Financial Development and Economic Growth in Sudan: Empirical Assessment Based on an Application of the Autoregressive Distributed Lag (ARDL) Model

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Abstract

This study investigates the effect of financial development on economic performance in Sudan over the period (1970- 2007) by using the Autoregressive Distributed Lag (ARDL) approach to co-integration. The main empirical findings indicate a weak relationship between financial development and economic growth in Sudan. These findings may be attributed to the inefficient allocation of resources by banks, along with the absence of an appropriate investment climate required to foster significant private investment and promote growth in the long run, and to the poor quality of credit disbursal of the banking sector in Sudan.

Keywords: Financial Development, ARDL, ECM, Economic Growth, Sudan

1. Introduction

The financial sector usually plays a central role in the process of economic development and growth in a country. Banks as financial intermediaries play a key role in transforming deposits into financial assets. They channel funds from entities with surplus liquidity to those lacking it, thereby facilitating capital formation and trade. In this context, well-developed financial systems can be expected to accelerate the development process by channeling financial recourses to the most productive use. The most influential works that underpin this hypothesis are perhaps (Levine and King 1993a, 1993b) which suggest that better financial systems lead to more robust economic growth.

However, despite the major role played by the financial sector in the process of growth and development, its role remains quite limited in many developing countries, especially sub-Saharan African countries. This due to the fact that, the financial sector in most countries remains highly fragmented and inefficient, protected from competition or is highly segmented and regulated. Moreover, financial systems in most SSA countries are dominated by a small number of banks that command heavy markets power, which undermines the efficiency allocation of resources.

In the mid 1980s, many countries in Sub-Saharan Africa (SSA) initiated financial Policy reforms as part of structural adjustment programs. As a result, most SSA governments shifted their economies from the state of "control" model to more market based systems as a means of promoting a stable economic environment. This was particularly relevant in the financial sector where it was hoped that streamlining the sector would stimulate domestic resource mobilization and increase the capacity of the banking system to support private sector participation in economic development.

As in most developing countries, the Sudanese financial market is still young and underdeveloped following years of repression, political and economic instability up healed by long chronic civil war. To develop the financial sector, the government embarked upon policies to reform it. These reforms, which took a variety of forms, started long years ago and can be traced back to the years following the independence in 1956, but these reforms had shown little improvements in the Sudan financial sector because they were not implemented under formal structural economic programs.

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This paper is concerned with the short and long run determinants of economic growth in the context of Sudan. It uses the bounds testing procedure to examine empirically the impact of the financial sector development on economic growth in Sudan by employing data for the period 1970-2007.

The paper proceeds as follows: section two, provides an overview of the Sudanese financial system and its contribution to economic performance. Section three, briefly reviews the literature on the growth- finance nexus. Section four, specify the model and indicates the sources of data and setting up the econometric methodology used in the study. Section five, contains the main findings of the study, their analyses and assessments, and the final section contains policy implications and conclusions

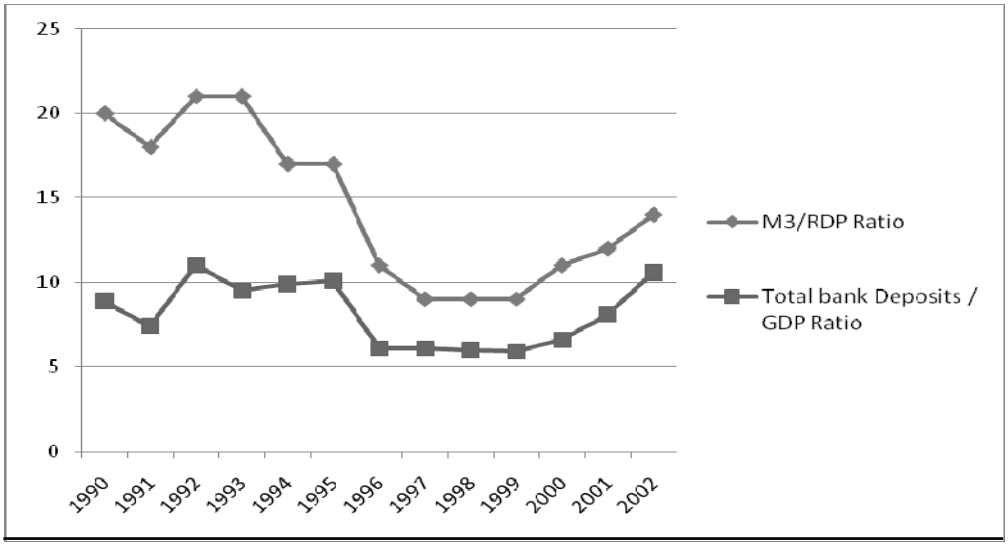
2. Financial Sector and Economic Performance in Sudan

