

# Interest Rate Liberalization and Economic Growth in Zambia: A Dynamic Linkage

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**Abstract:** This paper examines the dynamic impact of interest rate reforms on economic growth in Zambia—using two models in a stepwise fashion. In the first model, the efficacy of interest rate liberalization is examined by regressing the interest rate on the level of financial deepening. In the second model, the causal relationship between financial depth and economic growth is examined by incorporating savings as an intermittent variable in the bivariate setting, thereby creating a simple trivariate model. Using the cointegration-based error correction model, the study finds strong support for the positive impact of interest rate liberalization on financial deepening. In addition, the study finds that financial deepening, which results from interest rate liberalization, Granger causes economic growth. The results apply irrespective of whether the causality is estimated in the short run or in the long run. Other results show that: (1) lagged financial depth leads to further financial deepening; (2) savings and economic growth Granger cause each other; and (3) financial development Granger causes savings in the long run.

## 1. Introduction

The relationship between interest rate liberalization and economic growth has attracted considerable attention and debate in recent years. The thrust of the debate has been whether interest rate liberalization, as originally prescribed by the McKinnon (1973) and Shaw (1973) hypotheses, can unambiguously lead to economic growth. Although a number of empirical

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studies have been conducted on the link between interest rate liberalization and economic growth in many developing countries, the majority of these studies have concentrated mainly on Asia and Latin America, affording sub-Saharan African (SSA) countries very little coverage. In particular, the dynamic linkage between interest rate reforms and economic growth in countries like Zambia has not been fully explored. Even where such studies have been undertaken, findings on the role played by high interest rates and their effect on financial deepening, savings and economic growth are, at best, inconclusive (see Odhiambo, 2009c). Previous empirical studies on this subject suffer from three major limitations. First, the majority of the previous studies on this subject have attempted to examine the relationship between interest rate reforms and economic growth directly. Yet it is now becoming clear that the relationship between interest rate reforms and economic growth is an indirect one. Interest rate liberalization impacts on economic growth, *inter alia*, through its influence on financial deepening (Odhiambo, 2009c). Secondly, the majority of the previous studies on this subject have mainly used a bivariate causality test to examine the causal relationship between financial development and economic growth and may, therefore, suffer from the omission-of-variable bias. Thirdly, some of the previous studies have relied on the cross-sectional data to examine the relationship between interest rate reforms and economic growth. Yet, it is now clear that the cross-sectional method of lumping together countries that are at different stages of financial and economic development, may not satisfactorily address the country-specific effects (Odhiambo, 2008).

The current study, therefore, attempts to fill this lacuna by examining the dynamic relationship between interest rate reforms, financial development and economic growth in Zambia—using two models in a stepwise fashion. In the first model, the impact of interest rate reforms on financial development is examined by regressing financial development on the interest rate, real GDP growth rate, expected inflation and the lagged value of financial depth. In the second model, the inter-temporal causal relationship between financial development and economic growth is examined by including savings as an intermittent variable, thereby forming a simple trivariate model. The choice of savings as an intermittent variable in the trivariate framework has been largely influenced by the theoretical links between savings and economic growth, on the one hand, and savings and financial development on the other hand.

The remainder of the paper is organized as follows: Section 2 traces the origin of interest rate liberalization and the trends of financial deepening in Zambia. Section 3 sketches the relationship between interest rate reforms, financial development and economic growth. Estimation techniques and

empirical results are presented in Section 4, while Section 5 concludes the study.

