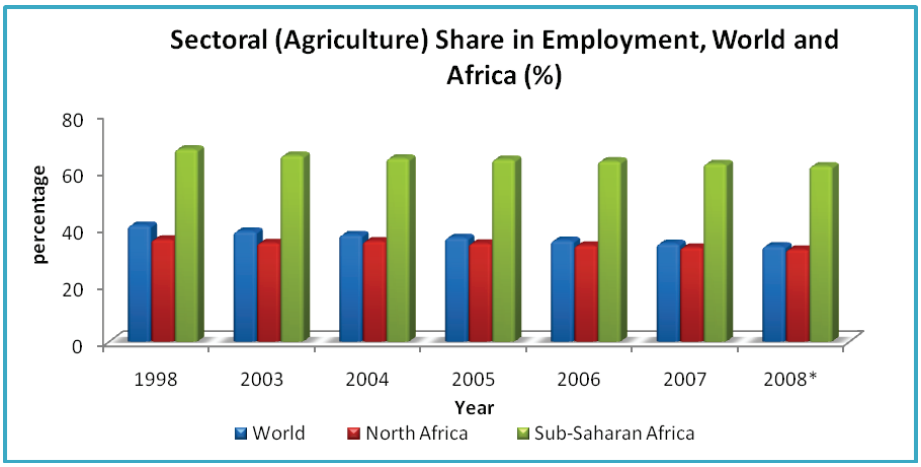


Table 4: Sectoral Shares in Employment, World and Africa (%)

	1998	2003	2004	2005	2006	2007	2008*
Agriculture							
World	40.8	38.7	37.5	36.5	35.5	34.4	33.5
North Africa	35.9	34.7	35.3	34.5	33.8	33.1	32.4
Sub-Saharan Africa	67.6	65.4	64.4	64.0	63.4	62.5	61.7
Industry							
World	21.1	20.7	21.1	21.5	22.1	22.7	23.2
North Africa	20.0	19.2	19.7	20.8	21.7	22.7	23.7
Sub-Saharan Africa	9.5	9.5	9.7	9.7	9.9	10.1	10.3
Services							
World	38.1	40.7	41.5	41.9	32.4	42.9	43.3
North Africa	44.1	46.1	45.1	44.8	44.5	44.2	43.0
Sub-Saharan Africa	22.9	25.1	25.9	26.3	27.7	27.4	28.0

***Source**: Global Employment Trends, ILO*

Annual employment growth in SSA averaged 2.8 percent in the decade 2000 – 2009. This is quite comparable with other regions of the world except for the developed countries where employment is propelled by industry and services. Output per worker in SSA grew at 1.8 percent between 2000 – 2005; there was no remarkable change due to the global economic crisis. At the height of the crisis in 2009 world output per worker declined by -2.5 percent; Latin America and the Caribbean by -3.5 percent while that of SSA stood at 1.7 percent representing a decline when compared to 3.4 percent in 2007.

Table 5: Annual Employment Growth (%)

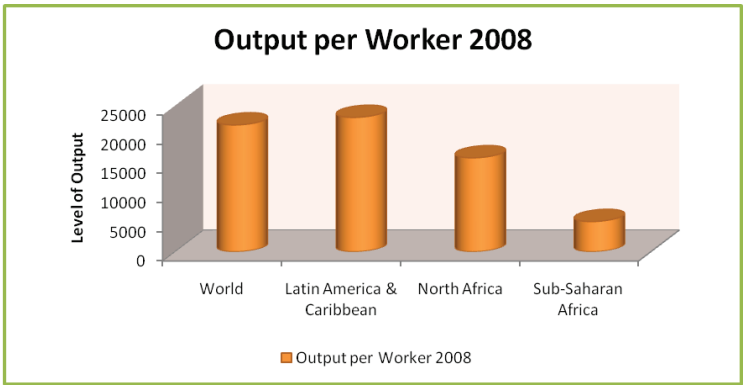
Region	2000–2005	2006	2007	2008	2009
World	1.6	2.0	1.9	1.4	0.7
Latin America & Caribbean	2.5	3.4	2.1	2.2	0.2
North Africa	3.2	3.9	2.7	2.6	2.4
Sub-Saharan Africa	2.9	2.8	3.0	2.9	2.8

***Source: Global Employment Trends**, January 2010, p.49.*

Table 6: Output Per Worker, Level and Annual Growth (%)

Region	Output per Worker 2008	2000 – 2005	2006	2007	2008	2009
World	21708	1.9	2.9	3.0	1.8	-2.5
Latin America & Caribbean	23002	0.2	2.1	3.3	1.9	-3.5
North Africa	16081	1.0	1.8	2.9	3.2	0.6
Sub-Saharan Africa	5166	1.8	3.1	3.4	2.0	1.7

***Source: Global Employment Trends**, January 2010, p. 49*



VI. BASIC LESSONS LEARNED

There is no doubt that economic growth in SSA before the crisis was not employment generating. The global economic crisis worsened the employment situation in SSA as evidenced by secondary data. Though rates of unemployment remained relatively single-digit during the crisis, there were job losses in the extractive industries, manufacturing and textile exports, among others. Unemployment among young persons was affected by the global economic crisis; a situation that needs to be addressed given the importance of social stability for economic growth and development. It is important that policy-makers and other stakeholders in SSA put in place strategies for reducing unemployment as well as ensuring that young persons are employable. It is crucial to strengthen the growth – employment nexus at both the macroeconomic and the sectoral levels. Macroeconomic policies must target employment generation as its outcome.

Consequently, the following basic lessons are deducible:

- policies must be put in place to moderate the effect of external shocks such as the recent economic crisis;
- it is necessary to design social safety net given the inevitability of economic crisis due to the cyclical nature of market – based economies;
- resources should be made available for capacity building and skills acquisition particularly for young persons to enable them to be employable;
- school curriculum must have a heavy dose of entrepreneurship training so that with the right environment, for example, access to credit, new entrants can create their own employment;
- it is necessary to invest in the production of reliable labour data to allow for robust analysis of employment issues in the continent;
- governments need to develop infrastructures in their countries using the public – private partnership approach. Within this context, regional projects that cut across countries should be embarked upon; and
- economies in SSA must be diversified away from being monocultures, that is resource – export based (raw materials); the trend should be towards industrialization so as to absorb the large number of unemployed persons.

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APPENDIX

Table A1

Some Socio-Economic Indicators for Africa (1990 – 2007)

Year	1990–1994	1995–1990	2000–2004	2005–2007
Output (GDP) growth	1.30	3.09	4.09	5.57
Per capita output (GDP) growth	-1.34	1.12	1.65	3.19
Annual rate of growth in the value of exports	1.53	4.34	14.79	18.33
Intra-African exports (per cent of total exports)	8.10	10.37	9.51	8.99
Exports to South Africa from the rest of Africa (per cent of total exports)	0.43	0.8	1.02	1.36
Export to China (per cent of total exports)	0.49	1.14	3.80	8.64
Export to India (per cent of total exports)	1.21	2.53	2.64	2.90
Export to Brazil (per cent of total exports)	0.87	1.73	2.29	2.95
Export to advance economies (per cent of total exports)	70.79	68.83	68.43	67.86
Gross domestic investment (per cent of GDP)	19.68	19.57	19.38	20.56
Public sector investment rate	6.76	6.38	6.98	6.94
Private sector investment rate	12.92	13.19	12.40	13.62
Africa's investment rate as a per cent of developing country average	77.0	78.4	78.8	74.2
Gross domestic savings (per cent of GDP)	17.23	17.32	23.5	30.79
Goods & services balance (per cent of GDP)	1.01	-0.05	2.95	7.04
Average level of reserves in months of imports	7.24	9.02	10.92	13.52
School enrolment, primary (per cent of gross)	74.6	81.1	88.14	96.55
School enrolment, secondary (per cent of gross)	29.88	31.45	40.81	34.12
Global all-commodity price index	53.62	55.7	65.07	131.94
Global index of energy prices	32.83	34.98	55.3	133.84
Global food price index	99.00	98.34	87.08	123.71
Global non-fuel commodity price index	88.67	91.16	81.78	128.72
Lending rate spread (domestic)	6.01	6.07	8.03	11.85
Domestic credit to the private sector (per cent of GDP)	42.33	51.52	50.69	50.84
Total private flows (per cent of GDP	0.24	0.11	2.32	1.34

Source: *ECA calculations based on African Development Indicators (2009)*

Table A2

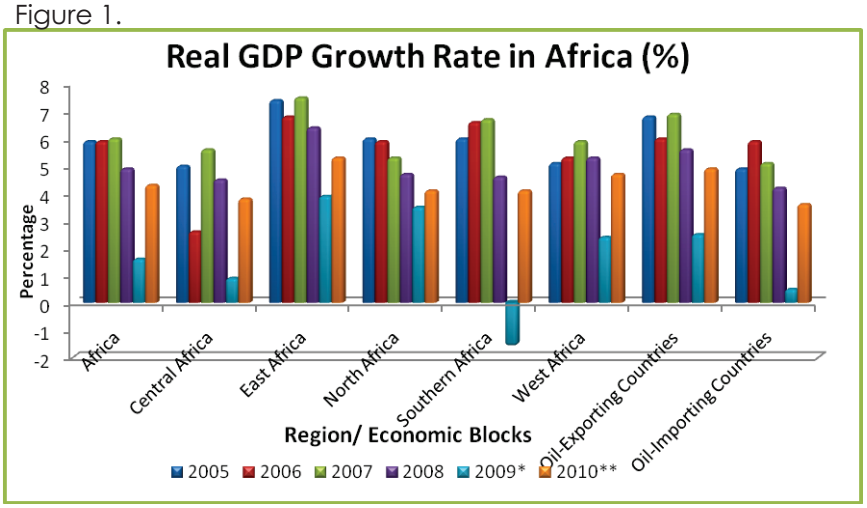
Decade Average for some Important Socio-Economic Aggregates

Year	**1980–1989**	**1990–1999**	**2000–2007**
Output (GDP) growth	2.64	2.50	4.65
Per capita output (GDP) growth	-0.26	-0.11	2.23
Annual rate of growth in the value of exports	3.26	2.94	16.12
Gross domestic savings (per cent of GDP)	25.39	17.27	26.12
Gross domestic investment (per cent of GDP)	22.21	19.62	19.82
Inflation, GDP deflator (annual per cent)	10.18	8.81	6.07
Fiscal balance, cash surplus/deficit (per cent of GDP)			-1.28
General government final consumption expenditure (per cent of GDP)	15.67	16.41	14.18
Current account balance (per cent of GDP) average across countries	-6.63	-5.43	-2.57
Average annual coefficient of variation for GDP growth	2.43	9.14	1.36
Proportion of the working age Population in agriculture	61.11	55.93	51.20
Value added in agriculture as a proportion of GDP	28.05	27.37	23.82
Value added in manufacturing as a proportion of GDP	10.65	10.72	10.01
Value added in mining as a proportion of GDP	8.94	7.77	11.24
Value added in services as a proportion of GDP	41.85	42.46	42.51
ODA total, net disbursement, all donors	12.85	21.22	28.5
Foreign direct investment (per cent of GDP)	0.42	0.8	2.05
Total debt stock (per cent of GDP)	35.94	54.11	37.38
Liquid liabilities (M3 as a per cent of GDP)	30.8	37.07	34.57
Literacy rates	55.96	44.5	
Mortality rate, under-five (per 1.000)	182.88	167.67	148.22
Lending rate spread (domestic)	6.04	9.94	11.04
Public sector investment rate	9.64	6.56	6.96
Private sector investment rate	12.57	13.06	12.86
Domestic credit to the private sector (per cent of GDP)	56.78	46.92	50.75
Total private flows (per cent of GDP	0.48	0.17	2.15

Source: *ECA calculations based on African Development Indicators (2009)*

APPENDIX 2

Figure 1.



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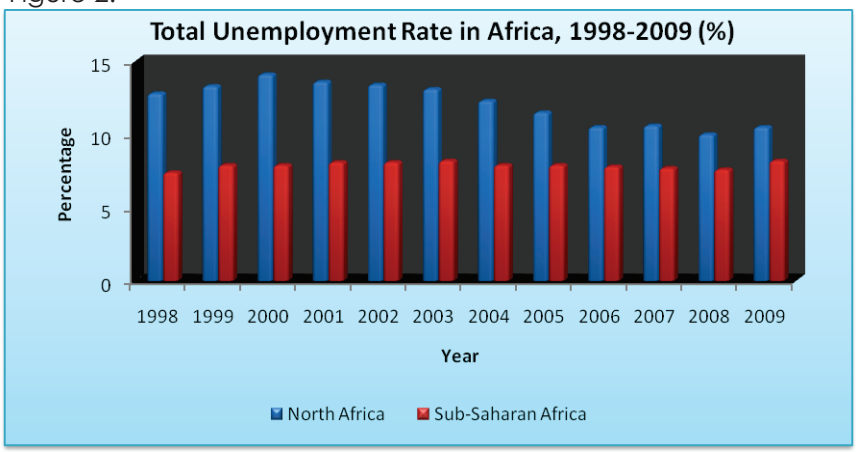

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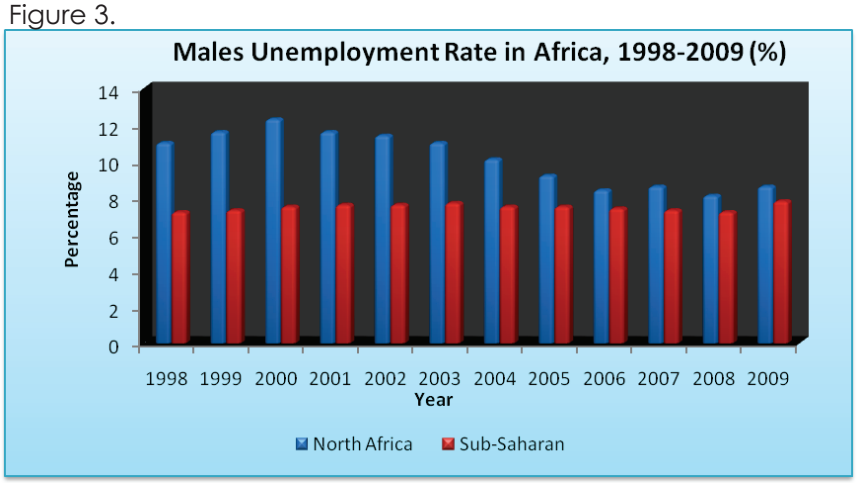

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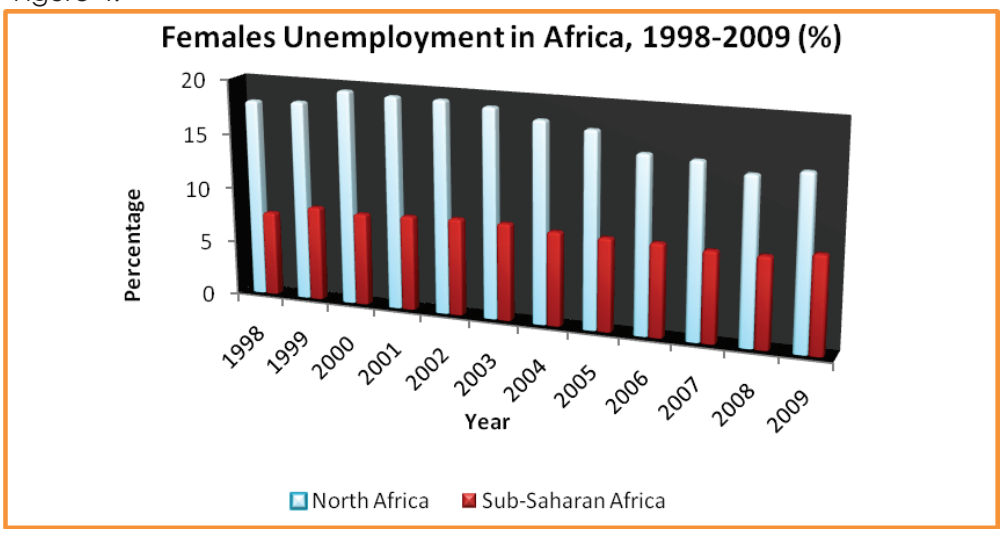

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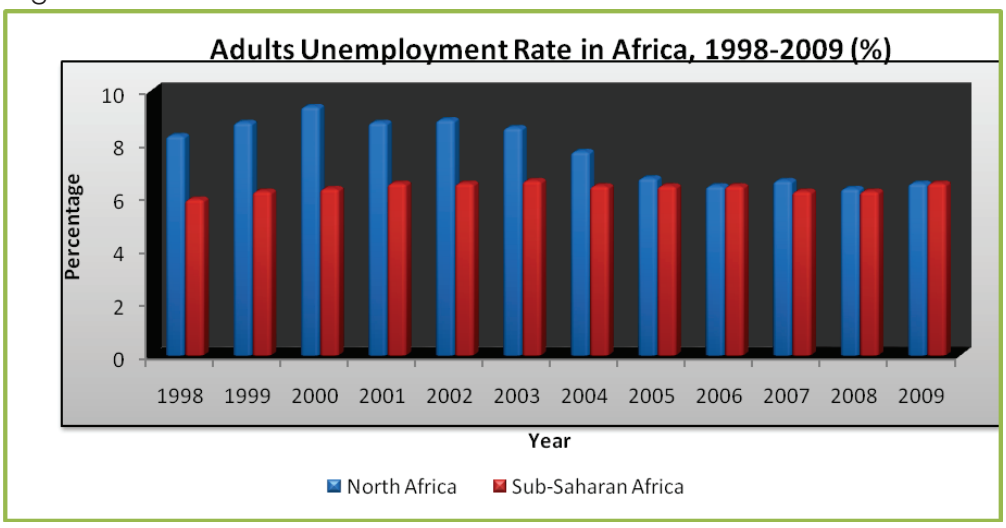

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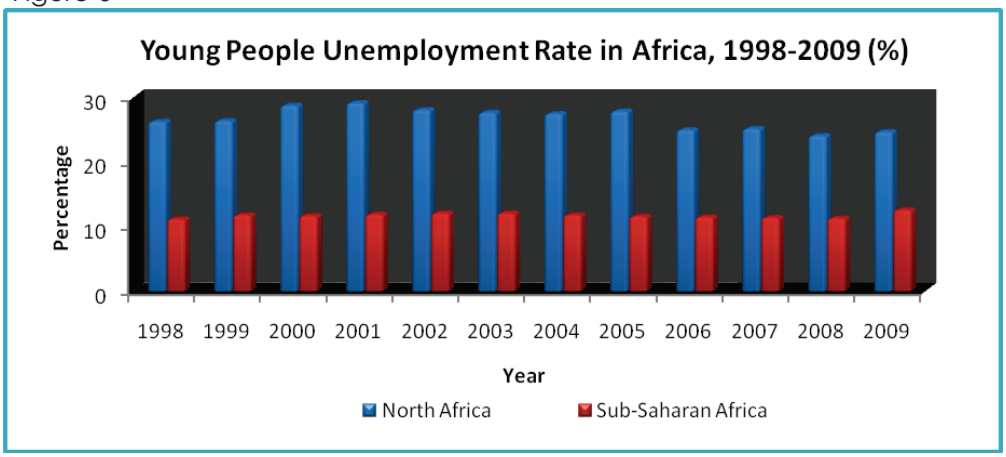

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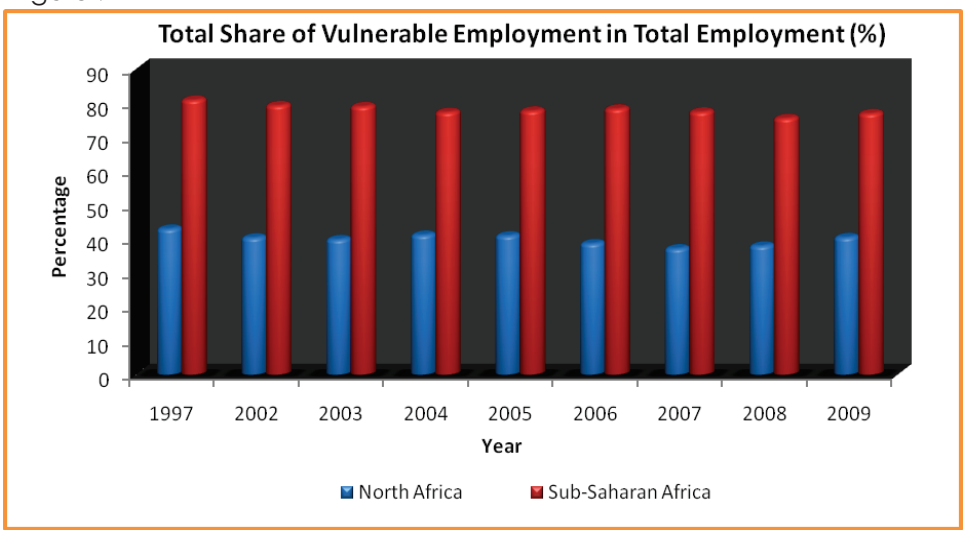

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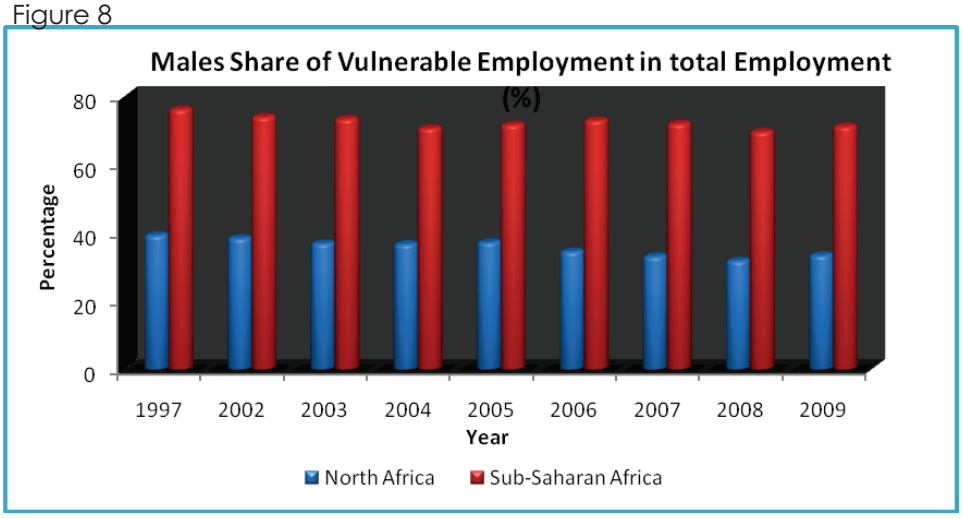

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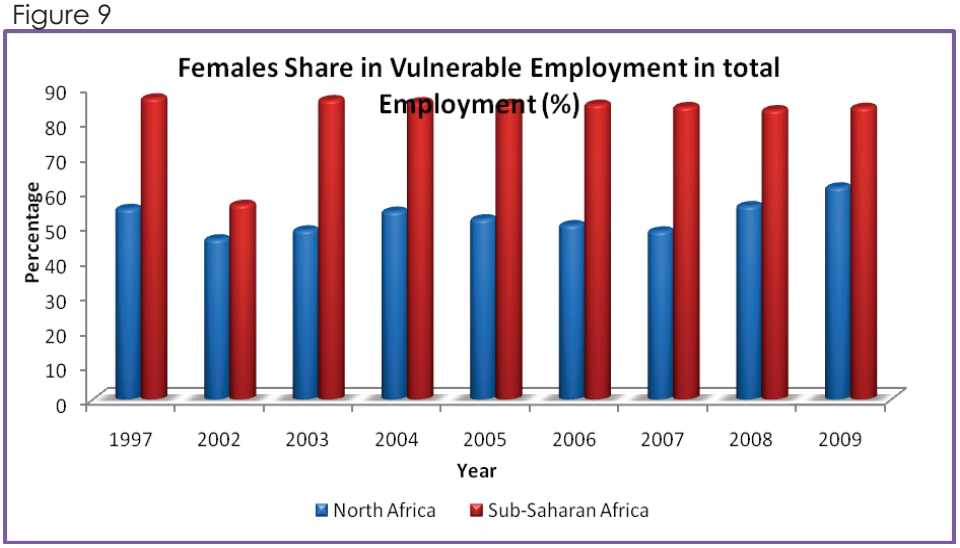

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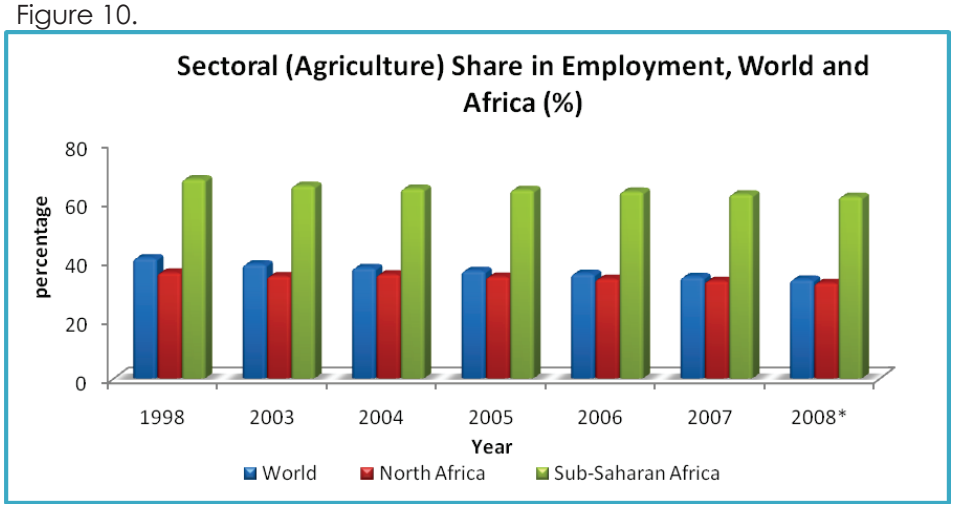

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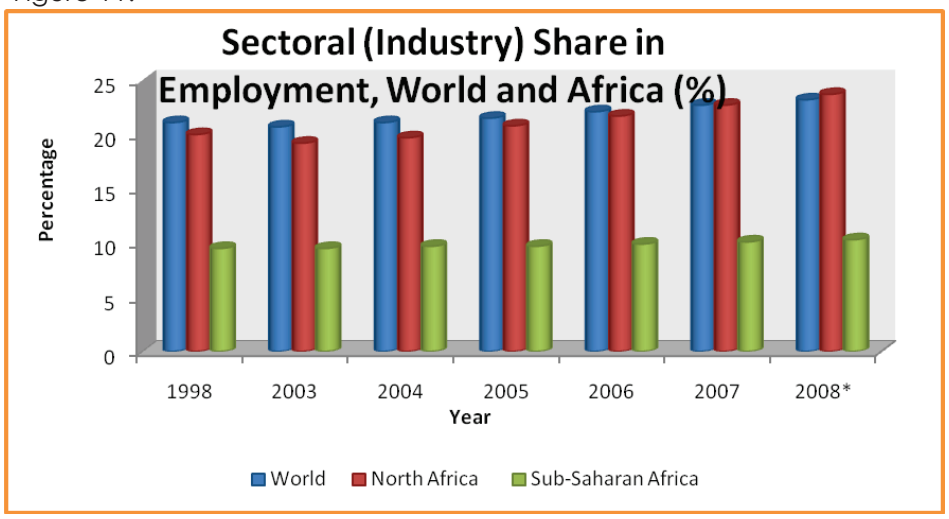

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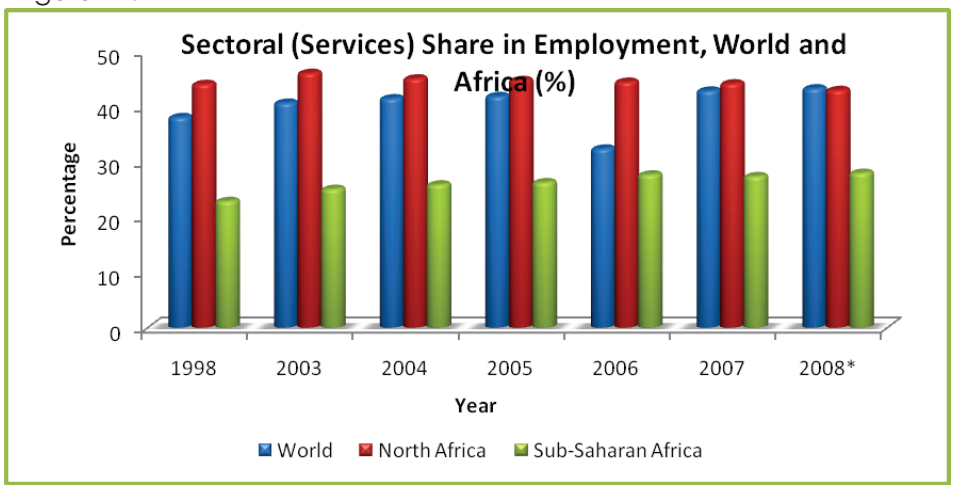

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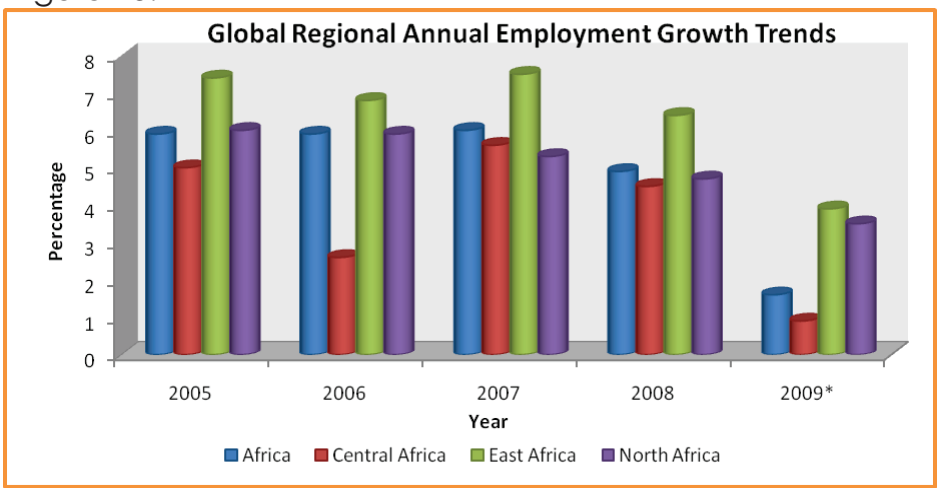

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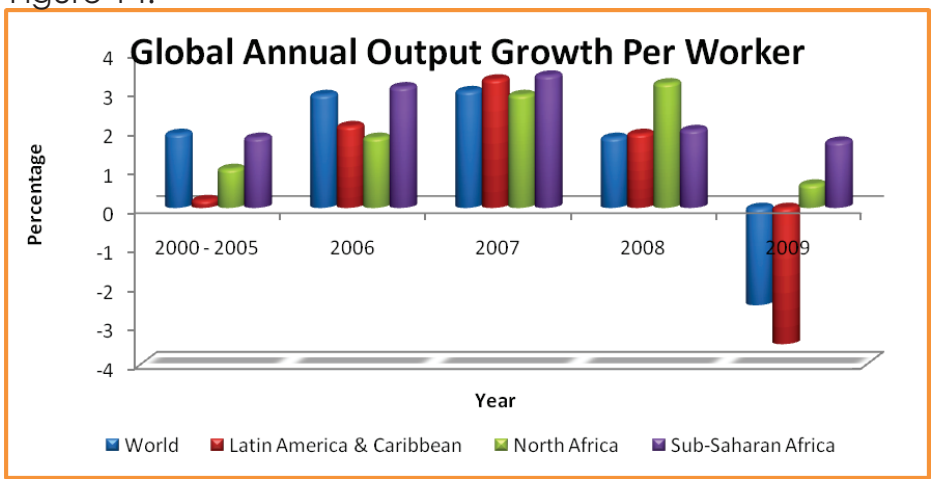

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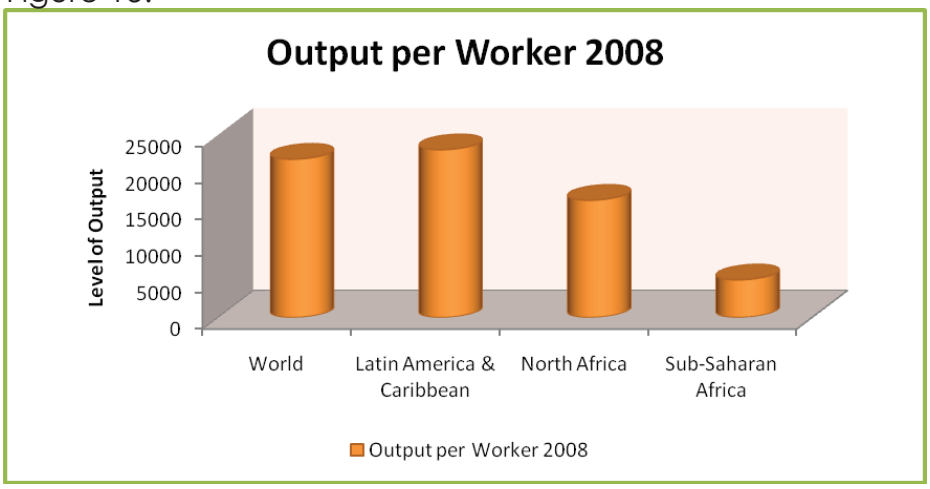

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OPENNESS, INSTITUTIONAL QUALITY, AND FINANCIAL DEVELOPMENT IN SUB-SAHARA AFRICA (1980 – 2009)

By ***Johnson P. Asiama* and Hakeem Mobolaji*****

ABSTRACT

The finance-growth literature is clear on the fact that financial development facilitates economic growth. Recent research effort is shifting towards exploring the determinants of financial development itself, and why the level of financial development varies across countries. In this paper, the authors contribute by exploring the evidence for countries in sub-Sahara Africa, a region that has implemented broad financial sector reforms for three decades, yet continues to lag behind in terms of financial development. Specifically, the paper focused on the impact of trade and financial openness as well as quality of institutions on financial development using dynamic panel data methods. The panel model specifications were estimated with three different measures of financial development - private credit, broad money and liquid liability as a ratio of GDP. The authors also tested the Rajan-Zingales' hypothesis. For all indicators of financial development, trade and financial openness boost financial development. There is also, evidence that weak institutional quality impacts negatively on financial sector development in the region. Finally, there is little support for the Rajan-Zingales hypothesis.

JEL Classification: G21,G15, 016 and 055

Keyword: Financial Development, Panel Data Methods, General Method of Moments,

1. INTRODUCTION

The economic growth literature is conclusive that a developed and well-functioning financial sector is beneficial for sustained growth (Schumpeter, 1911; Gurley and Shaw, 1955; Goldsmith, 1969; Mckinnon, 1973; Shaw, 1973; Levine, 2003; Demetriades and Andrianova, 2004; etc). This is because of the critical services provided by financial systems. For example, they evaluate, screen and allocate capital, monitor the use of that capital, and facilitate transactions and risk management. When financial institutions provide these services well, this ensures that capital flows appropriately to firms, promoting and sustaining economic

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The views expressed in the paper are those of the author and do not reflect the Institutions in which the authors work

growth. The debate now is on the determinants of financial development itself. For example, how and why financial markets and institutions evolve. Also, why financial markets are at different levels of development in different countries, and what legal and regulatory environment facilitates rapid development of financial institutions, etc.

On the differential levels of financial development across countries, one interesting result that has been reported in the literature suggests for example that, openness promotes financial development in rich countries but on the contrary, in poor countries, openness may constrain financial development (Beck, 2003; Do and Levchenko, 2004). Thus, the impact of trade and financial openness on financial development is an empirical question to be determined through research. This has motivated this paper to explore the determinants of financial development in a region such as Sub-Saharan Africa (SSA), with particular focus on the role of trade and financial openness, and institutional quality on financial development.

The paper focuses on the following research questions:

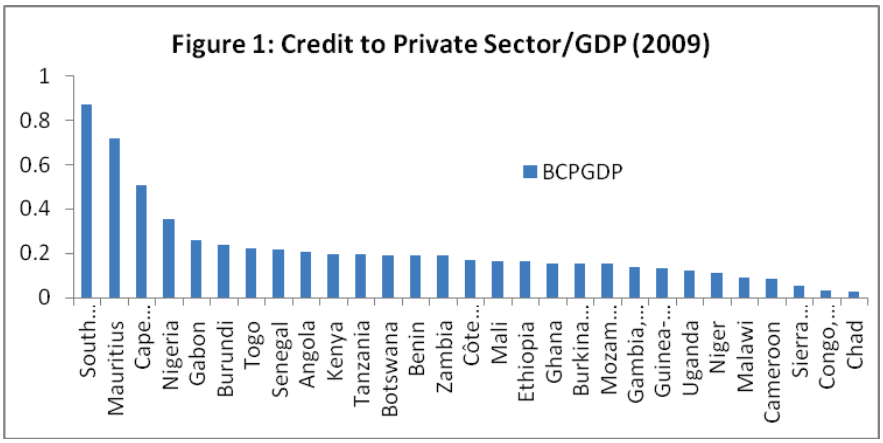
- What are the determinants of financial development in the sub region?
- To what extent do trade and financial openness, and institutional quality affect financial development in SSA?
- Is contemporaneous opening of both trade and financial sectors helpful for financial development in the region?

The third research question is a test of the simultaneity hypothesis, or the so-called Rajan- Zingales (RZ) hypothesis, which suggests that simultaneous opening of both the trade and financial sector, is necessary for financial development (See Baltagi et al, 2007).