Like many developing countries, the Sudanese financial sector[1] was dominated by commercial banks rather than by bonds and equity markets, which require a mature system of accounting and financial information. Historically, Sudan's financial system has been characterized by heavy government interventions and regulations, centralized lending by the central bank to public enterprises, absence of indirect monetary policy instruments, Lax bank supervision and an inadequate accounting system.

To develop the financial sector, Sudan has made notable efforts over the past decade to reform its financial system. Considered an integral part of macroeconomic policy, the financial reforms are expected to bring about significant economic benefits, particularly through more effective mobilization of domestic savings and more efficient allocation of resources. Following independence in 1956 up to the mid of the nineties the government of Sudan was mainly concerned with establishing the necessary infrastructure to support its different macroeconomic policies. So, since then, sporadic attempts were undertaken to reform the financial system[2].

The inefficiencies and distortions of the financial system were exacerbated by the emergence of severe macroeconomic difficulties in Sudan in the late the eighties. To overcome the financial problems and spur economic growth, the government of Sudan embarked on a wide range of stabilization and structural reform programme[3]. Financial reforms were an important component of this programme. The objectives of these reforms were to introduce some new measures with the aim of strengthening the financial system, notably the tightening of capital adequacy ratios and the establishment of new paid-in capital minimum. Previously, there had been no minimum capital requirements, and the introduction was designed both to make the sector more robust and to force Sudan's smaller banks to merge. Classification and provisioning regulations against bad

Figure 1: Selected Monetary Ratios in Sudan: 1990-2002



Source: World Bank development indicators, 2005 and bank of Sudan annual reports (various issues)

Table 1: Sudan Financial Sector: Some Financial Indicators (2000-2004)

Monetary Indicators	*2000*	*2001*	*2002*	*2003*	*2004*
Total Assets (M.SD)*	357.1	455.3	611.2	789.6	989.2
Paid-Up Capital (M.SD)	11.1	33.9	30.1	50.1	76.3
Capital- Adequacy ratio (%)	7.0	11.0	8.3	9.9	12.0
Expense/ Revenue Ratio (%)	65.5	54	51	46	71.1
Total Profits (M.SD)	5.4	5.7	7.9	17.9	21.5
Total Credits (M.SD):	92.7	140.1	487.9	294.7	493.7
in Local Currencies	79.2	111.4	160.0	216.0	461.3
in Foreign Currencies	15.3	28.7	33.2	78.7	32.4
Non-Performing Loans (%)	15.4	15.7	12.2	11.4	8.6

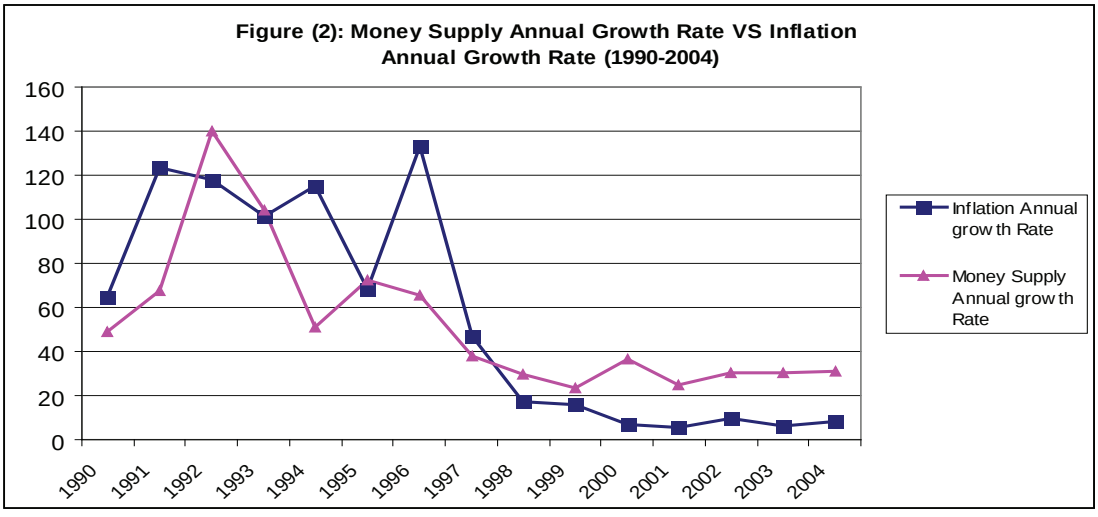
**Note: (M.SD) stands for Milliard Sudanese Dinars*