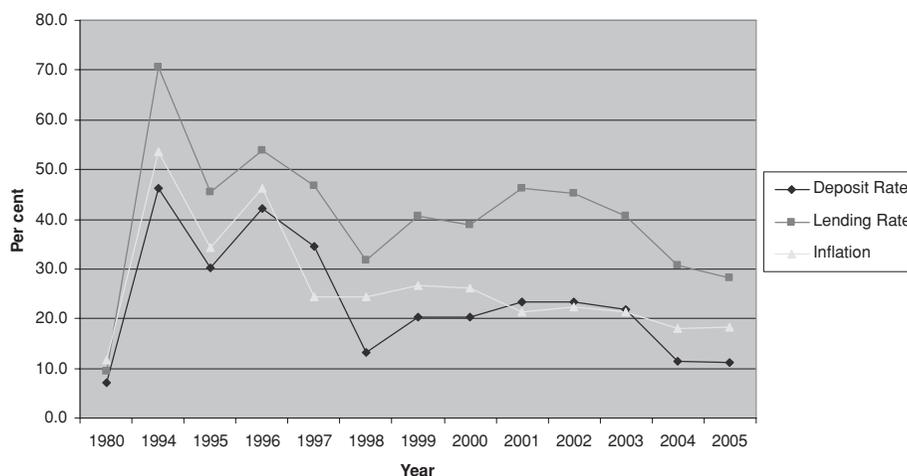
## **2. Overview of Interest Rate Reforms in Zambia**

### ***2.1 Interest Rate Liberalization***

For many decades, the Zambian economy was riddled with indirect controls over credit and interest rates. In particular, there were direct controls on lending as well as both local and international financial transactions. The government enforced a number of administrative controls in order to ensure that private lending is given to the priority sectors. Some of the controls imposed by the government included directed lending, limits on the composition of boards of directors and the control of interest rates. From the 1970s, both lending and deposit rates were kept low in Zambia in order to induce economic growth. This was mainly a Keynesian view that argues that low interest rates bolster investment, which leads to an increase in output. Low interest rates were also meant to keep the government and parastatal debt service costs as low as possible. However, in the 1980s, following the adoption of the structural adjustments programme, the government decided to increase the interest rates set for the financial institutions. For example, between 1983 and 1987, the lending rate increased by 63 percentage points while the treasury bill rate was increased by about 120 percentage points, from 7.5 percent to 16 percent. The interest rates in Zambia were finally liberalized in 1992. One year after the liberalization of interest rates, the lending rate rose by over 107 percentage points, from 54.57 percent in 1992 to 113.31 percent in 1993. During the same period the deposit rate and discount rate also increased significantly. The discount rate, for example, increased from 47 percent in 1992 to about 72.5 percent in 1993. Despite the fact that nominal interest rates increased phenomenally after the liberalization of interest rates in 1992, real interest rates remained positive for only a short period of time due to the high inflation recorded during this period.

From the foregoing, it is clear that financial liberalization in Zambia was hurriedly and prematurely implemented. Strictly speaking, the financial sector liberalization in Zambia should have been pursued more gradually and sequentially. For example, lending rate should be liberalized before deposit rate, and interbank interest rate should be liberalized before bank deposit and lending rates. This gradual approach is vital as it safeguards the profitability of banks while allowing time for people and firms to adjust accordingly. Figure 1 shows the trends of selected interest rates and inflation in Zambia between 1994 and 2005 when compared to 1980.

**Figure 1: Trends of interest rates in Zambia between 1994 and 2005 as compared to 1980**



Source: International Financial Statistics Yearbook (2007).

## ***2.2 Financial Sector Development and Economic Growth in Zambia***

The financial sector in Zambia is still small and shallow. The activity among commercial banks is limited and the derivatives market is virtually non-existent. The sector is basically a money market sector with a very small capital market. The Zambian financial sector has experienced two major phases since independence in 1964, namely the pre-reform phase (or Government's nationalization phase) and the post-reform phase. During the pre-reform phase, the Government made efforts to nationalize many financial institutions, especially the non-bank financial institutions (NBFIs). During this phase entry into the financial sector in Zambia was restricted. Instead, the government decided to establish financial institutions such as the Development Bank of Zambia (DBZ), the Local Authority Superannuation Fund (LASF) and the Zambia Export and Import Bank, through an Act of Parliament. However, during the second phase the liberalization of the financial sector took place on a large scale. The liberalization of the financial sector, which was implemented in 1991, led to the entry of new financial institutions into the industry. Since then the financial sector in Zambia has grown phenomenally. The financial sector currently consists of the Central Bank, commercial banks, non-bank financial institutions comprising the three building societies, some micro-finance institutions, the National Savings and Credit Bank (NSCB), the Development Bank of Zambia (DBZ), the 37 Bureaux de Changes and leasing companies, insurance companies, pension funds and the capital market. Notwithstanding the new entries into