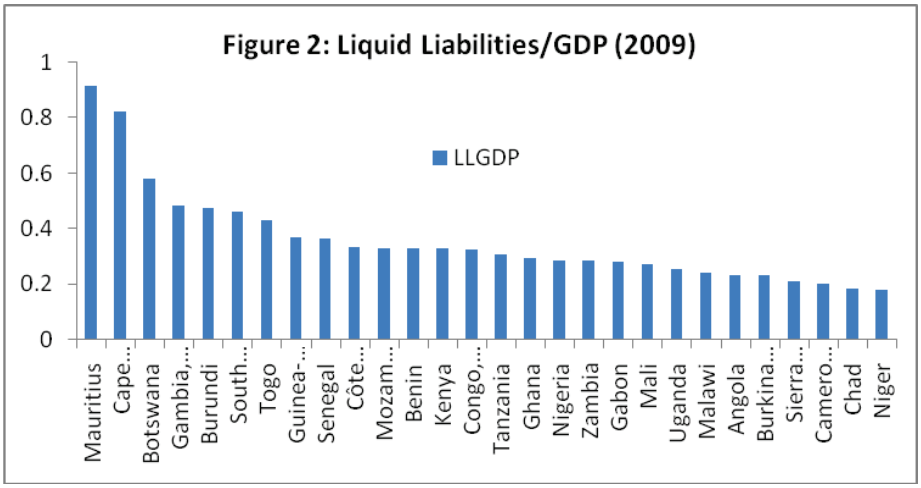
The paper is presented in five (5) sections. Section two reviews the state of financial development in Sub Saharan Africa, while section three discusses the theoretical and empirical issues. Section four (4) presents and discusses the results, and section five concludes the study.

2. FINANCIAL DEVELOPMENT IN SUB – SAHARAN AFRICA

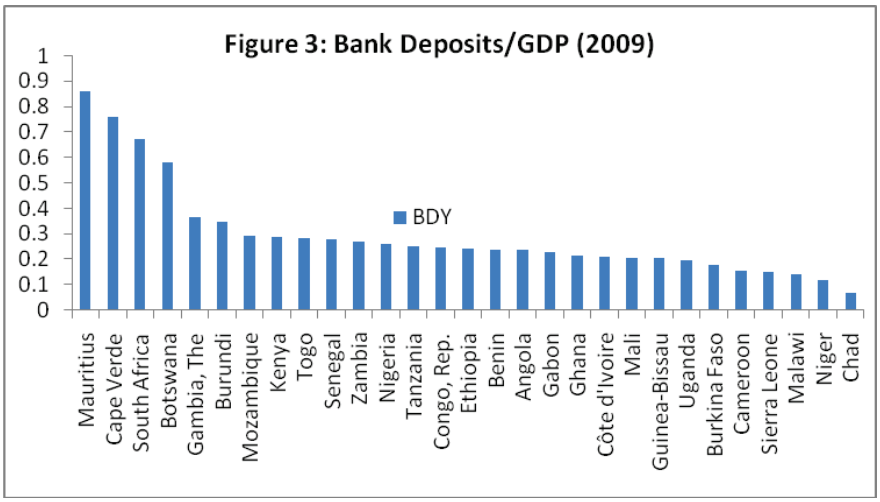
Since independence, many countries in Sub Saharan Africa have had financial systems that could be described as rudimentary, and even as at the end of 2009, the level of financial development remains relatively low (see Figure 1, 2, 3 and 4). The low state of financial development since the 1960s was attributable to a myriad of factors among which was the emphasis on government intervention in credit allocation. The banking system in most of these countries was effectively nationalized with mainly state-owned banks, apparently in pursuance of a policy of 'providing credit to drive economic development'.



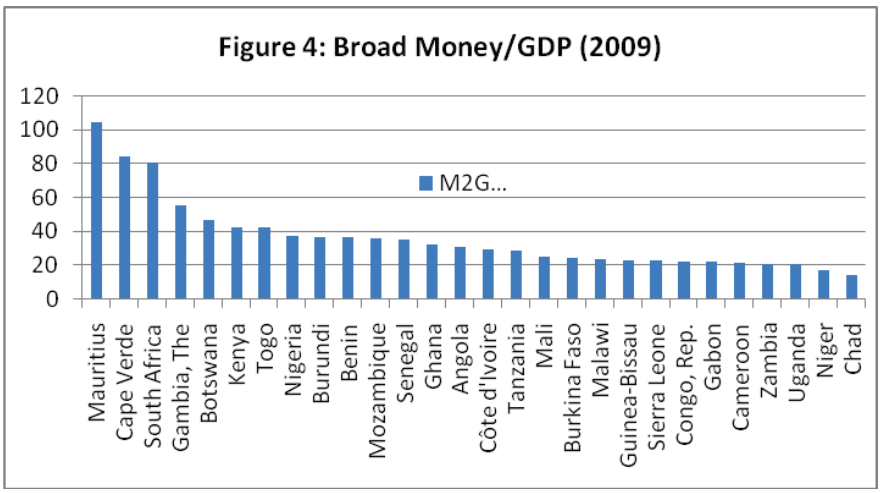
Governments also had ceilings on interest rates and directed credit to selected sectors of the economy. These resulted in inefficient allocation of resources, high proportion of non-performing loans, negative real interest rates, and inflationary refinancing by the central bank of commercial bank exposures. Hence, financial development in Sub Sahara Africa by the early eighties was rather one of disappointment.



From the mid-eighties, many of the countries embarked on a reform agenda with the help of the international financial institutions namely, the IMF and the World Bank. The package of reforms included interest rate liberalization, elimination of credit controls, restructuring of banks, indirect instruments of monetary policy, and targeted measures to develop financial markets. These reforms were further extended into the mid-nineties as more countries embraced the new economic and financial sector reforms.



In spite of more than two and a half decades of financial sector reforms, the status of financial development remains rudimentary, compared with other developing regions of the world (Kasekende 2010). As shown in Figures 1, 2, 3, and 4, which are graphs of indicators of financial development such as liquid liabilities as a ratio of GDP, credit to the private sector as a ratio of GDP, and bank deposits as a ratio of GDP, only four countries, namely, Botswana, Cape Verde, Mauritius, and South Africa, can be said to have developed banking sectors comparable to middle income countries.



In terms of other measures of financial development based on bond and equity market development, these do not perform any better. We are indeed mindful of the pitfalls of using these conventional measures of financial development for our review. As argued by Pill and Pradham (1995), the conventional indicators tend to overlook factors such as the extent of openness of the country to capital flows, the

extent of public borrowing from the domestic financial system, the development of nonbank financial intermediation, enforcement of contracts, and the competitiveness of the banking system. Pill and Pradham examined broad money, base money, bank credit to the private sector, and real interest rates as measures of financial development, but concluded that private sector credit was the only indicator that could vary directly with financial development. Alternatively, Gelbard and Leite (1999) proposed a comprehensive index of financial development such as a market structure index, a financial products index, a financial liberalisation index, and institutional environment index, a financial openness index, and a monetary policy index. This approach, albeit laudable, is apparently subjective as the technique included some judgmental questions and based on perceptions by country officials and hence has application difficulties.

The most robust measure of financial development is therefore private sector credit growth, and based on that alone, it is obvious(Figure 1) that the financial development gapfor Sub-Sahara Africa is significant, if countries are to fully benefit from the impact of financial development on economic growth. Not only is there a need to pursue deepening of the bond and equities markets; there is also the need to deepen further the banking sector.

3. LITERATURE REVIEW

3.1 THEORETICAL LITERATURE

Financial development is usually defined as a process that marks improvement in quantity, quality, and efficiency of financial intermediary services. This process involves the interaction of many activities and institutions and possibly is associated with economic growth. However, its measurement has been challenging in practice. The earlier literature used the ratio of broad money to GDP as indicator for financial deepening or development, but this has been criticized (Pill and Pradham, 1995) on the grounds that the measure ignores certain important factors, for example openness of a particular country to capital flows, public borrowing from the financial system, development of nonbank financial intermediation, and the competitiveness of the banking sector in the economy. Thus, an alternative measure of financial development is the ratio of private sector credit from deposit money banks (DMBs) to GDP, which captures the degree to which the private sector uses banks to finance consumption or investment.

As already explained, the role of financial development as a catalyst for economic growth is already well-documented in the literature. Notable works include Schumpeter (1911), Gurley and Shaw (1955), Goldsmith (1969), Mckinnon(1973), Shaw (1973),Levine (2003), Demetriades and Andrianova (2004), among many others. A new frontier of research is focusing on the determinants or factors that drive financial development itself. Among the potential determinants in the literature include; legal history, historical health conditions, institutions, political economy

factors, geographical factors, cultural factors, and macroeconomic factors i.e. trade openness, inflation, monetary policy efficiency, capital account liberalization etc. These are reviewed into greater detail below.

3.1.1 TRADE, FINANCIAL OPENNESS AND FINANCIAL DEVELOPMENT

In a seminal paper by Rajan and Zingales (2003), the authors identified the supply-side role of interest groups where it was demonstrated that financial development did not always serve the interest of the political and economic elite. When financial markets are underdeveloped, the incumbent industrialists and financial intermediaries enjoy rents. In other words, the 'industrial incumbents' are in a favourable position to obtain finance due to reputational capital and hence enjoy their rents because new firms have to team with them to obtain finance. The 'financial incumbents' enjoy rents because they have informational advantage which is the result of relationship based financing and hence they become monopolists in providing loans to potential entrants. Alternatively, the liberalization of trade and finance triggers competition hence jeopardizing the rents of incumbents. Hence, to protect their favourable position, dominant interest groups organize themselves by compelling politicians to shape up policies and institutions to their own benefit.

3.1.2 INFLATION AND FINANCIAL DEVELOPMENT

There are quite a number of channels in the theoretical literature on the way inflation impacts on the ability of the financial sector to allocate resources effectively. Recent views emphasize the importance of informational asymmetries in credit markets and how increases in the rate of inflation adversely affect credit market frictions with negative repercussions for the financial sector and therefore long-run real activity [Huybens and Smith 1999; Padachi, Seetanah and Rojid (2008)]. The argument is that the presence of informational friction implies that an increase in the rate of inflation drives down the real rate of return not just on money, but on assets in general. Hence the reduction in real returns worsens credit market frictions. Since these market frictions lead to rationing of credit, the latter becomes more severe as inflation rises. As a result, the financial sector makes fewer loans, resource allocation is less efficient, and intermediation activity diminishes with adverse implications for capital investment. This in turn lowers both long-run economic performance and equity market activity, where claims to capital ownership are traded [Huybens and Smith 1999).The models also emphasize the presence of threshold effects whereby only when inflation exceeds a certain critical level does informational frictions play a role (Azariadis and Smith (1996).These models further imply that there exists a second threshold inflation rate such that once inflation exceeds this second level, "…perfect foresight dynamics are associated with endogenous oscillation in all variables, so that inflation is highly correlated with inflation variability and asset return volatility" p.10.

3.1.3 INSTITUTIONAL QUALITY AND FINANCIAL DEVELOPMENT

The role of institutional quality in financial development has been discussed extensively in the literature. For example, Herger, Hodler and Lobsiger (2007) defined institutional quality as the extent to which man-made procedures foster investor protection and enhance access to funds for entrepreneurs within financial exchanges. According to Institutions theorists, upholding and credibly enforcing property rights (i.e. the right of property owners to extract returns on investment) stands crucial in financial transactions since potential financiers will be reluctant to surrender funds in the face of risks of being expropriated. In other words, investors rely on the state for enforcing contracts and protection, hence in countries where corrupt politicians/official abuse their authority for self-enrichment, investors would be unwilling to invest or surrender funds with increasing risks of expropriation, explaining why these states remain financially under-developed.

As argued by Clague et al (1996) and Olson (1993), in comparison with autocracies, democracies better facilitate property rights protection and contract enforcement, hence encouraging investment directly. In a research on the political economy of ?nancial development, Pagano and Volpin(2001), Rajan and Zingales (2003) and Beck, Demirguc-Kunt, and Levine (2003) highlight the role of political intervention and institutions in ?nancial development. In examining what forces lead governments to undertake reforms to enhance ?nancial development, Huang (2009) ?nds that the extent of democracy is one of the signi?cant factors.

According to the law and finance theory of La Porta et al. (1997), legal systems differ systematically in proliferating property rights. The common law evolved in 17th century in England in order to protect property owners from being dispossessed by the Crown, which gave rise to relatively good investor protection. Conversely, instead of protecting private contracts and property rights, the development of French civil law rested on the desire to solidify state power by giving the government the right to centrally enact statutes. Despite attempts to eliminate the role of corrupt courts, centralizing the legal system resulted instead in increased incentives to abuse public power for private benefit (Beck et al. 2003). Thus, legal origin matters against the background that financiers require, as a last resort, some third party like the court system to prevent entrepreneurs from deferring repayments. However, enforcing arm's-length contracts necessitates the delegation of discretionary power to some authority, which always opens up opportunities for predatory behaviour when bureaucrats, judges, or politicians infringe property rights in order to pocket rents accruing from financial transactions and development (Acemoglu and Johnson 2005).

3.1.4 OTHER DETERMINANTS

An earlier study by Tawney (1954) reported that one of the main reasons why protestant countries tend to be more financially developed compared to catholic ones was mainly due to the Calvinist reform that recognised that the payment of

interest rates was an integral part of commerce paving the way for increased creditor rights and investor protection. In particular, the study by Stulz and Williamson (2003) defined culture as the behaviours and beliefs that shape the actions of individuals within a society. The authors explored whether there was a relation between culture proxies (such as religion and language) and the protection of investor rights. Culture can affect how investor rights are protected in a country through its impact on values and institutions. The paper concluded that a country's principal religion helps predict the cross-section variation in creditor rights better than a country's natural openness to international trade, its language, its income per capita, or the origin of its legal system. For example, Catholic countries tend to protect the rights of creditors less than Protestant countries and have less private long-term debt. The paper also noted that a country's natural openness to international trade mitigates the influence of religion on creditor rights. Also, it was reported that religion has much more to say about creditor's rights and less about shareholders rights.

Herger, Hodler and Lobsiger (2007) acknowledged that religions impose rules for the ethical conduct on matters pertaining to self-enrichment; financial matters such as usury or even the charging interest rate which is an integral part in conducting financial transactions are spurned by major religions indicating that they emphasize more on the rights of debtors than those of creditors. Barth et al (2001) state that countries with Catholic and Islamic cultures tend to become intolerant which in turn fosters authoritative, hierarchical governments with powerful religious/state bond thereby affecting the efficiency of financial markets. As such if the cultural force of a country is supportive of financial markets it will be more financially developed in contrast with countries where the culture is hostile to the idea of self-enrichment, charging interest rate which is the basis of financial transactions as such it will remain financially under developed.

Other variables considered as determinants of financial development are economic growth, income level, financial liberalisation, population, religion, language, culture and so on. For example, Greenwood and Jovanovic (1990) and Saint-Paul (1992) argue that as the economy grows, the costs of financial intermediation decrease due to intensive competition, inducing a larger scale of funds available for productive investment. The effect of income levels on financial development was also explored by Levine (2003). Also, Jaffee and Levonian (2001) showed that the level of GDP per capita and the saving rate had positive effects on the structure of the banking system for 23 transition economies.

3.2 EMPIRICAL LITERATURE

As already pointed out, recent empirical interest appears to have shifted towards ascertaining the determinants of financial development (Huang, 2006; Do and Levchencho, 2004; Beck et al, 2003; Rajan and Zingales, 2003; etc.). For example, La Porta et al (1998) explored the legal determinants of financial development based

on the premise that historically determined legal traditions shape financial development across countries. Acemoglu et al (2001) also explored the impact of historical health conditions as proxied by settler mortality rates on financial development. More recently, Beck et al (2003) also explored the role of institutions in financial development. Another seminal study by Rajan and Zingales (2003) also explored the potential role of political economy factors through the impact of interest groups on financial development. Others also examined the impact of geographical factors. Stulz and Williamson (2003) also studied the impact of cultural factors on financial development. In terms of the potential role of macroeconomic factors on financial development, other segments of the empirical literature considered variables such as inflation, income levels, and the savings rate. Others explored the importance of trade and financial openness on financial development (See Chinn and Ito (2005).

A relatively recent work by Raja Jan Singh et al (2010), explored financial deepening in the CFA Franc Zone with particular attention on the role of institutions. The study was motivated by the empirical literature that seemed to suggest that countries whose legal systems were based on the English tradition tend to have deeper financial markets, while the French legal traditions seemed to hinder financial development. The authors reported that the gap in financial development between the countries of the CFA franc zone and the rest of SSA could be explained by differences in institutional quality such as credit infrastructure and the enforcement of contracts.

On the effect of policy variables such as inflation on financial development, Naceur and Ghazouani (2007) used dynamic panel techniques established that inflation has a negative impact on financial development for 11 Middle East and North Africa (MENA) countries over the period 1979-1999 and also assessed the threshold effect which showed that a rise in inflation rates after a certain level had no effect on banking sector development. Padachi et al (2008) also investigated the relationship between inflation and banking sector development applying a time series analysis over the period 1968-2006. Their results corroborated the threshold effect too for the case of Mauritius.

On the effect of macroeconomic variables, geography, income levels and culture, Huang (2006) making use of two prominent tools for addressing model uncertainty (the Bayesian Model Averaging and General to specific approaches) examined cross-country disparity in financial development. The results were that financial development was positively impacted by a wide range of variables namely, institutional quality, macroeconomic policies, geography, income levels and culture. The author in another paper also examined the connection between political liberalization in eliciting institutional improvement using a panel dataset of 90 developed and developing countries from 1960-1999. Empirical evidence revealed that political liberalization had at least in the short-run a constructive

outcome on financial development for lower-income countries as well as in countries where there are French based legal system and also that a democratic state is most likely to have a hike in financial development. Stulz and Williamson (2003) also explored the impact of cultural differences, measured by differences in religion and language, on financial development. Their findings suggest that culture predicts cross-country variation in protection and enforcement of investor rights, especially for creditor rights. The evidence also showed that the impact of culture on creditor rights protection is mitigated by the introduction of trade openness.

On openness, Demetriades and Law(2006) using dynamic panel data methods for 43 developing countries from 1980-2001 established that openness and institutions were key determinants of financial development. Additionally, the evidence suggested that liberalisation of both trade and capital flows is effective in promoting financial development in middle income countries, but less effective in low income countries. Rajan and Zingales (RZ) (2003) argue that the more opened an economy is, the more financially developed it would be, and more growth in the overall economy. Since, financial incumbents stand to lose from financial development in an open economy, because openness breeds competition which erodes their rents (Baltagi et al 2007). Kose et al (2006) examined the effects of financial openness on growth, and conclude that financial globalization indeed has potentials of indirect effects of promoting long-run economic growth in Less Developed Countries through an array of "collateral benefits" which include financial market development, institutional development, good governance and macroeconomic discipline. However, they believe that these collateral benefits can only be realised when countries meet certain threshold conditions. Baltagi et al (2007) tested the Rajan and Zingales's hypothesis that simultaneous openness to trade and capital flows have positive influence on financial development. Their findings suggest that simultaneous openness of trade and capital flows do have positive influence on financial development. In addition, capital flows are found to have separate positive influence on financial development independent of their interaction term. Trade openness on the other hand does not have separate independent influence on financial development.

This summary of the literature suggests that indeed relatively few studies have been undertaken for developing countries and the literature on the Sub Sahara African context is even more restricted. The paper therefore seeks to contribute to filling this knowledge gap.

4. EMPIRICAL ANALYSIS

4.1 DATA

The study uses three indicators of financial sector development. These indicators include liquid liabilities,broad money, and private credit from banks, each taken as a ratio of GDP. The first two indicators examine the depth of financial intermediaries

in the countries, while the last measure the relative degree to which the financial system allocates credit for productive ventures. Ang and Mckibbin (2007) argue that financial deepening measures (M2/Y, M3/Y) only reflect the extent of transaction services provided by financial system rather than the ability of the financial system to channel funds from depositors to investment opportunities. They argued that bank credit to the private sector is the most relevant measure of financial development, since the private sector is able to utilise funds in the most efficient and productive manner. Trade openness is measured by the ratio of total trade to GDP. Financial openness is measured by the ratio of foreign direct investment to the GDP, though we recognise this is a flow variable, and that Lane and Milesi-Feretti (2006) suggested using the volume of a country's financial assets and liabilities as a ratio of GDP, However, we are constrained by inadequate data. The data are sourced from the World Bank's World development Indicators 2010.

4.2 MODEL

While the theoretical underpinning of the impact of an exogenously determined process of financial development on economic growth is well demonstrated in the theoretical literature, the determinants of financial development are less explicit. For example, assume an augmented Solow model (Mankiw et al, 1992), adjusted to explain the growth impact of financial development and human capital (Demetriades and Law, 2006). It is further assumed that output in each country is determined by the following Cobb-Douglas production function:

$$Y_{it} = K_{it}^{\alpha} (A_{it} L_{it})^{1-\alpha} \qquad (4.2.1)$$

Where Yitis real output in country i at time t, Kitis the stock of physical capital in country i at time t, Lit is the stock of labour, Aitis a labour-augmenting factor reflecting technology and efficiency in a country at any given time. We assume 1<a, meaning that there are decreasing returns to capital.

In the original Solow model, saving rates, population growth and technological progress are taken as exogenous. L and A are assumed to grow exogenously at rates n and g.

$$L_{it} = L_i(0)e^{n_i t} \qquad (4.2.2)$$

$$A_{it} = A_i(0)e^{g_i t + P_{it}\theta_i} \qquad (4.2.3)$$

Indeed, earlier works (e.g. Schumpeter (1912), McKinnon (1973), Shaw (1973)) and also the endogenous growth literature suggest that financial intermediation potentially contribute directly to economic growth. For example, financial intermediaries facilitate the trading, hedging, diversifying and pooling of risk, allocate resources efficiently, mobilize savings for investment or physical capital accumulation, and facilitate the exchange of goods and services.

Let ni be the exogenous rate of growth of the labour force, ig is the exogenous technological progress in each country, ip is a vector of financial development, human capital and other factors that may affect the level of technology and efficiency in each country, and iq is a vector of coefficients of other related variables.

We further assume labour-augmenting technology (A) which is not only exogenously determined by technological improvements, but also level of financial development and human capital. Financial development can influence growth in a number of ways which include reduction of informational frictions (Greenwood and Jovanovic, 1990), risk sharing (Levine, 1997) and improvement in resource allocation efficiency (King and Levine, 1993). An efficient financial system boosts growth through provision of credit to facilitate human capital accumulation and technological advancement (Ang et al, 2007).

According to Demetriades and Law (2006), in a neoclassical framework, the impacts of financial development on economic growth is temporary, is assumed to be zero in the steady state, but can be either positive or negative in transition. The level of ip can vary across countries in the steady state, suggesting different countries can converge to different steady states depending on their steady state level of financial development and human capital accumulation. The output per effective worker [Y/AL] is constant but output per worker [Y/L] grows at the exogenous rate g.

$$\frac{Y_{it}}{A_{it}L_{it}} = \left(K_{it}\right)^{\alpha} \quad (4.2.4)$$

While output per worker evolves as:

$$\frac{Y_{it}}{L_{it}} = A_{it}\left(K_{it}\right)^{\alpha} \quad (4.2.5)$$

Where $y_{it} = \left(Y_{it} / L_{it}\right)$, and taking the log transformation of the two sides of equation (4.2.5), we obtain:

$$\ln y_{it} = \ln A_{it} + \alpha \ln K_{it} \quad (4.2.6)$$

Substituting equation 4.2.3 in 4.2.6, we obtain an equation for income per capita as:

$$\ln y_{it} = \ln A_0 + \left(1-\alpha\right)g_i t + \left(1-\alpha\right)\theta_i P_{it} + \alpha \ln K_{it} \quad (4.2.6)$$

The above shows that income per capita is determined by a vector of financial development, human capital variables, level of physical capital and the exogenous rate of output. To estimate equation 4.2.6, we specify a linear functional form for the vector of P.

$$\ln y_{it} = \ln A_0 + (1-\alpha)g_i t + (1-\alpha)\theta_{1i} P_{1it} + (1-\alpha)\theta_{2i} P_{2it} + \alpha \ln K_{it} + \varepsilon_{it} \quad (4.2.7)$$

P₁ is a financial development indicator, ***P₂*** is a human capital index,, ***k_it*** is the stock of physical capital and ε_{it} is the error term.

The above equation however assumes that financial development is exogenously determined, or enters the equation as a pre-determined variable. The question is what happens if this is not the case. If financial development was itself endogenously determined, then one has to explore its determinants separately. From the theoretical model above, it should follow that financial development could be determined endogenously by any of the variables such as economic growth, physical capital accumulation, and human capital accumulation. As earlier shown in the review of theoretical and empirical literature on the determinants of financial development, the determinants can vary from openness, international trade, macroeconomic factors such as the rate of inflation, and institutional quality. Other variables considered are economic growth, income levels, financial liberalisation, population, religion, language, culture and so on.

In this paper, the aim is to explore the determinants of financial development in Sub-Sahara Africa. The model is based on a reduced form specification which follows the framework used in Baltagi et al (2007), but amended by including a quadratic component. The model is based on a panel of ***i*** countries, observed over ***t*** periods of time regarding their level of financial development: FD_{it} *(i=1,2…….I; t=1,2,……...T):*

$$\ln FD_{it} = \beta_0 + \gamma \ln FD_{it-1} + \beta_1 \ln Y_{it} + \beta_2 \ln TO_{it} + \beta_3 \ln FO_{it} + \beta_4 InCPIA \varepsilon_{it..} \ldots\ldots\ldots\ldots\ldots\ldots\ldots (4.2.8)$$

Where **FD** is an indicator of financial development, **Y** is real income, which acts as a control variable for the demand for financial services, **TO** is the trade openness, **FO** is the financial openness, CPIA is a measure of institutional quality, and FD1-t the lagged dependent variable is included to allow for the partial adjustment of **FD** to its long run equilibrium value. The above specification is a test of the first hypothesis. A necessary condition to conclude that openness had an impact on financial development in the region requires either ß2 or ß3 to be significant, while a sufficient condition requires joint significance of both ß2 and ß3.To test the simultaneity hypothesis, which is the second hypothesis of this paper, trade and financial openness are interacted, and the interaction term enters as a separate independent variable as follows:

$$\ln FD_{it} = \beta_0 + \gamma \ln FD_{it} + \beta_1 \ln Y_{it} + \beta_2 \ln TO_{it} + \beta_3 \ln FO_{it} + \beta_4 (\ln FO_{it} * \ln TO_{it}) + \beta_5 CPIA + \varepsilon_{it} \ldots\ldots\ldots (4.2.9)$$

The partial derivatives of financial development with respect to each of the openness variables were introduced to assess the marginal effect of each openness variable on financial development.

The partial derivatives of financial development with respect to each of the openness variables were introduced to assess the marginal effect of each openness variable on financial development.

$$\frac{\partial \ln FD_{it}}{\partial \ln TO_{it}} = \beta_2 + \beta_4 \ln FO_{it} \qquad (4.2.10)$$

$$\frac{\partial \ln FD_{it}}{\partial \ln FO_{it}} = \beta_3 + \beta_4 \ln TO_{it} \qquad (4.2.11)$$

The simultaneity hypothesis requires that both derivatives are positive. This implies higher marginal effect of trade openness on financial development if the country is also financially open and vice versa.

We explore another proposition by introducing a quadratic specification of both trade and financial openness variables with each entering the model as a separate independent variable as follows:

$$\ln FD_{it} = \beta_0 + \gamma \ln FD_{it} + \beta_1 \ln Y_{it} + \beta_2 \ln TO_{it} + \beta_3 \ln FO_{it} + \beta_4 \ln TO_{it}^2 + \beta_5 \ln FO_{it}^2 + \beta_6 CPIA + \varepsilon_{it} \qquad (4.2.12)$$

Baltagi et al (2007) and Demetriades and Law (2006), found that continuous opening of economies may have little or no impact on financial sectors in poor developing countries. They suggest that an alternative channel of banking sector development may be particularly useful to low income countries that are already open, which stand to benefit little in terms of additional openness, and interestingly all the countries mentioned in their study are SSA. Thus, we try to test the hypothesis whether openness exhibits economies of scale. The partial derivative of financial development with respect to each of the openness variables can be expressed as:

$$\frac{\partial \ln FD_{it}}{\partial \ln TO_{it}} = \beta_2 + 2\beta_4 \ln TO_{it} \qquad (4..2.13)$$

$$\frac{\partial \ln FD_{it}}{\partial \ln FO_{it}} = \beta_3 + 2\beta_4 \ln FO_{it} \qquad (4.2.14)$$

[3] *Country Policy and Institutional Assessment (CPIA) index. See World Bank IDA Resource allocation.*

4.3 METHODOLOGY

We estimate the financial development equation with panel data from 33 SSA countries over the period2004-2009. To address the issue of endogeneity and orthogonality between the error term and the regressors, we use Arellano and Bond (1991) dynamic panel data estimator (DPD) based on the General Method of Moments (GMM) technique. This technique optimally exploits the linear restrictions implied by the dynamic panel specification proposed in this study. In estimating the model, all explanatory variables are lagged by one period to ensure that FD_{t-1} can be treated as predetermined in period t and that error terms are not serially correlated.

The consistency of the estimates is premised on the assumption of lack of first order autocorrelation of the error terms, thus the study tests for the existence of the first and second order serial correlation. A sargan test which is a joint test of model specification and the appropriateness of the instrument was also conducted. We restrict the moment conditions to a maximum of two lags on the dependent variable to reduce the potential bias resulting from too many moment conditions while increasing the efficiency of the estimates (See Baltagi, 2005).

5. DISCUSSION OF RESULTS

The datasets are summarized in Table 1 which provides the definition and source of each variable, its measurement, summary statistics, sample period and countries for which these variables are available. The correlation matrix between the variables is also provided. All variables display considerable variation between countries justifying the use of panel estimation techniques. Moreover correlations between various financial development indicators are positive and strong as expected from the literature. The correlation coefficient between trade openness and financial openness is positive. The correlation between trade openness and financial development indicators are also positive, small in case of credit indicators and high in case of monetary indicators. However, the correlation between our measure of financial openness and financial development indicators are negative for the credit indicators and positive with the monetary indicators.

The estimation results are presented in Tables 1-3. Most of the diagnostics tests in the tables are satisfactory. Specifically, the Sargan test does not reject the validity of the over-identification restrictions in all cases. The absence of first order serial correlation is rejected in some cases, while the absence of second order serial correlation is not rejected in most cases. Moreover, the lagged dependent variables in all cases are positive and significant. This further lends credence to the appropriateness of dynamic GMM as the preferred panel estimator as this is confirmed by the data, suggesting that our estimates have some good statistical properties.

The panel model specifications are estimated with three different measures of financial developments. Tables 1-3 give the estimation results using private credit,

broad money and liquid liability as a proxy for financial development respectively. Column 1(a) and (b) give the main model, where in financial openness and trade openness were included respectively, and real GDP was included as a control variable in the models. Column 2(a) includes both openness variables in a single model, while column 2(b) attempts to assess the Rajan-Zingales' hypothesis of simultaneous openness by introducing the interaction term in the model. Column 3 includes the measure of institutional quality in the model. Column 4 attempts to assess the impact of squared terms of the openness variables to assess whether continuous opening exhibits increasing returns or not. In summary, Columns 1 and 2 test the second and third hypotheses respectively while column 4 gives the estimation results of the quadratic model which corresponds to the third hypothesis.

5.1 PRIVATE SECTOR CREDIT AS FINANCIAL DEVELOPMENT INDICATOR

Focusing on credit to the private sector (see appendix Table 2), the lagged dependent variable has an estimated coefficient of an average of about 0.89, with a standard error of 0.02; this indicates a strong evidence of considerable persistence in the variable. It however indicates slow speed of adjustment to shock. This is in consonance with the findings of Baltagi et al (2007). Trade openness is positive and statistically significant at 1%, but the financial openness is negative though it is not statistically significant even at 5%.

The estimates from the second model (model with the interaction term) are more encouraging. The two measures of openness are positively signed and statistically significant at 5% level. When the interaction term is introduced in column 2(b), the sign became negative, suggesting that there is no evidence that simultaneous opening enhances financial development when using private credit as a proxy for financial development. In column 3, when the institutional quality variable is introduced, the coefficient is negative and statistically significant at 5%. This is in consonance with the apriori theoretical expectation, suggesting that a weak institution retards financial development in the region. The quadratic specification in column 4 indicates that both openness variables are negative but statistically significant at 5%. There is no robust evidence to suggest that continuous opening of financial sector may impact positively on the financial development in the region. This may also imply that the region needs a relatively long time lag for the region to reap the benefit of globalization.

In all, there is a high persistence in the financial development variable, and that trade openness has more positive impact on financial development than financial openness. There is neither any robust evidence to support Rajan-Zingales hypothesis nor that continuous opening of the sector would enhance financial development in the region.

5.2 LIQUID LIABILITIES (% GDP)

From the estimation results (see appendix Table 3), there is evidence of considerable persistence of financial development variable. The lagged dependent variable has an estimated coefficient of 0.51. It suggests high persistence of shock and low speed of adjustment. However, the persistence is less than what was observed when using the private credit as a proxy for financial development. The real GDP is positive and significant. The trade openness enters with a positive sign, and it is statistically significant at 5% for most of the estimations. The financial openness consistently enters with negative sign but statistically significant in many estimations. The trade openness seems to provide more empirical evidence that satisfies the necessary condition that globalization may have a limited impact on financial development in the region. The interaction term is not statistically significant, thus, no evidence for Rajan-Zingales hypothesis. The institutional quality variable introduced into the model enters with the coefficient being negative and statistically significant at 5%. This is in consonance with the apriori theoretical expectation, suggesting that a weak institution retards financial development in the region. In the quadratic specifications, in column 4, the two measures of openness are positive and statistically significant even at 5%. This may suggest that continuous opening may impact positively on financial development. It may also indicate that benefits from openness can only be reaped with continuous or consistent policy.

5.3 BROAD MONEY (% GDP)

From the estimation results (see appendix Table 4), there is considerable persistence in the financial development variable. The lagged dependent variable has an estimated coefficient of 0.94, suggesting high persistence of shocks. The real GDP variable is negative and statistically significant for several alternative results.

Trade openness enters with a positive sign for several estimation results but not statistically significant. However, financial openness enters with a positive sign and statistically significant at 5% level. This suggests that financial openness may have a positive impact on financial development in the region. The interaction term is also positive and statistically significant at 1%, providing empirical support for the Rajan-Zingales hypothesis, that simultaneous opening of both financial and trade sectors would impact more on financial development in the region. The institutional quality variable introduced into the model enters with the coefficient being negative and statistically significant at 5%. This is in consonance with the apriori theoretical expectation, suggesting that a weak institution retards financial development in the region. In the quadratic specifications, in column 4, the two measures of openness enter with mixed signs, while financial openness enters with a positive sign and statistically significant at 5% level, the trade openness enters with a negative sign but also statistically significant at 5% level.

In summary, for all the financial development indicators, there is empirical evidence to suggest high persistence. There is limited empirical evidence to support the first

hypothesis, as the variables of interest (trade and financial openness) are either negatively signed or statistically insignificant, except when using private credit where trade openness is both positive and statistically significant. For the second hypothesis, the coefficient of the interaction term is positive and statistically significant only when using broad money as a proxy for financial development. This suggests that there is limited statistical evidence for the positive impact of simultaneous opening of both trade and financial sector,(the Rajan-Zingales hypothesis).

There is however, strong evidence that weak institutional quality impacts negatively on financial sector development in the region. This is evidenced by a negative sign observed on the coefficient of the CPIA for all the different proxies of financial development used in the models. There is also limited empirical support for the third hypothesis, as the coefficients of the quadratic specifications of the openness variables are both positive and statistically significant only when liquid liability is used as a proxy for financial development. For, other proxies, the result has been mixed, with no clear direction.

6. CONCLUSION AND POLICY RECOMMENDATIONS

This study explored the determinants of financial development in the context of countries in sub-Sahara Africa. Specifically, the paper explored the impact of trade and financial openness and institutional quality on financial development. The panel model specifications were estimated with three different measures of financial development - private credit, broad money and liquid liability. The paper also tested the Rajan-Zingales' hypothesis of contemporaneous openness by introducing an interaction term. The measure of institutional quality was based on the World Bank's CPIA scores for the sample of countries.

Focusing on credit to the private sector, the results suggest high persistence in the financial development variable, and that trade openness shows a more significant impact on financial development than financial openness. There is no evidence to support the Rajan-Zingales hypothesis, and hence no evidence that simultaneous trade openness would enhance financial development in the region.

In terms of liquid liabilities as a measure of financial development, trade openness shows a positive impact on financial development in the sub-region while financial openness suggests an insignificant effect. The institutional quality variable has the expected sign, suggesting that strong institutions could be beneficial for financial development in the region. Again, there was no evidence for the Rajan-Zingales hypothesis. Finally, broad money as a measure of financial development suggests that trade openness is positive but statistically insignificant. Strikingly, financial openness enters with a positive sign and there appears to be support for the Rajan-Zingales hypothesis, that simultaneous opening of both financial and trade sectors would impact more on financial development in the region. The institutional quality

variable still has the expected sign, suggesting that weak institutions retard financial development in the region.