Source: Bank of Sudan Annual Reports (Various issues)

and suspect loans were also tightened, internal liquidity ratios revised upward and central bank monitoring and supervision requirements strengthened. In addition, the central bank reformed its liquidity management tools to encourage the development of a more active inter-bank local and foreign-currency market. In 1993, the Central bank of Sudan (CBOS), which is the monetary authority in the country "abolished the individual bank credit ceiling; tightened conditions for extending lending to non-banks: and introduced requirements for inter-bank control, loan classifications and provision of capital adequacy (Kireyev, 2001).

However, following the reforms, financial intermediation activity has certainly experienced relative expansion. The bank deposits which frequently used measure of financial depth have increased from around 6 per cent of GDP in 1996 to 10.6 percent in 2002. Similarly, the ratio of M3 to GDP rose from 9 per cent in 1997 to 11, 12, and 14 per cent in 2000, 2001, and 2002 respectively. The other financial indicator such as non-performing loans, capital adequacy ratio and paid-up capital also, shows relative improvements (Refer to Figure 1 and Table 1).

Moreover the period of adjustment witnessed increased macroeconomic stability. Budget deficit/GDP ratio



Source: World Development Indicators, 2005

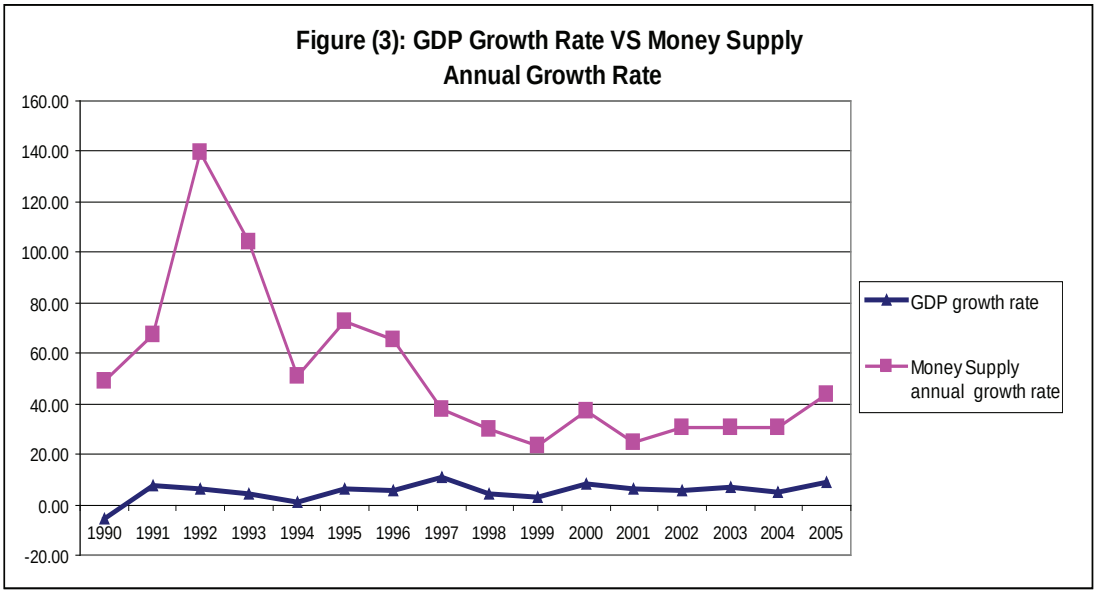
dropped drastically from 4.4 per cent in 1993/93 to 1.8 percent in 2001.The rate of inflation has been reduced from more than 130 percent in 1996 to one single digit in 2000 and 2001 with an average of 8 and 6 per cent respectively. In addition, the money supply growth rate ranges between 23 to 30 per cent during the period (1999 –2002) from an average of 66 per cent in 1996. This is mainly due to the reduction of domestic credit and reform policies that have taken place in commercial banks (see figure 2 &3). An impressive growth in real GDP has also been achieved. The economy improved from -5% annual growth rate in 1990 (The pre-reform period) to relatively steady growth rate of about 6 per cent during the reform period. However, to ascribe this impressive performance in real GDP growth rate only to financial sector reform would be dubious. In 1991, the immediate year preceding the reform, real GDP grew by 8 percent where as it dropped to 7, 5, and 1 percent in 1992, 1993 and 1994 respectively (the first years of reforms). The channels through which the reform would have led to improved growth have been shown to deteriorate during the first years of the reform. Financial savings, efficiency, credit flow to the private sector became poorer during the reform period. Thus forces outside the financial sectors must have influenced the growth in real GDP.