the financial sector since the onset of financial liberalization, the Zambian financial system has remained relatively small and underdeveloped. For example, the monetization ratio (i.e. the ratio of  $M_2$  to GDP) has been in the range of 15–20 percent over the last 5 years compared to about 35 percent recorded in the 1980s. Apart from the state-owned Zambian National Commercial Bank (ZNCB), the majority of the banks in Zambia are foreign owned. In addition, the financial sector in Zambia is also mainly bank-based—with more than 90 percent of the financial system assets held by banks. Because of this, the foreign equity participation is very significant. The foreign equity participation in Zambia constitutes about 75 percent of the total banking system capitalization. The insurance business in Zambia is also very small. The business is currently dominated by the insolvent public sector—the Zambia State Insurance Corporation (ZSIC). In 2000, for example, the insurance sector only contributed 1.5 percent of GDP in premium.

### 3. Literature Review

The debate regarding the relationship between financial liberalization in general and interest rate in particular and economic growth has attracted considerable attention since the reinvention of the financial liberalization hypothesis by Ronald McKinnon and Edward Shaw in 1973. In particular, the efficacy of interest rate liberalization (proxied by real deposit rate) has been hotly contested from both the theoretical and empirical fronts in recent decades. According to the so-called McKinnon-Shaw hypotheses, the liberalization of interest rates enables savers to switch some of their savings from unproductive real assets to financial assets—hence expanding the supply of credit in the economy. In this way, financial liberalization impacts on economic growth, *inter alia*, through its influence on financial deepening and savings. However, in recent decades the theoretical arguments against this policy have been steadily growing in number and substance, and whether interest rate liberalization actually contributes to economic growth through its influence on savings, investment and financial deepening remains an empirical issue. One of the most influential arguments against interest rate liberalization is based on its ambiguous impact on domestic savings. This argument maintains that interest rate liberalization may not influence the level of savings, and if it does, it may reduce rather than increase the volume of savings. A number of reasons have been advanced in the literature to support this argument. The first and most appealing reason is that the negative income effect of increased interest rates might offset the positive substitution effect between consumption and savings. A change in interest rates, just like other prices, has two effects: substitution

and income effects. The substitution effect encourages saving by making current consumption more expensive, but the income effect deters savings because at a higher interest rate the same income can be obtained with less savings. In other words, high interest rates increase the opportunity cost of consumption, thus making households increase savings (the substitution effect), while the increase in wealth due to the increase in interest rates increases consumption (the income effect). This means that an increase in interest rates has an ambiguous effect on savings and current consumption. The income effect leads to more current consumption (hence less savings), while the substitution effect leads to less current consumption (hence more savings). However, many critics of interest rate liberalization, especially the structuralists, believe that the negative income effect of interest rate liberalization will offset the positive substitution effect between consumption and savings, thereby leading to a negative overall effect on savings (see Bandiera *et al.*, 1999; Warman and Thirwall, 1994; Cho and Khatkhate, 1990; Arrieta, 1988; Giovannini, 1983).

The second argument that has been advanced on the interest elasticity of savings is based on a strong belief that an increase in the real interest rate will only reallocate the existing volume of savings in favor of financial savings, and leave the total volume of savings unchanged. When the real interest rate is high, financial savings are made more attractive and economic agents find it more rewarding to transfer their savings from other forms of savings to financial savings. Such reallocation may also occur if reforms provide a new range of financial investments such as shares, mutual funds, postal savings, and pension funds. In other words, if these assets are made more attractive, it is likely that economic agents may reallocate their savings in favor of these assets, but such a reallocation may have no impact on the volume of the total savings (Gupta, 1984; Mahambare and Balasubramanyam, 2000).