In summary, for all the financial development indicators, there is empirical evidence to suggest that trade and financial openness is good for financial development. Based on private sector credit as a measure of financial development in particular, there is strong evidence that trade openness is both positive and statistically significant. There is also limited statistical evidence for the positive impact of the simultaneous opening of both trade and the financial sector (the Rajan-Zingales hypothesis). There is also evidence that weak institutional quality impacts negatively on financial sector development in the region.

In terms of policy recommendations, it is clear that openness is good for financial development, and also that enhancement in the quality of legal and regulatory institutions is good for financial development. This calls for further work beyond the second generation reforms in the financial sector in countries of the sub regions, aimed at improving the quality of institutions especially the framework for the enforcement of credit contracts and property rights, and reducing information asymmetry in credit delivery. It is also important to maintain an appropriate stance of the external sector so as to promote financial development. Finally, the regulatory and supervisory side also needs to be strengthened as progress is made in financial deepening. In particular, the early warning system and the entire surveillance systems, ensuring the appropriate supervisory framework to accommodate cross-border activity, and building a strong risk monitoring and management framework to ensure stability.

Endnotes

Specifically, Do and Levchenko (2004) reported that, "…when a wealthy and a poor country open to trade, the financially dependent sectors grow in the wealthy country, and so does the financial system. By contrast, as the financially intensive sectors shrink in the poor country, demand for external finance decreases and the domestic financial system deteriorates, ".

iiiSee Bawumia, 2010 for a review

iiiAs discussed in the article by Louis Kasekende, a number of factors need to be tackled in order to go beyond the first and second generation financial sector reforms across sub Saharan Africa. These include the need to tackle the root causes for the lack of credit to the private sector such, reducing asymmetric information in credit markets, improving banking infrastructure, reducing the high level of concentration in the banking systems, and to upgrade services particularly in the area of payments systems infrastructure. A number of regulatory and supervisory

gaps also need to be tackled. These include, gaps in early warning systems or surveillance, consolidated and cross-border supervision, risk monitoring and management, and strengthening the legal framework to support bank insolvency issues. There are also related issues about gaps in the regulation and supervision of capital markets.

ivOne of the key features of the financial system in SSA is the underdevelopment of the capital market. There are large number of small firms that are privately owned and (families have significant control), but they are usually not listed in the capital market, hence the major source of finance is through the banks and not the capital market. Thus the financial system in the region can be described as a bank-based system rather than market-based system. Furthermore, Pagano (1993) suggests that bank lending to firms seems to be the first transmission mechanism through which financial development affects economic growth and then followed by stock and bond markets, and finally insurance markets. These factors justify the choice of banking development indicators as the appropriate financial development indicators in the region.

vLiquid Liabilities (LLY) measures the size, relative to the economy, of financial intermediaries, including three types of financial institutions: the central bank, deposit money banks and other financial institutions. It is calculated as the liquid liabilities of banks and nonbank financial intermediaries (currency plus demand and interest-bearing liabilities) divided by GDP.

viThe countries mentioned are Cameroon, Ethiopia, Gabon, Ghana, Kenya, Malawi, Nigeria, Senegal, Togo, and Zambia (Baltagi et al 2007, pg23). All the countries are in our sample data set.

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APPENDIX
Table 1: Correlation Coefficients of Variables

	FDI	M2	TRADE	LLIAB	PSCREDIT	REALGDP	CPI	INFLATION	CPIA
FDI	1.00								
M2	0.10	1.00							
TRADE	0.48	-0.06	1.00						
LLIAB	0.12	0.80	-0.02	1.00					
PSCREDIT	-0.10	0.78	-0.17	0.80	1.00				
REALGDP	0.00	-0.22	-0.21	-0.15	-0.18	1.00			
CPI	-0.04	0.00	-0.01	-0.08	0.10	-0.14	1.00		
INFLATION	0.03	-0.07	0.24	-0.06	-0.05	-0.19	-0.03	1.00	
CPIA	-0.07	0.30	-0.31	0.26	0.37	0.02	0.07	-0.01	1.00

All measures of financial development are positively correlated among themselves, with the highest correlation being that between liquid liabilities and broad money.

Table 2: Broad Money (as a % of GDP)

Specification	1(a)	1(b)	2(a)	2(b)	3	4(a)	4(b)	
Ln FD_{it-1}	0.91*** (0.03)	0.99*** (0.04)	0.96*** (0.04)	0.97*** (0.03)	0.92*** (0.02)	0.92*** (0.03)	0.93*** (0.06)	
Ln Y_{it}		-0.13 (0.01)	-0.06** (0.01)	-0.06** (0.02)	-0.06 (0.01)	-0.10*** (0.03)	-0.03** (0.01)	-0.04* (0.02)
Ln TO_{it}			0.05 (0.05)	0.05 (0.05)	-0.03 (0.06)	0.008 (0.05)		2.84*** (1.00)
Ln FO_{it}		0.02** (0.01)		0.02** (0.01)	-0.22** (0.08)	0.006 (0.008)	0.31*** (0.01)	
Ln FO_{it}*ln TO_{it}					0.06*** (0.02)			
$CPIA_{it}$						-0.25*** (0.06)		
Ln FO^2_{it}							0.01*** (0.001)	
								-0.34**
Ln TO^2_{it}								(0.12)
Sargan Test (p-Value)		20.66 (0.11)	20.17 (0.12)	18.68 (0.17)	18.89 (0.16)	20.34 (0.11)	21.03 (0.10)	19.83 (0.14)
Autocovariance of Order 1		0.04	0.09	0.14	0.23	0.31	0.04	0.11
Autocovariance of Order 2		0.03	0.01	0.01	0.02	0.10	0.06	0.01

1 GMM estimations using a maximum of two lags of the dependent variable as instruments N=29, T=10

2 The variables are defined as follows FDit = financial development; Yit= real GDP per capita, TOit= Trade openness defined as total exports plus imports/GDP, FOit=Financial openness defined as the ratio of foreign direct investment to GDP,

3 Figures in the parentheses are the standard errors.

*4 ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively*

Table 3: Private Credit (as a % of GDP)

Specification	1(a)	1(b)	2(a)	2(b)	3	4(a)	4(b)
Ln FD_{it-1}	0.89*** (0.01)	0.95*** (0.02)	0.89*** (0.02)	0.90*** (0.03)	1.02*** (0.02)	0.87*** (0.02)	0.87*** (0.02)
Ln Y_{it}	0.05*** (0.01)	-0.05 (0.04)	-0.45** (0.01)	-0.003 (0.02)	-0.07** (0.03)	0.06*** (0.02)	-0.03 (0.03)
Ln TO_{it}		0.28*** (0.04)	0.19*** (0.04)	0.35*** (0.09)	-0.15*** (0.02)		9.37*** (1.32)
Ln FO_{it}	-0.004 (0.002)		0.007** (0.003)	0.88*** (0.1)	0.03* (0.015)	-0.02*** (0.01)	
Ln FO_{it}*ln TO_{it}				-0.21** (0.02)			
$CPIA_{it}$					-0.20* (0.11)		
Ln FO^2_{it}						-0.01** (0.004)	
							-1.08**
Ln TO^2_{it}							(0.15)
Sargan Test (p-Value)	13.69 (0.47)	23.19 (0.41)	21.89 (0.42)	18.21 (0.19)	13.68 (0.47)	15.82 (0.32)	19.49 (0.15)
Autocovariance of Order 1	0.92	0.89	0.98	0.21	0.11	0.99	0.53
Autocovariance of Order 2	0.03	0.07	0.04	0.78	0.16	0.09	0.74

1 GMM estimations using a maximum of two lags of the dependent variable as instruments N=29, T=10
2 The variables are defined as follows FDit = financial development; Yit= real GDP per capita, TOit= Trade openness defined as total exports plus imports/GDP, FOit=Financial openness defined as the ratio of foreign direct investment to GDP,
3 Figures in the parentheses are the standard errors.
*4 ***, ** and * indicate statistical significance at the 1%, 5% and 10% levels respectively*

Table 4: Liquid Liabilities as a % of GDP

Specification	1(a)	1(b)	2(a)	2(b)	3	4(a)	4(b)
Ln FD_{it-1}	0.53*** (0.01)	0.49*** (0.01)	0.48*** (0.01)	0.48*** (0.01)	0.42*** (0.01)	0.53*** (0.01)	0.49*** (0.01)
Ln Y_{it}	0.05*** (0.01)	0.06 (0.06)	0.06 (0.01)	0.06 (0.01)	0.07*** (0.01)	0.06*** (0.01)	0.06*** (0.01)
Ln TO_{it}		0.08 (0.05)	0.15*** (0.09)	0.14** (0.04)	0.15*** (0.05)		-0.50* (0.28)
Ln FO_{it}	-0.01** (0.002)		-0.006 (0.004)	0.013 (0.04)	-0.002 (0.002)	-0.005*** (0.001)	
Ln FO_{it}*ln TO_{it}				-0.05 (0.01)			
$CPIA_{it}$					-0.16*** (0.03)		
Ln FO^2_{it}						0.002** (0.004)	
							0.07**
Ln TO^2_{it}							(0.03)
Sargan Test (p-Value)	18.47 (0.18)	11.70 (0.63)	14.25 (0.43)	13.79 (0.46)	13.14 (0.51)	20.08 (0.12)	12.08 (0.59)
Autocovariance of Order 1	0.39	0.50	0.43	0.42	0.95	0.45	0.50
Autocovariance of Order 2	0.34	0.33	0.34	0.34	0.32	0.30	0.35

1 GMM estimations using a maximum of two lags of the dependent variable as instruments N=29, T=10

2 The variables are defined as follows FDit = financial development; Yit= real GDP per capita, TOit= Trade openness defined as total exports plus imports/GDP, FOit=Financial openness defined as the ratio of foreign direct investment to GDP,

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TOWARDS INFLATION FORECASTING: EVIDENCE FROM NIGERIA DATA

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Abstract

Inflation forecasting has continued to be of great interest to central banks on account of its importance for inflation targeting and because controlling inflation is often the primary goal of central banks. Some central banks use the output gap to forecast inflation because positive output gaps indicate excess demand and inflationary pressures while negative output gaps point to deflation. Obtaining reliable estimates of output gap is difficult since it is unobservable. This paper utilizes four statistical methodologies -- linear trend, Hodrick-Prescott filter, Baxter-King band-pass filter, and Christiano-Fitzgerald filter -- to estimate Nigeria's output gap, using data for 1981Q1- 2009Q4. Laidler's specification for explaining inflation, which incorporates an output gap, was modified and estimated, with good results, which suggest that output gap is an important factor in forecasting inflation in Nigeria. Therefore, an econometrically estimated output gap is highly recommended as one of the key variables for predicting inflation in Nigeria.

JEL Classification: C32, C53, E31, E32, E37

Key words: Inflation forecasting, output gap, Hodrick-Prescott filter, Baxter-King band-pass filter, Christiano-Fitzgerald filter, Nigeria

1.0 INTRODUCTION

The major objectives of macroeconomic policy in modern economies are the achievement of a sustainable high economic growth rate and price stability (low and stable inflation). There have been conflicting arguments among different schools of thought regarding the inflation and economic growth relationship. While some economists find a positive correlation between inflation and growth, others maintain that the relationship is negative, while yet another group perceives the link to be neutral. Economic pundits who claim that inflation can spur growth maintain that during periods of high inflation, labour unions agitate for increases in wages, but when inflation reduces, wages do not fall because they are sticky downwards. So this school of thought is of the view that some dose of inflation is better for the economy than zero inflation. However, when inflation

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exceeds a given threshold, it becomes very costly and detrimental to economic growth. The question now is what is the optimal level to which inflation can be subdued for sustainable economic growth in a developing country?

In addition, it is essential to ascertain the rate of economic growth that will not cause negative side effects in an economy. This is important if we consider reducing the unemployment rate by increasing output. However, if the unemployment level gets to near 6 per cent considered currently as threshold for full employment for an economy, it becomes more costly to a nation to grow because this might lead to demand pull and cost-push inflation. In such a situation, aggregate demand for goods and services would increase more than the supply of such goods, and wages are likely to rise due to the tight labour market.

The classical growth theory popularized by Adam Smith postulates that output is a function of labour (population), capital (investment), and land inputs, and argues that increases in output growth are due to increases in population growth, investment and overall productivity. Although, the relationship was not explicitly built into the model, it was averred to implicitly lead to a reduction in firm's profits as a consequent of rising wage costs. This implies that rising inflation will reduce firm's earnings through high costs of production arising from increases in wages.

The Keynesian theory uses the aggregate demand and aggregate supply curves framework to determine the inflation-growth relationship. In the short run, the aggregate supply curve is upward sloping and changes in aggregate demand affects both prices and output, (Dornbusch et al, 1996). Initially, movement from the short run to long run (steady state) situation will result in an initial positive relationship between inflation and growth due to 'time inconsistency problem', (Gokal, et al, 2004). This is the case where some producers erroneously perceive that only the prices of their products have increased and decide to produce more, without realizing that there has been a general rise in the level of prices. Thus, even with increases in the general price level and higher cost of production due to inflation, output is increased. This accounts for the positive relationship. But towards the later part of the adjustment path, the inflation-growth relationship becomes negative in the long run steady state. This is referred to as stagflation, (Gokal, et al, 2004).

On the other hand, the monetarists pioneered by Milton Friedman posit that inflation occurs when the velocity of money is greater than the rate of growth of an economy. In other words, the monetarists contend that if the growth in money supply is higher than the economic growth rate, inflation would result.

There are different results emanating from the neo-classical framework. Following the Tobin effect, an increase in inflation leads to higher output because inflation makes economic agents to substitute their money for interest earning assets which implies a higher capital intensity and hence higher growth, (Tobin, 1965). But

Sidrauski (1967) found a neutral effect of inflation on output because money is 'super-neutral' such that real variables, including the growth rate of output, are independent of the growth rate of money supply in the long run. Therefore, an increase in inflation has no effect on the steady state capital stock; hence, output (or economic growth) is not affected.

The concept of potential output came into lime light through the idea of neo-Keynesians. If the actual output is higher than the potential output and unemployment is less than the natural rate of unemployment, inflation rate will be higher and vice versa. But the problem here is how to determine what constitutes the exact level of potential output and natural rate of unemployment that is consistent with economic growth and stability.

Finally, endogenous growth theory posits that growth depends on the rate of return on capital and regards inflation as a cost that reduces the rate of returns, and hence capital accumulation. This tends to retard economic growth.

1.1 The need for concern about Inflation generally

Inflation tends to erode consumers' purchasing power as well as the propensity to save, such that economic agents tend to spend rather than save during periods of inflation. Thus, inflation reduces the level of investment and contributes to inefficient use of productive factors. More often than not, rapid growth in output causes inflation in developing countries because people are inclined to spend more money due to uncertainty about the future value of money. However, low and anticipated inflation does not pose serious problems to any economy. Nonetheless, when inflation is volatile and unpredictable, it creates uncertainty about future profitability of investment projects and makes it difficult for economic agents to undertake long term investment plans, since economic decision making becomes riskier, with higher costs and limited choices. This dampens investment and savings and also creates inefficiencies in the market.

Both policy makers and the public have concern for inflation as it affects the investment atmosphere and welfare. Where utility depends on consumption and consumption is considered to be an appropriate measure of welfare, inflation reduces welfare as it shrinks consumption through increased cost of consumption. Inflation makes economies suffer from relative price distortions. This puts pressure on real deposit rates to be negative, especially where deposit rates do not respond greatly to monetary policy rates. This is again inimical to savings and investment.

Inflation can also lead to a loss in international competitiveness of a country and consequently a deterioration in its balance of payments. This would impact negatively on economic growth and employment. Where exchange rate depreciation lags behind the rate of inflation, real appreciations are more common than depreciations of the real exchange rate. This hurts export performance.

The existence of high and variable rates of inflation reflects in the volatility of both real interest rate and real exchange rate. This macroeconomic instability has negative implications for investment and growth and the volatility in the real exchange rate may also hamper export performance.

It is also the case that inflation reduces public savings through its impact on real tax collections and expenditure on public utility. This is common where taxes are collected often with lags, a common feature in Nigeria, while government expenditure keeps rising. This often translates into a widening fiscal deficit and a reduction in public savings.

In addition, high inflation creates uncertainty about future rates of inflation, as policy makers would double efforts at mitigating the inflationary pressure, which may not always be successful and this has adverse implications for the efficiency of investment and the level of investment.

In sum, the general consensus is that high and volatile inflation is harmful to growth. Therefore, efforts aimed at controlling inflation would improve economic performance and lead to higher per capita income. Specifically, a reduction in inflation by 1 percent has been found to increase per capita income by 0.5 – 2 percent, (Andres, et al, 1997).

This paper aims to evolve a reliable inflation forecasting function that could be used by economic agents, including central banks for policy. Secondly, the study will econometrically estimate Nigeria's output gap and use it as an important argument in the inflation function. Finally, the paper will recommend policies that will mitigate inflationary pressures and ensure economic growth and stability. The rest of the paper is structured as follows: Section 2 highlights at the inflationary trends in Nigeria between 1981 and 2009. Section 3 reviews the relevant literature, while section 4 deals with the theoretical framework, including a discussion of the different approaches to estimating the output gap and the associated potential output. Section 5 presents the model, methodology and regression results. Section 6 provides simulation and choice of preferred inflation function for forecasting inflation. The last session contains the conclusion and policy implications.

2.0 INFLATIONARY TRENDS IN NIGERIA BETWEEN 1981 AND 2009

A cursory look at the inflationary trend in Nigeria between 1981 and 2009 (see Table 1 and Fig 5), indicates that inflation rate was erratic during the period. The inflation rate which was over 27 per cent in 1981Q2, declined to 10.9 per cent in the corresponding quarter in 1982. By 1984, inflation had risen to 44.5 percent and became negative in 1985Q3, but ballooned to 89.6 per cent in the mid 1990s, following the economic response to SAP measures. However, since the year 2000, inflation rate has been rather moderate but has nevertheless oscillated between 5.8 per cent and 24 per cent, reflecting the success of government demand

management measures put in place to subdue inflation and achieve other macroeconomic objectives.

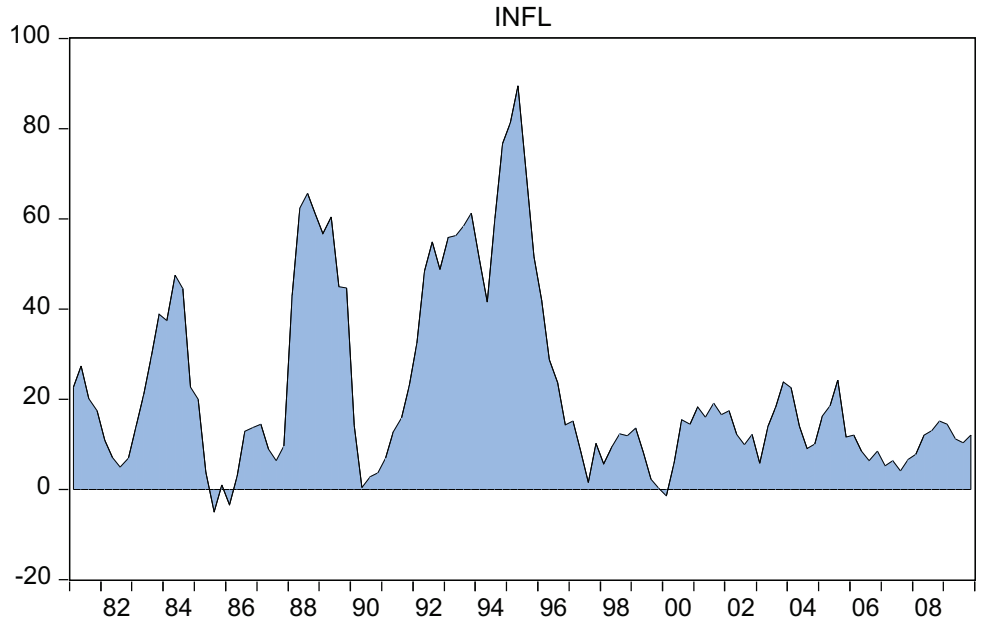


Fig 5: Trends in Inflation (CPI), 1981-2009

Table 1: Nigeria's Inflation, 1981Q1-2009Q4

Observation	Inflation	Observation	Inflation	Observation	Inflation
1981Q1	22.7300	1991Q1	6.9300	2001Q1	18.2000
1981Q2	27.3000	1991Q2	12.6600	2001Q2	16.0600
1981Q3	20.0900	1991Q3	15.9200	2001Q3	19.1100
1981Q4	17.4000	1991Q4	22.9600	2001Q4	16.5000
1982Q1	10.9100	1992Q1	32.5100	2002Q1	17.3800
1982Q2	7.0200	1992Q2	48.4700	2002Q2	12.2200
1982Q3	4.8900	1992Q3	54.8800	2002Q3	9.9700
1982Q4	6.9400	1992Q4	48.8000	2002Q4	12.1900
1983Q1	14.1000	1993Q1	55.8500	2003Q1	5.8600
1983Q2	21.1300	1993Q2	56.3400	2003Q2	14.0000
1983Q3	29.5700	1993Q3	58.3500	2003Q3	18.3500

1983Q4	38.7700	1993Q4	61.2600	2003Q4	23.7900
1984Q1	37.4000	1994Q1	50.7100	2004Q1	22.5000
1984Q2	47.5200	1994Q2	41.5700	2004Q2	14.0700
1984Q3	44.5400	1994Q3	60.1800	2004Q3	9.1000
1984Q4	22.6300	1994Q4	76.7600	2004Q4	10.0100
1985Q1	20.0000	1995Q1	81.3000	2005Q1	16.3000
1985Q2	3.7700	1995Q2	89.5700	2005Q2	18.6000
1985Q3	.9800	1995Q3	69.8800	2005Q3	24.3000
1985Q4	1.0300	1995Q4	51.5900	2005Q4	11.6000
1986Q1	.45000	1996Q1	41.9000	2006Q1	12.0000
1986Q2	2.9500	1996Q2	28.8500	2006Q2	18.6000
1986Q3	12.8900	1996Q3	23.6600	2006Q3	24.3000
1986Q4	13.6700	1996Q4	14.3200	2006Q4	11.6000
1987Q1	14.5000	1997Q1	15.1500	2007Q1	12.0000
1987Q2	8.9700	1997Q2	8.5100	2007Q2	8.5000
1987Q3	6.4200	1997Q3	1.5200	2007Q3	6.3000
1987Q4	9.6900	1997Q4	10.2100	2007Q4	8.5000
1988Q1	43.0900	1998Q1	5.6500	2008Q1	7.8000
1988Q2	62.3500	1998Q2	9.4100	2008Q2	12.0000
1988Q3	65.7200	1998Q3	12.2500	2008Q3	13.0000
1988Q4	61.2100	1998Q4	11.9100	2008Q4	15.1000
1989Q1	56.7300	1999Q1	13.5500	2009Q1	14.4000
1989Q2	60.3600	1999Q2	2.2800	2009Q2	11.2000
1989Q3	44.9700	1999Q3	2.2400	2009Q3	10.4000
1989Q4	44.6700	1999Q4	2.2000	2009Q4	12.0000
1990Q1	14.2000	2000Q1	4.300		
1990Q2	.40000	2000Q2	5.8700		
1990Q3	2.7900	2000Q3	15.5100		
1990Q4	3.6100	2000Q4	14.5200		

Source: Central Bank of Nigeria Statistical Bulletin, various issues

3.0 REVIEW OF LITERATURE

There is abundant evidence in the literature that inflation and output are negatively correlated in countries experiencing volatile inflation. Rising inflation leads to inflation expectations that can aggravate the trade-off between unemployment and inflation. Inflation hampers economic growth when it exceeds some critical level, but below that level, it exerts positive impact on growth, (Choi, et al, 1996; Azariadas and Smith, 1996). Still on the threshold effects, Khan and Senhadji (2001) did a study on the inflation-growth relationship for 140 countries made up of developed and developing countries and found that low inflation impacts favourably on growth performance of the countries with estimates of inflation threshold levels of 1 – 3 percent for developed countries and 11 – 12 percent for developing countries. On their own part, Christofferson and Doyle (1998) examined the interaction between inflation and growth for 22 transitional countries between 1990 and 1997, and found the inflation threshold level to be 13 percent. They concluded that countries should maintain inflation at some specific threshold level in order to sustain high growth performance. Sarel (1996) also supports the proposition that inflation has favourable effect on growth when it is less than a threshold level of 8 percent, and impedes growth otherwise.

In determining the long run and short run effects of inflation, Faria and Carneiro (2001) used the VAR approach and data from 1980 to 1995 for Brazil. They found zero long run response of output to high inflation, but a negative impact in the short run. Other studies that utilized time series, cross section and panel data to investigate the link between inflation and growth, found a negative correlation between the two, (Gokal et al, 2004; Dewan and Hussein, 2001; Bruno and Easterly, 1995; De Gregorio, 1994, 1992; and Fisher, 1993).

Inflation forecasting has continued to be of great interest to central banks on account of its importance for inflation targeting and because controlling inflation is often the primary goal of central banks. According to Frenkel, Goldstein and Masson (1989) "the goals of monetary policy are often stated as price stability, full employment, and sustainable economic growth". To these may be added the international goals of monetary policy, namely, stable exchange rates and balanced trade (or balance of payments equilibrium). It should be apparent that an attempt to use monetary policy to simultaneously attain these five goals is condemned to failure. So, how do we prioritize? A suggestion that has been advanced is to assign monetary policy "to price stability in the long run and stabilizing output in the short run", Morgan (1989). This sounds quite reasonable and appears to be what the US Federal Reserve System does. According to Uchendu (2009), this also appears to be what is done by the Central Bank of Nigeria (CBN). However, the consensus among monetary economists and central bankers is that price stability should be given the pride of place as the primary goal of monetary policy. Thus, Frenkel, Goldstein, and Masson (1989) conclude that "the bottom line is that price stability is now widely regarded as the principal priority for monetary

policy". But if price stability is the most important objective of monetary policy, central banks must find ways to correctly forecast inflation as a prelude to controlling it.

In recent years, there has been growing support among both academic economists and practitioners for inflation targeting as a desirable framework for monetary policy since it can be used to achieve price stability in the long run and has the added virtues of flexibility, consistency, transparency, credibility, and accountability. According to Svensson (2000),

During the 1990s, an increasing number of central banks adopted inflation targeting, which due to its logical and transparent design and apparent success so far has become a focus of interest and a natural frame of reference.

A similar point has also been made by Croce and Khan (2000) of the International Monetary Fund. This has led to the adoption of inflation targeting as a valued operating procedure of monetary policy in many modern economies. Currently, inflation targeting is explicitly used by the United Kingdom, Australia, New Zealand, Canada, Sweden, Spain, and Finland. Inflation targeting is also used by Israel, Chile,, Brazil, Colombia, Mexico, and South Africa. The Euro system and the United States also conduct monetary policy through a more or less formal process of inflation targeting. Also, all indications are that the Nigerian Central Bank is concluding preparations to migrate to an Inflation Targeting regime. But it should be noted that under the system of Inflation Targeting, the intermediate target is forecasted inflation, (Svensson, 1999; Mishkin 2000; and Croce and Khan, 2000). Hence, the need to correctly forecast inflation becomes imperative.

One common method of forecasting inflation is by using the Output Gap, which is the difference between actual output and potential output. Potential output is the level of output that is consistent with the maximum sustainable level of employment. It is the level of output at which demand and supply in the aggregate economy are balanced so that, all things being equal, inflation tends to gravitate to its long-run expected value. Theoretically, the output gap plays an important role in the inflation process. The labour and product markets tend to be very tight when the output gap is positive, that is, when the actual level of output is above potential output. In this case, inflation will tend to rise given that expected supply factors are held constant. On the other hand, when the output gap is negative and labour and product markets are slack, inflation will tend to fall.

However, monetary authorities are faced with the challenges of obtaining an accurate measure of potential output and of the output gap - which are not directly observable - in order to assess the expected inflation that would emerge eventually, and formulate appropriate policies that will achieve a high level of employment and sustainable non-inflationary growth over time. Therefore, this study is aimed at

providing the best approach to estimating Nigeria's output gap as a critical argument in a reliable inflation forecasting function necessary for policy formulation.

4.0 THEORETICAL FRAMEWORK

4.1 Estimating the Output Gap for the Nigerian Economy

Two general approaches exist for estimating the output gap and the associated potential output. The first approach is to estimate a production function and calculate potential output as the level of output assuming that all factors of production are fully utilized. This structural approach has the advantage of explicitly identifying the sources of economic growth, namely, capital, labor, and technical change (or productivity). However, this approach has two main disadvantages, viz, (i) the appropriate production function to estimate is not known a priori; and (ii) total factor productivity, an important source of economic growth, is not observable and not easily obtained for developing countries. Thus, the alternative approach using statistical decomposition techniques is often preferred. When statistical methods are used for obtaining the level of potential output and the output gap, estimates of these variables do not depend on the choice of a structural model or production function. Rather, these techniques use statistical criteria to decompose the trend and cyclical components of output. Basically, potential output is then taken as the permanent (supply or stochastic trend) component of output while the output gap is taken to be the transitory (demand or cyclical) component. Filters, such as the Hodrick and Prescott (1997) filter or the band-pass filter proposed by Baxter and King (1995) are among the commonly used techniques that extract a trend measure from actual output series.

In this paper, the focus is on the use of univariate statistical estimation methodologies. Four methods or techniques of estimation are presented and estimated by using quarterly data for real gross domestic product from 1981 Q1 to 2009 Q4. The data were obtained from the Golden Jubilee edition of the CBN's Statistical Bulletin (2009). Methodologies used are the univariate statistical techniques of linear time trend, Hodrick-Prescott filter, Baxter-King band-pass filter and the time-varying Christiano-Fitzgerald filter.

4.11 Linear Trend Method

This method is simple, straightforward and intuitively appealing. Potential output is obtained using a linear time trend. Basically, potential output is computed from a linear equation of output or log of output on a time trend. The fitted line is taken as potential output while the difference between the fitted line and actual output is considered to be the estimate of the output gap. The drawback of this method is that it is mechanical and not based on theory.

Figure 1 gives us the relationship between actual and potential output during the entire period. An examination of the graph shows that it agrees with what we already know, namely, that the 1990s were years of recession while there was a boom during the first decade of the 21st century. These results can of course also be obtained from an examination of the output gap in Fig 1. All in all, the simple univariate trend model gives pretty good results.

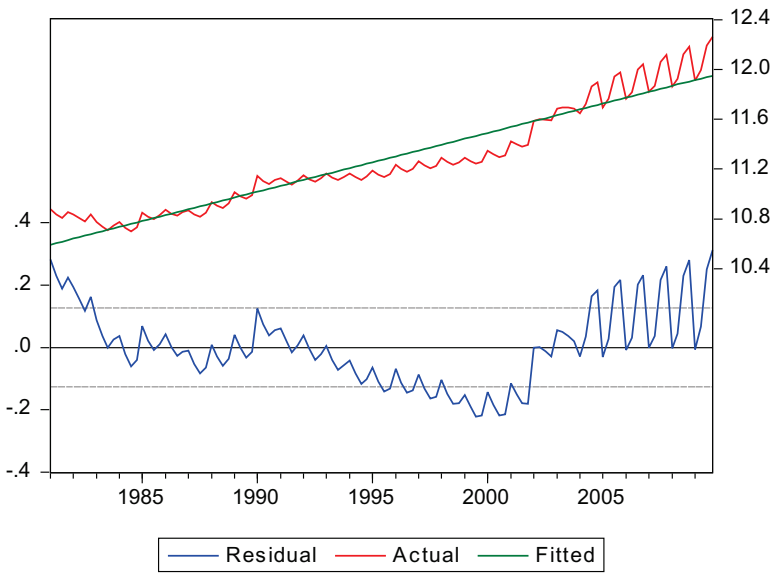


Fig. 1: Potential Output and Output Gap (Linear Trend)

4.12 The Hodrick-Prescott Filter

The Hodrick-Prescott (HP) filter (see Hodrick and Prescott (1997)) is another univariate technique for obtaining an estimate of potential output from actual output data. The HP filter minimizes a combination of the size of the actual output fluctuations around its trend and the rate of change in the trend output for the sample period. Thus, in essence, the Hodrick-Prescott filter selects the potential output sequence which minimizes the squared difference between actual and potential output subject to the constraint that there is no undue fluctuation in potential output. One advantage of the HP filter over the linear trend method is that it makes the output gap stationary over a wide range of smoothing values in addition to allowing the output trend to change over time. However, it suffers from the same criticism as the linear trend method -- that it is mechanical and not based on economic theory.

Figure 2 gives us the results of the Hodrick-Prescott filter. Unfortunately, the results are not as impressive as those obtained from the linear trend model. Notice that the results do not accurately capture the deep recession of the 1990s, though they show the boom in the new millennium.

4.13 Baxter-King band-pass Filter

The Baxter-King filter (see Baxter and King, 1995) is the most popular "band-pass" or frequency domain filter used in the literature. This filter relies on the theory of spectral analysis of time series and this is achieved by performing a finite and moving average process of the real GDP. Thus, the resulting filter is a centered moving average with symmetric weights. The Baxter-King filter has some desirable features that have contributed appreciably to its extensive application in the literature. First, this approach is more flexible than the H-P filter. It can easily handle monthly or annual data and also estimate the output gap directly, while the trend output is then computed as the actual output minus the estimated output gap. Secondly, since the resulting filtered series is stationary and symmetric, it does not introduce the so-called 'phase shift'. Finally, this filter has the ability to track closely the US business cycles. However, like other band-pass filters, it is also subject to many limitations. The chief one is that filtering in the time domain involves the loss of K observations at the beginning and at the end of the sample. This type of filter is also often criticized on the basis that it produces spurious dynamics in the cyclical component.

Figure 3 gives us the results of the Baxter-King band-pass filter. The left hand partition provides estimates of potential output and the output gap. It is quite similar to the results of the Hodrick-Prescott filter.

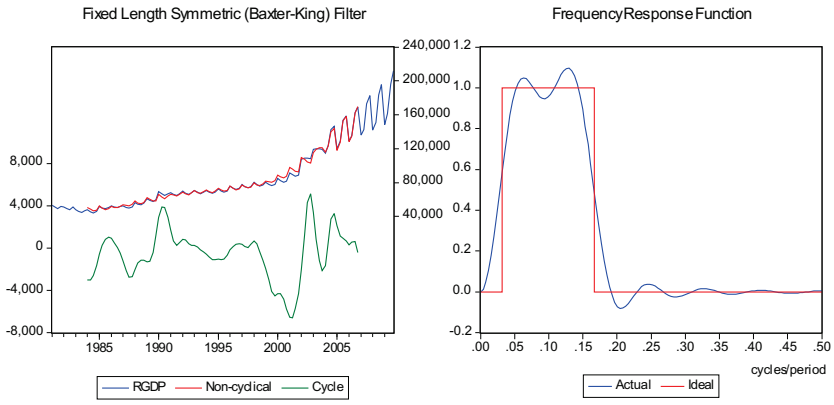


Fig. 3: Potential Output and Output Gap (Baxter-King band-pass Filter)

4.14 Christiano-Fitzgerald Filter

The Christiano-Fitzgerald filter is also a frequency domain filter. It is a full sample asymmetric filter. It can be fixed or time-varying. There is no loss of K observations at the beginning and at the end of the sample. For this reason the Christiano-Fitzgerald filter is preferred to the Baxter-King band-pass filter.

Figure 4 gives the results of the time-varying Christiano-Fitzgerald filter. The graph shows both the estimated potential output level and the estimate of the output gap. While generally good, the estimates of potential output and output gap are disappointing in the new millennium as they suggest economic depression rather than an overheated economy.

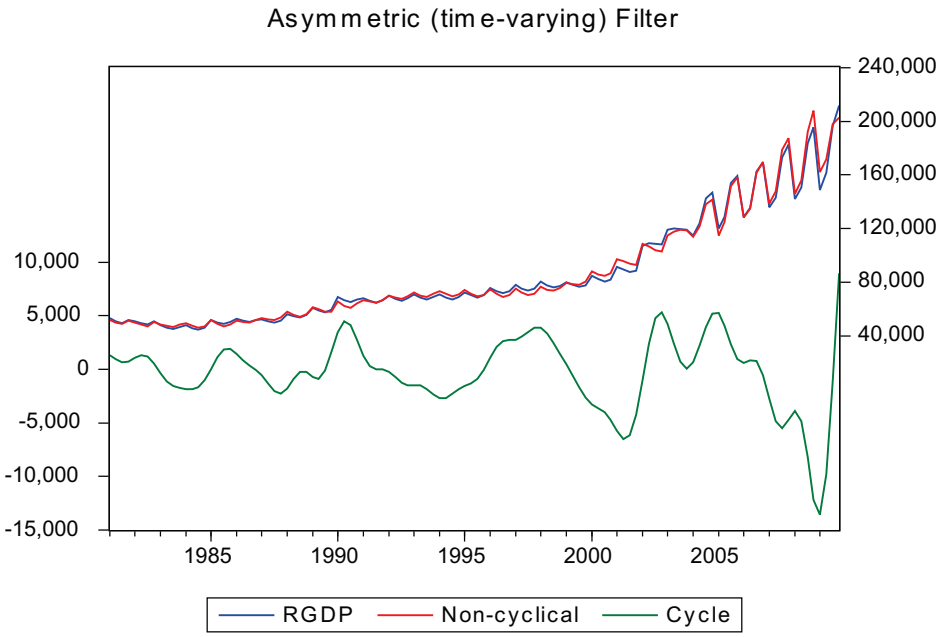


Fig. 4: Potential Output and Output Gap (Christiano-Fitzgerald Filter)

4.2 Inflation Forecasting

The ability to forecast and predict how inflation will respond to policy actions depends very much on the forecaster's capacity to measure and to understand what determines the public's expectations of inflation. Forecasting procedures depend on the forecast horizon. An accurate forecast of near-term inflation is an important starting point for a longer-term forecast. Since inflation exhibits some inertia, improved near-term forecasts translate into more accurate longer-term forecasts.