To sum up, the reform policy showed some progress specially in the relative success of stopping the disintermediation process. Some indicators have been improved during the reform period but still remain lower if compared with other developing countries. Moreover, the financial sector is far to achieve the full efficiency since some recent reforms have not already produced their expected effect especially those designed to promote long-term savings mobilization and financing investment.

3. Literature Review

Financial systems have long been recognized to play an important role in economic development and growth. Their role in economic growth has attracted much interest among academics, policy makers and economist around the world and has resulted in a large body of literature, both at the theoretical and empirical levels, that addresses the potential links between financial development and economic growth.

The theoretical literature suggests that a well-developed financial sector plays an important role in the overall development. The idea that financial development promotes growth was first put forth by Schumpeter as early as 1911 (Schumpeter, 1912). Several other economists have investigated this relationship and hold the view that financial development is a necessary condition for achieving high rate of economic growth (Goldsmith, 1969; Mckinnon, 1973; Shaw, 1973 and Ergungor, O. E. (2008). This is what Patrick calls the 'supply leading' role of financial development. Financial development is seen as contributing to economic growth through various channels: (i) efficient allocation of capital as the proportion



Source: World Development Indicators, 2005

of financial saving in total wealth rises, (ii) mobilization of savings by providing attractive instruments and saving vehicles, (iii) provision of vehicles for trading, pooling and diversifying risk, (iv) lowering of cost of gathering and processing information and thereby improve the allocation of resources and (v) increased specialization in production, development of entrepreneurship and adoption of new technology. In short, it is argued that the existence of a well functioning financial sector will assist in the mobilization of limited resources from the surplus units to the deficit units thereby promoting efficient allocation of resources and thus lead other economic sectors in their growth process.

In contrast, is the view called 'demand following' argument. According to this view, financial development is viewed as the handmaiden of economic development, reacting passively to the demand for financial services by a growing economy (Robinson, 1952; Romer, 1990; Stem, 1989). The development in the financial sector is facilitated by growth in the real sector of the economy. The argument is that high economic growth creates demand for certain financial instruments and arrangements and that financial markets effectively respond to these demands and changes.

The third view called 'feedback' hypothesis suggests a two-way relationship between financial development and economic growth, with the nature of the relationship depending on the stage of economic development. The proponents of the model assert that a country with a well-developed financial system could promote high economic expansion through technological changes, product and services innovation (Schumpeter, 1912). In turn, this economic expansion will create high demand on the financial arrangements and services (Levine, 1997). However, as the financial institutions effectively respond to these demands, then these changes will stimulate a higher economic growth. In short, both financial development and economic growth are positively interdependent and their relationship could lead to feedback causality$_4$ (Luintel & Khan, 1999, Rousseau & Vuthipadadorn, D. (2005).

Moreover, many empirical studies have investigated the relationship between financial development and economic growth. But the results are ambiguous. Studies based on the cross-section and panel data find positive effects of financial development on output growth, even after accounting for other determinants of growth as well as the potential biases induced by simultaneity, omitted variables and unobserved country-specific effect on the finance–growth nexus (see, for example, Gelb (1989); Khan and Senhadji (2000); King and Levine (1993a, 1993b and 1993c); and Levine et al. (2000)). On the other hand, studies based on the time-series data give contradictory results. Demetriades and Hussein (1996) find finance to be a leading factor in the process of economic growth. They further found that for the majority of the countries, causality is bi-directional, while in some cases financial development follows economic growth. Luintel and Khan (1999) used a sample of 10 Least Developed Countries (LDCs) and concluded that the causality between financial development and output growth is bi-directional for all. Finally, the studies that relate the structure and sources of company finance also conclude that the development of the financial sector facilitates the growth of the corporate sector (Rajan and Zingalas 1996). Based on the literature, one can say that a consensus on the role of financial development in the process of economic growth does not appear to exist.