The third argument is based on the fact that at low levels of income, interest rates are unlikely to stimulate savings because the totality of incomes will be devoted to consumption rather than savings. When income is low, especially during economic downturn, even if a high deposit rate is sustained, savings will not increase unless income rises beyond consumption level. Empirical studies have shown that even at relatively high levels of income, financial reforms, which ease borrowing constraints, may stimulate consumption rather than savings (see also Japelli and Pagano, 1989, 1994; Hall, 1978).

On the empirical front, a few studies have attempted to directly or indirectly examine the role of interest liberalization on economic growth in a number of developing countries, but with conflicting results. Fry (1980), for example, in a study of seven Asian countries, concludes that around half a percentage point in economic growth is foregone for every percentage point by which the real rate of interest is set below its equilibrium level. World Bank (1989)

also finds a positive relationship between real interest rates and economic growth in 33 developing countries for the period 1965–85. Roubini and Sala-i-Martin (1992), while using a more sophisticated method to examine the link between financial liberalization and growth, find that financial repression in the main tends to lower growth. Gibson and Tsakalotos (1994), however, cast doubts on the Roubini and Sala-i-Martin (1992) results. Their argument is that just like in other empirical work in this area, the results of Roubini and Sala-i-Martin (1992) could suffer from omitted variable bias because each measure of financial repression is added individually. Despite the arguments in favor of a positive relationship between interest rate liberalization and economic growth, a number of studies have also found contradictory results on the efficacy of interest rate liberalization. These include studies such as Khatkhate (1988) for the case of 64 developing countries and Gupta (1984) for the case of 25 Asian and Latin American countries, among others.

Just like the relationship between interest rate liberalization and economic growth, the causal relationship between financial development and economic growth has been very controversial and, therefore, remains an empirical rather than a theoretical construct. To date, there are at least four possibilities in the literature regarding the causal relationship between financial depth and economic growth. The first possibility is that financial development and economic growth are not causally related at all. This implies that neither of the two has any significant effect on the other, and that the empirically observed correlation between them is merely the result of a historical peculiarity. In other words, even though economies grow as the financial sector grows, the two sectors—financial development and economic growth—follow their own paths (see Graff, 1999). The second possibility is that financial development follows economic growth. This hypothesis is known as a demand-following response. According to this hypothesis, the development of the real sector induces the demand for financial services, which are passively satisfied by the introduction of new financial institutions (financial development).<sup>1</sup> The third possibility, which is known as a supply-leading response, argues that financial development is the ultimate determinant of economic growth, and that the line of causation runs from financial development to economic growth. The fourth possibility, however, maintains that both financial development and economic growth Granger cause each other. In other words, there is a bi-directional causality between financial development and economic growth. However, recent empirical studies have shown that the relationship between financial development and economic growth differs from country to country and over time. In addition, studies have shown that the causal relationship between these sectors is sensitive to the proxy used as a measure for financial development (see Odhiambo, 2007, 2008).

## 4. Estimation Techniques and Empirical Analysis

### 4.1 Financial Deepening Model

In this section, the relationship between interest rate liberalization and financial deepening is examined by regressing the financial depth variable on real income, deposit rate, expected inflation and the lagged value of financial depth. The research question in this case is whether real interest rates positively or negatively affect financial depth. The model can be expressed as follows:

$$\log(FD)_t = \beta_0 + \beta_1 \log y_t + \beta_2 \log d_t + \beta_3 \log P_t^e + \beta_4 \log(FD)_{t-1} + E_t \quad (1)$$

where  $(FD)_t$  is the financial depth variable proxied by M2/GDP;  $y$  is real income;  $d$  is the deposit rate (nominal);  $P^e$  is expected inflation; and  $(FD)_{t-1}$  is financial depth lagged once.