Most central banks use a version of Phillips curve to forecast inflation on a quarterly basis, and also diversify their modeling efforts by not depending on a single model. This is done to avoid forecast errors that would lead to serious policy errors. This diversification approach would result in a more robust policy, (Razzak, 2002). However, a degree of expert judgment is required in the forecasting process because most estimated forecasting models do not reflect information about special factors affecting the outlook. It follows therefore, that the forecast for inflation should be consistent with the forecasts for key economic variables, as well as, the forecaster's overall view of the economy.

Some economists have contended that accurate forecasting is not feasible due to the fact that economic data are not independently and identically distributed, and because forecasts are invalidated by economic agents' reactions to them, (Hendry and Morgan, 1995; Clement and Hendry, 1998). In addition, model mis-

specification, data mis-measurement and structural breaks have impacted adversely on the ability to forecast future outcomes, (Clement et al, 2002; Fildes et al, 2002; and Makridakis et al, 2000). Clement and Hendry (1999) opine that structural breaks are the most insidious cause of forecast failures.

Forecasting models should be hinged on stable relationships among variables to ensure accurate forecasts for effective policy making. According to Blinder (1997), the empirical Phillips curve has worked amazingly for decades, and should have a prominent place in the core model used for macroeconomic policy making. .

Modern specifications of Phillips curve equations relate the current rate of unemployment to future changes in the rate of inflation. This is based on the idea that there is a baseline rate of unemployment rate, otherwise known as non-accelerating inflation rate of unemployment (NAIRU). NAIRU Phillips curves produce more accurate inflation forecasts for policy making, than forecasts made with other methods.

However, Atkeson et al (2001) find that the three sets of NAIRU Phillips curve-based inflation forecasts (a simple textbook model of the NAIRU Phillips curve, two NAIRU Phillips curve-based inflation forecasting models, and the Greenbook forecast of the Federal Reserve Board of Governors of the Bank of Minneapolis) used for a 15 year forecasting, were not more accurate than the forecast from their naïve model, that makes a prediction that: inflation over the coming year is expected to be the same as the inflation over the previous year. They therefore concluded that NAIRU Phillips curves are not useful for forecasting inflation.

On their own part, Meyer and Menmet (2010), have generated a number of forecasts, using a simple statistical model and discover that no single specification out-performs all others over all time periods, but maintain that 'naïve' specifications (other than the naïve forecast using the headline consumer price index (CPI) seem to perform well compared to simple statistical models.

A number of central banks in fact use the output gap to forecast inflation. New Zealand is an example. According to Claus (1999), "in the Reserve Bank of New Zealand's Forecasting and Policy System (FPS), domestic inflation is largely driven by the output gap". Recently, Akinlo and Akinlo (2003) have used capacity utilization to forecast inflation for Nigeria. Note that capacity utilization can be considered as the empirical counterpart of output gap since an index of capacity utilization is often defined as the ratio of actual output to maximum output. According to Akinlo and Akinlo (2003, p 47), the link between capacity utilization and inflation arises from the economic notion that "when there is unused capacity, competition among producers hold prices down. As capacity constraints are reached, competitive pressures are increased and prices can be raised".

5.0 MODEL SPECIFICATION, METHODOLOGY AND REGRESSION ANALYSIS

The function that this study uses to explain inflation is a modification of the function used by Laidler (1976). Laidler hypothesized that the rate of inflation depends on the expected rate of inflation and the general level of excess demand in the economy. This latter variable was represented by the difference between the actual level of real output and the capacity real output. This variable is now commonly known as the output gap. Thus, Laidler's equation was:

$$D \log P = a_0 + a_1 \{\log (Y/P) - \log (Y/P)^*\} + a_2 \pi \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5.1)$$

Where P is the price level, D log P is the inflation rate calculated as the percentage rate of change of the price level, (Y/P)* is capacity or trend real output, and p is the expected rate of inflation. Laidler generated expected inflation by assuming an adaptive expectations process where the change in the expected inflation rate is a positive function of the error between the actual rate of inflation and the previous expected rate, that is,

$$D \pi = \lambda (D \log P - \pi(t-1)), \lambda > 0. \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (5.2)$$

However, we believe that instead of using the mechanical adaptive expectations model, it would be preferable to make expected inflation to depend on what happens in key sectors of the economy. Accordingly, we assume that expected inflation depends on the percentage rate of change of money supply, the percentage rate of change of government expenditure, the percentage rate of change of imports and the percentage rate of change of agricultural output. Thus, the econometric equation for the determination of inflation is given as:

$D \log P = a_{0+a1} \{\log (Y/P) - \log (Y/P)^*\} + a_2 D \log M_2 + a_3 D \log GE + a_4 D \log MP + a_5 D \log AGR + u$ ..... (5.3)

Where M2 is broad money supply, GE is government expenditure, MP is imports, AGR is agricultural output, and u is the stochastic error term. The paper calls this the modified Laidler equation since it is inspired by Laidler's original specification.

5.1 Econometric Estimation: Co-integration and Error-Correction Modeling

The study begins by examining the time series properties of all the variables in the equation. Specifically, we test all the variables for stationarity, using the unit root test in EVIEWS 7.0. All the variables, namely, D log P, output gap taken as {log Y/P – log (Y/P)*}, D log M2, D log GE, D log MP and D log AGR were found to be first difference stationary using the augmented Dickey Fuller criterion. Thus, they are all I(1) variables. A summary of the Unit Root tests is given below while the details are reported in the Appendix 1.

5.2 Summary of Unit root tests using the ADF Criterion:

Variable	Order	ADF	Decision
DLP	1st difference	-7.39	I(1)
DLM2	1st difference	-10.56	I(1)
DLMPORT	1st difference	-12.6	I(1)
DLGE	1st difference	-6.56	I(1)
DLAGR	1st difference	-17.26	I(1)
YGAP	1st difference	-16.78	I(1)

Note: 95% critical value for the Dickey Fuller statistics = -3.4

5.3 Testing for Co-integration

Note that all the variables, viz., DLP, DLM2, DLGE, DLMPORT, DLAGR and YGAP, are difference stationary, that is, they are I(1) variables. Since there is no variable integrated of order greater than I(1), the autoregressive distributed lag model and the Bounds Testing Approach (See Pesaran, Shin and Smith (2001)) can be used for the analysis. Below is the result using the ADF technique to test for the stationarity of the residuals from the OLS regression:Null Hypothesis: RESIDYGAPINFL has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, max lag = 2)

	t-Statistic	Prob.*

Method: Least Squares

Sample (adjusted): 1981Q2 2009Q4

Included observations: 115 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.629057	0.284646	-2.209965	0.0292
YGAPTIME	-0.206762	0.072169	-2.864987	0.0050
LM2	0.005217	0.026114	0.199768	0.8420
LGE	-0.045946	0.033415	-1.375025	0.1720
LMPORT	0.037022	0.015718	2.355476	0.0203
LAGR	0.091319	0.038324	2.382844	0.0189
LCPI(-1)	0.883351	0.043635	20.24425	0.0000

R-squared	0.999000	Mean dependent var	2.996446
Adjusted R-squared	0.998944	S.D. dependent var	1.797925
S.E. of regression	0.058428	Akaike info criterion	-2.783116
Sum squared resid	0.368690	Schwarz criterion	-2.616033
Log likelihood	167.0292	Hannan-Quinn criter.	-2.715298
F-statistic	17973.18	Durbin-Watson stat	1.346010
Prob(F-statistic)	0.000000		

Augmented Dickey-Fuller test statistic		-7.641577	0.0000
Test critical values:	1% level	-3.488585	
	5% level	-2.886959	
	10% level	-2.580402	

*MacKinnon (1996) one-sided p-values.

See the Appendix 2 for more details.

The observed ADF test statistics is -7.64. The absolute value of this statistic exceeds the absolute value of -3.48, which is the 99% critical value for the Dickey-Fuller statistic. Hence, the conclusion is that inflation is co-integrated with all the other variables in the model.

5.4 Econometric estimation results of the modified Laidler equation

Using OLS to estimate the modified Laidler equation yields the following results:

The overall fit is excellent with an adjusted R-squared of 99 percent. The output gap variable is correctly signed and significant at the 1 percent level. Both the agricultural output variable and import variable are highly significant and positively signed. This confirms our expectation that rapid growth in these variables will tend to fuel inflation. The coefficient of the one-period lagged value of inflation is positive and highly significant. This demonstrates that there is distributed lag adjustment and confirms the existence of a significant amount of inflation inertia in Nigeria.

6.0 SIMULATION AND FORECASTING OF INFLATION

A useful framework for examining and forecasting inflation is the Phillips Curve. In its general form, the Phillips curve provides a link between inflation, inflation expectations and output. This is usually of the form:

$\Pi_t = \Pi^e_t + \varphi\,(y_t - y^*_t) + u_t$..... (6.1)

Where:

Π_t = Current inflation

Π^e_t = Expected inflation

$y_t - y^*$ = Output gap

u_t = Other determinants of inflation including "inflation shocks"

Equation (1) asserts that the inflation rate is determined in part by expected inflation, the output gap, and possibly other forces ('inflation shocks'). One view holds that expectations are 'backward looking' that is, regressive, in the sense that people form their expectations of inflation primarily on a recent history of actual inflation rates. For our purpose, the simplest thing to assume is backward-looking behavior; for example:

$\Pi^e_t = \Pi_{t-1}$..... (6.2)

Where:

Π_{t-1} = One-period lagged value of inflation

In this case, we can combine Equations (6.1) and (6.2), and the Phillips curve relationship may be rewritten as follows:

$\Pi_t = \Pi_{t-1} + \varphi\,(y_t - y^*_t) + u_t$. ..... (6.3)

In what follows, the paper undertakes a forecasting exercise of inflation using an eclectic approach. Basically, we accomplish this by combining the existing approaches to the determination of inflation, namely, (i) excess demand approach; (ii) growth of money supply approach; and (iii) imported inflation or increase in import prices approach. This strategy leads to the following specification:

$$\pi_t = a_0 + a_1 GAP_t + a_2 \pi_{t-1} + a_3 m_t + a_4 g_t + a_5 \frac{\phi_t - \phi_{t-1}}{\phi_{t-1}} + e_t \quad \text{..... (6.4)}$$

Where:

π = inflation rate

GAP = output gap

π_{t-1} = One-period lagged value of inflation

m = growth in money supply

g = growth in potential output

Φ = import price

e_t = stochastic error term

6.1 Econometric Inflation Forecasting

The paper then use the above specifications (equations 6.1 to 6.4) to forecast inflation using quarterly data for Nigeria for the period 1981Q1 through 2009Q4. Data for the study was obtained from the Central Bank of Nigeria Statistical Bulletin, various issues.

6.11 A simple forecast with output gap

The simple forecast hypothesizes that change in inflation depends just on the output gap. Presumably, change in inflation is inversely related to the output gap. Accordingly, current inflation depends on lagged inflation and the output gap. The ordinary least squares (OLS) regression method was used to estimate the equation for inflation, utilizing the estimated output gaps from the 4 univariate statistical techniques, one at a time. Employing the usual goodness-of-fit statistics (R2, F-statistic, t-statistics and in particular, the sign and significance of the coefficient of the output gap), it was found that best results were obtained using the estimated output gap from the Christiano-Fitzgerald filter. This best fitting equation is reported below:

Dependent Variable: INFL

Method: Least Squares

Sample (adjusted): 1981Q2 2009Q4

Included observations: 115 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.749258	1.140919	1.533201	0.1280
YGAPCHRFITZ	-0.000417	0.000227	-1.833189	0.0694
INFL(-1)	0.912121	0.037297	24.45544	0.0000
Adjusted R-squared	0.843029	S.D. dependent var		20.81653
S.E. of regression	8.247409	Akaike info criterion		7.083416
Sum sq. residual	7618.212	Schwarz criterion		7.155023
Log likelihood	-404.2964	Hannan-Quinn criteri.		7.112481
F-statistic	307.1251	Durbin-Watson stat		1.292766
Prob(F-statistic)	0.000000			

Where: YGAPCHRFITZ is the output gap using the Christiano-Fitzgerald filter.

Note that the coefficient of the output gap exhibits the expected negative sign and is significantly different from zero at the 7 percent confidence level. The F-statistic is highly significant and the hypothesis of a significant linear relationship between change in inflation and the output gap cannot be rejected at the 1 percent level. The two regressors (output gap and the one-period lagged value of inflation) explain about 85 percent of the variations in the inflation rate during the period.

6.12 An expanded inflation forecast with an auto-regressive moving average (ARMA) process

The expanded specification utilizes a variant of equation (6.4). Accordingly, it is hypothesized that inflation depends on the output gap, growth in money supply, growth in potential output (proxied by growth in agricultural output), growth in import prices (proxied by growth in imports) and an ARMA process. It was decided to continue to use the estimate of output gap generated by the Christiano-Fitzgerald filter. From preliminary OLS estimates using various combinations of autoregressive and moving average processes it was found that an ARMA (2, 3) process gave the best results in terms of consistent parameter estimates, lowest residual variance and highest predictive ability as reflected in the highest adjusted R2. The results using the optimal ARMA process are reported below.

Dependent Variable: INFL

Method: Least Squares

Sample (adjusted): 1981Q4 2009Q4

Included observations: 113 after adjustments

Failure to improve SSR after 20 iterations

MA Backcast: 1981Q1 1981Q3

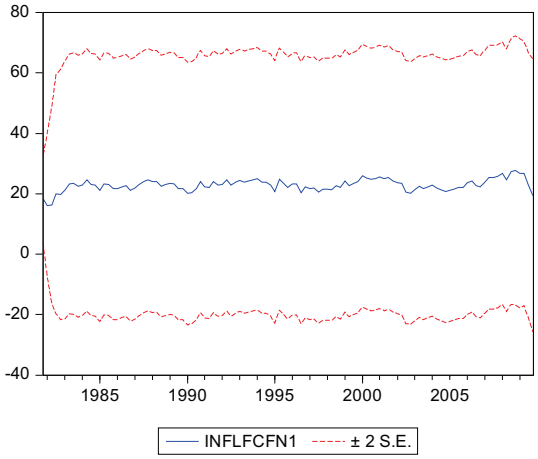
Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	22.48972	5.475577	4.107279	0.0001
YGAPCHRFITZ	-0.000399	0.000539	-0.739484	0.4613
DLOG(M2)	10.22765	3.424538	2.986577	0.0035
DLOG(RYAGR)	1.088788	1.240489	0.877709	0.3821
DLOG(MPORT)	-2.420266	0.990546	-2.443366	0.0163
AR(1)	0.265908	0.112727	2.358862	0.0202

AR(2)	0.279766	0.111072	2.518779	0.0133
MA(1)	1.157973	0.077157	15.00810	0.0000
MA(2)	0.996688	0.088740	11.23150	0.0000
MA(3)	0.834481	0.068045	12.26366	0.0000

R-squared	0.906072	Mean dependent var	22.57156
Adjusted R-squared	0.897864	S.D. dependent var	20.99552
S.E. of regression	6.709890	Akaike info criterion	6.729374
Sum squared residual	4637.330	Schwarz criterion	6.970736
Log likelihood	-370.2097	Hannan-Quinn criteri	6.827317
F-statistic	110.3979	Durbin-Watson stat	2.050664
Prob(F-statistic)	0.000000		

A quick examination of the regression results shows that the expanded equation explains over 90 percent of the variations in the inflation rate during the period studied. .An examination of the reported results shows that the overall fit is good. The regressors succeed in explaining over 90 percent of the variations in the inflation rate during the period studied. The F-statistic has a value of 110.4 which shows that the hypothesis of a linear relation between inflation and the regressands cannot be rejected at the 1 percent significance level. The coefficient of output gap has the expected negative sign but is not significantly different from zero. The coefficients of money supply and import prices are significantly different from zero. The ARMA variables are highly significant suggesting that Nigerian inflation is strongly driven by forces of inertia.

The forecast of inflation using the EVIEWS forecasting software is also reported below.



Forecast: INFLFCFN1	
Actual: INFL	
Forecast sample: 1981Q1 2009Q4	
Adjusted sample: 1981Q4 2009Q4	
Included observations: 113	
Root Mean Squared Error	20.72949
Mean Absolute Error	16.74634
Mean Abs. Percent Error	309.0647
Theil Inequality Coefficient	0.385841
Bias Proportion	0.000220
Variance Proportion	0.835912
Covariance Proportion	0.163867

7.0 SUMMARY AND POLICY IMPLICATIONS

In this paper, an attempt has been made to econometrically estimate Nigeria's output gap and use it to forecast inflation. Forecasting inflation is becoming ever more important in modern economies and for the proper conduct of monetary policy. It is important for countries with monetary management based on monetary targeting. It is even more important for countries that have adopted (or are about to adopt) the monetary policy management framework based on inflation targeting.
This study has used the approach of estimating the output gap by the statistical decomposition of the univariate GDP time series data. Four methodologies, viz., the linear time trend, the Hodrick-Prescott filter, the Baxter-King band-pass filter and the Christiano-Fitzgerald filter were utilized. Next, the estimates of the output gap obtained from the four methods were used to econometrically forecast inflation. It was found that the estimate of output gap obtained by using the Christiano-Fitzgerald filter performed best in predicting inflation.

In order to systematically explain inflation, the paper leaned on the specification used by David Laidler many years ago. Laidler (1976) specifies inflation to depend on the output gap and inflationary expectations. In this context, Laidler assumes that expected inflation is generated by an adaptive expectations process. Since this process is rather mechanical, evolving some data mining, the paper modifies Laidler's function by assuming that expected inflation is driven by forces within the economy, in particular, growth in agricultural output (a proxy for increase in food prices), growth in imports (to capture imported inflation), growth in money supply and growth in government expenditures. This modified Laidler equation was estimated and gave excellent results.

Finally, an eclectic inflation forecasting equation was estimated. It was found that inflation in Nigeria is largely driven by the forces of inertia. Thus, while broad money stock and import prices exert some influence, the preponderant role is played by an ARMA process with strong showing by both the autoregressive and moving average

components. The final equation had an R2 in excess of 90 percent and a Durbin-Watson statistic of 2.0, thus indicating a robust result.

There is a growing consensus that for the efficient conduct of monetary policy in Nigeria, there is need to forecast inflation correctly. The output gap has shown that it can play an important role in this enterprise. Therefore, the use of an econometrically estimated output gap variable is highly recommended as one of the key variables for predicting inflation in Nigeria.

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APPENDIX 1: Unit Root tests of variables

Null Hypothesis: D(LGE) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.558416	0.0000
Test critical values:	1% level	-4.040532	
	5% level	-3.449716	
	10% level	-3.150127	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LGE,2)

Method: Least Squares

Sample (adjusted): 1981Q3 2009Q4

Included observations: 114 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LGE(-1))	-0.561174	0.085565	-6.558416	0.0000
C	0.028709	0.015425	1.861195	0.0654
@TREND(1981Q1)	-1.49E-05	0.000221	-0.067449	0.9463

R-squared	0.279347	Mean dependent var	-0.000659
Adjusted R-squared	0.266362	S.D. dependent var	0.090632
S.E. of regression	0.077629	Akaike info criterion	-2.247793
Sum squared resid	0.668912	Schwarz criterion	-2.175788
Log likelihood	131.1242	Hannan-Quinn criter.	-2.218570
F-statistic	21.51347	Durbin-Watson stat	2.024410
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LM2) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-10.56473	0.0000
Test critical values:	1% level	-4.040532	
	5% level	-3.449716	
	10% level	-3.150127	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LM2,2)

Method: Least Squares

Sample (adjusted): 1981Q3 2009Q4

Included observations: 114 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LM2(-1))	-1.005455	0.095171	-10.56473	0.0000
C	0.039099	0.012775	3.060664	0.0028
@TREND(1981Q1)	0.000332	0.000184	1.801672	0.0743

R-squared	0.501403	Mean dependent var	0.000832
Adjusted R-squared	0.492420	S.D. dependent var	0.089774
S.E. of regression	0.063959	Akaike info criterion	-2.635178
Sum squared resid	0.454077	Schwarz criterion	-2.563173
Log likelihood	153.2052	Hannan-Quinn criter.	-2.605955
F-statistic	55.81242	Durbin-Watson stat	1.993265
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LMPORT) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-12.60766	0.0000
Test critical values:	1% level	-4.040532	
	5% level	-3.449716	
	10% level	-3.150127	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LMPORT,2)

Method: Least Squares

Sample (adjusted): 1981Q3 2009Q4

Included observations: 114 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LMPORT(-1))	-1.181079	0.093679	-12.60766	0.0000
C	0.043329	0.049187	0.880906	0.3803
@TREND(1981Q1)	0.000380	0.000731	0.519881	0.6042

R-squared	0.588876	Mean dependent var	0.001741
Adjusted R-squared	0.581468	S.D. dependent var	0.396703
S.E. of regression	0.256643	Akaike info criterion	0.143701
Sum squared resid	7.311078	Schwarz criterion	0.215706
Log likelihood	-5.190954	Hannan-Quinn criter.	0.172924
F-statistic	79.49574	Durbin-Watson stat	1.988137
Prob(F-statistic)	0.000000		

Null Hypothesis: D(LAGR) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 1 (Automatic - based on SIC, max lag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-17.26002	0.0000
Test critical values:	1% level	-4.041280	
	5% level	-3.450073	
	10% level	-3.150336	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(LAGR,2)

Method: Least Squares

Sample (adjusted): 1981Q4 2009Q4

Included observations: 113 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LAGR(-1))	-1.711257	0.099146	-17.26002	0.0000
D(LAGR(-1),2)	0.693569	0.070159	9.885619	0.0000
C	0.105612	0.023624	4.470521	0.0000
@TREND(1981Q1)	-0.000110	0.000339	-0.323458	0.7470

R-squared	0.739445	Mean dependent var	-0.001413
Adjusted R-squared	0.732273	S.D. dependent var	0.226865
S.E. of regression	0.117385	Akaike info criterion	-1.411958
Sum squared resid	1.501938	Schwarz criterion	-1.315413
Log likelihood	83.77562	Hannan-Quinn criter.	-1.372781

Null Hypothesis: D(LCPI) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.393527	0.0000
Test critical values:	1% level	-4.040532	
	5% level	-3.449716	
	10% level	-3.150127	

*MacKinnon (1996) one-sided p-values.

Dependent Variable: D(LCPI,2)

Method: Least Squares

Sample (adjusted): 1981Q3 2009Q4

Included observations: 114 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LCPI(-1))	-0.660137	0.089286	-7.393527	0.0000
C	0.042631	0.012377	3.444496	0.0008
@TREND(1981Q1)	-0.000198	0.000165	-1.195405	0.2345

R-squared	0.329991	Mean dependent var	-0.000343
Adjusted R-squared	0.317919	S.D. dependent var	0.069573
S.E. of regression	0.057459	Akaike info criterion	-2.849533
Sum squared resid	0.366468	Schwarz criterion	-2.777528
Log likelihood	165.4234	Hannan-Quinn criter.	-2.820310
F-statistic	27.33477	Durbin-Watson stat	1.921825
Prob(F-statistic)	0.000000		

Null Hypothesis: D(YGAPTIME) has a unit root

Exogenous: Constant, Linear Trend

Lag Length: 2 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-16.77896	0.0000
Test critical values:	1% level	-4.042042	
	5% level	-3.450436	
	10% level	-3.150549	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(YGAPTIME,2)

Method: Least Squares

Sample (adjusted): 1982Q1 2009Q4

Included observations: 112 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(YGAPTIME(-1))	-2.957213	0.176245	-16.77896	0.0000
D(YGAPTIME(-1),2)	1.429072	0.109142	13.09366	0.0000
D(YGAPTIME(-2),2)	0.583779	0.084468	6.911218	0.0000
C	-0.036778	0.008855	-4.153368	0.0001
@TREND(1981Q1)	0.000590	0.000131	4.506378	0.0000

R-squared	0.858430	Mean dependent var	0.000231
Adjusted R-squared	0.853137	S.D. dependent var	0.113661
S.E. of regression	0.043558	Akaike info criterion	-3.385825

Sum squared resid	0.203012	Schwarz criterion	-3.264464
Log likelihood	194.6062	Hannan-Quinn criter.	-3.336585
F-statistic	162.2018	Durbin-Watson stat	1.328887
Prob(F-statistic)	0.000000		

APPENDIX 2: ADF unit root test for Co-integration

Null Hypothesis: RESIDYGAPINFL has a unit root

Exogenous: Constant

Lag Length: 0 (Automatic - based on SIC, maxlag=2)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.641577	0.0000
Test critical values:	1% level	-3.488585	
	5% level	-2.886959	
	10% level	-2.580402	

*MacKinnon (1996) one-sided p-values.

Augmented Dickey-Fuller Test Equation

Dependent Variable: D(RESIDYGAPINFL)

Method: Least Squares

Sample (adjusted): 1981Q3 2009Q4

Included observations: 114 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
RESIDYGAPINF-1)	-0.684980	0.089639	-7.641577	0.0000
C	0.000136	0.004751	0.028565	0.9773

R-squared	0.342699	Mean dependent var	0.000109
Adjusted R-squared	0.336830	S.D. dependent var	0.062292
S.E. of regression	0.050728	Akaike info criterion	-3.107290
Sum squared resid	0.288213	Schwarz criterion	-3.059287
Log likelihood	179.1156	Hannan-Quinn criter.	-3.087808
F-statistic	58.39370	Durbin-Watson stat	2.012075
Prob(F-statistic)	0.000000		

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ON THE INFLATION AND INFLATION UNCERTAINTY HYPOTHESIS IN THE WEST AFRICAN MONETARY ZONE (WAMZ) ECONOMIES

By ***Adedapo T. Adenekan****

ABSTRACT

This paper investigates the relationship between inflation and inflation uncertainty in five WAMZ Member-States (Gambia, Ghana, Guinea, Nigeria, and Sierra Leone). A generalized autoregressive conditional heteroscedasticity (GARCH) model is employed to generate a measure of inflation uncertainty, which is then applied to test for causality between average inflation and uncertainty following Granger methodology. In all the WAMZ economies, inflation significantly raises uncertainties, while less robust evidence is found on direction from uncertainties to inflation.

JEL classification – E31, E52, E60

Keywords: inflation, inflation uncertainty, GARCH, WAMZ,

1.0 INTRODUCTION AND LITERATURE REVIEW

Okun (1971) plants the seeds of debate relating to the theory of inflation and inflation-uncertainty. He denounces the no-damage impact of mildly higher but steady inflation and argued that government's acceptance of any higher inflation rate would influence expectations in such a way as to make prices rise more rapidly and less steadily due to imperfect capability of public policy and its influence on price expectation. For that reason, inflation variability is functionally related to the policy maker's ability to apply corrective measures when actual inflation is greater than targeted or required rate (Okun, 1971, p489). Following Friedman Nobel Prize Speech (December 1976) where he alluded to a proposition of a plausible relationship between higher inflation rates in level and higher variability, the debate sprouted and gained much prominence. Friedman specifically emphasized how higher inflation can create higher uncertainty about inflation. According to him, in a situation of political commitment and policy makers' adherence to price stability, the outbreak of increasing inflation generates unpredictable policy responses that fuel further the wide variation in actual and anticipated rate of inflation. As uncertainty leads to erratic policy response, increased volatility in inflation further fuels the distortion and frictions that render the market prices a less efficient system

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4 *Using a Stop-Go analogy in a model with a driver (policy maker) faced with the objective function of maximizing speed (economic expansion) or minimizing bumpiness (inflation) while traveling along a road that contains substantial and un-even amounts of bumpiness as well as some uphill and downhill stretch, Okun suggests that countries with high inflation rates will experience more variables inflation rates.*

for coordinating economic activities and high natural rate of unemployment, thus a lower or negative economic growth."(Friedman, 1976; p283-284).

Applying Barro-Gordon model, Cukierman and Meltzer (1986) theorize that monetary authority has the tendency to create inflation surprises in the presence of high inflation uncertainty to stimulate growth. "An exogenous increase in the variance of shock, which raises the variance of inflation also raises average inflation in the discretionary equilibrium; and, in a situation that policymaker is more biased toward economic stimulus than preventing inflation, 'a larger variance of monetary control errors makes it harder for the public to detect an intentional increase in inflation, raising a policymaker's gain from inflating." [Cuckierman and Meltzer (1986), p1120].

A formal model substantiating the Friedman proposition within the framework of the positive monetary policy theory was posited by Ball (1992) who postulates that when actual and expectation are low, economic agents' consensus assume that inflation will remain low. However, in a situation of high inflation, agents are not sure of the anticipated response of authority; and, the monetary regime is equally faced with the dilemma regarding the monetary options in the face of a consequential potential recession implication of a reduced inflation. Hence, high inflation raises uncertainty about whether the target itself will change. It is this policy-uncertainty distortion that represents the important source of inflation level-uncertainty. Ball also suggests that private sector responses to higher inflation spurts could also generate such inflation level-uncertainty. "High trend inflation can raise variability by making money demand more responsive to shock; reduces nominal rigidity and thus steepens the short-run Phillips curve, to the extent that a steeper Phillips curve implies that inflation varies more as demand fluctuates; and finally, possibly destabilizes the relation between the money stock and the Fed's policy instruments, magnifying monetary control errors. Hence, inflation varies more with higher desired inflation rates." (Hasbrouck, 1979; Ball, Mankiw, and Romer, 1988).

Other economists have provided counter arguments of an inverse relationship between inflation and uncertainty, strengthening the subsistence of the theoretical ambiguity on the subject. Higher inflation or inflation uncertainty has the tendency to result in lower inflation in a monetary regime concerned with the objective function of minimizing welfare losses associated with higher inflation or uncertainty. Such monetary authority will strive to monitor closely the inflation development and employ all necessary tools to curb it. The stabilization motive a monetary regime in a period of rising inflation attracts a swift tight monetary policy option, which will mitigate inflation uncertainty and its attendant welfare cost [Holland (1995)].Moreover, recognizing that higher inflation contributes to the difficulty in predicting price changes, higher and rising inflation may gear economic agents to invest more resources in forecasting inflation, an endeavor that produces less uncertainty. "Higher variable inflation rates may not be of much concern if they are,

at the same time, predictable. In such cases, economic agent can take the steps to protect themselves from generally anticipated inflation or disinflation to come." (Pourgerami and Maskus, 1987, p287). And, to the extent that economic actors based their expectations on predictable variables other than past inflation, low uncertainty can accompany high inflation variability suggesting a negative causal effect of inflation uncertainty on inflation [Frohman, Laney, and Willet (1981)]

Several empirical studies have investigated the linkage between inflation in levels and its uncertainty. It is convenient to commence with Okun (1971) findings from the international (cross countries) evidence for the positive relationship between inflation and inflation-uncertainty. Data from Organization for Economic Cooperation and Development (OECD) and other industrialized economies confirmed his conjecture that countries with high inflation rates experienced more fluctuation in the rates from year to year. Cukierman and Meltzer (1986) however noted that the positive relationship between level of inflation and its variability as observed across countries in Okun (1971) could be attributed to the differences in the relative instability of governmental objectives across countries. Such variation will produce a positive relation between average money growth and the variability of money growth, which will, in turn, induces a positive relationship between that average level and the variability of inflation across countries.

Analyzing the post-war U. S. inflation rates, Engle (1983) constructs an autoregressive conditional heteroscedasticity (ARCH) model to estimate the parameters of the price equation and estimates of the variance at each point in time. His findings could not evidently substantiate that the positive relationship between level and variance of inflation hold. Variance in the seventies was only slightly greater - but predictable - than in the sixties and both were well below the variances in the late forties and early fifties. Thus, the variance did not increase. According to Engle: "This conclusion is rather apparent in the inflation data where the seventies exhibit a gradual acceleration of inflation, while the early period shows some quarters of even higher inflation interspersed with quarters of negative inflation rates. This erratic behavior is presumably very difficult to predict and thus appears as a high variance." (Engle, 1983, p297). Cosimano and Jansen (1988) however claimed that the study endears little support to the hypothesis of a link between the level and conditional variance of inflation because Engle's framework was suspect to error, to the extent that the modeling is sensitive to a specification of the reduced-form equation for inflation not consistent or supported by the Final Predictive Error (FPE) criterion or by the conventional F-test. (Akaike, 1969; Hsiao, 1981).

Unger and Meyer (1993) find evidence of a significant positive relationship between inflation and its unpredictability in Israel, particularly during the period of high inflation only; in a period of relatively moderate inflation, no significant relationship was evident, hence the plausibility of a threshold effect. For the postwar United States, Holland (1995) found that increases in the rate of inflation tend to precede

increases in the level of inflation uncertainty, suggesting that higher inflation uncertainty is part of the welfare cost of inflation. He attributed this relationship to a high rate of inflation that increases uncertainty about future monetary policy and the associated uncertainty about the persistence of inflation.

In Estonia, Vork (1999) suggests mixed results about the relationship between inflation and uncertainty, depending on the measure of uncertainty. The uncertainty measure based on backward looking survey of retail shop is not correlated with or caused by changes in prices in Estonia. However, an econometrically generated proxy for uncertainty (from a GARCH-model) provided evidential support for the positive relation with inflation, with uncertainty being the highest in 1994 during the period under study. Within the same framework, the impact of inflation uncertainty on real economic activity is negative.

Grier (1998) investigated the relationship between inflation and inflation uncertainty for G7 countries (US Germany, Japan, the UK, Canada, Italy and France), using the GARCH model to generate a time-varying conditional variance of surprise inflation. His Granger-causality findings indicated that in all these countries, lagged inflation is significantly and positively correlated with inflation uncertainty. Weaker evidence, however, existed for some of the countries that inflation uncertainty Granger-causes inflation. Specifically in the US and Germany) increased uncertainty lowers inflation while in Japan and France increased uncertainty raises inflation, as the Cukierman-Meltzer model predicts.

In a similar study, Fountas, et al (2002) also find that higher inflation and inflation uncertainty lead to lower output growth in Japan. Conrad and Kanasos (2005) also support the Friedman hypothesis of a positive inflation level-uncertainty relationship in USA, Japan, and UK. The study also concludes that greater uncertainty is negatively correlated with economic activity, thus depicting a representation of significant cost of inflation. Korap (2009) results from Turkish data also verify the suggestions of Friedman (1977) and Ball (1992) and indicate that stabilization policies aiming at reducing inflation would decrease both inflation and its conditional volatility, and in turn, the lower uncertainty for inflation that enables relatively more efficient functioning of the price system. As host of studies, both theoretical and empirical, continue to focus on the issue, the debate is far from abating and the empirical findings across the board still inconclusive.

This study provides an insight into the relationship between the levels of inflation and uncertainties in five member-States (The Gambia, Ghana, Guinea, Nigeria, and Sierra-Leone) within the West African Monetary Zone (WAMZ). This exercise is particularly relevant as one of the core criteria toward instituting monetary union in the region is to curtail and maintain inflation rates within the single digits. As Friedman noted, high inflation rates would not likely be steady during the transition decades subject to new institutional arrangements to which firms in the economy try to

adapt. Understanding whether inflation uncertainty is a distinct channel for higher inflation rates couldn't be any more overstated during this transitional period, as this represents additional perspective through which a case could be established or articulated for a common monetary policy. To the best of the author's knowledge, no study has addressed the issue.

The rest of the paper is organized as follows. The next section provides the data descriptive, using the conventional summary statistics and graphical representations of the behavior of variables under study. Section three presents the econometric modeling, empirical methodology and summary of findings, while section four provides the concluding remarks.

2.0 DATA DESCRIPTIVE AND SUMMARY STATISTICS

To investigate the relationship between inflation rate in its level and variability in the WAMZ, the month to month data on inflation, calculated from the consumer price index, is used. The data sources are the International Financial Statistics and the Central Banks of respective countries under study. With the exception of Sierra Leone that covers January 1990 to December 2008, the period under consideration for other countries is from January 1990 to December 2009. Presented in Table 1 is the summary statistics of monthly inflation rates in the WAMZ. During this period, The Gambia has the lowest average inflation rates, 0.47 percent, and the lowest standard deviation of monthly changes, 1.10 percent. Next to The Gambia at the lower end is Guinea, with 0.93 percent average inflation rates and 1.57 percent standard deviation. The other three countries have higher monthly average inflation rates with relatively higher standard deviation.

The coefficients of variation (CV) indicate that the degrees of dispersion of data within the countries portray different incidences. Although Sierra Leone still recorded the largest variation (333%) among these countries, The Gambia has the second largest CV (234%), followed by Guinea (204%) and Nigeria (149%). Ghana is relatively less dispersed than other countries. It is also evident from the data that the distributions are generally non-normal, as indicated by the positive measures of skewness and illustrated by the kernel density functions (Figure 1), as well as leptokurtic in kurtosis (large values of k in all countries, especially in Sierra Leone that is unusually high at 77.8). The huge values of Jarque-Bera (J-B) statistics in all cases also confirm the non-normality features in the series.