At the outset, it can be noted that, although numerous studies have been undertaken in this area on the importance of the impact of the banking sector development on economic growth, this paper contributes to this debate and concentrate on Sudan.

4. Model, Data Sources and Methodology

4.1 Model and Data Sources

The general model specification in our analysis includes three categories of variables which in the relative literature appear to play an important role in explaining the growth performance. The three broad categories are: financial development, macroeconomic policies and other control variables. The model specification used in the analysis is:

$$Y_t = \beta_0 + \beta_1 FinDev_t + \beta_2 Policy_t + \beta_3 Control_t + \varepsilon \qquad (1)$$

Where: t is the time dimension ($t=1...T$); Y_t is the growth rate of GDP per capita income; $FinDev_t$ is a measure of financial development; $Policy_t$ is a measure that approximates macroeconomic environment; $Control_t$ is a set of other country specific variables.

For the empirical work, we employ data from sources and reports that have been internationally recognized for their

reliability. These are: World Development Indicators (WDIs) from World Bank (2007)[5] and International Financial Statistics published by the World Bank. The dependent variable of the present analysis is Y_t and it is defined as the growth rate of real per capita GDP in constant 2000 U.S. dollar. In various model specifications of our study, two different measures of financial development are employed in an attempt to capture the effect of as many possible aspects of financial' role in economic performance. The first measure M3/GDP is denoted by M3Y. M3 as a percentage of GDP has become a standard measure of financial depth and an indicator of the overall size of financial intermediary activity in cross-country studies. The choice of M3Y may be seen in accordance with the inside money model of McKinnon (1973) where the accumulation of real money balances is a required condition for investment. An increase in M3Y may be interpreted as an improvement in financial deeping in the economy. The second proxy of financial development is the value of credit offers by the commercial banks to the private sector divided by GDP denoted by CBS is used to measure the private sector financing role of commercial banks and is in line with De Gregario and Guidotti (1995). This proxy does not include credit to the private sector by non-deposit money banks, the central bank; credit issued to governments or public enterprises and hence is an exclusive measure of the intermediary role of commercial banks. This proxy represents the financial intermediary in one of its main function namely that of credit intermediation by channelling savings to investors. This indicator represents an accurate indicator (proxy) of functioning of financial development because it is a measure of the ability of the banking system to provide finance-led growth (Levine and Zervos, 1998).

Following the relative growth literature, we introduce a number of macroeconomic policy measures in out attempt to explain Sudan country differences in economic performance. Among the policy variables we include inflation *INF* as an indicator of macroeconomic instability and it is measured by the change rate of consumer price index. It is expected that high inflation distorts economic activity and reduces economic growth. We also include government spending (*GOV*) as a percentage to GDP. Like inflation, *GOV* may be used as a measure of macroeconomic instability but also it can present the demand busting policies to growth promotion by the government; hence, the relationship can be either way.

An additional set of explanatory variables often used in this type of research refers to a set of variables that describe either the investment conditions or the trade position of the country. Among these variables, we include Index of Trade Openness (*TROP*) measured as the sum of imports and exports as a percentage of nominal GDP. Domestic Investment (INV) as proxies by gross fixed capital formation as percent of GDP, is considered an important factor to growth performance and thus it is included in our work. In addition to the six variables described above we introduced a dummy variable which takes the value of zero from 1970 to 1990 and the value of one afterwards, to account for the financial reform of the banking system launched in Sudan during 1990's.

4.2 Econometric Methodology

This study employs the autoregressive distributed (ARDL) bounds test proposed by Pesaran, Shin, and Smith (2001) to examine the co- integration relationship between financial development and economic growth[6].

Moreover, the ARDL modelling approach to co integration, involves OLS estimation of an unrestricted Error Correction Model (ECM) of the following type as a first stage:

$$\Delta Y_t = \lambda_{0+} \lambda_1 T + \psi_1 Y_{t-1+} \psi_2 X1,_{t-1} +\ldots\ldots\ldots + \psi_k X_{k,t-1+}$$

$$\sum_{i=1}^{p-1} B \Delta Y_{t-1+} \sum_{i=1}^{q-1} \psi_1 \Delta X1,_{t-1+\ldots\ldots\ldots} \sum_{i=1}^{k-1} \Phi ki \Delta X_{1,t-1+} \varepsilon_1 \quad (2)$$

Where Δ is the difference operator, λ_0 is a constant, T is a time trend, Y is the dependent variable, Xi ($i = 1, 2, \ldots, k$) are explanatory variables, ε is the error term, p and q are maximum lag orders, and the rest are coefficients.