The rationale for including different variables in the financial deepening model is based on the following theoretical arguments: The inclusion of the deposit rate is expected to capture the impact of interest rate liberalization on financial deepening. The coefficient of deposit rate in the financial deepening model is, therefore, expected to be positive and statistically significant. A positive relationship between the real interest rate and financial depth will inevitably corroborate the positive role of interest rate liberalization on economic growth. The inclusion of inflation rate is meant to capture the impact of inflation on the various components of money. There has been an argument that inflation adversely affects the holding of all classes of financial assets and not just a narrow class. In addition, it has been argued that inflation tends to encourage the holding of currency and discourage the holding of quasi-money (see also Odhiambo, 2009b; Ikhide, 1992). According to English (1999), a higher inflation rate encourages households to substitute purchased transaction services for money balances, thereby boosting the financial sector. The coefficient of inflation in this case is, therefore, expected to be positive and statistically significant. The inclusion of real GDP is supported by the life cycle hypothesis and the coefficient of the variable is expected to be positive and statistically significant.

### 4.2 A Trivariate Granger Causality Model

In this section, a trivariate Granger causality model is used to examine the causal relationship between financial development, savings and economic growth in Zambia. A trivariate causality model has been used in this study because the causality tests based on a bivariate framework have been found

to be very unreliable. The introduction of a third important variable in the causality model can change both the causal inference and the magnitude of the estimates (see also Caporale and Pittis, 1997; Caporale *et al.*, 2004; Odhiambo, 2008; Odhiambo, 2009c). The trivariate Granger causality test based on the error correction model can be expressed as follows (see also Odhiambo, 2008):

$$y/N_t = \lambda_0 + \sum_{i=1}^m \lambda_{1i} y/N_{t-i} + \sum_{i=1}^n \lambda_{2i} FD_{t-i} + \sum_{i=1}^n \lambda_{3i} S/Y_{t-i} + \lambda_4 ECT_{t-1} + \mu_t \quad (2)$$

$$FD_t = \varphi_0 + \sum_{i=1}^m \varphi_{1i} y/N_{t-i} + \sum_{i=1}^n \varphi_{2i} FD_{t-i} + \sum_{i=1}^n \varphi_{3i} S/Y_{t-i} + \varphi_4 ECT_{t-1} + \varepsilon_t \quad (3)$$

$$S/Y_t = \delta_0 + \sum_{i=1}^m \delta_{1i} y/N_{t-i} + \sum_{i=1}^n \delta_{2i} FD_{t-i} + \sum_{i=1}^n \delta_{3i} S/Y_{t-i} + \delta_4 ECT_{t-1} + \nu_t \quad (4)$$

where  $ECT_{t-1}$  is the error correction term lagged one period;  $Y$  is economic growth (real GDP per capita);  $FD$  is financial depth variable (M2/GDP);  $S/Y$  is savings (a third important variable affecting finance-growth relationship); and  $\mu$ ,  $\varepsilon$  and  $\nu$  are mutually uncorrelated white noise residuals.

It is worth noting that in the error correction based causality test, the short-run causal impact is measured through the  $F$ -statistics and the significance of the independent variables, while the long-run causal impact is measured through the error correction term (see also Odhiambo, 2009b).

### 4.3 Data Source and Definitions of Variables

#### Data Source

Annual time series data, which cover the 1969 to 2006 period, are utilized in this study. The data used in the study are obtained from different sources, including various issues of the Bank of Zambia annual reports, International

**Table 1: Stationarity tests of variables on first difference—Phillips-Perron (PP) test**

Variable	No trend	Trend	Stationarity status
$\Delta LM2/GDP$	-7.6956***	-7.8973***	Stationary
$\Delta Ly$ -growth	-11.2490***	-11.5850***	Stationary
$\Delta Ld$	-6.0506***	-5.9984***	Stationary
$\Delta Ly/N$	-5.5969***	-5.2451***	Stationary
$\Delta LS/Y$	-6.8659***	-8.6186***	Stationary
$\Delta LP^e$	-5.5530***	-5.5323***	Stationary

Note: The truncation lag for the PP tests is based on Newey and West (1987) bandwidth.

\*\*\* denotes significance at 1%.

Financial Statistics (IFS) Yearbooks published by the International Monetary Fund and World Bank Statistical Yearbooks.