TABLE 1
SUMMARY STATISTICS OF MONTH -TO-MONTH INFLATION RATES

	GAMBIA	*GHANA*	*GUINEA*	*NIGERIA*	*SIERRA LEONE*
Mean	*0.47*	*1.69*	*0.93*	*1.57*	*1.91*
Median	*0.20*	*1.50*	*0.70*	*1.25*	*1.10*
Std. Dev.	*1.10*	*1.74*	*1.57*	*2.34*	*6.36*
C. V.	*234.0*	*103.0*	*168.8*	*149.0*	*333.0*
Skewness	*0.52*	*1.47*	*1.92*	*0.73*	*6.45*
Kurtosis	*7.10*	*9.78*	*10.58*	*3.93*	*77.75*
Jarque-Bera	*179.21*	*545.88*	*723.10*	*29.87*	*54426.45*
P-value for J-B	*0.000*	*0.000*	*0.000*	*0.000*	*0.000*
Sum Sq. Dev.	*289.32*	*725.94*	*588.72*	*1312.39*	*9142.58*
Number of Obs.	*240*	*240*	*240*	*240*	*227*
Period	*1990M1 - 2009M12*	*1990M1 - 2009M12*	*1990M1 - 2009M12*	*1990M1 - 2009M12*	*1990M1 - 2008M11*

As depicted in Figure 1, month-to-month inflation series clearly show volatility pattern in each country. Also, countries with high inflation rates also experience more variable inflation rates. During the period under study, countries with high average rates of inflation have had more widely fluctuating rates from month to month. This is illustrated in Figure 2 where standard deviation of monthly increase in inflation, from the average rate of increase, is used as a measure of variability for each country.

Figure 2
Average & Variability of Month-to-Month Inflation Rates

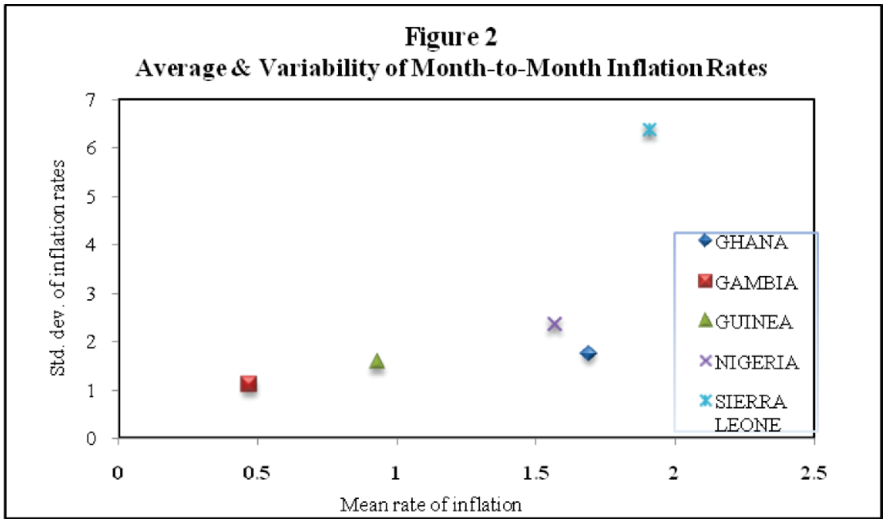

Figure 1
WAMZ Countries - Behavior of the Monthly Inflation Rates

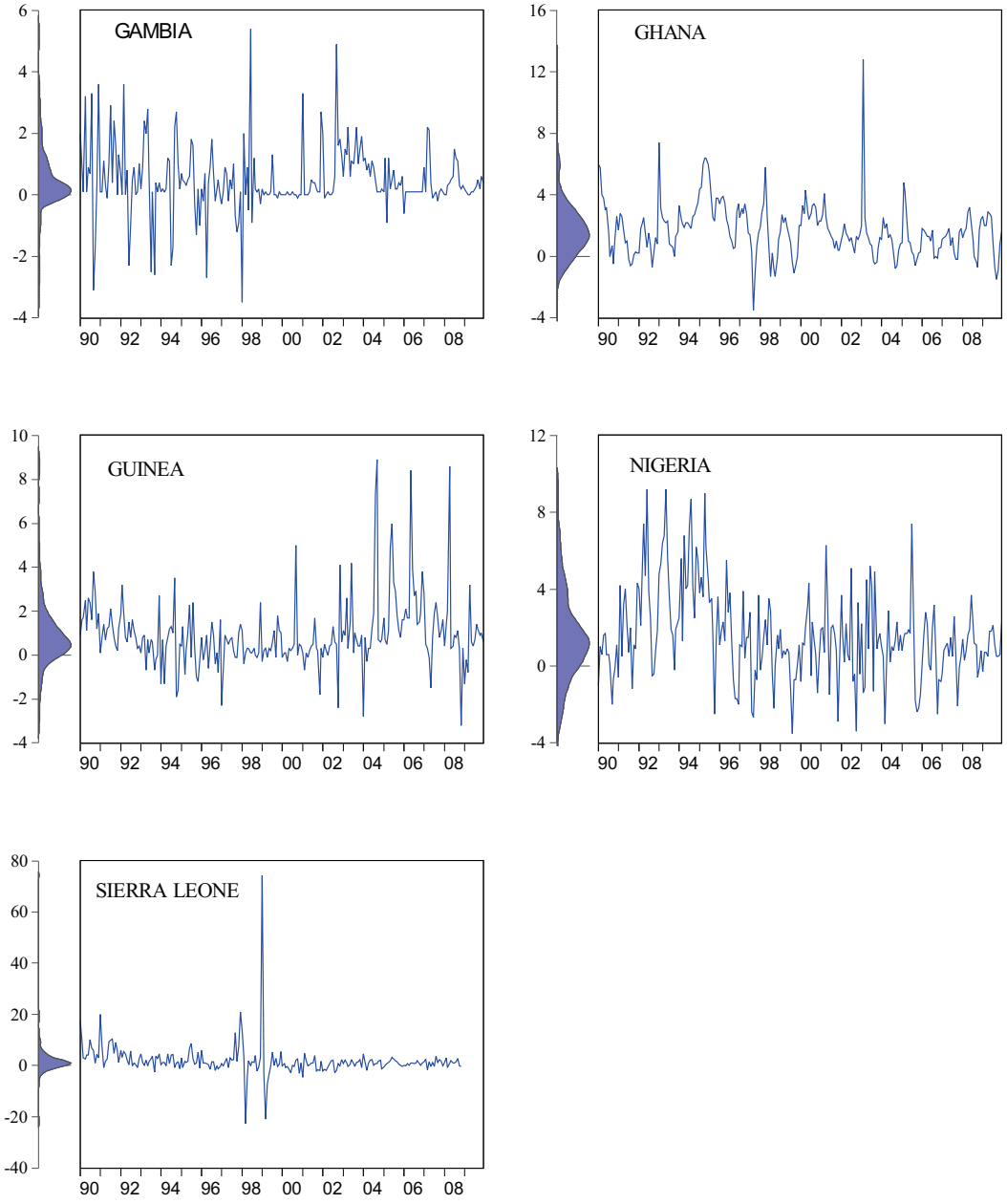

Figure 1

The time series properties of inflationary process in each country are examined to determine whether they are stationary, so that the residuals are white noise, and that the residual variances of inflation are significantly time-varying. Otherwise, any pattern in the residuals will bias tests for patterns in the squared residuals in favor of falsely finding ARCH effects [Cosimano and Jansen (1988)]. The conventional Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) tests statistics are employed. The results of these tests are provided in Table 2, which indicate that in all countries, the inflationary processes are stationary in levels. The next section discusses the model formulation and estimation, and then presents the empirical findings.

TABLE 2

UNIT ROOT TESTS FOR MONTHLY INFLATION RATES

(Null hypothesis: Inflation has a unit root)

	*ADF t-statistics (P-value in parentheses)**			*Phillips-Perron t-statistics (P-value in parentheses)**		
	Intercept Only	Trend and Intercept	None	With Intercept	Trend and Intercept	None
Gambia	-13.86 (0.000)	-13.83 (0.000)	-7.94 (0.000)	-13.92 (0.000)	-13.86 (0.000)	-13.01 (0.000)
Ghana	-7.35 (0.000)	-7.47 (0.000)	-5.17 (0.000)	-7.28 (0.000)	-7.42 (0.000)	-4.96 (0.000)
Guinea	-10.97 (0.000)	-10.89 (0.000)	-6.19 (0.000)	-11.19 (0.000)	-11.18 (0.000)	-9.63 (0.000)
Nigeria	-8.92 (0.000)	-9.46 (0.000)	-4.97 (0.000)	-9.19 (0.000)	-9.60 (0.000)	-7.19 (0.000)
Sierra Leone	-11.76 (0.000)	-12.28 (0.000)	-12.33 (0.000)	-13.08 (0.000)	-13.64 (0.000)	-12.32 (0.000)
Critical Values	*1% (-3.45) 5% (-2.87) 10% (-2.57)*	*1% (-3.99) 5% (-3.43) 10% (-3.14)*	*1% (-2.57) 5% (-1.94) 10% (-1.62)*	*1% (-3.45) 5% (-2.87) 10% (-2.57)*	*1% (-3.99) 5% (-3.43) 10% (-3.14)*	*1% (-2.57) 5% (-1.94) 10% (-1.62)*

**Based on MacKinnon (1996) one sided p-values*

3.0 MODEL SPECIFICATION AND ESTIMATION

The model follows GARCH (q, v) construction [Grier and Perry (1998)] and extended to allow for the inclusion of the inflation rate as an exogenous regressor in the variance equation [Fountas (2001) and Thornton (2008)]. The mean equation for inflation, π_t,, is specified as an AR (p) process with time varying conditional variance:

$$\pi_t, = \psi_0 + \psi_1 \pi_{t-1} + \ldots + \psi_p \pi_{t-p} + \varepsilon_t \qquad (1)$$

The assumption in the mean equation (1) follows that $E(\varepsilon_t|I_{t-1}) = 0$ and $Var(\varepsilon_t|I_{t-1}) = \sigma_t^2$; and the associated GARCH equation is represented as:

$$\sigma_t^2 = \delta_0 + \delta_1 \varepsilon_{t-1}^2 + \ldots + \delta_q \varepsilon_{t-q}^2 + \rho_1 \sigma_{t-1}^2 + \ldots + \rho_v \sigma_{t-v}^2 + \kappa \pi_t, \qquad (2)$$

where $\delta > 0$; $\delta i \geq 0$, for $i = 1, \ldots q$; $\rho j \geq 0$, for $j = 1, \ldots, v$; It-1 contains the information set available at time t; and, κ measures the Friedman coefficient that is conjectured to be a positive value (i.e., $\kappa > 0$).

The mean and variance equations (1) and (2) above are estimated and the results for each country provided in Table 3. Starting with inflation lag length of thirty-six months, the appropriate lag length was selected on the basis of three criteria [Akaike Information (AIC), Schwartz-Bayesian (SC), and Hannan-Quinn (HQ)] for respective countries. Through this process also, the insignificant lags in the mean equation have been parsimoniously removed. Reported coefficients in the mean equations are highly robust and strongly significant. The results also indicate that parameters in each equation have long memory impact in the effects of past inflations on the current inflation rates, and mostly positively correlated.

The values of the estimated Friedman's coefficient, κ, are positive [Gambia (0.214), Ghana (0.16), Guinea (0.21) Nigeria (0.18) and Sierra Leone (1.07)], and strongly significant in all countries. This finding is consistent with Friedman's hypothesis that higher inflation tends to raise higher inflation uncertainty. The values are generally close among the countries, except the outliers in Sierra Leone. The implication is that if inflation rises by one unit, the unit measurement for conditional variances rises between 0.16 and 0.21 as represented in the four countries. For Sierra-Leone however, the magnitude of the rise in the unit of conditional variance, the measure of uncertainty, outweighs the proportion of rise in the unit of inflation rate, indicating higher signals of uncertainty than the increase in inflation rates. The residual diagnostics tests are also conducted to check whether there are remaining ARCH effects in the residuals. The values of Q (.) or Q2 (.) and Lagrange multiplier (LM) test statistics as presented indicate no ARCH effects in the residuals.

TABLE 3

GARCH RESULTS

GAMBIA

$\pi_t = -0.017 + 0.29\,\pi_{t-1} + 0.22\pi_{t-2} + 0.09\pi_{t-11} + 0.07\pi_{t-15} + 0.13\pi_{t-20} - 0.05\pi_{t-28} - 0.06\pi_{t-33}$
(0.635) (0.000) (0.000) (0.000) (0.0134) (0.000) (0.071) (0.012)

GARCH Equation: $\sigma_t^2 = 0.056 + 1.4\varepsilon_{t-1}^2 + 0.064\sigma_{t-1}^2 + 0.214\pi_t$
(0.008) (0.000 (0.017) (0.000)

R-sq = .021; Adj. R-sq.= -0.014,
Q(12) = 17.10 (0.146); Q(24) = 31.52 (0.139); ARCH-LM 1.34 (0.139)

GHANA

$\pi_t = -0.19 + 0.63\pi_{t-1} + 0.19\pi_{t-12} - 0.15\pi_{t-15} + 0.18\pi_{t-24}$
(0.249) (0.000) (0.000) (0.003) (0.000)

GARCH Equation: $\sigma_t^2 = 0.98 + 0.21\varepsilon_{t-1}^2 - 0.027\sigma_{t-1}^2 + 0.16\pi_t$
(0.000) (0.0000 (0.003) (0.000)

R-sq = 0.46; Adj. R-sq. = 0.45
Q(12) = 5.78 (0.92); Q(24) = 16.19 (0.881); ARCH-LM 0.08 (1.00)

GUINEA

$\pi_t = 0.14 + 0.17\,\pi_{t-1} + 0.11\,\pi_{t-9} + 0.13\pi_{t-12} + 0.16\,\pi_{t-22} - 0.14\,\pi_{t-25} + 0.14\,\pi_{t-26}$
(0.339) (0.01) (0.045) (0.037) (0.0381) (0.014) (0.039)

GARCH Equation: $\sigma_t^2 = 0.033 - 0.023\varepsilon_{t-1}^2 + 0.93\sigma_{t-1}^2 + 0.20\,\pi_t$
(0.106) (0.071) (0.000) (0.000)

R-sq = 0.14; Adj. R-sq. = 0.11
Q(12) = 11.52 (0.485); Q(24) = 24.73 (0.420); ARCH-LM 1.50 (0.125)

NIGERIA

$\pi_t = 0.41 + 0.35\,\pi_{t-1} + 0.13\,\pi_{t-11} + 0.24\pi_{t-12} - 0.12\pi_{t-29}$
(0.04) (0.000) (0.029) (0.000) (0.011)

GARCH Equation: $\sigma_t^2 = 0.11 + 0.13\,\varepsilon_{t-1}^2 + 0.77\,\sigma_{t-1}^2 + 0.18\,\pi_t$
(0.32) (0.043) (0.000) (0.002)

R-sq = 0.35; Adj. R-sq. = 0.34
Q(12) = 5.37(0.940); Q(24) = 19.84 (0.706); ARCH-LM 0.16 (0.697)

SIERRA LEONE

$\pi_t = 0.24 + 0.11\,\pi_{t-2} + 0.10\,\pi_{t-3} + 0.15\pi_{t-4} + 0.08\,\pi_{t-5} + 0.42\,\pi_{t-11} + 0.08\,\pi_{t-21}$
(0.01) (0.11) (0.078) (0.003) (0.035) (0.0346) (0.000)

GARCH Equation: $\sigma_t^2 = -0.63 + 1.15\,\varepsilon_{t-1}^2 + 0.41\sigma_{t-1}^2 + 1.07\,\pi_t$
(0.003) (0.000) (0.000) (0.000)

R-sq = -0.11); Adj. R-sq.= -0.14
Q(12) = 9.76 (0.637); Q(24) = 19.93 (0.70); ARCH-LM 0.16 (0.992)

Granger Causality Tests

Having obtained a proxy for inflation uncertainty, this measure is then use to test for causality between the level of inflation rates and inflation uncertainty. Granger causality method is applied to provide the statistical evidence of the direction of causality. Table 4 shows the F-statistics and the associated p-value at different, generally up to 12 lag levels inclusive, except Guinea that truncates at four lags due to the insignificant relations after three lags. The two null hypotheses under consideration here are that inflation does not Granger-cause inflation-uncertainty (Panel A) and inflation-uncertainty does not Granger-cause Inflation (Panel B). In all cases, the null hypothesis that inflation does not Granger-cause uncertainty is strongly and resoundingly rejected. The only exception is Guinea, where the null can be weakly rejected at 10 percent significant level in two and three lags. And, to the extent that the causality effects are positive in all cases provide strongly corroborating evidence sympathetic to Friedman (1977) and Ball (1992) postulate.

The results of the causality test from uncertainty to inflation, however, are not as robust. The null hypothesis cannot be rejected at any lag length in Gambia and Ghana,. Interestingly, inflation uncertainty is strongly Granger causing inflation rates at approximately one percent level of significance in one-lag and at 10 percent at two-lags only. The direction of causality from uncertainty to inflation is also significant in Nigeria at 10 percent with four lags, and one and five percent significant at lags six and eight respectively. Also in Sierra Leone, the null hypothesis of uncertainty to inflation is strongly rejected at one percent significant level in one, ten, and twelve lags, respectively. To some appreciable extent therefore, the Granger causality direction from uncertainty to inflation in Guinea, Nigeria, and Sierra Leone suggests a plausible consideration for Cukierman-Meltzer's opportunistic Central Bank hypothesis in these countries.

TABLE 4: GRANGER-CAUSALITY TESTS

Country	*Lags*	PANEL A *H_o: Inflation does not Granger-cause Uncertainty*		PANEL B *H_o: Uncertainty does not Granger-cause Inflation*	
		F-statistics	P-value	F-statistics	P-value
Gambia	2	7.8	0.001***	0.2	0.840
	4	4.3	0.003***	0.2	0.914
	6	3.0	0.007***	0.7	0.690
	8	2.2	0.031**	0.5	0.857
	12	2.6	0.003***	0.5	0.937
Ghana	2	69.5	0.000***	0.4	0.663
	4	35.4	0.000***	0.5	0.720
	6	23.4	0.000***	0.7	0.659
	8	17.2	0.000***	0.9	0.487
	10	13.8	0.000***	1.0	0.470
Guinea	1	0.9	0.345	6.7	0.011***
	2	2.7	0.070*	2.4	0.089*
	3[@]	2.2	0.094*	1.7	0.164
	4	1.6	0.164	1.1	0.379

Nigeria	2	21.9	0.000***	2.3	0.102
	4	10.3	0.000***	2.1	0.078*
	6	6.5	0.000***	3.3	0.004***
	8	4.4	0.000***	2.3	0.021**
	10[@]	3.7	0.000***	1.2	0.289
	12	3.2	0.000***	1.3	0.250
Sierra-Leone	1	208.9	0.000***	9.5	0.002***
	2	129.2	0.000***	2.1	0.129
	3	98.4	0.000***	1.2	0.305
	4	61.5	0.000***	0.7	0.618
	6	50.7	0.000***	0.5	0.804
	8	38.5	0.000***	1.0	0.412
	10	29.0	0.000***	9.3	0.000***
	12	31.3	0.000***	14.4	0.000***

[@]*Guinea: Beyond three lags, the causality becomes statistically insignificant in both directions.*

[@]*Nigeria: From Lag 10 and beyond, null hypothesis of inflation uncertainty Granger causing inflation cannot be rejected*

4.0 CONCLUSION

This paper modeled a GARCH (q, v) contraption, allowing for inclusion of inflation rate as an exogenous regressor in the variance equation to capture a measure of inflation uncertainty for five Member-States in the WAMZ. The Granger-Causality framework was then applied to examine the relationship between inflation and inflation uncertainty in these economies. In all cases, higher inflation rates are causing inflation uncertainty, laying credence to Friedman and Ball hypotheses. However, the results of the causality test from uncertainty to inflation, however, are not as robust. In Gambia and Ghana, for example, uncertainty clearly has no causal impact on inflation; while only in the immediate past two months do uncertainty drive inflation, beyond which it has no impact. Also in Nigeria, uncertainty that prolonged between four and eight months has information contents in inflation. The long memory in uncertainty is even more pronounced in Sierra Leone. Meanwhile, to some appreciable extent, the Granger causality direction from uncertainty to inflation in Guinea, Nigeria, and Sierra Leone suggests a plausible consideration for Cukierman-Meltzer's opportunistic Central Bank hypothesis in these countries.

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BANK DISTRESS, BANKING SECTOR REFORM AND THE REAL ECONOMY: THE NIGERIAN EXPERIENCE

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Abstract

The study examines bank distress, the current reform in the Nigerian banking sector and the real economy. It appraises the success of the ongoing reforms and the prospects of the financial recovery in laying a solid foundation for the future of banking in the country. The poor performance of the real sector of the economy and the sluggish manner of financial intermediation by banks to the non-financial private sector has motivated the study. Econometric method and descriptive technique of analysis were adopted. The study reveals that there is no coherent financial intermediation by the Nigerian banking sector because the banks would not release significant proportion of their deposits to the real sector in form of credits or loans when compared to the large proportion of deposits they mobilise. The study observes the recurrent waves of bank distress in Nigeria as unacceptable. It shows that depleted capital base, frauds, insider abuses and indiscriminate granting of credits and large portfolios of non-performing loans are largely responsible for bank distress in the country. The paper also reveals that the high incidence of financial crisis in Nigerian banks has negatively affected the real sector of the economy, and consequently led to the decline in national output of goods and services. It has also led to rising level of inflation and unemployment. Policy recommendations were offered to further strengthen the banking system in the country. The current reform effort being championed by the Central Bank of Nigeria should therefore be sustained. Government and the Nigerian people should extend greater support to the CBN for this laudable exertion, so that the reform will yield the desired results. It was also recommended that in view of the increasing demands on government to bail out ailing banks, punishments to individuals and organisations involved in aiding the banking crisis in Nigeria should be equated to their level of involvement in fraud, financial recklessness or negligence. Recovery through the sale of their properties and prison sentences that will deter them from enjoying the stolen wealth of people and investors – the Murdoch example, should be adopted and vigorously enforced in the country.

JEL Classification: G21, G28

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The views expressed in the paper are those of the author and do not reflect those of the University of Jos.

I. INTRODUCTION

The major players in the money market are the banks and the discount houses. The role of banks in financial intermediation ensures the mobilization and reallocation of idle funds from surplus units to the deficit sector. This means that banks provide the platform for the stimulation of growth and development through financial intermediation in mobilizing savings from surplus to the deficit units in every economy. They make available the needed capital to facilitate production in the real economy for generation of employment and income in the long-run. However, one of the outstanding controversies that lingered in the banking industry is the growing increase in a spate of fraud and distress of the Nigerian banks. This implies that bank distress has over the years affected the performance of the Nigerian banking sector. For example, the history of bank failure in Nigeria dates back to 1930s when twenty one (21) of the twenty five (25) indigenous banks failed. The establishment of the Central Bank of Nigeria in 1958 via the Banking Ordinance of 1952 was as a result of the looming crises in the banking system. After the deregulation exercise in 1986, nine (9), fifty (50) and thirty four (34) banks were distressed in 1990, 1996 and 2003, respectively (Itodo, 2008). Even after banking consolidation in 2004, cases of distressed banks were reported. In 2009 for instance, the Central Bank of Nigeria (CBN) quickly bailed out some ailing banks and changed their management in order to safe-guard depositors' money. These banks include: Oceanic Bank Plc, Intercontinental Bank Plc, Union Bank Plc, Bank PHB Plc, Spring Bank Plc, FinBank Plc, Afribank Plc and Equitorial Trust Bank Ltd. Nonetheless, the upsurge in the wave of fraud in banks has contributed to this malaise. Consequently, banking sector reforms became necessary in the country. For example, in July 6, 2004 when the Central Bank of Nigeria increased the minimum capital base of banks from N2 billion to N25 billion, about 89 banks in Nigeria were enjoined to consolidate through recapitalization, mergers and acquisitions. As a result, the country was left with 25 'strong banks'. This policy has changed the nature of competition in the industry and has also raised entry barriers for those wishing to start banking business. This implies that marginal players are no longer in the system. However, the emerging 'mega banks' have brought the challenge of checking abuses and establishing good corporate governance practices in these banks. Thus, cases of distress and inefficiency were still witnessed in the economy despite this effort. This implies that more drastic reform measures have become imperative to restore confidence and ensure stability in the system.

There have been radical changes in the contextual and regulatory frameworks of the Nigerian banking sector since the public presentation of the 'state of the banks' by the Governor of the Central Bank of Nigeria (Sanusi Lamido Sanusi) in August, 2009. The ongoing banking reforms were anchored primarily on four cardinal principles including enhancement of banks, establishment of financial stability, creating a healthy financial sector evolution and ensuring that the financial sector contributes to real economy (Taofik, 2011). The poor performance of the real sector in relation to financial intermediation in Nigeria as well as the current reform which

has been different in both its approach and perspective from those in the past have been the motivation for this study. For example, the emphasis under the new risk-based regulatory approach lies on quality credit risks management alongside adequate capital. Again, commercial banks in Nigeria are not only now mandated to put in place mechanism to identify, measure, monitor and control risks, they are also expected to report such mechanism for review by shareholders. This gives the majority of shareholders of banks the opportunity to assess the operational structures of their companies.

From the foregoing, the study seeks to appraise the current banking reforms in Nigeria, with a view to achieving the following broad and specific objectives:

i) to examine the causes and effects of bank distress or failure in Nigeria;
ii) to explain the current banking reform efforts in Nigeria;
iii) to identify the problems and challenges of the banking sector and financial intermediation to the real sector in the country; and
iv) to proffer policy recommendations that could be used to tackle these problems.

The paper is divided into six sections. Section I is the introduction. Section II gives an overview of the banking industry in Nigeria. Section III dwells on the current reforms and subsisting challenges in the sector, while Section IV discusses the impact of the distressed banking sector on the real economy in the review period 1989 - 2010. Summary, conclusion and recommendations are presented in Sections V and VI respectively.

II. OVERVIEW OF BANKING INDUSTRY IN NIGERIA

In spite of improvement in banking reforms as well as the socio-political and economic environment in 2010, the Nigerian banking industry has continued to grapple with the challenges of the global financial crisis as they maintained a cautious approach to credit extension. This was borne out of the need to rebuild capital, maintain liquidity and the spectre of further credit write-downs, mostly related to non-performing exposures to commercial real estates and stock markets. The cautious approach adopted by most banks during the period under review also informed the marginal increase in banks' branch network by 3.63 percent from 5,379 in 2009 to 5, 574 in 2010 (NDIC Report, 2010). According to NDIC report, the industry, however, continued to witness heightened competition for deposits, especially with the harmonization of end of financial year as directed by the CBN. The industry also witnessed some growth in non-traditional banking delivery channels with IT-based services increasingly complementing branch banking.

Presented in Table 3 (see appendix) are key macroeconomic indicators as well as some specific indicators for the banking industry. As shown in the table, total assets of the industry (inclusive of off-balance sheet, OBS) recorded an increase of 6.50 percent from N17.522 trillion in December, 2009 to N18.661 trillion in December 2010.

The total deposit of insured deposit money banks grew by about 8.48 percent to N10.837 trillion as at December 31, 2010 from N9.99 trillion in December 2009. The table also indicates that a total of 89 banks were in existence in Nigeria in 2004 but were characterised by distress syndrome. From Table 1 (see appendix), a total of about N2.9 billion of depositors' money/bank funds was stolen through fraud and forgeries in 2000, and N11.2 billion was lost to fraud in 2001. The loss continued to increase to N12.9 billion and N11.8 billion in 2002 and 2004, respectively,. worsening the distress situation. The distressed banks were made to consolidate and recapitalize to become stronger and the number was reduced to 25 banks in 2005, and further reduced to 24 in 2007 through 2010, until three of the 24 banks were nationalized and acquired by the Federal Government of Nigeria in 2011, following liquidity problems in the nationalized banks as reported by CBN (Taofik, 2011).

The health and performance of the industry improved in 2010, relative to its performance in previous years; in that year, the financial condition of fifteen (15) of the twenty four (24) banks were rated by the CBN and the NDIC as sound and satisfactory. Six (6) were rated as marginal as against one in the previous year whilst only three (3) banks remained in the unsound category (Afribank, Bank PHB and Spring Bank). These three banks were later nationalized and acquired by the government through the Asset Management Corporation of Nigeria.

The Nigerian banking system has been beset with problems and challenges. For example, excess liquidity problem has posed a serious challenge to the Nigerian banking system and by extension the real sector; it could deter investment, increase the risk of inflation and limit economic growth and development in the economy (Gushibet, 2011). According to him, the major causes of excess liquidity are decline in the demand for credits and the injection of liquidity into the banking system financed by the CBN. The banking system in Nigeria is dominated by relatively small assets-base banks and is not internationally competitive as it has not fully taken advantage of information technology to transform the sector. In this era, countries are competing and fighting over control of information rather than natural resources. This means that continuous improvement in banking technology for operational efficiency has become imperative. This fact was supported by Gates (2001), who observed that the successful companies of the next decades will be the ones that use digital tools to re-invent the way they work. This implies that going digital will put a company on the cutting edge of the shock wave of change.

The need to minimize the high rates of fraud and other banking malpractices in the banking system is another challenge for the sector. It is in this light that Dabwor (2010) warns that banking industry players must maintain the highest ethical and professional standards in all transactions with customers and interbank dealings. Again, the challenge before banks is how to redefine and refocus their marketing policies and strategies in the regime of niche banking. Furthermore, pressure is being intensified to generate superior returns to shareholders following the sharp increase in the capital base of banks.

Enforcing dormant laws especially those relating to the issuance of dud cheques has remained a problematic. The laws would positively impact on banking habit and in the process, reduce the volume of cash-based transactions in the country. When implemented, the laws will have a beneficial effect on the payment system by promoting the use of cheques, plastic cards and machines (electronic banking). The banking industry stands to gain from the cutting-edge technology in terms of cost saving. For example, the huge sums that banks spend on cash management will fizzle-out.

However, the scenario is not all on the downside; opportunities also abound for the Nigerian banking sector. Banks can tap into opportunities in the growing sectors such as telecommunications, oil and gas, aviation, manufacturing and agriculture. Banks in Nigeria can become more competitive in the face of globalization if they fully embrace electronic banking system. When banks actually provide funding to the real sector, they will no longer depend on the public sector (the government) as their main source of deposits. This is because as the real sector develops, the economy will grow and develop, and with development businesses will blossom and wealth will be created. Consequently, banks can then enjoy the numerous and available opportunities in the various market segments.

III. CURRENT BANKING REFORMS AND SUBSISTING CHALLENGES IN NIGERIA

Attempts at making the banking system in Nigeria a vibrant and competitive one started with the liberalization of banking licensing in 1986 through 2004, when banks were forced to recapitalize (bank consolidation) to a minimum of 25 billion naira capital base per bank. The consolidation resulted in mergers and acquisitions of banks. Despite these endeavours, most of the consolidated banks were later loomed in serious cash crises and liquidity-risk problems. Urgent steps to further reform the banking industry in the country became necessary. In view of this, a more fundamental effort at reforming the Nigerian banking sector has been on since 2009 with the coming on board of Sanusi Lamido Sanusi as CBN Governor. Under this administration, the CBN has provided guidelines for developing risk management frameworks, upon which banks are required to develop their own specific guidelines. Government has instituted the credit bureau system as part of measures to foster the development of a credit focused banking management that will develop the real sector of the economy. It should be pointed out that poor credit management has been a major cause of the banking failures in the country. So, credit risk management of the banks is the major thrust of the reform efforts.

The present banking sector reforms provided for the harmonization of the year-end of all banks to December 31, of every Gregorian calendar. The reform has also been extended to the microfinance industry. Other aspects of the reform include the on-going efforts to develop alternative non-interest financial system, synchronization of the regulatory and economic roles of the CBN, new rules and regulations on

electronic banking and customer service, code of corporate governance to address peculiarities of banks in addition to code of corporate governance for all quoted companies, full adoption of International Financial Reporting Standards (IFRS) by all Nigerian banks by the end of 2012, and facilitating credits to some key sectors including agriculture, manufacturing, power, aviation and small businesses among others. These indicate the comprehensiveness of the current banking reform.

As part of the current reform, a credit risk regulatory approach was adopted through the reversal of modus operandi of the Nigerian banking system from universal banking system to niche banking system. Against the one-size-fits-all universal banking, niche banking allows banks to specialize within the broad spectrum of whole and retail banking as well as geographical spread of operations. The implication of this is that the extent of banking operations would determine the minimum capitalization. This implies that banks are now to be categorized as regional banks, national banks and international banks based on identified capital base and areas of operations. By this policy, banks are required to concentrate fully on core banking rather than fiddling with non-banking financial services. Also, the current reform has introduced tenure system for bank chief executives and auditors. This represents a major shift in the Nigerian corporate governance system. Managing Directors of banks can now only serve for a maximum of 10-year period. This means that the continuous influence and control of a bank management by a single rich family could be curtailed by this reform – the Oceanic Bank unfortunate experience.

The new reform effort also saw the unprecedented sack of management of banks, the use of 'naming' and 'shaming' to recover bad loans and the prosecution of sacked chief executives of banks. These struck the roots of chronic debtors and executive recklessness which have been the most known causes of bank collapse in Nigeria. However, the establishment of the Asset Management Corporation of Nigeria (AMCON), as the bad-debt warehouse, has brought a new sense of relief and assurance to the banking sector. AMCON has so far invested N1.7 trillion naira in purchase of non-performing loans to rescue banks that would have otherwise been liquidated due to terminal capital insolvency (Taofik, 2011). This implies that the impact of AMCON on the stability of the banking sector is underscored by the fact that the corporation has investments in all banks including the non-intervened banks. This has complemented the avowed commitments of the CBN and the Nigerian Deposit Insurance Corporation to the safety of depositors, a general sense of security that has prevented massive customer defection on the ailing banks.

IV. IMPACT OF THE DISTRESSED BANKING SECTOR ON THE REAL ECONOMY

This section is pre-occupied with review of literature, methodology and the formulation of an appropriate macro-econometric model, as well as interpretation

of empirical results, which theoretically establishes the relationship between financial intermediation and the real economy.

Review of Literature

Studies conducted by Itodo (2008), Bello and Aminu (2005), and Aderibigbe (2004) have shown that the banking system in every economy is a catalyst for stimulating growth and development especially in the intermediation and deployment of financial resources from the surplus to the deficit units. Nwanyanwu (2010) is of the view that, the banking sector makes credit available by mobilizing surplus funds from savers and channeling same to investors who have brilliant ideas in creating wealth but lack the necessary capital to execute these ideas. The intermediation function of banks is often hindered by excess liquidity problem, bank distress, systemic crisis and unethical behaviours of players in the system.

The emergence of banking crisis in Nigeria became more pronounced prior to the deregulation of the financial institutions in 1986. Regulative measures such as; setting of interest rates ceiling, restriction of entry into the banking industry, and provision of credit to priority sectors were the prevailing order prior to the introduction of Structural Adjustment Programme (SAP). The direct method could not stop the crisis but rather increased it in the mid eighties and consequently triggered the liberalization and deregulation of the banking sector (Itodo, 2008). The liberalization of licensing of banks following the introduction of SAP in the second half of 1980s has expanded the scope of banking, and this heightened the rate of competition among banks in Nigeria (Ochejele, 2003) as captured in Dabwor (2010). The regulatory and reform efforts became necessary to accommodate the growing banking system, influence competition in the sector and consequently develop the real economy.

According to Taofik (2011, avers that poor credit management was a major cause of bank failures as most banks piled up non-performing loans amidst dwindling capital base. This has necessitated the need for the current banking reforms in Nigeria. Toby (1995) views the relative causes of poor performance of the banking industry in financial intermediation to include the rising costs of sources of funds, fraud, and mismatched interest sensitivity and duration period. This could result in bank distress. Bank distress is traceable to the weakness in the financial institutions, inadequacy of financial portfolios and excessive regulations particularly in the area of interest rate determination and credit rationing (CBN, 1993). Financial crises in Nigerian banks have been posing serious negative consequences for national output of goods and services, employment and prices (Gbosi, 2000). Bank distress could be explained by factors internal and exogenous (macroeconomic factors particularly weak macroeconomic management). The health of a bank therefore, is determined by the quality of management and the level of organizational control and effectiveness (Oyedotun, 1994 and Gbosi, 2000). Alashi (2002) echoes the view that bank crisis occurs when numerous banks in a country are distressed to the

extent that it becomes systemic and severe when all or most of these conditions are revealed: gross undercapitalization, high ratio of non-performing loans to the total loan portfolio, liquidity reflected in the inability to meet customers' cash withdrawal needs, persistent overdrawn position with the CBN, low earning resulting in large operational losses, and weak management as reflected by poor assets quality, insider abuses, fraud, inadequate internal controls, and so on. Ogunleye (1993) corroborates this statement. He observes that bank distress is visibly traceable, especially when the following symptoms are noted; late submission of returns to the regulatory authorities, falsification of returns, rapid staff turnover, frequent top management changes, inability to meet obligations as and when due, use of political influence, petition/anonymous letters, persistent adverse clearing positions, borrowing at desperate rates, persistent contravention of laid down rules and persistent overdrawn of current account position at the CBN. Paying credence to these points, Donli (2004) defines banking distress as a situation when there is widespread failure among banks where the solvency or liquidity of many or most banks have suffered shocks that have shaken public confidence. Nevertheless, the Nation (2011) observes that mergers and acquisitions will redefine the Nigerian banking sector, strengthen the management and capital base of banks, thereby reducing the risks of bank distress in the country.

The current reforms in the Nigerian banking sector have brought about some structural changes in terms of ownership, management, re-engineering, size and number of licensed banks as a result of regulatory induced efforts. The implications of the banking sector reforms include among others; improvement in lending to the real sector, restoration of public confidence in the banking system, ensuring a sound, responsive, competitive and transparent banking system suited to address the challenges of globalization, and enhance economic growth and development in the economy (Oluyombo and Ikomi, 2008). This means that superior reforms are capable of motivating banks to effectively assume their role of powering the real sector of the economy.

Methodology and Sources of Data

The study employs econometric method of analysis and descriptive statistics. Tables and percentages were used for the descriptive statistics. The paper utilizes secondary literature, which was obtained from journals, textbooks, newspapers and magazines, internet websites and other documentary sources. Secondary data obtained from the Central Bank of Nigeria (CBN) were used for the study. Time series data covering a period of 22 years (1989-2010) were used. The Ordinary Least Square (OLS) regression equations were adopted. The period was deliberately chosen to correspond with the timing of major reforms in the Nigerian banking sector. The trend in banking reforms was be analyzed. The indices to measure the impact of financial intermediation by the banking system on the real economy include such variables as GDP at constant year prices, consumer price index, real interest rate, discount rate, and national savings for financing investments. These

indices were computed and analyzed using econometric method.

Since the data are time series, there is the need for the data to undergo a unit root and co-integration tests. The Phillips-Perron unit root test was used to emphasize and validate the stationarity or non-stationarity of the time series data used for this paper. The test for unit root is to avoid a spurious regression model, which may lead to spurious results.

$\Delta F/P = f\ ((I - p^{\circ}), Y/P, t)$ ---------- (1)
$R/P = K\ (\Delta F/P, t)$ ---------- (2)
$\Delta F/P + R/P = S/P$ ---------- (3)
Where:
$\Delta F/P$ = change in financial assets (savings) of the non-financial private sector
$\Delta F/P$ = computed value of $\Delta F/P$ = proxy indicator of financial intermediation

$\tilde{S}/P$ = computed national savings

S/P = actual national savings
R/P = proportion of total national savings, S/P, that is internally generated and retained by businesses and individuals for financing investments.
= S/P - $\Delta F/P$ (the difference between S/P and $\Delta F/P$ equals R/P)
Y/P = GDP at constant year prices
$(i - p^{\circ})$ = real interest rate
P° = percentage change of consumer price index over the previous year
i = government bond yield or discount rate
t = trend variable, 1, 2,3, --- nth year; symbols f and k = functional notations for the equations.

Choice of the Econometric Model

The above macro-econometric policy model consists of a set of simultaneous equations. It can be noted that while $\Delta F/P$ is an endogenous variable in equation one, it is exogenous in equation two. Since equation one is in a reduced form and the model is a recursive one, the ordinary least square (OLS) is appropriate in estimating the parameters. So, the computed values of equation one could be substituted in equation two to minimise the simultaneity problem (simultaneous equation bias) inherent in the model.

Estimates of Structural Model

The above model is supposed to capture the impact of financial intermediation on the real sector of the Nigerian economy. Equation (1) explains change in financial assets (savings) of the non-financial private sector as a function of real interest rate, GDP and the trend in financial intermediation for the period under consideration. Equation (2) shows the proportion of total national savings as a function of change in

financial assets (savings) of the non-financial private sector and the trend in financial intermediation, while equation (3) is an identity equation that explains the real national savings in the economy which is the sum of equations (1) and (2).

The Empirical Results of the Model

Change in financial assets equation as a proxy indicator of financial intermediation is specified as:

$\Delta F/P = a_o + a_1(i - p^\circ) + a_2 Y/P + a_3 t + e$ ---------- (4)

$\Delta F/P = -43530 - 4590\,(i - p^\circ) - 2.1660\,Y/P + 57836t$

SEE (18089) (4195.9) (2.4706) (19128)

T* (-2.4063) (-0.876) (-1.094) (3.023)

$R^2 = 0.99$ $\bar{R}^2 = 0.98$ F* = 401.76 DW-stat = 1.35

(See appendix for regression results/computed values)

The proportion of total national savings internally generated and retained by businesses and individuals for financing investments is given as:

$R/P = bo + b1\Delta F/P + b2t + u$ ---------- (5)

$R/P = -11537 - 1.2363\Delta F/P + 25515t$

SEE (70528) (0.0104) (5735.2)

T* (1.6359) (-118.13) (4.448)

$R^2 = 0.99$ $\bar{R}^2 = 0.99$ F-stat 4599.5 DW-stat 1.085

Interpretation of Results

From equation (4), the coefficients of real interest rate (i – po) and GDP at constant year prices (Y/P) did not possess the expected signs at 5% level of significance, except for the trend in financial intermediation. That is, they possess negative signs instead of the envisaged positive symbols. By this result, we can conveniently deduce that real interest rate and GDP at constant year prices insignificantly influenced the change in financial assets of the non-financial private sector. This could affect the real economy negatively. This implies that financial intermediation in Nigeria has not been effective in powering the real sector, a reflection of the impact of excess liquidity problem, poor credit management, weak macroeconomic management, bank failure, systemic crisis, and unethical behaviours of bank management and employees. This result obviously differs from our a priori expectation and may partly be explained by data deficiencies. Difficulty in obtaining accurate data is therefore a limitation of the study. On the other hand, the estimate of the coefficient of the third explanatory variable in equation 1 (trend in financial intermediation) was statistically significant. This means that financial intermediation in Nigeria was significantly influenced by the trend of intermediation by the banking sector. The trend is positively related to financial intermediation, suggesting that as time goes by, financial intermediation tends to increase financial assets of the non-financial private sector, and this would invariably increase the proportion of total savings in the economy that are not channeled to non-financial private sector investors. The coefficient of determination for equation 1 ($R^2 = 0.99$)

shows the goodness of fit of the regression line which indicates that over 90 percent of variation in financial intermediation is explained by the trend, real interest rate and GDP at constant year prices. The adjusted $\bar{R}^2$ = (0.98) is slightly less than the unadjusted R2 in equation (4), which implies that the adjusted $\bar{R}^2$ reduces the degree of freedom for additional explanatory variables in the regression equation. The adjusted $\bar{R}^2$ = (0.99) in equation 5 has the same value as the unadjusted R^2 in the same equation, but however was adjusted for degree of freedom to forestall statistical increases as the number of the explanatory variables increases in the equation. From equations (4) and (5), the Durbin-Watson (DW) values are low, but the HAC procedure in E-view version 4 has already taken this into account in correcting the OLS standard errors for the presence of autocorrelation and heteroscedasticity. This is in consonance with the result obtained by Gujarati and Porter (2009).

From equation (5), apart from the trend in financial intermediation, the coefficient of change in financial assets of the non-financial private sector and the intercept term (b1) possess unexpected signs (negative). This is an indication that the banking sector is not contributing significantly to the growth of the real economy, suggesting that a significant proportion of total national savings is not channeled to the real sector such as agriculture, industry and manufacturing. Results indicate that, the influence of change in financial assets on the real economy was insignificant. Equation (3) is an identity equation which shows that the computed actual national savings is the sum of change in financial assets and the proportion of total savings in the economy. The computed year by year actual total savings is indicated in Table 4 (see appendix). It shows that there has been steady increase in actual national savings from N23,801.30 million (N23.801 billion) in 1989 to N5,763,511.20 million (N5.764 trillion) in 2009. It is clear that total national savings has increased as a result of financial intermediation during the period under review. This difference or increase was attributable to channeling of funds by the banking system to the services sector and government (public sector) rather than the real economy. It implies that a large proportion of actual national savings has not been utilized or channeled to the non-financial private sector over the years in Nigeria, implying that the real economy suffers from weak financial intermediation.

From the result of Phillips-Perron test (see table 5 in the appendix), the PP test shows that $\Delta F/P$, R/P, $(i - Po)$, and computed value of $\Delta F/P$ are integrated of order one {I(1)} at 5% level of significance. Although they are non-stationary at their own individual levels, they become stationary at first difference. This is shown by the value of PP test statistic greater than the 5% critical value of -1.96. This implies that though the data being individually non-stationary, a linear combination of the variables is stationary. Hence, the variables are co-integrated; having a long term relationship or equilibrium. The equations are called cointegrated equations while the slope parameters are called cointegrated parameters. However, the variable Y/P is integrated of order two. The implication is that the data for the variable is non-stationary, but it becomes stationary of second difference.

I. SUMMARY AND DISCUSSION OF FINDINGS

Since ?F/P is a proxy measure of financial intermediation, an increase (positive) in the level of financial intermediation will lead to a larger total national savings through a rise in R/P. This implies that the proportion of total national savings will rise as actual national savings increases by businesses and individuals in order to finance investments. This is partly attributable to the existence of various financial instruments which encourage total savings, and partly because financial institutions would only finance a certain proportion of business investments. Thus, the study found that an increase in the computed value of financial assets of the non-financial private sector through a rise in the proportion of total national savings has resulted to an increase in national savings that are not largely intermediated to the real economy. This implies an increase in financial liabilities of the banking industry and a rise in financial assets of individuals and businesses.

From the regression results (see appendix), the relationship between the trend in financial intermediation and financial assets is positive. This implies that an increase in trend of financial intermediation leads to an increase in financial assets. However, real interest rate and GDP at constant year prices are negatively related to change in financial assets. This means that an increase in GDP at constant prices will lead to a decrease in financial assets. The inverse relationship shows that GDP at constant year prices does not contribute to the growth of financial assets in the banking system, suggesting a weak performance of the real economy.

The regression result also showed that financial intermediation is negatively affected by the level of real interest rate. An increase in the level of real interest rate reduces the level of intermediation in the economy. This is largely responsible for the insignificant impact of banking sector on the real economy. The GDP at constant year prices shows insignificant impact on financial intermediation because the banking sector has not been adequately servicing the real sector of the economy in order to accelerate economic growth and development. The overall result shows that there is no coherent financial intermediation by the Nigerian banking sector because the banks would not release significant proportion of their deposits to the real sector in form of credits or loans when compared to the large proportion of deposits they mobilize. The banks would argue that businesses and individual investors could hardly provide marketable collaterals. This could reflect in excess liquidity problem in the banking system. This is in consonance with the result obtained by Gushibet (2011). By implication, any increase in financial intermediation by banks could reduce the excess liquidity problem in the banking system. This will create impacts on the products market and develop the real economy.

II. CONCLUSION

On the whole, our results suggest that the inadequate financial intermediation by banks in Nigeria has severe adverse consequences for the real economy, and has not led to any significant expansion in non-financial private sector investment and

domestic output (GDP). The contribution of banks as the engine of growth and development in any given economy cannot be over-emphasized. It does that by distributing financial resources from the surplus units to the deficit units of the real economy. Therefore, a sound, efficient and stable banking system is critical to the development of an economy. However, the banking sector in Nigeria has witnessed substantial problems at every stage of its evolution and throughout the annals of history. Right from its inception, the banking system has expressed one form of distress r the other. The distress in the banking industry is a reflection of many problems such as fraudulent practices, existence of non-performing loans, risk-insensitive credit administration, weak capital base, inadequate prudential guidelines, poor management, etc. In the light of the above, reforms in the sector became imperative, culminating in the current banking reforms in the country. From the foregoing therefore, the Nigerian banks can further be strengthened if the following suggestions are taken into consideration by government, policymakers and the banks:

i) The current reform effort being championed by the Central Bank of Nigeria should be sustained. Government and the Nigerian people should extend greater support to the CBN for this laudable effort, so that the reform will yield the desired results.

ii) Government should further encourage mergers and acquisitions of banks in Nigeria. This will strengthen the management of these banks and fortify their capital base as well as reduce the risk of bank distress in the Nigerian banking system

iii) All non-bank financial institutions in Nigeria should be re-structured by the monetary authorities in order to ensure a healthy and competitive financial sector necessary for the transmission of monetary policy impulses to the real sector of the economy. To achieve this end, government should strengthen the supervisory capacity of the CBN and other regulatory authorities to cope with the expansion in the size and structure of the financial sector in order to plug the leakages in the effects of monetary policy and thereby enhance its effectiveness.

iv) In view of the increasing demands on government to bail out ailing banks, punishments to individuals and organizations involved in aiding the banking crisis in Nigeria should be equated to their level of involvement in fraud, financial recklessness or negligence. Recovery through the sale of their properties and prison sentences that will deter them from enjoying the stolen wealth of people or investors – the Murdoch example, should be adopted and vigorously enforced in the country.

v) Credit risk experts should be engaged by banks to specifically and professionally manage credits in order to monitor and scrutinize loans and advances to curb eventual distress. This will reduce the incidence of non-performing loans and bad debts in the banking system.

vi) Government should ensure effective prudential supervision of banks to check the incidence of bank failures. This implies that supervisory institutions should place particular emphasis on the monitoring of credit risks and provide incentives on prudent management of banks as well as ensure sound banking legislation in the country.

vii) Banks should ensure the appointment of knowledgeable, integrity-based and experienced Board of Directors, and should fully upgrade their ICT capability and embrace cutting-edge technology in their banking operations. This would make Nigerian banks sophisticated and more amenable to competition even with foreign banks at the international doorsteps. Education and training of bank employees as well as transparent disclosure of financial information for the protection of shareholders' rights and wealth should be adequately pursued.

viii) The CBN should come up with a policy that compels banks to power the real sector. In doing this, CBN could direct all commercial banks to use at least 30 per cent of their total deposits to create credits to priority non-financial private sectors such as industry, manufacturing and agriculture, while maintaining quality assets. This could also reduce the problem of excess liquidity in the system, and could enhance the profit margins of banks in Nigeria. There is therefore the need to accelerate the rate of financial intermediation in order to adequately power the real economy, and further re-direct investment funds toward the most productive sectors so as to boost output, income and employment in the economy.

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Appendix

Table 1: The Extent of Fraud and Forgeries in Nigerian Banks (1989-2008)

Year	Amount Involved (N'M)	Actual/Expected Loss (N'M)	No. of Staff Terminated, Retired or Dismissed for Fraud
1989	105.0	15.3	313
1990	804.2	55.8	417
1991	388.6	26.7	514
1992	411.8	73.1	436
1993	1419.1	246.4	516
1994	3399.4	950.7	737
1995	1011.4	229.1	625
1996	1600.7	375.3	552
1997	3777.9	226.5	566
1998	3196.5	692.3	311
1999	7386.3	2730.1	596
2000	2857.1	1080.6	493
2001	11243.9	906.3	152
2002	12919.6	1299.7	85
2003	9383.7	857.5	106
2004	11754.0	2610.0	383
2005	10606.2	5602.1	378
2006	4832.2	2768.7	331
2007	10005.8	2870.9	273
2008	53522.9	17543.1	313

Source: NDIC/CBN Bank Returns from 1989 to 2008

Table 2: Assets Quality of Banks/Performing and Non-Performing Loans (1989-2001)

	Loans & Advances (N'billion)		Non-Performing Loans (N'billion)		Proportion of Non - Performing Loans to Total Loans (%)	
Year	**Industry**	**Distressed**	**Industry**	**Distressed**	**Industry**	**Distressed**
1989	23.1	4.3	9.4	2.9	40.8	67.1
1990	27.0	6.4	11.9	4.9	44.1	72.8
1991	32.9	5.4	12.8	4.1	39.0	76.5
1992	41.4	15.7	18.8	6.8	45.5	43.0
1993	80.4	25.3	32.9	14.7	41.0	58.0
1994	109.0	45.6	46.9	29.5	43.0	64.6
1995	175.9	48.9	57.8	29.5	32.9	68.9
1996	213.6	51.7	72.4	33.9	33.9	75.5
1997	290.4	49.6	74.9	40.7	25.8	81.9
1998	327.2	24.2	63.3	18.7	19.3	77.3
1999	370.2	29.1	24.8	21.0	25.6	72.2
2000	519.0	26.4	111.6	20.0	21.5	75.8
2001	803.0	123.1	135.7	35.4	16.9	28.9

Source: NDIC/CBN Yearly Report

Table 3: Key Macroeconomic and Banking Industry Indicators

Macroeconomic Indicator	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**2010**
GDP at Current Market Price (N'billion)	8,563.3	14,572.2	18,222.8	22,907.3	23,842.1	25,487.4	29,498.6
Number of Banks	89	25	25	24	24	24	24
Inflation %	15.0	11.9	8.5	6.6	15.1	12.0	11.8
Total Deposits of Banks (N'billion)	1,814.75	2,469.07	3,412.3	5,357.2	8,702.0	9,989.8	10,837.14
Ratio of Total Bank Deposits to GDP (%)	21.2	16.9	18.9	23.26	33.34	39.19	36.74
Total Assets of Banks (inclusive of OBS Engagements (N'billion)	4,046.00	5,463.1	8,140.2	13,011.6	19,261.02	17,522.86	18,661.27
Ratio of Total Assets of Banks to GDP (%)	47.3	37.5	44.7	56.8	66.6	68.7	63.26
Total Loans and Leases of Banks (N'billion)	1,145.7	1,832.18	2,840.1	4,676.34	7,411.43	8,912.14	7,166.76

Source: NDIC Annual Report, 2010

Table 4: Data on Financial Intermediation in Nigeria (1989-2010)

YEAR	Change in Financial Assets	GDP @ constant price	Real Interest Rate	Trend	Proportion of Total Savings	Actual National Savings (N'bn)
1989	45,708.50	236,729.58	-32	1	-21907.2	23,801.30
1990	49,906.10	267,549.99	11	2	-20254.9	29,651.20
1991	86,416.00	265,379.14	1.8	3	-48677.8	37,738.20
1992	86,714.70	271,365.52	-27.3	4	-31597.9	55,116.80
1993	112,485.53	274,833.29	-31.2	5	-27457.6	85,027.93
1994	183,906.68	275,450.56	-43.5	6	-75446.2	108,460.48
1995	-8,376.43	281,407.40	-59.3	7	116866.7	108,490.27
1996	177,895.83	293,745.38	-15.8	8	-43392.6	134,503.23
1997	15,483.95	302,022.48	2.8	9	162164.7	177,648.65
1998	530,052.42	310,890.05	6.4	10	-329987.3	200,065.12
1999	338,316.06	312,183.48	11.4	11	-60648.6	277,667.46
2000	369,235.35	329,178.74	6.6	12	15955.5	385,190.85
2001	-365,349.00	356,994.26	-4.6	13	853394.4	488,045.40
2002	154,351.98	433,203.51	6.1	14	437742	592,093.98
2003	1,537,869.16	477,532.98	1.7	15	-882129.5	655,739.66
2004	1,004,464.25	527,576.04	0	16	-206947.1	797,517.15
2005	5,627,779.78	561,931.39	-4.8	17	-4310822.4	1,316,957.38
2006	-1,345,525.97	595,821.61	4	18	3085162.9	1,739,636.93
2007	987,675.30	634,251.14	3.4	19	1705879	2,693,554.30
2008	-321,688.70	672,202.55	-1.8	20	4439861.5	4,118,172.80
2009	-9,354,971.80	718,977.33	-4.9	21	15118483	5,763,511.20

Source: CBN various issues

Table 5: Phillips-Perron (PP) Unit Root Test Results

Variable	PP t-stat	Decision	Critical Value (CV) at 5% L.S
? F/P	**-4.93** I(1)**	**I(1)**	**-1.96**
Y/P	**-6.09** I(2)**	**I(2)**	**-1.96**
R/P	**-3.58**I(1)**	**I(1)**	**-1.96**
(i –Po)	**-4.81**I(1)**	**I(1)**	**-1.96**
Computed value of ? F/P	**-4.92**I(1)**	**I(1)**	**-1.96**

Note: ** means significant at 5% level
The order of integration is in parentheses

Serial Correlation Test Results

Breusch-Godfrey Serial Correlation LM Test:

F-statistic	3.546193	Probability	0.061649
Obs*R-squared	7.058067	Probability	0.029333

Regression Results

Dependent Variable: D(CHANGE_IN_FINANC)

Method: Least Squares

Date: 05/23/12 Time: 10:34

Sample(adjusted): 1989 2007

Included observations: 19 after adjusting endpoints

Newey-West HAC Standard Errors & Covariance (lag truncation=2)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(D(GDP___CONSTANT_P))	-2.166086	2.470634	-0.876733	0.3954
D(REAL_INTEREST_RA)	-4590.501	4195.970	-1.094026	0.2924
TREND	57836.75	19128.98	3.023514	0.0091
D(PROPORTION_OF_TO)	-0.948510	0.036477	-26.00274	0.0000
C	-435307.9	180896.1	-2.406397	0.0305

R-squared	0.991364	Mean dependent var	-494993.6
Adjusted R-squared	0.988896	S.D. dependent var	2958238.
S.E. of regression	311723.7	Akaike info criterion	28.35856
Sum squared resid	1.36E+12	Schwarz criterion	28.60709
Log likelihood	-264.4063	F-statistic	401.7652
Durbin-Watson stat	1.351881	Prob(F-statistic)	0.000000

White Heteroskedasticity Test:

F-statistic	12.77327	Probability	0.000250
Obs*R-squared	17.30639	Probability	0.027072

Dependent Variable: D(PROPORTION_OF_TO)

Method: Least Squares

Date: 05/23/12 Time: 10:52

Sample(adjusted): 1988 2007

Included observations: 20 after adjusting endpoints

Newey-West HAC Standard Errors & Covariance (lag truncation=2)

Variable	Coefficient	Std.Error	t-Statistic	Prob.
D(EST_CHFIN)	-1.236371	0.010466	-118.1368	0.0000
TREND	25515.78	5735.282	4.448915	0.0004
C	-115379.5	70528.01	-1.635938	0.1202

R-squared	0.998155	Mean dependent var	757019.5
Adjusted R-squared	0.997938	S.D. dependent var	3137144.
S.E. of regression	142442.6	Akaike info criterion	26.70875
Sum squared resid	3.45E+11	Schwarz criterion	26.85811
Log likelihood	-264.0875	F-statistic	4599.507
Durbin-Watson stat	1.085269	Prob(F-statistic)	0.000000

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REAL EXCHANGE RATE AND ECONOMIC GROWTH: DETERMINING THE DIRECTION OF IMPACT IN GHANA

By **Abel Fumey***

ABSTRACT

The study examines the relation between the real exchange rate and economic growth in Ghana with emphasis on the channel through which the impact is transmitted by using an annualized data from 1980 to 2010. The long run and short run dynamics of the variables of interest are captured by estimating an Error Correction Model using Johansen Cointegration approach. The empirical result suggests that, there is a significant long run relationship between real exchange rate and economic growth and that real exchange rate impact positively on Gross Domestic Product. The result implies that an appreciation of real exchange rate improves economic growth; therefore adopting a suitable exchange rate policy towards its appreciation may help improve output capacity and achieve a higher economic growth. Importantly, the study also revealed that real exchange rate in Ghana operates through aggregate supply channel to impact economic growth. The study cautions against allowing real exchange rate appreciation to be sustained and long drawn in order to protect domestic industries from massive importation of goods. It is recommended that fiscal, monetary and exchange rate policies be designed to ensure sustainable and suitable macroeconomic stability which would stimulate real appreciation of the exchange rate in order to enhance economic growth.

Key Words: *Real Exchange Rate, Economic Growth, Impact, Ghana.*

1.0 INTRODUCTION

1.1 Background of the Study

The direction of influence between exchange rate and economic growth has been blurred according to researchers. Macdonald (2000) pointed out that the role of the exchange rate in the economic growth process is not immediately clear from the growth literature. The motivation for this study is therefore to examine the situation for Ghana by establishing the empirical evidence of the actual relationship between the exchange rate changes and the economic growth of

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The views expressed in the paper are those of the author and do not reflect those of the University of Ghana.

Ghana. Considering that Ghana has experienced various exchange rate regimes, from fixed to floating exchange rate regimes it is imperative to ascertain the impact of the various regimes on the economic growth of the country.

Despite the seemingly blurred indication of the linkages that exist between the exchange rate and economic growth, there are pieces of evidence that point to the likely effects of their relationships particularly when the exchange rate is flexible. One evidence is that, when the exchange rate is flexible, it exhibits a very close correlation between nominal and real exchange rates even though there are disagreements among researchers, that when prices are sticky, the real exchange rate is driven by the nominal exchange rate. Also, once there is a change in real exchange rate, it tends to be persistent. Another evidence is that flexible exchange rate regimes have the tendency of becoming excessively volatile which is unmatched by corresponding volatility in other factors determining the direction of movement of the exchange rates such as prices and relative money supply.

The exchange rate is a major economic performance measuring tool because of its influence on the relative prices of local and foreign goods as well as demand for such goods. This is supported by Bautista (1987) who he defines the real exchange rate as "the real worth of foreign exchange in terms of a given domestic currency". One major link by which exchange rate is seen to influence economic growth is through its volatility on investment and profit on international trade but this linkage is tenuous, reflecting a major weakness of the flexible exchange rate regimes.

A number of economies in the world today are experiencing real exchange rate instability which affects their economic performance due to inability to achieve realistic exchange rate and stable prices as expected. Economic theory has it that for standard of living to be improved or for an economy to grow and develop, such economy needs to be linked up with other economies, through exchange rate regimes and trade flows. In the process, real exchange rate emerges as an important variable that requires prudent management in order to influence the standard of living of Ghanaians.

There is abundant evidence in the literature pointing to the fact that inappropriate exchange rate policy is harmful to the overall well being of an economy. For instance an undervalued exchange rate results in Balance of Payment deficit which could lead to a decline in standard of living while an overvalued exchange rate leads to artificial rise in standard of living beyond a nation's productive capacity and creates a deficit in the current account balance and this is often financed by depleting foreign exchange reserve or incurring external debt (Obadan, 1994). Thus, the misalignment of the actual exchange rates from equilibrium indicates lack of adjustment in rates to changes in economic fundamentals. So how are these fundamentals changing with respect to Ghana and to what extent are exchange rate policies formulated in order to avert the problem of reserve depletion?

The effects of "wrong" exchange rate policies are quite complex in that mostly changes in the real exchange rate will depend on other prevailing policies in the economy, such as fiscal and monetary policies which may strengthen or weaken the transmission mechanism. While this may seem to suggest that the adverse effect of undervalued or overvalued real exchange rate does not come by itself, an understanding of the extent is nonetheless important, as it may serve as a likely cost to the economy in terms of its exports competitiveness.

Thus, the study examines the limit to which movements of the real exchange rate of the Ghanaian currency affects the competitiveness of trade flows and the likely consequences of such competitiveness for economic growth.

The implementation of liberalization policies in many developing countries has exposed the behaviour of real exchange rate in those countries, with some experiencing persistent overvaluation and others persistent undervaluation which has resulted in worsened economic outcomes (Dollar, 1992; Akinlo, 2003; Aguirre and Calderon, 2005). This study therefore investigates the channel through which Ghana's real exchange rate operates to impact economic growth.

The primary objective of this study therefore is to examine the relationship that exists between real exchange rate and economic growth in Ghana with particular interest on the channel of impact between the two variables based on the Keynesian national account approach.

The study will help address the following research questions:
Has management of exchange rate in Ghana been in the best interest of the economy in terms of Growth? Is the channel of impact between real exchange rate and economic growth through Aggregate Demand or Aggregate Supply? What is the causal relationship between economic growth and real exchange rate in Ghana? Is this impact observable both in the short and long run periods?

For an effective exchange rate management, it is important for policy makers to know the kind of relationship that exists between the real exchange rate and the economic variables they target to achieve. Quantitative answers as to how real exchange rates affect economic growth are essential for implementing appropriate exchange rate policy as well as for forecasting the possible consequences of such policies. This is particularly important for Ghana, since a well formulated real exchange rate policy can be used as a strategy in Ghana's bid to reduce poverty in the context of export-led growth. The real exchange rate which acts as a key relative price in the economy may not only change the country's external balance but also other socially sensitive variables such as income distribution, poverty, and employment.

The rest of the paper is organized into four sections. Section II reviews some relevant

theoretical and empirical literature; it also gives a brief overview of exchange rate policies in Ghana since Independence. Section III deals with the Methodology and Results and Section IV provides conclusion and recommendations of the study.

3.0 AN OVERVIEW OF EXCHANGE RATE POLICY IN GHANA

A brief overview of exchange rate movement in Ghana since independence in 1957 is presented below. It considers the situation before and after the structural adjustment programme era.

3.1 Exchange rate policy before the Structural Adjustment Programme (1957-1983)

This period generally experienced gradual reduction in convertibility under a fixed exchange rate regime where the cedi was virtually pegged to the US dollar. This involved a fixed exchange rate subject to intermittent devaluations, with surrender laws, exchange rationing and controls as well as removal of convertibility of the cedi with fiduciary issues.

On 8th July 1967, the first official devaluation of the Cedi was undertaken in Ghana as the cedi was devalued by 30% against the dollar and the pound sterling in order to overcome the problems of low export growth and shortage of essential import goods.

In December 1971, the cedi again was devalued by 44% with the aim of tackling the problems of balance of payment, depleting foreign reserves and short-term debts which has bedeviled the economy at the time. Two weeks after the devaluation the government of the day was overthrown because the policy worked hardship on the masses.

The devaluation was cited as the cause of the socioeconomic problems of the country so after the overthrow of the government the currency was revalued by 29%. Harrigan and Oduro (2000) note that the revaluation limited the government in the use of exchange rate as a policy variable. Later in 1972 the cedi appreciated with the devaluation of the US dollar thereby worsening the country's problem which was characterized by foreign exchange constraints. However, the government could not revert to devaluation after condemning it as the cause of economic woes in the country but it was the best policy option at the time. The appreciation of the currency continued until 1978 due to the huge government deficits and accelerating rates of inflation (Jebuni et al, 1991). To overcome the severe foreign exchange constraint, the government introduced trade and exchange controls but it rather led to the creation of parallel market for foreign exchange and a large black market premium by 1975. The controls further led to a rise in rent seeking activities and scarcity of imported raw materials (Harrigan and Oduro, 2000).

The inability of the fixed exchange rate system to resolve the economic problems compelled the authorities to introduce a flexible exchange rate regime in June 1978 which was supposed to be adjusted to cater for the economic and balance of payments problems (Jebuni et al, 1991). However the adjustment was discontinued in August 1978, after just two months. So the fixed exchange rate regime persisted until October, 1983.

3.2 Post- Structural Adjustment Exchange Rate Policy (ERP) 1983-2010

With limited policy options available to government by 1983, the period from 1983 to 1990 was characterized by fixed with adjustable pegs and the partial removal or restrictions on capital account transactions under the IMF supported stabilization programme. The exchange rate reform under the ERP was aimed at realigning the official exchange rate with the parallel rates and by extension merge the two markets (i.e. parallel and legal) and also to ensure free market allocation of foreign exchange (Harrigan and Oduro, 2000). To achieve the set objectives, the government began a system of multiple exchange rates based on bonuses and surcharges applied to specific transactions of imports and exports of selected goods.

In 1985, after the exchange rate had undergone three adjustments and further adjustment in January 1986 to ¢90=US$1, a two-tier system was later introduced in September 1986 as a first step towards a market determined exchange rate. This system was unified in February 1987 at ¢150 per US dollar with all transactions settled at the weekly auction rate which was to bridge the gap between the parallel and official exchange rate. In practice, however, the two rates became unified in 1990. The establishment of foreign exchange bureau by the private sector to trade in foreign currencies was the beginning of parallel market legalization. The real exchange rate depreciated continuously from 1983 to 1988 due to these policies (Jebuni et al, 1991).

By 1990s the exchange rate regime had gradually moved towards a floating system that is managed by the Bank of Ghana with occasional smoothing of short-term fluctuations through the supply of foreign exchange to shore up the system in order to stabilize prices and maintain high levels of international reserves. The real appreciation of the cedi over the period 1986-94 may be attributed to huge foreign inflows in support of the ERP through the Dutch Disease syndrome (Younger, 1992).
By late 1997, the exchange rate was adopted as the nominal anchor for the economy and the central bank became an active player in the foreign exchange market in order to protect the domestic currency from depreciation and to reduce pressure on the government budget by lowering the cost of servicing external debt in the current period. These interventions led to a reduction in the pace of nominal exchange rate depreciation. On the other hand, the BoG was faced with massive decline in foreign exchange reserves to maintain the nominal anchor from over 10 percent of GDP in 1996 to only 6 percent in 1999. In 2000 the uncertainty that

surrounded the elections with huge government outlays and the downturn in terms of trade caused a speculative attack. So the cedi depreciated significantly by 174 percent in nominal terms and 106 percent in real terms between June 1999 and December 2000 (Kyeremeh, 2008).

In order to fully liberalize the foreign exchange market in Ghana the Foreign Exchange Act 2006 (Act 723) was established in December 2006 to address some of the shortcomings of the exchange control act of 1961.

2.0 LITERATURE SURVEY

This section explores the theoretical literature under two main thematic areas: The real exchange rate concept and the link between Real exchange rate and Economic growth. A survey of some empirical studies is also considered here.

2.1 The Real Exchange Rate Concept

There is no single generally accepted definition for real exchange rate by researchers. Montiel (2003) defines it in broad terms as the relative price of foreign goods in terms of domestic goods. Hinkle and Nsengiyuma (1999) had two definitions for the real exchange rate, the first definition is in external terms as nominal exchange rate adjusted for differences in price level between economies and these are measured in a common currency. The second definition is in internal terms as the ratio of local price of tradable to non-tradable within a country. The first definition is based on purchasing power parity (PPP) theory which compares the relative value of currencies by measuring the relative prices of foreign and domestic consumption baskets. The second definition captures the internal relative price incentives of an economy for the production or consumption of tradable goods as against non-tradable goods.

Edwards (1988) also defined the real exchange rate as the ratio of the prices of tradable to non-tradable. It means real exchange rate determines the rate at which countries trade among themselves, so the real exchange rate is sometimes referred to as terms of trade and it can be defined as the nominal exchange rate that takes the inflation differentials among the countries into account. RER is calculated as: *ePRERP=

Where: P, P* represent domestic and international prices respectively; whiles e denotes Nominal Exchange Rate which is the rate at which a person can trade the currency of one country for the currency of another but the RER is the relative price of the goods of two countries. Therefore, the real exchange rate is a function of nominal exchange rate and prices of goods in the two countries measured in the local currencies. So, if the real exchange rate is high, foreign goods become relatively cheaper compare to domestic goods. Conversely, if the real exchange rate is low, foreign goods become relatively expensive compare to domestic goods. Another description of this definition is that, an increase in RER is termed appreciation and a decrease is termed depreciation.

2.2 Real Exchange Rate and Economic Growth Link

The link between real exchange rate and economic growth has been found to be operating either through aggregate demand or aggregate supply side of the economy. One school of thought believes that Real Exchange Rate (RER) operates through the aggregate demand channel and they contend that devaluation or depreciation of the RER enhances international price competitiveness of locally produced goods (tradable) which tends to improve the Balance of Payment. With the improvement in international competitiveness, net exports increases and boast aggregate demand in the economy, but with revaluation or appreciation, it adversely affects the performance of locally produced goods which tends to decrease net export thereby contracting the economy through low aggregate demand. Another school of thought maintains the view that real devaluation or depreciation can cause a reduction in aggregate supply through an increase in the cost of imported raw materials which tends to reduce importation of productive raw materials hence affects production (Cottanni, et al 1990; Papazoglou, 1999).

2.3 Survey of Empirical Studies

Below are some empirical studies particularly those on sub-Saharan Africa, which attempt to investigate the relationship between exchange rate and economic growth in diverse ways.

Bleaney and Greenaway (2001) investigate effects of terms of trade and Real Exchange Rate volatility on growth and investment in fourteen sub-Saharan African countries using the Generalized Autoregressive Conditional Heteroscedasticity (GARCH) models. Based on annual data for 1980-1995, the studies find that GARCH model volatility of Real Exchange Rate has a negative impact on growth and investment.

Gyimah-Brempong and Gyapong (1993) have investigated the effects of exchange rate distortion on economic growth in Ghana, based on time series data from Ghana and a five-equation simultaneous model; they aver that exchange rate distortion, as measured by the black market premium, has a harmful effect on economic growth rate. The negative effect according to them, is imparted through reduced investment and a constriction of international trade. So they recommend that liberalized exchange rate policies will enhance the growth prospects of LDCs, particularly those in sub-Saharan Africa.

McPherson and Rakovski (2000), examine the possible direct and indirect relationship between real and nominal exchange rates and GDP growth in Kenya over the period 1970 to 1996. The study uses a single equation instrumental variable estimation model and finds no strong evidence of direct relationship between changes in the exchange rate and GDP growth. They, however, conclude that improvements in exchange rate management alone are not enough to revive economic growth in Kenya but should be part of a broader economic reform programme.

Akinbobola and Oyetayo (2010), assess the relationship between real exchange rate and domestic output growth in Nigeria using the Engel-Granger cointegration approach for the period 1986 to 2004. The study finds that real exchange rate in Nigeria operates through the aggregate supply channel to enhance output and economic expansion and concludes among other things, that real exchange rate needs to be used as one of the macroeconomic policy instruments, and also diversification of exports to boost foreign exchange.

Adjasi, Harvey and Agyapong (2008), uses the Exponential Generalized Autoregressive Conditional Heteroscedasticity (EGARCH) model to establish the relationship between exchange rate volatility and stock market volatility. They find a negative relationship between exchange rate volatility and stock market returns and contend that depreciation of the local currency leads to an increased stock market returns in the long run and reduce stock market returns in the short run.

The above body of literature indicates the existence of various studies on the relationship between real exchange rate and economic performance in sub-Saharan Africa which reveals the relevance of exchange rate issues in national development. However, related studies on Ghana are scanty and most had focused on Exchange Rate Misalignment and Volatility. This study therefore intends to contribute to the literature by assessing the impact of real exchange rate on economic growth by determining the channel through which the impact is felt using Johansen Cointegration approach and an Error Correction model.