### *Definitions of Variables*

- Financial depth =  $M2/GDP$   
where  $M2$  = broad money stock; and  $GDP$  = gross domestic product.
- Nominal deposit rate ( $d$ ) = interest rate on 6 to 12 months deposit in commercial banks.
- Expected inflation ( $P^e$ ) = The unobservable expected inflation is generated from the actual inflation rate using the adaptive expectations theory.
- Real GDP per capita ( $y/N$ ) = Real GDP ( $y$ )/Total Population ( $N$ )
- Savings ( $S/Y$ ) = Gross Domestic Savings/GDP

## **5. Empirical Results**

### **5.1 Stationarity Test**

The results of the stationarity tests in levels (not presented here) show that all variables are non-stationary in levels. Having found that the variables are not stationary in levels, the next step is to difference the variables once in order to perform stationary tests in difference form. The results of the stationarity tests in first differences based on the DF-DLS and the Phillips-Perron class of tests are presented in Tables 1 and 2.

The results reported in Tables 1 and 2 show that after differencing the variables once, all the variables were confirmed to be stationary. It is, therefore, worth concluding that all the variables are integrated of order one.

**Table 2: Stationarity tests of variables on first difference—DF-GLS test**

Variable	No trend	Trend	Stationarity status
$\Delta LM2/GDP$	-7.3994***	-8.1191***	Stationary
$\Delta Ly$ -growth	-9.2352***	-5.3967***	Stationary
$\Delta Ld$	-5.7658***	-5.8015***	Stationary
$\Delta Ly/N$	-3.4782***	-3.6218***	Stationary
$\Delta LS/Y$	-6.6280***	-7.5006***	Stationary
$\Delta LP^c$	-6.6220***	-6.7491***	Stationary

Note: Critical values are based on Elliot-Rothenberg-Stock (1996, Table 1).

\*\*\*, \*\*, and \* denote 1%, 5% and 10% level of significance, respectively.

**Table 3: Johansen-Juselius maximum likelihood cointegration tests**

Trace test				Maximum eigenvalue test			
Null	Alternative	Statistics	95% Critical value	Null	Alternative	Statistics	95% Critical value
<b>Cointegration—financial deepening model</b>							
$r = 0$	$r \geq 1$	73.00	47.2	$r = 0$	$r = 1$	43.11	27.1
$r \leq 1$	$r \geq 2$	27.89	29.7	$r \leq 1$	$r = 2$	12.73	21.0
$r \leq 2$	$r \geq 3$	14.16	15.4	$r \leq 2$	$r = 3$	10.62	14.1
$r \leq 3$	$r = 4$	2.534	3.8	$r \leq 3$	$r = 4$	2.534	3.8
<b>Cointegration—causality model</b>							
$r = 0$	$r \geq 1$	110.7	24.3	$r = 0$	$r = 1$	91.76	17.9
$r \leq 1$	$r \geq 2$	11.99	12.5	$r \leq 1$	$r = 2$	10.11	11.4
$r \leq 2$	$r = 3$	2.875	3.8	$r \leq 2$	$r = 3$	2.875	3.8

Note:  $r$  stands for the number of cointegrating vectors

## 5.2 Cointegration Test

Having established that the variables included in both the financial deepening and multivariate causality models are integrated of the same order (order one), the next procedure is to test the possibility of cointegration among the variables used. For this purpose, the study uses the Johansen–Juselius (maximum-likelihood) technique. The results of the cointegration tests are presented in Table 3.<sup>2</sup>

The results of the trace tests indicate that there is a unique cointegrating vector between the variables included in both the financial deepening model and the Granger causality model. The trace and Eigenvalue tests statistics reject the null hypotheses of  $r = 0$  in both models in favor of the general alternative hypotheses of  $r \geq 1$  and  $r = 1$ , respectively. It is, therefore, concluded that there is at least one cointegrating vector in both models.