4.0 METHODOLOGY

4.1 Model specification

The study tracks the model specification by Akinbobola and Oyetayo (2010) to investigate the channel (i.e whether AD or AS) through which the real exchange rate impacts on economic growth in Ghana. Following Keynesian income model, the standard framework for the demand side of economic growth in an open economy is as follows:

$GDP = C+I+G+(X-M)$ ---------- (1)

Where GDP = Gross domestic product, C = private consumption, I = investment, G = government consumption or expenditure, X = export, M = imports and (X – M) = net export.

Private consumption is a positive function of GDP and negative function of real interest rate. Investment is a negative function of real interest rate. Government consumption is the exogenous factor which is a stock. Net export is a negative function of Real Exchange Rate.

In determining the real GDP, equation (1) can be manipulated in the following equation:

$$GDP = \alpha \pm \beta_1(R - \pi^e) - \beta_2 RER + \beta_3 G + \mu_t \quad \text{---------- (2)}$$

or

$$GDP = \alpha - \beta_1(R - \pi^e) - \beta_2 RER + \beta_3 G + \mu_t \quad \text{---------- (3)}$$

Where R=nominal interest rate, RER =real exchange rate, π^e=expected inflation rate, G = government consumption, μ_t=error term.

Now since nominal interest rate is a function of money supply, by substituting $(R-\pi^e)$ in equation (3) by the money supply (M), the new equation becomes:

$$GDP = \alpha + \beta_1 M - \beta_2 RER + \beta_3 G + \mu_t \quad \text{---------- (4)}$$

So money supply has positive impact on real GDP in that with an increase in nominal money supply, nominal interest rate falls which leads to an increase in investment all other things remaining equal, real GDP therefore increases.

Therefore based on equation (4) above, the estimation model for the study takes the following forms which is a modified version of the model used by Thapa (2002) and Akinbobola and Oyetayo (2010). The model is expressed in log-linear form so that the data will be smoothened and the coefficients be interpreted as elasticities that gives the response of the dependent variable (lnGDP) to a unit change in any of the explanatory variable when others are held constant.

$$\ln GDP = \beta_0 + \beta_1 \ln M + \beta_2 \ln G + \beta_3 \ln RER + \beta_4 \ln INF + \beta_5 \ln OPEN + \varepsilon \quad \text{---------- (5)}$$

Where: GDP denotes real GDP, M represents money supply, G is the real government consumption/expenditure, RER is the real exchange rate, INF is the inflation rate, OPEN is the degree of openness in the economy measured as the sum of real export and import and e is the error term.

4.2 Expected Signs

The study is expected that ß1 will be positive and ß4 to be negative. ß2 is indeterminate depending on whether or not government consumption crowds out private consumption, if the government consumption crowds out private consumption, ß2 will be negative but if it is positive, it signified that government consumption compliments private consumption. ß3 is indeterminate depending on whether the real exchange rate operates through the aggregate demand or supply channel. If it is positive, it operates through the aggregate supply channel and if it is negative, it operates through aggregate demand channel. ß5 is indeterminate depending whether real openness is import dependent or export dependent, however since Ghana is predominantly an importing economy just like many sub-Saharan African country, the openness is import dependent. So if it is negative, the

economy is import dependent and if it is positive the economy is export dependent and indicates that exports boost the output growth rate.

4.3 Definition of Variables

The variables used in the estimation model are briefly explained below.

Real Broad Money (M2)

Broad money is a measure of the money supply in an economy and it includes currency and coins, and deposits in current account, savings account and short-term deposits, overnight repos at commercial banks, and non-institutional money market account. This is the main measure of money supply and is the economic indicator usually used to assess the amount of liquidity in the economy.

Real Gross Domestic Product (GDP)

Gross Domestic Product is the monetary value of all finished goods and services produced in a country at a specific time period. It is important to note that GDP is the most common indicator of the economic size of a nation. The Real Gross Domestic Product (RGDP) of Ghana for the study is used as a measure of the size of the economy and its percentage change in two consecutive time periods is used as measure of economic growth.

Real Exchange Rate (RER)

Following Dornbusch (1987), Real exchange rate can simply be described as the domestic relative price of traded to non–traded goods. The real exchange rate measures the relative cost of living between two countries. So for instance a rise in the real cedi/dollar exchange rate (i.e. a real depreciation of the cedi against the dollar) reflects a relative increase in the US cost of living, conversely a fall in the real cedi/dollar exchange rate (i.e. a real appreciation of the cedi against the dollar) means a relative increase in cost of living of Ghanaian.

Government Consumption (G)

This variable is appropriately measured as the ratio of government consumption or expenditure on non-tradables to gross domestic product Edwards (1984). Opoku-Afari et al (2004) also defined government consumption as the ratio of government consumption to gross domestic product. Its impact can either be negative or positive, depending on whether the consumption is respectively directed towards the tradable or non-tradable sector. In the long run however, higher government consumption can undermine confidence in a currency due to associated distortions and have a negative impact on the real exchange rate (Maesofernandez, et al 2001).

Openness (OPEN)

Openness is measured as the exports and imports as a ratio of GDP. Openness is an important criterion when choosing an exchange rate region. When import tariffs or

subsidies on exports are exempted, the prices of tradable goods decrease and this leads to a depreciation of the real exchange rate. It must be noted that, several other proxies of openness ranging from the ratio of the tariffs to GDP to the ratio of tariff revenue to imports have been used, but this study adopts the most widely used proxy by researchers such as Aron et al (1997), Edwards (1984), MacDonald and Ricci (2003) and Mkenda (2001). Thus, OPEN $= \frac{(Exports + Imports)_t}{RGDP_t}$

A decrease in the degree of openness leads to a fall in imports and improves the balance of payment of a country; this causes the real exchange rate to appreciate. The reverse is also true for a depreciation of the real exchange rate.

Inflation (INF)
The persistent and appreciable increase in the general level of prices in an economy is termed Inflation. It is known that a country with a persistently lower rates of inflation exhibits an increasing value of currency as well as high purchasing power relative to other currencies whiles countries with higher inflation normally experience depreciation in their currency in relation to the currencies of their trading partners.

4.4 Data Source
The study used secondary data for the analysis within the period 1980 to 2010. An annualized time series data derived from International Financial Statistics Database of the International Monetary Fund, Quarterly bulletin of the Ghana Statistical Services and Quarterly Digest of Bank of Ghana.

4.5 Time Series Data Characteristics
The various data characteristics are discussed in this section. These characteristics include the unit root, cointegration test and error correction model.

4.5.1 Unit Root
According to Granger and Newbold (1974) most time series variables are non-stationary and using non-stationary variables in models might lead to spurious regressions. Unit root tests are therefore used to assess whether the data is stationary or not which helps to avoid spurious regressions. This study adopts the Augmented Dickey-Fuller (ADF) test as well as the Phillip Perron (PP) test to carry out the unit test. According to Ramanathan (1992), the first or second differenced terms of most variables will usually be stationary and this is different from non-stationary time as follows: Assume a model such as $Y_t = \beta_0+\beta_1 Y_{t-1}+u_t$ where Y is any arbitrary variable at time (t).

A stationary series is one whose absolute value of ß1 is less than or equal one. A non-stationary series is one whose absolute value of its coefficient (ß1) is greater or equal to one.

4.5.2 Granger Causality

In order to capture the important relationship between the mean of the real exchange rate and economic growth, Granger causality test is performed (Granger, 1980) by specifying the possible linkages between the variables in terms of a VAR system framework and compute the relevant p-values. The Granger causality tests will indicate whether a set of lagged variables has explanatory power on the other variables. If the null hypothesis is rejected, then it can be concluded that one variable does Granger cause the other variable.

4.5.3 Cointegration Test

Two or more variables are said to be cointegrated if they exhibit a long run equilibrium relationship, though in the short run, they may drift apart Engel and Granger (1987).

The Johansen and Juselius (1990) maximum likelihood testing procedure is used in testing for cointegration in this study. The Johansen-Juselius method provides a unified framework for the estimation and testing of cointegrating relations in the context of vector error correction models. Co-integration analysis provides a powerful discriminating test for spurious correction. The Johansen-Juselius method suggests two statistics in the determination of the number of cointegrating vectors: the trace statistics and the maximum eigen values. Osterwald Lenum (1992) provides the appropriate critical values for the tests. The null and alternative hypotheses are tested using both the trace and maximum-eigen values.

4.5.4 Error Correction Model

The specified and estimated error correction model (ECM) with the error-correction term is used to investigate the dynamic behaviour of the model. The error correction specification restricts the long-run behaviour of the endogenous variables to converge to their co-integrating relationships while allowing a wide range of short-run dynamics. The size of the Error Correction Term indicates the speed of adjustment of any disequilibrium towards a long run equilibrium state since the deviation from long-run equilibrium is corrected gradually through a series of partial short-run adjustments. An over-parameterized error correction model based on Hendry's general to specific approach is estimated from which a parsimonious one is derived using a series of F-tests against the information from each lagged period together with both the Akaike and Schwartz information criteria.

4.5.5 Diagnostic Tests

The following diagnostic tests are carried out to assess the performance of the models, these tests include autocorrelation tests, Jarque-Bera normality test, Hetroscedasticity test and Ramsey reset test for proper model specification. Also stability tests is performed to ascertain the stability or otherwise of the model using the Cumulative Sum (CUSUM), Cumulative Sum of Squares (CUSUM Square). These tests support valid and reliable result.

4.6 Results and Discussion

This section presents the results of the empirical estimations and its analysis and discussion.

4.6.1 Stationarity Result (Unit root test)

In this section, the time series characteristics of the data are explored by testing the data for stationarity using unit root test analysis. The Augmented Dickey-Fuller and the Phillip Perron tests are adopted here and the results are shown in the table 1 below.

Table 1: Results of Unit Root Test in Level and First Difference

	LEVELS (Constant)		FIRST DIFFERENCE (Constant)	
VARIABLE	**ADF**	**PP**	**ADF**	**PP**
lnGDP	**-1.58077 (0.4819)**	**-1.644647 (0.42921)**	**-5.00718 (0.0002)**	**-5.203031 (0.0001)**
lnM	**-1.533333 (0.5056)**	**-1.927190 (0.29821)**	**-5.418914 (0.0001)**	**-6.180485 (0.0000)**
lnG	**-1.373053 (0.5845)**	**-1.473877 (0.52025)**	**-6.543950 (0.0000)**	**-5.096145 (0.0002)**
lnRER	**-1.382022 (0.5802)**	**-3.381158 (0.10724)**	**-5.270001 (0.0001)**	**-10.21294 (0.0000)**
lnINF	**-1.753298 (0.3960)**	**-1.661408 (0.41124)**	**-3.913561 (0.0050)**	**-5.099135 (0.0002)**
lnOPEN	**-1.971180 (0.2976)**	**-2.352204 (0.21827)**	**-5.190823 (0.0001)**	**-8.804653 (0.0000)**

NB: the critical values at levels are 5% =-2.943427 and 1% = -3.621023; the critical values at first difference are 5% = -2.945842 and 1% = -3.626784. probability values are in parenthesis.

From the table, it indicates that all the variables in both the ADF and PP tests were not stationary at levels but in first difference they all became stationary and based on this it can be concluded that the variables are integrated of order one (i.e. Xt ~ I (1), where Xt is a vector of all the variables). That is the variables may have similar long run characteristics indicating the possibility of cointegration. If the variables are cointegrated, then it means linear combinations of the variables in the model are stable in the long run.

4.6.2 Granger Causality between Real Exchange Rate and Economic Growth

Table 2: Granger Causality Test (Sample:1980-2010)

Null Hypothesis:	Obs	F-Statistic	Probability
GDP does not Granger Cause RER	28	0.33885	0.71594
RER does not Granger Cause GDP*		3.38313	0.02117

*Note: * denotes rejection of the null hypothesis at 5% significance level.*

Table 2 provides result of the Granger causality test based on bi-variate regression between real GDP (GDP) and real exchange rate (RER) with lag length of 3 which was selected based on the Schwarz information criteria (SC). The test result indicates the rejection of the null hypothesis "RER does not Granger cause GDP". This means, the Granger causality is unidirectional moving from RER to GDP and not the other way. The possible explanation of this result is that when the real exchange rate appreciates, costs of the imported goods become relatively cheaper in terms of the local currency and this increases the volume of imports. Since most Ghanaian businesses depend heavily on imported inputs, the appreciation of the local currency (Ghana Cedi) will reduce cost of production and eventually lead to high levels of output.

4.6.3 Cointegration Test of the Model

Table 3 below shows the result of the cointegration analysis conducted on the data for the study period in order to establish the long run relationship between the variables.

Table 3: Cointegration Test Result

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	5percent Critical value	Max Eigen Statistic	5percent Critical Value
None	0.858748	178.4733**	124.24	68.50245**	45.28
At most 1	0.674304	109.9708**	94.15	39.26269	39.37
At most 2	0.5536684	70.70814*	68.52	28.23548	33.46
At most 3	0.427679	42.47265	47.21	28.23548	27.07
At most 4	0.363851	22.94072	29.68	15.83130	20.97
At most 5	0.182116	7.109427	15.41	7.036204	14.07

** (*) denotes rejection at 1% (5%) significance level

Linear deterministic trend is chosen since this is observed from the graphs of some of the variables. Trace test indicates 2 cointegration equations at 1% significance level and 1 cointegration equation at 5% significance level. Max-Eigen test indicates 1 cointegration equations at 1%.

The result indicates a number of cointegration relations or equations among the variables. While the max-eigen statistics from the result indicates the existence of one (1) cointegration equation at 1% significance level, the trace test on the other hand indicates three (3) cointegration equations. The presence of cointegration shows that there exists a long run equilibrium relationship among the variables. From the result, the maximum eigen statistic is used to select the number of cointegration

equation based on the objectives of the study and in line with economic theory. For the purposes of estimation a normalized model is derived from the cointegration equation by setting the estimated coefficients to negative one (-1).

lnGDP	*lnM*	*lnG*	*lnRER*	*lnINF*	*lnOPEN*
1.000000	*-0.04347*	*-0.41044*	*-0.49921*	*0.29304*	*0.44641*
	(0.02101)	*(0.10552)*	*(0.10310)*	*(0.01263)*	*(0.08575)*

(NB: Standard errors are in brackets)

This is presented in table 4 below:

Table 4: Long-run Parameter Estimates of the Model Dependent Variable: lnGDP

Variable	Elasticity Coefficient	Standard error	t-value
lnM	**0.04347**	**0.02101**	**2.5507**
lnG	**0.41044**	**0.10552**	**3.3309**
lnRER	**0.49921**	**0.10310**	**4.6527**
lnINF	**-0.29304**	**0.01263**	**-9.1731**
lnOPEN	**-0.44641**	**0.08575**	**-4.5068**

Table 4 gives the long run parameter estimates generated from the normalized cointegration equation. All the variables are significant at conventional levels (1%, 5%, and 10%) and are correctly signed. The most significant determinants of the growth model in the long run are Real Government Consumption, Real Exchange Rate and the Real Openness. A unit change in lnG will positively cause about 0.41 unit change in real growth in the long run. This is in line with theory as an increase in Real Government Consumption which goes to compliment private consumption leads to an increase in aggregate demand particularly if the consumption is made on productive goods. The real exchange rate has positive effect on real growth rate in the long run as can be seen from the elasticity coefficient value of 0.4992 which means a unit change in lnRER would lead to about 0.5 of a unit change in real growth in the long run; theoretically this means the real exchange rate operates through the aggregate supply channel which means that an appreciation of the exchange rate would lead to a relatively reduced cost of imported capital goods and raw materials leading to lower cost of production which would boost output growth. This result is similar to that of Akinbobola and Oyetayo (2010) which also indicated that real exchange rate operates through the aggregate supply channel in Nigeria.

The degree of trade openness has a negative effect on real economic growth in Ghana in the long run. A unit increase in trade openness leads to a decrease in real

growth by about 0.4 of a unit and vice versa. The negative impact implies the structure of the Ghanaian economy is predominantly imports dependent, so the openness here leads to a fall in output hence do not promote economic growth contrary to economic theory. A unit increase in the index of inflation also leads to 0.29 unit fall in real economic growth of Ghana within the study period. The negative impact of the inflation on real economic growth is expected as it indicates the presence of macroeconomic instability in the economy which does not augur well for investment and reduce real growth rate. Money supply also had a significant positive impact on real growth of the economy but the impact was marginal as a unit increase in money supply would lead to 0.043 unit increase in real GDP.

4.6.4 Error Correction Model (ECM)

For the dynamic short run analysis of the model, the results are shown below by the parsimonious model derived from an over-parameterized model with a lag length of two (2) based on the Akaike information criteria.

Table 5 Parsimonious Real GDP model

Dependent Variable: D lnGDP
Method: Least Squares
Sample (adjusted): 1982 2010
Included observations: 25 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.132213	0.047355	-2.580793	0.0164
DlnM(-1)	0.191521	0.076038	2.537153	0.0181
DlnG(-2)	0.078716	0.051534	1.721507	0.0380
DlnINF(-1)	-0.206801	0.088890	-2.663971	0.0136
DlnOPEN	1.043355	0.132367	7.655629	0.0000
DlnRER	-0.331991	0.064185	-5.483985	0.0000
DlnGDP(-1)	0.000423	0.000166	2.544355	0.0178
ECM1(-1)	-0.553973	0.159757	-4.719513	0.0001

R-squared	0.920622	Meandependent var	0.040216
Adjusted R-squared	0.813356	S.D. dependent var	0.269364
S.E. of regression	0.099572	Akaikeinfocriterion	-1.535949
Sum squared resid	0.237948	Schwarz criterion	-1.087020
Log likelihood	36.11114	F-statistic	24.16699
Durbin-Watson stat	1.921944	Prob(F-statistic)	0.000000

Diagnostic test summary statistics	
Jarque – Bera	1.122033[0.570629]
Breusch – Godfrey Serial Correlation LM Test	
F – Statistics	1.097045[0.351437]
TR^2	3.083359[0.214021]
White Heteroscedasticity Test (no cross products)	
F – Statistics	1.352623[0.275284]
TR^2	20.04934[0.271713]
Ramsey Reset Test	
F – Statistics	1.168735[0.290867]
Log –likelihood ratio	1.685231[0.194231]

From the result in Table 4.5 real growth in Ghana is influenced by the previous year's money supply, previous two years government consumption, and then previous year's inflation rate. Other determinants of growth in this study include current level of the degree of openness, real exchange rate and real gross domestic product. All the explanatory variables were significant at either 1% or 5% level. Moreover, all the variables have correct signs. In the short run, the most important determinant of real GDP for that matter real growth in Ghana is the degree of openness of the Ghanaian economy which has an elasticity coefficient of 1.04. The results show that in the short run, there is a positive relationship between the previous year's money supply with a significant coefficient value of 0.191. Also, government consumption with two years lag period affects the current real growth of the economy whiles previous year's inflation influences the current real GDP negatively with an elasticity coefficient value of -0.206. This implies that current government consumption as well as current inflation does not influence the current real economic output.

In the short run, current real exchange rate impacts negatively on the real growth of the Ghanaian economy with a coefficient value of (-0.332). The real GDP at lag interval one was not very important as its elasticity coefficient is very negligible (0.0004) indicating that real economic growth is very income inelastic in the short run.

An equilibrium error correction model must have the coefficient of the first lag length of the residuals, also known as the error correction term. The error correction term must satisfy two conditions: it must be negative and less than unity in absolute terms. The coefficient of error correction terms which shows the speed of adjustment of real growth to changes in the broad money supply, government consumption, inflation, economy openness and real exchange rate is correctly signed and statistically significant at 1% level. The error correction term of -0.55 means that any deviation in economic growth (real GDP) from its long run (equilibrium) value that will occur in one period will be partially corrected in the next period. In other words, about 55% of the error in period one will be corrected in the following period. The size of the error reduces period after period until there is no error by which time, real GDP would

have achieved its long run equilibrium. The result suggests that economic growth in Ghana adjust fairly quickly to its long-run equilibrium.

Diagnostic tests conducted indicate that the specification is correct based on the Ramsey Reset test. Also the tests showed that there is no autocorrelation up to three lags, no heteroskedasticity and the errors are normally distributed. Thus, the money supply, government consumption, inflation, openness and real exchange rate are important Ghana's economic growth function over the period under study. Moreover, the high R-squared value indicates that the variables influenced real GDP in Ghana over the period, 1980-2010 by explaining about 90% of the variation in it. The low probability associated with the F-test for the overall regression also lends credence to the short run model.

4.6.5 Stability Tests for Real GDP model.

In stability tests, the growth model is examined to know whether it has shifted over the study period. The Recursive Coefficients test, Cumulative sum (CUSUM) and Cumulative Sum of Squares (CUSUM of Squares) tests (Brown, Durbin and Evans 1975) is adopted to ensure the stability. The CUSUM (figure 2) and CUSUM (figure 3) Squares tests show that the hypothesis of parameter constancy is not rejected as the statistic falls within the 5% confidence bound. This is supported by the Recursive coefficients graph which shows that the entire variables lie within the $\pm$ 2 standard error bound. The CUSUM and CUSUM Square plotted against the critical bound of the 5 percent significance level indicated that the models are generally stable over time.

Figure 1: Recursive Graphs for Parameter Stability of the Model

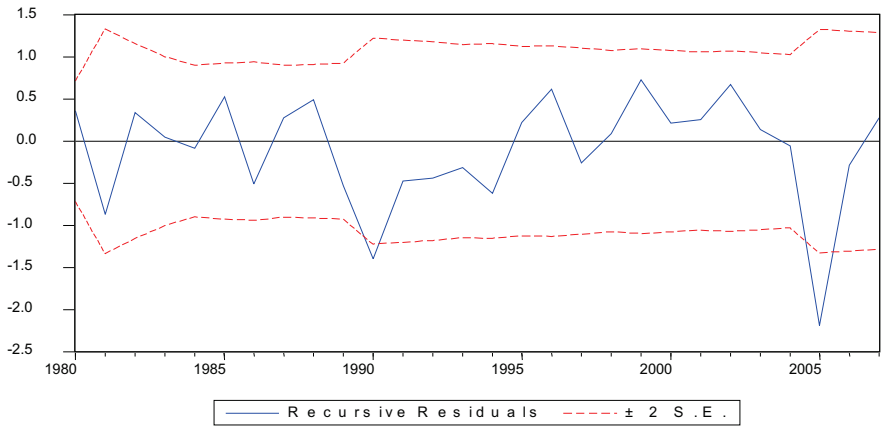


Figure 2: CUSUM Test for Parameter Stability for the Model

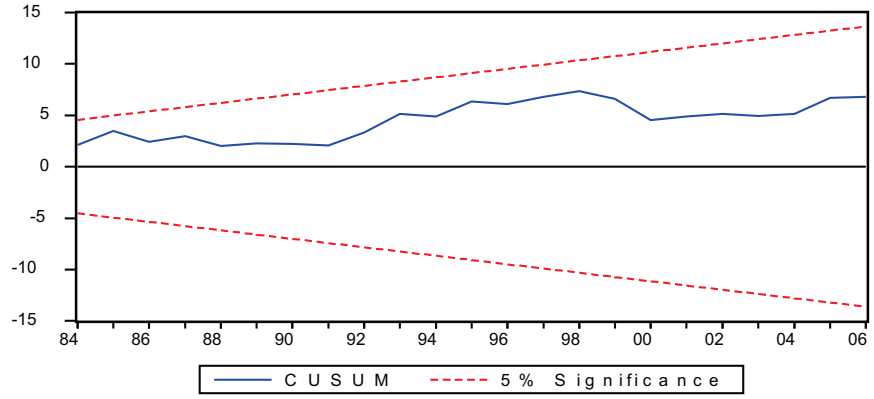
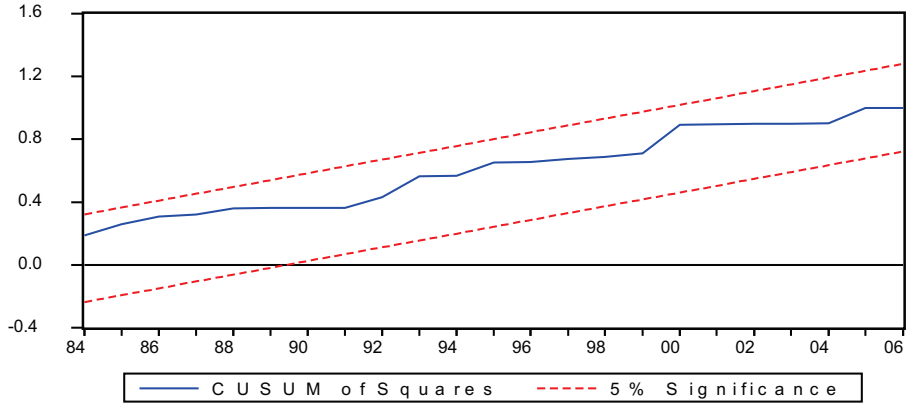


Figure 3: CUSUM Square Test for Parameter Stability for the Model



5.0 CONCLUSION AND RECOMMENDATION

This part provides the general conclusion and suggested recommendation of the study as follows:

5.1 Conclusion

This study sought to determine the direction through which real exchange rate influences economic growth in Ghana by using the Johansen Cointegration method to establish their long run relationship, an error correction model is also applied to ascertain the short run dynamics of the variables. The study period was 1980 – 2000.

The findings of the study revealed that real exchange rate operates through the aggregate supply channel and not the aggregate demand channel to impact on the economic output. This means cost of imported goods and raw materials would fall all other things being equal due to the appreciation of the cedi and making cost of production relatively low thereby boosting economic growth through high productivity which would also go a long way to reduce inflation. This finding was also revealed in a different way by the Granger causality test results between real GDP

and real exchange rate which reflected a one way movement from real exchange rate to economic growth.

The result also indicated that inflation in Ghana needs to be taken seriously since it exerts negative influence on economic, growth hence the need to take measures at curbing the inflationary pressure on the economy in order to ensure a stable macroeconomic environment that can boost economic activities.

The positive impact of government consumption on real output growth defies a conventional wisdom in a typical developing country, where government consumption normally crowds out the private sector by impacting negatively but in the case of Ghana it is rather complimenting private consumption to ensure economic growth.

The economy openness also negatively influenced the economic growth meaning the economy is import dependent so does not support growth sustainably particularly in the long run. This is because the demand for foreign currency to import goods exerts excessive pressure on the local currency thereby eroding its value which has devastating economic consequences. The call is therefore to promote exports.

5.2 Recommendation

From the major findings of the study, it implies that fiscal, monetary and exchange rate policies need to be designed in order to ensure sustainable and suitable macroeconomic stability which will stimulate real appreciation of the cedi in order to enhance economic growth. In doing so, care needs to be taken so that real appreciation does not exceed the equilibrium exchange rate in order to prevent massive importation of goods which has the tendency of killing domestic industries

Though government consumption exerted positive impact on economic growth according to the findings of this research which is a good thing, it is suggested that government should keep its consumption on productive goods or be directed at areas of the economy which are growth enhancing rather than undertaking profligate consumption which may lead to debt accumulation.

The import dependency nature of the economy leaves much to be desired, so government must create enabling environment for local industries, to increase their production capacities and to target foreign markets so that problems of balance of payment can also be tackled. There is also the need to intensify the campaign on "domestication" where consumers are urged to buy made in Ghana goods in order to reduce the importation of consumer goods into the country. Government should try to diversify exports especially in the area of agriculture and agri-business as well as allied-oil industries since Ghana now produces oil in commercial quantities. All these would go a long way to improve foreign exchange earnings.

To curb the problem of inflationary pressures on the economy government should formulate suitable and sustainable fiscal and monetary policies to ensure growth in domestic output in the economy. Some of measure may include improved tax administration to rake in more tax revenue, careful and regulated money supply based on the central bank's own research and not under government influence and ensuring appropriate exchange rate policies which would exert positive impact on the economy and not to allow high rates of depreciation of the currency which may create an opportunity for banks and individuals to do businesses which will be detrimental to the economy especially its impact on the real sector. Any mismanagement of the real exchange rate would lead to risk and uncertainty in business and investment climate culminating into low economic growth in Ghana.

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METHODOLOGICAL AND CONCEPTUAL ISSUES IN DEBT SUSTAINABILITY ANALYSIS AND FRAMEWORK: A PEDAGOGICAL EXPOSITION.

By **Sam Omoruyi*, Baba Yusuf Musa** and Karamo Jawara*****

Abstract

The paper seeks to explicate issues in debt sustainability analysis (DSA) and debt sustainability framework for low income countries (DSF-LICs). In particular, it identifies the major measurement typologies of fiscal and external debt sustainability in the form of pedagogical notes. It provides succinctly, the practical step-by-step approach to the application of the DSF-LIC template in the context of debt sustainability framework, thus, marrying theory with practice. It represents a major contribution to efforts at deepening understanding in debt sustainability issues.

JEL Classification: E00, E62, E69

I. INTRODUCTION

A great many low income highly indebted poor countries (HIPCs) especially those in Africa as well as non- HIPCs countries such as Nigeria have received the much needed debt relief from the international community. In particular, debt relief is provided under the HIPC initiative, through the Paris Club, and on a bilateral basis. A recent report about debt relief given by the World Bank and IMF indicates that debt reduction packages under the HIPC Initiatives provided US$76 billion in debt service relief as at 2009 to 30 of the 36 countries in Africa that participated in the Initiatives. If all 39 potentially eligible countries reach conclusion point, total debt relief provided by the bank and all participating creditors is estimated at US$112.5 billion at end – 2011 in Present values terms. The amount excludes the 19 billion debt relief grants provided by the Paris Club to non-HIPC Nigeria.

The low debt burdens in countries which have received debt relief will improve their creditworthiness significantly, creating borrowing space and raising concerns that they might borrow excessively even from non concessional sources. This could offset the efforts made to improve debt sustainability, leading to yet another lending-forgiveness cycle. Meanwhile the emergence of potential new lenders, both public and private has presented new borrowing opportunities for the low income countries (LIC).

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However, where the LICs take undue advantage of the borrowing opportunities created by the debt relief, they stand the risk of contributing to the re-emergence of debt vulnerabilities and creating risks to development. Herein lies the major challenges. Compounding those challenges has been the increasing tendency of some governments to borrow domestically to a large scale, which impacts on overall debt risks and adds to the complexity of assessing these risks.

Those concerns for the sustenance of debt in the wake of debt relief cannot be over-emphasized. The debt relief occasioning an expanded borrowing space has meant that LICs may wish to use the freed up resources to make faster progress toward achieving the millennium development goals (MDGs) including poverty reductions goals. Therefore the LICs would need to be guided by some new financing strategies-forward-looking framework- that would be consistent with long term debt sustainability. This led to the introduction of the IMF/WB debt sustainability framework for LICs, designed among other things to guide the borrowing decisions of LICs, the lending policies of creditors and as well as serve to provide early warning signal against vulnerabilities and risks.

The DSF-LICs is critical to the enthronement of sound debt management practice which can minimize vulnerabilities and optimize debt levels. In the milieu of sound debt management, risky debt structures are avoided, thus blocking a source of vulnerabilities that could impart shocks to market rates trigger debt crisis and suggest the maintenance of unsustainable fiscal policies.

An assessment of debt sustainability is also important in moderately indebted countries as it helps to identify potential vulnerabilities and risks, and provides input in the design of effective stabilization programmes, especially in countries undergoing a debt crisis.

Besides throwing up debt restructuring possibilities especially in countries defaulting on payment, debt sustainability encourages the evolution of a sustainable debt level consistent with fiscal sustainability. Indeed, debt sustainability is an essential condition for macroeconomic stability and sustained economic growth.

The purpose of this paper is to identify the major measurement typologies of fiscal and external debt sustainability in the form of pedagogical notes. It will also articulate notes on the practical step by step approach to the application of LIC Template in the conduct of debt sustainability framework for low income countries. These pedagogical notes are different from the Staff Guidance notes on the application of the joint Bank-Fund debt sustainability analysis for low income countries. This paper is aimed at contributing to a deeper understanding of debt sustainability analysis and the use of DSF – LIC Template by countries. There is no doubt therefore that the analysis contained in the paper will prove useful and handy to debt managers and any persons or officials interested in debt sustainability analysis as well as its conduct for low-income countries.

For ease of presentation the paper is divided into five parts. Part 1 is this introduction. Part II dwells on the definitions and measurement typologies in debt sustainability. Part III outlines DSF-LIC operational modalities in a didactic fashion while Part IV focuses on methodological and conceptual issues involved in debt sustainability analysis. Part V contains the conclusion of the paper.

I. THEORETICAL DISCOURSE

Fiscal sustainability is defined with respect to both static or current period and inter-temporal budget constraints. A static budget constraint is satisfied if the public sector is able to finance its current expenditures with its revenues, and new borrowing, including the creation of high-powered money (i.e. borrowing from the Central Bank) and meet or roll over its maturing liabilities; that is if it is not liquidity constrained (AKYUZ, 2007). Formally, the current period or static budget constraint is of the form:

$D_t = (1-i_t)D_t\text{-}1 - SP_t - \Delta M_t$ ..... (1)

Where:

D_t = current debt

i_t = (average) nominal interest rate

SP_t = primary balance (overall surplus excluding interest payments)

ΔM_t = variation in the stock of high-powered money during time t

The inter-temporal budget constraint is often formulated with respect to conditions for solvency. Solvency condition requires that the present discounted value of future primary budget balances should at least be equal to the value of the outstanding stock of debt. If that happens debt is sustainable. Formally, inter temporal budget constraint is:

$$Dt + \sum_{k=0}^{\infty} \frac{E_t (G_{t+k} + iD_{t+k})}{(1+i)^k} \leq \sum_{k=0}^{\infty} \frac{E_t (REV_{t+K})}{(1+i)^k}$$

Where:

Et = denotes expectation taken at time t

Dt = stock of public debt

REV = taxation (net of transfer) and other revenues such as royalties

G = government expenditure on goods and services

I = interest rate paid by government debt

In the same vein, debt sustainability is defined by the IMF as follows: "a debt is sustainable if it satisfies the solvency condition without a major correction to the balance of income and expenditure [...] given the costs of financing (IMF 2002, P 5)." By without a major correction is meant without running into arrears, recourse to debt rescheduling, and eventually a drastic balance of payments adjustment.

Debt solvency is achieved when future primary surpluses will be large enough to pay back the debt principal and interest. More technically solvency requires that the current debt plus the present discounted value of all expenditures does not exceed the present discounted value of all revenues (or equivalently, that the current debt

does not exceed the present discounted value of future revenue, net of non interest expenditure (primary surpluses) Debt sustainability is thus a forward looking concept. In much the same vein that the concept of sustainability based on static budget constraint is criticized as imprecise, being a mere accounting identity that is always satisfied, sustainability concept based on solvency is also problematic. It is problematic because it does not impose specific constraints on debt and deficits at any point in time (AKYUZ, 2007. P3). In addition, evaluating equation 2 requires formulating expectations on the future path of government revenues and expenditures as well as, assuming that the interest rate paid on debt is constant and equal to the discount rate. Since current deficits are collateralized by surpluses in some distant future, any level of debt and fiscal deficits could be compatible with the present value budget constraint. On the other hand, both the underlying economic conditions as reflected by the growth-adjusted interest rate (that is, the rate at which future primary balances are discounted) and the fiscal policy stance vary over time and are highly uncertain. Thus, it is not possible to know if a liability "satisfies the present value budget constraint without a major correction in the balance of income and expenditure", since changes in the growth-adjusted interest rate can make it unviable over the longer term (Ibid p3). Thus by the same token even a falling debt ratio does not necessarily imply long-term sustainability.

Akyuz argues that a flexible approach to sustainability adopts a weak solvency constraint and allows the government to be a net debtor in present value terms up to a maximum level. In such a case the inter-temporal budget constraints would be satisfied for levels of present value of future primary balances less than the current debt ratio (Crose and Juan-Ranwu 2003)

More importantly, there is no theory to indicate what a sustainable debt threshold is. However, an alternative measure of sustainability is based on the dynamic stability approach and allows thresholds to be defined. (Pasinetti 1998). But this is second best as it does not fully overcome the limitations of the dominant neo- classical approach anchored on solvency.

For these reasons, in practice sustainability analyses rarely rely on the theoretical concept of solvency. Rather, they often focus on the evolution of the debt ratio. One approach is to specify a certain debt ratio and the threshold and assess if fiscal policy would lead to a path that will violate it; another approach emphasizes government reaction to the divergence of the debt ratio from a target threshold; that is sustainable if government generates an adequate level of primary surplus when the actual debt ratio exceeds the target ratio (Bohu, 1995; Croce and Juan-Raman 2003; IMF 2003 b). In any event, a compromise position on this issue is that simply stabilizing the debt ratio does satisfy the solvency condition (E. Ley, 2005).

II.2 Debt Sustainability Indicators

II.2.1. The One-Period Primary Gap (GAP)

Buiter (1995) developed the one-period primary gap indicator:

$$Gap_t = - - SP_A \quad 01 = \left[\frac{rt\text{-}gt}{1\text{-}gt}\right] b_{t-1} - SP_t \quad \ldots\ldots (3)$$

GAP, the one-period primary gap in period is excess of the augmented primary surplus-to GDP ratio that stabilizes this period's debt to- GDP ratio over actual current augmented primary surplus-to- GDP ratio (Buiter, 1995). The indicator was developed in order to measure the different between the next period (t +1) required primary surplus and the current one (t). If the calculated difference between these terms is positive, this fact means that the fiscal policy and therefore debt is unsustainable and there is an urgent need for a policy reform in order to prevent insolvency.

The term $\left[\frac{rt\text{-}gt}{1\text{-}gt}\right] bt - 1$ shows the required primary surplus and the terms SP_t shows the current primary surplus.

In this equation (1), r, b, g, SP denote the following ones respectively:

- r: Domestic real interest rate
- b: Nominal value of the public debt at the end of period, as a junction of that period's GDP
- g: Rate of growth of real GDP
- SP: The primary surplus as a fraction of GDP

II.2.2 The Medium- Term Tax Gap Indicator

Blancard et al (1990) developed this indicator:

$$t^x - t^t = \frac{1}{5}\sum\frac{S}{1} \quad = og_{t+1+} \frac{r_{trs} - n_{t-s}}{1 + n_{t+s}} b_t\text{-}t_t \ldots \ldots \ldots \ldots \ldots \ldots (4)$$

The indicator shows the difference between the sustainable tax ratio (t_x) for the next five years and the current one (t_t). If the result is positive, fiscal policy and debt are unsustainable and the need is thus indicated for the authorities to increase the tax ratio in order to provide debt sustainability.

A number of caveats apply to the indicators discussed above and include: first, the indicators mostly focus on stabilizing a particular debt-GDP ratio but do not say anything at all about the optimality of debt ratio. Hence, some countries may need to aim at a lower debt target, and sustainability should be defined as the policy

stance needed to reach this new target. Second, the indicators are sufficient (but not necessary) conditions for long run sustainability. Some countries may have good reasons to run a large deficit. Hence, it may be sub-optimal to prevent a country from smoothening expenditures because this would lead to over-shooting a fiscal ratio that corresponds to long run sustainability (Alvarado, C.D. et al, 2004). Third, these indicators require assumptions on GDP growth, interest rates, government expenditures and revenues, and implicitly assume that these variables are exogenous. However, most of these variables tend to be endogenous and correlated with each other. It is unrealistic therefore to assume that changes in primary deficit will have no effect on the interest rate and growth or that changes in growth do not affect the primary surplus.

II.3. Debt sustainability Analysis Embedded in the DSF: Current Approach.

The debt sustainability Analysis (DSA) applied to an individual country within the DSF comprises three elements:

(i) Constructing a baseline scenario of debt dynamics, representing the projected macroeconomic framework with economic policies and growth potentials, main assumptions and relevant parameters;

(ii) Conducting a series of bound tests applied to the baseline scenario, providing a probabilistic upper bound for the debt dynamics under different assumptions; and

(iii) Constructing alternative scenarios (Barkbu et al, 2008)

With regard to (i) above, Nissanke (2010) proffers the formulae used for generating a baseline scenario debt dynamics in the DSA are presented as follows:

$$D_t = (1+i_t)\, D_{t-1} + TD_t - TR_t - FDI_t + \Delta R_t \quad \ldots\ldots(5)$$

D_t = nominal debt stock at the end of the period t,

It = average effective interest rate in period t (= interest payments in period t adjusted by the debt stock in the previous period

TD_t= deficits in the trade and services account;

TR_t = sum of official grants and current transfers;

FDI_t= net non- debt creating capital inflows; and

ΔR_t = change in official reserves and other foreign assets.

Since debt is provided in concessional terms, grant elements (GE_t) which reflects concessionality of a loan is defined as follows:

$$GE_t = \left(\frac{D_t - pv_t}{D_t}\right) \ldots\ldots(6)$$

Thus,

$$D_t = \left(\frac{pv_t}{1-GE_t}\right) \ldots\ldots(7)$$

Where

P_v = present value of debt

Assuming concessionality of loans (grant elements), external debt dynamics, expressed as a ratio of the present value of debt stock to exports, is generated by the current primary balance adjusted for concessional financing and the difference between the concessional interest rates (it) and the growth rate of export (▪t)

$$\frac{PV_t}{X_t} - \frac{PV_{t-1}}{X_{t-1}} = \frac{(i_t-\varepsilon_t)}{(1-\varepsilon_t)} \frac{PV_{t-1}}{X_{t-1}} + \frac{(1-G\varepsilon_t)}{(X_t)} \text{ x } (Td_t - TR - FDI_t + \Delta R_t) \text{ ..... (8)}$$

For generating public debt dynamics, DSA uses the following formulae;

$B_t = PE_t + i_t D_t - T_t$ ..... *(9)*

Where

B_t = new public borrowing

Pe_t = public expenditure

it^D = interest payments on the outstanding stock of debt,

T_t = tax revenue

To ensure fiscal sustainability new borrowing, Bt, must track the following path;

$B_t = D_t - g_t$ ..... *(10)*

Where

g_t = growth rate of mineral GDP

Then the long-run budget constraint is given by:

$D_t g_t = PE_t - T_t + i_t D$ *or* $(i_t - g_t) D_t = D_t = T_t - PE_t$ ... ... *(11)*

Then the change in public debt to GDP (d_t) is:

$$\Delta d_t = \frac{\text{primary deficit}}{\text{GDP}} + (r_t - g_t) d_t \text{ ... ... (12)}$$

Nissanke's (2010) Equation (12) is analogous with that given by Fisher and Easterly (1990) which indicates the rate at which public debt ratio will grow a year:

$\Delta p^d = (d_{pri} - nd) + (r - g) p^d$ ... ...(13)

p^d = ratio of public debt to GDP

d_{pri} = where of primary deficit in GDP

n^d = non-debt related sources of financing as a share of GDP

r = real interest rate

g = growth rate of GDP in real terms

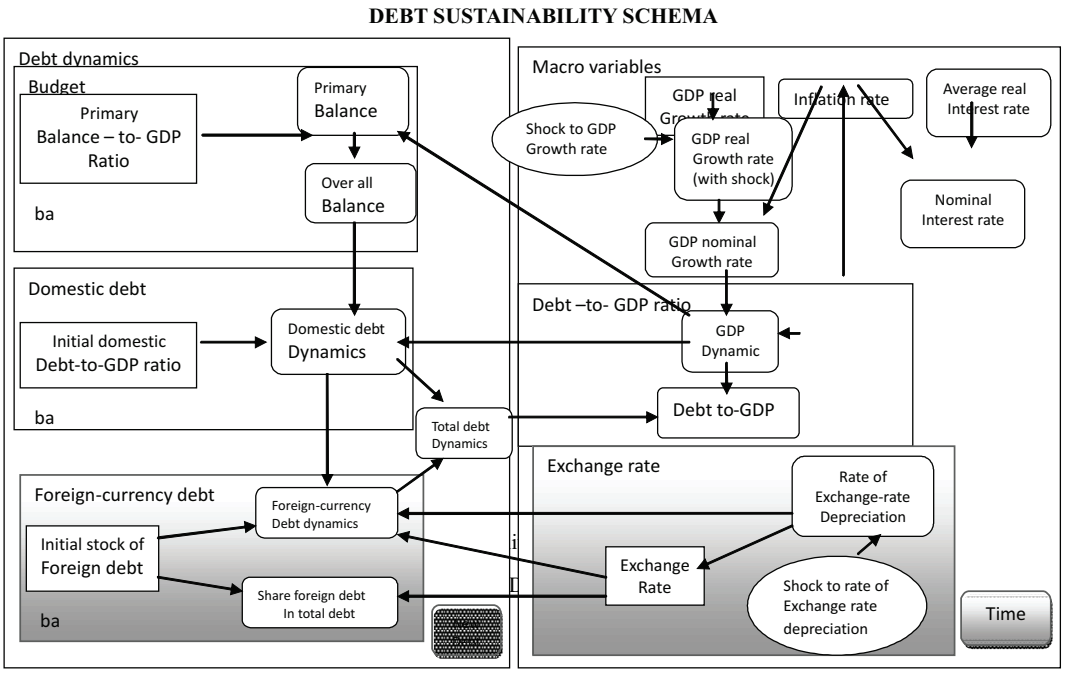

Fig: Visual representation of the debt sustainability analysis

Source: Eduardo Ley & Ngoc-Bich Tran (2008),
"Debt Sustainability Risk Analysis with Analytica". The World Bank.

Public debt dynamics is thus generated by dynamics of primary fiscal deficit in relation to GDP, adjusted for non-debt related flows, and the difference between real interest rate (rt) and real growth rate (Equations 12 or 13).

III OPERATIONALIZING DSF- LIC (for hands-on exercise)

The LIC DFS framework is built on three pillars; (i) a standardized forward looking of debt and debt service dynamics under a base line scenario, alternative scenarios, and standardized stress test scenarios (also referred to as bound tests); (ii) a debt sustainability assessment based on indicative country-specific debt burden thresholds that depend on the quality of policies and institutions in the country; and (iii) recommendations on a borrowing (and lending) strategy to limit the risk of debt distress, while maximizing the resource envelope to achieve the Millennium Development Goals (MDGs).

Baseline Scenario; the base line scenario identifies the base line year as starting point for the projections. Base line projection of macro variable represent the realistic situation of macro variables, which takes due accounts of a countries growth potentials but also capacity constraints and vulnerabilities.
In addition to the baseline scenarios, two alternative scenarios and six bound tests are run:

- An historical average scenario in which key variables (real GDP growth, GDP deflator, non-interest current account deficit, net FDI and other non-debt

creating flows) are set at their respective 10-year average throughout the projection period.

- An alternative financing conditions scenario in which the interest rate on new borrowing is set 200 basis points higher than in the baseline scenario
- Four bound tests in which real GDP growth, export growth, inflation (as measured by the variation in the US dollar GDP deflator) or net non-debt flows are set one standard deviation below their historical average in the second and third year of the projection period
- A combined bound-test that is a combined shock to the four variables above
- An exchange rate shock scenario of a one-time 30 percent depreciation of the domestic currency in the first year of the projection period.

The above are standard scenarios. There are also a customized scenario (fiscal) and a customized scenario (external). These scenarios are country specific, reflecting impact of countries realities.

In developing this framework, the BWI have linked the external debt sustainability thresholds to the quality of a country's policies and institutions, reflecting the hypothesis that countries with strong or good policies and institutions are more likely to be able to shoulder higher external debt burdens and therefore are less likely to fall into debt distress, than countries with weak or poor policies and institutions. The World Bank Country Policy and Institutional Assessment (CPIA), is used to categorize countries into three performance groups; strong, medium and weak. A three year moving average of the CPIAs is used to arrive at these indices; of the order of scale of 1 to 6;

Strong Performer	CPIA> =3.75
Medium Performer	3.25<CPIA<3.75
Weak Performer	CPIA<=3.25

On the basis of these classifications, the DSF debt burden indicators for external debt sustainability are set out in Table 1.

Table 1: Indicative External Debt Burden Indicators

	PV of Debt in %			Debt Service in %		
	EXPORTS	GDP	DBR*	EXPORTS	DBR* updated (2010)[1]	
Strong Performer	100	30	200	15	25	18
Medium Performer	150	40	250	20	30	20
Weak Performer	200	50	300	25	35	22

* Revenue defined exclusive of grants.

Public debt benchmarks

Indicative Policy-Dependant Public Debt Benchmarks		
	Public debt to GDP	
	PV	Nominal
Weak policies and institutions	38	49
Moderate policies and institutions	56	62
Strong policies and institutions	74	75

III.1 The LIC DSA Framework: Operational Modalities

As stated in the BWI guidelines, the DSF requires projection of external and total public sector debt burden indicators. Therefore, the user is required to insert historical and projected data for a range of macroeconomic variables. Although the analysis on external debt sustainability is the straight-forward application of the new framework as it has been historically the main issue for LICs, all DSF-based analysis must include a Fiscal DSA, according to the BWI. In spite of the non-existence of any internationally agreed thresholds for domestic debt sustainability, the BWI suggest the need to undertake a thorough review of risks in cases where domestic debt stocks are significant (i.e., above 15-20 percent of GDP) or if there had been any rapid recent build-up, irrespective of the level of domestic debt.

The template is designed for a twenty-year projection period due to the long maturity of debt in LICs, and in sync with the philosophy that debt sustainability is inherently a long term phenomenon. It uses a uniform discount rate to calculate the present value of future external debt-service obligations. The discount rate used in the template is the six-month average U.S.

dollar CIRR, which is currently 4%. The template automatically produces output tables that display the dynamics of debt and debt-service ratios in the baseline scenario and summarizes the results of standardized alternative scenarios and stress tests to enable an assessment of the country's vulnerability to sustained deviations from the baseline and to various plausible shocks.

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(1) Debt service to revenue thresholds were revised lower in February 2012 to 18, 20 and 22 per cent for weak, medium and strong policy performers, respectively.

III.2 Debt Distress Risk

Once data has been fed into the DSF template and output tables and graphs produced, it remains to determine the external debt distress risk according to the following classification:

III.2.1 Low Risk

Under this category, debt indicators are well below relevant country-specific debt-burden thresholds. Stress testing and country-specific alternative scenarios do not result in indicators significantly breaching thresholds. In cases where only one indicator is above its benchmark, judgment is exercised to determine whether there is a debt sustainability problem or data constraint problem.

III.2.2 Moderate Risk

Baseline scenario does not indicate a breach of thresholds. However, alternative scenarios or stress tests result in a significant rise in debt service indicators over the projection period (nearing thresholds) or a breach of debt or debt-service thresholds. Under this category, debt distress risk is asymptomatic.

III.2.3 High Risk

Baseline scenario indicates a prolonged breach of debt or debt-service thresholds, but currently the country does not face any payment difficulties. The situation is often exacerbated by the alternative scenarios or stress tests.

III.2.4 In Debt Distress

Current debt and debt-service ratios are insignificant or sustained breach of thresholds. The existence of arrears would generally suggest that a country is in debt distress, unless there are other reasons than debt-service burden for not servicing its debt.

It is important to highlight that caution is needed in the assessment of the risk of external debt distress as such an exercise must be balanced between a mechanistic use of the risk taxonomy and a judgmental approach. For instance:

i) in some cases there could be marginal and temporary breach of thresholds that may not necessarily represent the debt distress situation of a country after applying the above mentioned classification;

ii) sometimes an ability to service debt may not be captured in the templates but may be evidenced from the level of foreign exchange reserves;

iii) there could also be problems in computation of the relevant CPIA/IRAI scores, and therefore in setting the relevant indicative external debt burden indicators. In any of these cases, judgment should be applied to assessing debt sustainability.

III.3 DSF Template

The Debt Sustainability Framework (DSF) template analyzes total external debt as well as total public debt. According to the BWI guidelines, total external debt refers to liabilities that are owed by residents to non-residents of an economy. It can be decomposed into public and publicly guaranteed (PPG) external debt, private non-guaranteed (PNG) external debt and short-term debt.

Public and publicly guaranteed (PPG) external debt comprises the external debt of the public sector, defined as central, regional and local government and public enterprises. Public enterprises subsume all enterprises, of which the government owns 50 percent or more. PPG external debt also includes public sector-guaranteed private sector debt.

Private sector non-guaranteed (PNG) external debt refers to external liabilities that are owed by private residents of an economy. As for public domestic debt, it is defined on a residency basis and may thus include foreign currency-denominated obligations. Public Domestic debt data should seek to cover the liabilities of the broader public sector, including the central government, local governments, government-owned enterprises, and the central bank, based on data limitations.

The template consist of two input worksheets to fill in data:

i) the "Data-Input" worksheet, which collects both historical and projected macroeconomic and aggregate debt data (public and privately owned), and
ii) the "Input-Output debt" worksheet which is set to enter medium and long term PPG debt figures only (see next section for details).

In addition, there are:

i) a language sheet,
ii) a template navigator, which shows all the information available throughout the Template;
iii) four output tables—two for each type of debt (external and total);
iv) two output figures;
v) a range of worksheets that transform the input data into the information provided in the output tables;
vi) two worksheets that allow for customized scenarios for each type of debt, and
vii) a summary of the instructions.

III.3.1 Data Requirement

Data requirements comprise the external, real and fiscal sectors, along with balance of payments and prices.

III.3.I.I Real Sector Debt Fiscal Sector

- GDP, Current prices
- GDP, Constant prices
- US GDP deflator
- Medium and Long Term PPG Debt
- Short Term PPG debt
- Medium and Long Term Private Debt
- Short Term Private debt
- Foreign Currency denominated public domestic debt
- Medium and Long Term Public Domestic Debt
- Short Term Domestic Debt
- PPG External Debt Interest and Amortization Due
- Private External Debt Interest and Amortization Due
- Total Public Domestic Debt Interest and Amortization Due
- Aid flows (total grants, concessional loans and debt relief)
- Debt Service Projections: outstanding disbursed debt
- External Disbursements projections
- Public Sector Revenues
- Public Sector Grants
- Privatization Receipts
- Public Sector Expenditure
- Public Sector Assets
- Recognition of Implicit Liabilities

III.3.I.2 Prices, Balance of Payments and Other

- Exchange rate, average
- Exchange rate, end of period
- Current Account Balance
- Exports/Imports of Goods and Services
- Current Transfers (Net Total, Official)
- Net Foreign Direct Investment(FDI)
- Exceptional financing
- Gross Reserves (flow)
- Qualitative features of the country (CPIA rating, IMF/WB status, HIPC/MDRI status).

III.3.2. Input Data Worksheet "DATA-INPUT" WORKSHEET

The Input Sheets ("Data-input" and Inp-Outp-debt") require information on the key macroeconomic series in the baseline scenario and assumptions regarding the terms of new borrowing. The required inputs are the cells shaded in yellow in the input sheets (the non-shaded cells are formulas automatically calculated). The analysis requires data on the total stock of existing debt on new borrowing terms by main creditors. The LIC DSA does not require loan-by-loan data.

Worksheet "Data input": This worksheet collects key macroeconomic series for the baseline scenario and qualitative features of each country. Only those areas shaded in yellow are to be populated, the rest will be calculated automatically. In the first two boxes qualitative information is included such as the debt distress rating, HIPC, MIDRI, IMF-supported program, IDA status and the three-year moving average of the CPIA.

Macroeconomic series are displayed in the data table: (i) those related to indebtedness such as the stock of total external and public debt, the associated debt service (including on new borrowing); (ii) those related to the external accounts such as exports, imports, current transfers, etc.; (iii) those related to public accounts, such as revenue, expenditure, grants; (iv) and data on the fundamentals of the economy such as nominal GDP, GDP deflator, etc.

Before working on the data table, the scale for the template needs to be selected in cell E17. When filling in information, special attention should be paid to those variables for which only historical data needs to be completed, namely public and publicly guaranteed external debt (stock and debt service) and concessional loans1. In formulating the baseline scenario for the public debt sustainability analysis, the coverage of the public sector must be determined (e.g., central government, general government, nonfinancial public sector, etc.) and which debt concept (net or gross) is most appropriate for the country, taking into account country-specific institutional features and data availability.2 The coverage and type of debt should be noted in the DSA write-up. The level of coverage should also be consistent across fiscal series, so that changes in debt stocks can be compared to fiscal flows. To facilitate this, data on contingent liabilities32 should be reported as a separate item (if available), rather than as part of the debt stock. Likewise, if public debt is accounted on net terms, a separate line for public sector assets should be reported. To ensure that the coverage of series taken from (IMF) BOP files is consistent with the coverage of the public sector in the fiscal series, the series should be entered only on the External Debt disaggregation and it is automatically calculated on the Public Debt disaggregation.

It is of utmost importance to determine well in advance the level of coverage of the public sector (e.g. central government, general government, non-financial public sector, etc.) that is the most appropriate for the country, taking into account country specific institutional features and data availability.

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1. *Projected concessional loans are computed based on new borrowing assumptions, i.e., the average concessionality of each lender.*
2. *The concept of "gross" debt is used by default in the public DSA.*

Data should only be entered in cells shaded in yellow as the non-shaded are automatically calculated as formulas. When introducing data bear in mind the following:

- All data should be entered in US dollars unless indicated otherwise. It is recommended to use the IMF's World Economic Outlook exchange rate projections (average values) for converting figures in national currency to US dollars.

- If you are using different datasets, be careful that these are consistent in terms of scope and data quality.

- Public Domestic debt data should seek to cover the liabilities of the broader public sector, including the central government, local governments, government-owned enterprises, and the central bank.

- The level of coverage should also be consistent across fiscal series, so that changes in debt stocks can be compared to fiscal flows.

- The first year of projections is to be entered in cell T20, which is the reference for other worksheets.

- Projected data should portray the baseline scenario of the most recent Debt Strategy and Macroeconomic Assumptions, which in turn should be consistent with IMF's projections (if applicable) and/or the country's national development strategy or similar.

- While filling out this sheet requests information on total public debt (public and private) in order to ensure consistency in the balance of payments and public sector accounts, it is important to note that DSA calculations only focus on Public and Publicly Guaranteed (PPG) external debt, reflecting the fact that the indicative thresholds are constructed in terms of PPG external debt.

- The discount rate usually corresponds to the rounded 6-month average US$ CIRR on maturities.

- For calculating the PV of total public debt it is assumed that the nominal value of the public domestic debt equals its present value (in other words, this suggests that the nominal interest rate is the same as the discount rate).

III.3.2.1 Consistency Check

In checking for consistencies;

- Ensure that projected data should cover a period of 20 years, and historical

data should cover the past 10 years.

- Be cautious to use the appropriate scale across the worksheets (i.e. billions, millions, etc.).
- Crosscheck the level of data coverage across the projection period, especially if you are using different datasets. As the template is designed to enter external debt service figures only one time for both fiscal and balance of payments calculations, it is of upmost importance to double check the coverage level. The public sector in the BoP should cover the general government (central and others), the monetary authority, and public corporations. For DSA calculations, however, coverage of the public sector can be limited, for instance, to the central government. Users should ensure that coverage of the public sector in the external and public DSA is consistent. The actual coverage of the public sector should be explicitly stated in the LIC DSA presentation.

III.4 "Input-Output Debt" Worksheet

This worksheet is divided in two sections: (A) INPUT (where data is to be filled in) and (B)
OUTPUT to be calculated automatically as formulas).Similarly to the "Data-Input" worksheet, data should only be entered in cells shaded in yellow. The first part of the INPUT section requires the introduction of assumptions on "new external debt" as well as "new public debt". While the former will impact directly the output for the baseline scenario (for both external and fiscal DSAs) as this refers to new disbursements per se, the latter refers to marginal borrowing (that is, additional financing resulting from the stress tests) required only for the fiscal DSA.

The template allows dividing the marginal borrowing between foreign-currency denominated debt (held by residents –domestic debt- or by non-residents–external debt), domestic MLT debt, as well as ST debt.

The introduction of financial conditions and assumptions has to consider the following issues:

- The template allows for desegregation of creditors. To customize the template, enter the name of each creditor in the corresponding category in the "Descriptor" cell. The list of creditors entered in this section will appear in both "old MLT debt" and "new external debt" sections where data is to be entered.

- When introducing average repayments terms for new external debt, be advised that for the loan maturity and grace period only integer numbers can be entered (e.g. introducing 7.5 years as the loan maturity will cause an error in the formulas).

- In principle, the terms on foreign-currency marginal borrowing (forex) should be consistent with the average terms assumed in the baseline for new external debt (considering the mix between domestic and external borrowing in this category) but could be adjusted, if warranted.

- Next, it is required to enter projected data for "old medium and long-term (MLT) debt". Projections of arrears are to be inserted in Section 2 of DSF Template.

- In the absence of a detailed breakdown by major creditor, aggregate figures are to be inserted in rows 54, 55 and 56, for total PPG MLT debt, principal and interest payments, respectively.
- Bear in mind that converting debt service payments into US dollars using exchange rates projections, while using an initial nominal stock of debt converted to US dollars at the prevailing year-end exchange rate for the base year, implies that the stock of debt will differ from the sum of principal payments. This is reflected in the "Check" cell E61, which will be different from zero. However, unless there is expected debt relief in flow terms, this should be fairly close to zero.

In this section, debt service projections should:

- Include data until all existing claims are paid off (e.g. 40-year time horizon).

- Be calculated for the existing disbursed outstanding PPG debt only. Debt service arising from new disbursements are not to be included (these will be calculated in Section 3 of the worksheet).

NB

After the Summary Report has been generated in excel format, check that all nominal debt stock and service figures are consistent with those available from your national recording system as well as data published in creditors' documents. Once you have done this task, proceed to copy/paste debt data to the DSF Template accordingly. Section 3 of the worksheet requires information on new borrowing for external debt.

4.0 OUTPUT WORKSHEETS

The output worksheets and graphs are calculated automatically once the two input worksheets are filled in correctly. These worksheets include external debt ratios and their corresponding thresholds, combined domestic and external debt and their ratios to GDP, exports and revenue. These outputs can be sensitized in order for the user to tailor a dynamic behavior of key macroeconomic variables in the presence of exogenous shocks.

On the basis of the DSA output, an overall rating is assigned based on the risk of

external debt distress:

- **low risk:** all debt burden indicators are well below the thresholds in baseline scenarios and do not breach them under any stress tests
- **moderate risk:** debt burden indicators are below the thresholds in the baseline scenario, but stress tests indicate that thresholds could be breached if there are external shocks or abrupt changes in macroeconomic policies
- **high risk:** baseline scenario and stress tests indicate a protracted breach of debt or debt-service thresholds, but the country does not currently face any repayment difficulties
- **in debt distress:** the country is already having repayment difficulties

IV. METHODOLOGICAL AND CONCEPTUAL ISSUES

Since its official release in 2004-2005, DSF-LIC has raised several methodological issues and a series of modifications have been made over the last quinquennium, through regular review processes. Even so, some fundamental issues relating to the analytical framework are yet to be addressed. Also missing analysis of investment in debt dynamics in DSAs, i.e in the debt –growth nexus needs to be flagged.

IV.I Baseline Scenarios

Projections of debt dynamics under a baseline scenario are generated based on equations (12) or (13) and various assumptions made with respect to key variables. The assumptions themselves are derived from the macro-economic framework in use. DSAs are often presented as authoritative forecasts with forward-looking and probabilistic features which should be interpreted with great caution. This caveat is given hold relief in the 2004 IMF document which avers that "such projections are only as good as their underlying assumptions, and these assumptions have a particularly slender basis for the long time horizon implied by the average maturity of concessional loans. The scope for error is large, both on the upside and the downside" (IMF 2004:13)

And the baseline is a crucial scenario in the DSA because first, it is compared with a historical scenario and it is against it that a reality check is carried out to compare the projected time paths against alternative scenarios created by a series of bound tests through exposing key variables to various shocks.

Projections for the long term are problematic especially as relationships between macroeconomic variables are never static; indeed they often undergo some significant changes through time because of intervening events which need to be factored into the projections. The instability of macroeconomic relationships in LICs in a highly integrated and globalised world is a veritable phenomenon, with high potentiality to derail projections.

It is thus little wonder that WYPLOSZ (2007) reminds pundits that any debt sustainability assessment is only valid within the bounds of the underlying guesses.

VI.2 Alternative approaches to conducting stress tests

Currently stress tests are conducted based on the baseline scenario, to generate different scenarios. This can be improved upon in several directions including the use of more dynamic econometric simulation techniques. There is merit, however in the current practice of applying country specific events for bound tests in addition to standardized analysis of the impact of shocks to ease comparison across LICs, but the current DSAs do not exploit fully the time-series historical data for forecasting exercises. It does not take account uncertainty about future movements of macroeconomic variables that are directly relevant to determining debt dynamics (Arizala et al, 2008).

A manual by the Inter-American Development Bank (IADB) has featured approaches to calculating the likelihood that specific unfavourable shocks raise debts to levels that exceed the servicing capacity or fall into an explosive path over time (Borensztein, 2010). The "value at Risk analysis (fan charts analysis) is a strand of this method widely used for short term macro economic forecasting. The framework of fan charts" based on value at risk model can incorporate the structure of random shocks hitting the economic to obtain a complete distribution of probable outcomes.

This is a probabilistic approach undertaken to uncertainty analysis and is certainly superior to the current approach to forecasting adopted in DSAs, which is silent on how the main key variables in the equations of debt dynamic interact with one another.

Again the procedure in the fan charts can be automated to generate randomly a very large number of shocks, through Monte-Carlo simulations, assigning probability of occurrence to each shock. Therefore, a corresponding evolution of the debt dynamics associated with shocks is finally produced with a probability of occurrence. Currently the DSAs make arbitrary choices about the nature and size of shocks whereas the use of Fan Charts will make the choices more rational. This means that Fan Charts would be preferred to stress tests as the charts are able to produce a graphic illustration of wide-ranging possible paths of debt dynamics induced by shocks. In other words the Fan Charts are capable of conveying a "message" of probabilistic nature of debt sustainability exercises much more explicitly.

Even so, the use of fan charts does not guarantee the accuracy of forecasting value generated. It is still built on assumptions that the past is a good guide for future.

VI. 3 Use of discount rates

A technical question often raised in DSF exercise is over the choice of discount rate use for forecasting the present value (PV) of debt. The PV of debt is the sum of discounted values of all future principal and interest ($a_t + i_t$) at a given discounted rate (β) that is

$$PV = \sum_{t=1}^{h} \frac{(a_t + i_t)}{(1 + \beta)\, t - 1}$$

Since PV is always lower than the face nominal value debt is concessional. Hence the use of PV in the DSF, in calculating debt burden is justified on grounds that it can account for concessionality of debt by applying an appropriate discount rate. With the PV one can calculate the grant element (GE) an index of concessionality as follow:

$$\underline{GE} = \frac{\underline{(face\ value) - PV}}{\text{face value}}$$

In this regard, currently in the DSF the US dollar CIRR (commercial interest reference rate; six month average) is applied as an uniform discount rate for all LICs, the World Bank and IMF in 2009 aver that it is about to be adjusted downward from 5 to 4 percent.

The issue here is that there is no persuasive reason to apply this global commercial reference rate as a discount rate, to an official concessional debt. Donors insist on the use of a reference commercial rate, as the commercial rate reflects the opportunity cost of commercial landing from their perspective. But from a sovereign borrower's perspective in the case of LICs, it makes sense also to use other discount rates appropriate to the environment e.g. domestic interest rates adjusted for inflation or rate of currency movement. Domestic interest rate is already factored in domestic public debt. For external debt, it may be necessary to use relative real domestic interest rates in relation to effective interest rates on external loans (Nissanke, 2010) Thus, deciding which interest rates to use for forecasting in the debt sustainability analysis is problematic.

In the DSF- LIC framework, the uniformity in the discount rate used in the DSAs across combines is given a higher order of importance over country-specific discount rates which can take into account country specific circumstances such as reference domestic interest rate, exchange rates, inflation rate and stages of economic development. (Nissaanke, 2007) Alternative discount rates need to be articulated considering that the degree of debt burden is always influenced by the choice of discount rate for DSA.

IV.4 Omission of investment in the public debt-dynamics

A recent review of the DSF (2009) acknowledges that the DSAs do not explicitly and sufficiently consider the role of investment in the debt-growth nexus in stress tests. Hence the review requests the staff at the IFIs to carry out series of cross country regression analyses to examine the debt-investment-growth nexus (IMF/World Bank 2009).

In that regard, it is necessary to estimate the impact of additional public investment on other macroeconomic variables, such as GDP growth, exports and public revenues, which are the denominators of the debt indicators (Barkbu et al, 2008:13) So there could be two scenarios in this regard: high-investment, high growth scenario and high investment, low-growth scenario, thus suggesting the need to guard against excessive optimism on high growth dividends scenario.

LIC's sovereign debt should therefore not result solely from the need for financing temporary shortfalls in external and fiscal macroeconomic balances or consumption smoothing due to income shocks. Sovereign debt for LICs is justified on grounds that such borrowing/lending is for financing not just temporary shortfalls but development, i.e primarily to accelerate economic growth that will facilitate the process of economic development. Indeed development finance is the essential raison-d'etre of multilateral agencies and institutions.

IV.5 Conceptual issues

IV.5.1 Definitions

Debt sustainability is a vexing issue. Its importance is immediately obvious but it escapes any easy definitions, and therefore defies easy direct measurement. Granted that sustainability is entirely forward looking concept, any practical definition is arbitrary and sustainability indicator will be both arbitrary and too imprecise to serve as a tool for policy prescription. There is the issue of making definitions operational.

There seems to be too many competing definitions of external or public debt sustainability. One theoretically – pure concept is solvency. The other theoretically-clear concept proposed by Arrow et al. (2004), is that the net worth (of the country for external debt or the government for public debt) be weakly increasing. The second concept is less strict than the first one since solvency requires that the net worth be always positive. These concepts cannot be implemented as such, because they require knowledge of the future evolution of the debt (WYPLOSZ, 2007).

IMF (2002) further qualifies the solvency condition by averring that solvency be always maintained without any major adjustment. Wyplosz argues that both because it relies on solvency and because it rests on an unspecified limit to "major

adjustment", this definition of debt sustainability cannot be implemented as such. The definition, however is made operational by requiring that the debt does not exceed a threshold. Wyplosz avers that the Arrow et al (2004) concept can be made operational by ignoring the unobservable present value of primary balances and requiring that the debt-to-GDP ratio be stationary. Since stationarity is difficult to assess in practice, the definition can be implemented by requiring that the debt ratio be on a declining trend, which does not rule out occasional but temporary increases.

IV.5.2 Stabilizing the debt/GDP ratio

Goldstein (2003) proposes a relationship to monitor for debt GDP ratio stability:

$$D_{pri} = D_t (g - r)/(1 + g)$$

Where:

D_{pri} = *primary fiscal deficit*

From Equation (16), it can be inferred that the required primary deficit to keep the debt/GDP ratio stable will be lower (and hence fiscal effort higher), the higher the initial debt stock, dt the higher the real interest rate, r on the debt and the lower the rate of real GDP growth. The same observation can also be inferred from the basic debt dynamics given by Fisher and Easterly (1990):

$$Dp^d = (D_{pri} - nd) + (r - g) P^d \quad \text{.....15}$$

Optimize Equation (17) by setting

$$DP^d = 0 \text{ and solve for } d_{pri}$$

$$d_{pri} = n^d - p^d (r - g)$$

The required adjustment in primary deficits to keep debt GDP ratio stable can be derived using equation (18) by substituting values for n^d, p^d, r and g and multiplying the result by 100 to get the result in percentage terms.

Equations 16, 17 and 18 are at the centre of debt dynamics monitoring. Whenever, for instance, the interest rate exceeds the economy's growth rate, the debt accumulation process is unstable, thus giving bold relief to sustainability as an important issue or concern. Second, when the real interest rate and growth rates are close, small shocks can have dramatically powerful effects on the debt path.

V. CONCLUSION

This paper has reviewed the methodological and conceptual issues on debt sustainability analysis (DSA). It has also attempted a description of the practical

exercise of applying the WB/IMF debt sustainability analysis Template for low income countries (DSF/LIC) in conducting a generic debt sustainability analysis. It is expected that the pedagogic approach applied will serve as useful guides to participants in a DSA workshop.

Debt sustainability is an essential condition for economic stability and growth in low income countries. This is so reflecting the fact that excessive debt levels create adverse incentives for private investors or governments to engage in activities that spur long-term growth, irrespective of whether debt service obligations are expected to be financed by a country's resources or by additional aid inflows.

Even so, public debt sustainability is no doubt a daunting task. The economic environment that affects the evolution of debt ratios is highly variable and uncertain: government can make a credible commitment for the foreseeable future to adhere to a particular policy stance. A constant and even falling debt ratio may be unsustainable over the longer-term if domestic and external environment evolves unfavourably and the government is unable to respond to changed circumstances by squeezing out the primary surpluses needed.

The level of debt that should be considered as sustainable is country-specific and as such no single "safe" debt ratio could apply to all countries, for obvious reasons. First, the amount of primary budget and/or current account surplus needed to stabilize debt can be different in different countries with similar degrees of indebtedness depending on the terms and conditions of their debt stocks and potential growth rates. Second, countries differ in their ability to generate budget and/or current account surpluses needed, depending not only on economic factors, such as their tax and export bases, but also socio-economic characteristics.

The paper also notes that theoretical concept of sustainability based on solvency is problematic because it does not impose specific constraints on debt and deficits at any point in time. Since current deficits are collateralized by surpluses in some distant future, and level of debt and deficits could be compatible with the present value budget constraint. On the, other hand, both the underlying economic conditions as reflected by the growth-adjusted interest rate (that is, the rate at which future primary surpluses are discounted) and fiscal policy stance are highly uncertain.

Projections of debt dynamics under a baseline scenario are generated based on various assumptions made with respect to key variables. The assumptions themselves are derived, from the macroeconomic framework in use. DSAs are often presented as authoritative forecasts with forward-looking and probabilistic features which should be interpreted with great caution. This caveat is given hold relief in the 2004 IMF document which avers that "such projections are only as good as their underlying assumptions, and these assumptions have a particularly slender basis for the long time horizon implied by the average maturity of concessional loans. The scope for error is large, both on the upside and the downside" (IMF 2004:13)

Besides, the baseline is a crucial scenario in the DSA because first, it is compared with a historical scenario and it is against it that a reality check is called out to compare the projected time paths against alternative scenarios created by a series of bound tests through exposing key variables to various shocks.

Projections for the long-term are problematic especially as relationships between macroeconomic variables are never static; indeed they often undergo some significant changes through time because of intervening events which need to be factored into the projections. The instability of macroeconomic relationships in LICs in a highly integrated and globalised world is a veritable phenomenon.

It is thus little wonder that Wyplosz (2007) reminds pundits that any debt sustainability assessment is only valid within the bounds of the underlying guesses.

Alternative approaches to the design of stress tests, targeted at moderating DSA results by taking account of the increasingly stochastic environment are being canvassed. They include the use of probabilistic techniques such as Monte Carlo stimulations and value at risk (VAR) models. Even so, DSA results remain informed guesses that offer useful policy guides/choices or warnings to policy makers.

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