**Table 4: The results of the preferred model**

Variable	Coefficient	T-value	T-prob
Constant	0.00674	0.216	0.8319
$\Delta LM2/GDP\_3$	0.44039	2.090	0.0540
$\Delta LM2/GDP\_4$	0.15778	0.659	0.5200
$\Delta LM2/GDP\_5$	0.79947	2.705	0.0163
$\Delta y$ -growth	-0.00715	-1.699	0.1100
$\Delta y$ -growth <sub>1</sub>	0.004265	1.190	0.2527
$\Delta y$ -growth <sub>2</sub>	0.00243	0.570	0.5774
$\Delta y$ -growth <sub>4</sub>	-0.00706	-1.997	0.0643
$\Delta LD\_1$	0.26688	2.156	0.0477
$\Delta LD\_2$	0.15114	1.296	0.2146
$\Delta LD\_3$	-0.12760	-1.138	0.2728
$\Delta LD\_4$	0.19419	1.591	0.1325
$\Delta LP^e\_1$	-0.25402	-2.380	0.0310
$\Delta LP^e\_2$	0.19714	1.959	0.0689
$\Delta LP^e\_3$	-0.36323	-2.944	0.0100
$ECM\_1$	-0.35953	-2.207	0.0433

$R^2 = 0.676634$   $F(15, 15) = 2.0925$  [0.0821]  $\delta = 0.15176$   $DW = 2.07$

$RSS = 0.3454656585$  for 16 variables and 31 observations

AR 1-2  $F(2, 13) = 0.18982$  [0.8294]

ARCH 1  $F(1, 13) = 0.014706$  [0.9053]

Normality  $\chi^2(2) = 4.9974$  [0.0822]

RESET  $F(1, 14) = 4.4957$  [0.0523]

### 5.3 Empirical Analysis

#### *Financial Deepening Model*

The results of the over-parameterized error correction models (not reported here) are difficult to interpret and many variables are not significant. The model is therefore reduced until the preferred model is obtained. The results of the preferred model are presented in Table 4.

The results reported in Table 4 show that there is a positive relationship between financial deepening and the deposit rate in Zambia. As shown in Table 4, the lagged deposit rate in the financial deepening model is positive and statistically significant, as expected. Likewise, the error correction term lagged once is negative and statistically significant, as expected. Specifically, the coefficient of the error correction term indicates that about 36 percent of the discrepancy between the actual and equilibrium values of the financial depth in Zambia is corrected each period. Other results show that the coefficients of the lagged values of the financial depth are positive and statistically significant, as expected, while the coefficients of the real GDP growth rate and inflation rate are mixed.

**Table 5: Causality test between  $\Delta L_y/N$ ,  $\Delta S/Y$  and  $\Delta LM2/GDP$** 

Variables in equation	Dependent variables		
	$\Delta L_y/N$	$\Delta LM2/GDP$	$\Delta S/Y$
$\Delta L_y/N$	—	—	1.9115(2.186)**
$\Delta L_y/N-1$	0.76153(3.554)***	—	—
$\Delta L_y/N-3$	0.42982(2.135)**	0.48326(2.546)**	—
$\Delta L_y/N-5$	0.32286(1.558)	0.16529(1.558)	—
$\Delta LM2/GDP-2$	-0.28638(-1.568)	—	1.6160(1.557)
$\Delta LM2/GDP-3$	-0.24992(-1.387)	—	2.3175(2.144)**
$\Delta LM2/GDP-4$	—	—	0.99062(1.071)
$\Delta LM2/GDP-5$	0.28744(1.985)*	0.071272(0.499)	—
$\Delta S/Y$	0.050023(1.750)*	—	—
$\Delta S/Y-1$	0.055291(1.578)	0.11743(3.517)***	—
$\Delta S/Y-2$	0.033072(0.965)	0.062326(2.038)**	0.12492(0.689)
$\Delta S/Y-3$	—	—	0.23164(1.209)
$\Delta S/Y-4$	0.057514(1.908)*	0.046006(1.645)	—
$ECM_{-1}$	-0.63164(-3.774)***	-0.21458(-1.549)	-0.90627(-4.509)***
F-Test	3.184 [0.0147]	2.934 [0.0250]	3.5237 [0.0109]
R <sup>2</sup>	0.69	0.48	0.53
DW	2.40	2.07	1.91

Notes: \*, \*\* and \*\*\* denote 1%, 5% and 10% level of significance respectively. The numbers in parentheses represent *t*-statistics.

### Multivariate Causality Analysis

Although cointegration indicates the presence of Granger causality, at least in one direction, it does not indicate the direction of causality between variables. The direction of the Granger causality can only be detected through the error correction model (ECM) derived from the long-run cointegrating vectors. In addition to indicating the direction of causality among variables, the ECM enables us to distinguish between the short-run and the long-run Granger causality. The *F*-test of the explanatory variables indicates the ‘short-run’ causal effects, whereas the ‘long-run’ causal relationship is implied through the significance of the *t*-test of the lagged error correction term. The results of the causality test between financial depth ( $M2/GDP$ ), savings ( $S/Y$ ) and real GDP per capita ( $y/N$ ) are displayed in Table 5.

The empirical results reported in Table 5 reveal that for the causality between financial depth and economic growth, there is a distinct (short-run and long-run) causal flow from financial development to economic growth and a *prima facie* (short-run) causal flow from economic growth to financial development. As reported in Table 5, the short-run causal flow from financial development to economic growth is supported by the significant *F*-statistics and the lagged financial development variable in the economic growth equation, while the long-run causal flow is supported by the lagged value of the error correction term—which is negative and statistically significant as

**Table 6: Summary of causality test—Zambia**

Variables	Long-run causality	General conclusion
$\Delta L_y/N$ and $\Delta LM2/GDP$	There is a distinct causal flow from financial development to economic growth and a <i>prima facie</i> (short-run) causal flow from economic growth to financial development.	Finance-led growth predominates.
$\Delta LS/Y$ and $\Delta LM2/GDP$	There is a distinct causal flow from financial development to savings and a <i>prima facie</i> (short-run) causal flow from savings to financial development.	Financial development Granger causes savings in the long run.
$\Delta L_y/N$ and $\Delta LS/Y$	There is a bidirectional causal relationship between economic growth and savings	Economic growth and savings Granger cause each other.

expected. The *prima facie* causal flow from economic growth to financial development is supported by the  $F$ -statistics and the lagged economic growth variable, which are statistically significant. Overall, the results show that in the main financial development Granger causes economic growth in Zambia. Other results show that there is a bidirectional causality between savings and economic growth in Zambia, as shown by the coefficients of the lagged independent variables, lagged error correction term and the  $F$ -statistics in the savings and economic growth equations, which are all statistically significant, as expected. The results also show that there is a distinct causal flow from financial development to savings and a *prima facie* (short-run) causal flow from savings to financial development. A summary of the long-run causality test between the three variables is presented in Table 6.

## 6. Conclusion

This study examines the dynamic impact of interest rate reforms on economic growth in Zambia through its influence on financial deepening. The study attempts to answer two critical questions: Does interest rate liberalization in Zambia have any positive influence on financial deepening? Does the financial depth that results from interest rate liberalization lead to economic growth? The study uses two models in a stepwise fashion to examine this linkage, namely a financial deepening model and a trivariate causality model. The empirical results show that there is strong support for the positive impact of interest rate liberalization on financial deepening. In addition, the study finds that financial deepening, which results from interest rate liberalization,

Granger causes economic growth—although there is a short-run feedback causality from economic growth to financial development. Other empirical results show that: (1) savings and economic growth Granger cause each other; and (2) financial development Granger causes savings in Zambia—although there is a *prima facie* (short-run) feedback causality from savings to financial development. The findings of this study, therefore, support the interest rate liberalization policy, which has been ongoing in Zambia since the 1990s.

### Notes

1. See Robinson (1952); Patrick (1966); Demetriades and Hussein (1996); Chuah and Thai (2004).
2. The Akaike and Schwarz criteria were used to determine the number of lags for the cointegration test.

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