There are two steps in testing the co integration relationship between economic growth and the explanatory variables. First, we estimate Eq. (2) by ordinary least square (OLS) technique. Second, the presence of co integration is traced by restricting all estimated coefficients of lagged variables equal to zero. That is, the null hypothesis $\varphi_1 = j_{2=} \ldots = j_k = 0$ against the alternative hypothesis $\varphi_1 \quad 0, = j_2 \quad 0. \ldots \varphi_k$ 0. If the computed F-statistic is less than lower bound critical value, then we don't reject the null hypothesis of co integration. However, if the computed F-statistic is greater than upper bound critical value, then we reject the null hypothesis and conclude that there exists steady state

equilibrium between variables under study. However, if the computed value falls within lower and upper bound critical values, then, the result is inconclusive.

5. Empirical Results

The bounds testing approach to co integration does not require any pre-testing of unit roots. However, it is not necessary that all the series are I (0) and I (1); if any of the series are I (2), then the ARDL procedure gives spurious results.

Hence, testing of unit root for each series is important before the implementation of the ARDL cointegration method. To examine the time-series properties of the data, we employ an augmented Dickey-Fuller (ADF) unit root test. The ADF tests results as presented in Table 2 clearly reveals that all the financial variables along with the selected growth variables are integrated at order 1, 1(1), i.e., they become stationary after first differencing.

Table 2: Unit Root Test Results

ADF Test		
Variables	**levels**	**Ist differenced**
Y_t	-I.21345	- 4.343***
INV	-0.54321	-6.044**
GEX	-2.10121	-3.233**
INF	-1.56112	-5.145***
TROP	-2.21211	-6.021*
CBS	-2.23451	-3.556**
M3Y	-1.3212	-8.072***

Note: (1) Critical values follow McKinnon (1991) (2) One, two and three asterisks indicate statistical significance at the 1%, 5% and 10% levels respectively.

In the first step of the ARDL analysis, we tested for the presence of long-run relationships in model (1) and model (2). Given the fact that we have annual time series data and limited number of observations (38), the lag length will be restricted to two, that is, n = 2. Table (3) reports results of the bound test for the existence of a long run relationship. According to the computed F-statistics, we have enough evidence to reject the null hypothesis of no co integration at 1% significance level for both the private credit (CBS) and liquidity level (M3Y) indicators for financial development. This simply means that the computed F-statistic for these models is above the upper critical value.

Table 3: F-Statistics Test for Long Run Co-integration

Critical value bounds of the F-statistics*					
	1% Level		5% Level		Calculated F.statistics
Model	1(0)	1(1)	1(0)	1(1)	
1	3.668	4.978	2.945	4.088	6.876
2	3.668	4.978	2.945	4.088	7.432

**Critical values were obtained from Pesaran & Pesaran (1997)*

Having found a long run relationship, we applied the ARDL method to estimate the long run and the short run coefficients. The results for each of the models are reported in Tables 4 and 5 for the long-run and 6 and 7 for short -run respectively.

For model I, Table (4) shows the results of the long- run relationship between the dependent variable Y and the other regressors. As expected, the investment variable has the expected positive sign. But despite the fact that, the level of investment exerts a positive and statistically significant impact on real GDP in the long run, the relationship between them in term of elasticises remains very weak i.e. a one percent increase in investment leads to a respective real GDP increase of 0.20 only. This indicates that investment in Sudan does not have an important effect on real GDP. This weak relationship between investment and real GDP is attributed usually to the prevailing situations of political instability, prolonged civil wars, and other factors such as uncertainty over agricultural leases which resulted in declining investment, particularly in major agricultural projects. The government spending variable also appears with the correct sign and is statistically significant at 10 percent level. The results suggest that a one percent increase in government spending leads to -0.396 decrease in real GDP. The negative relationship between government spending and real GDP is logical because governments usually tend to increase spending during poor economic conditions to boost the economy. Openness, measured as the sum of exports and imports as a share of GDP, does not seem to have a significant effect on real GDP.The estimated coefficient is positive (0.001) and statistically insignificant. The financial sector variable M3Y affects negatively real GDP in Sudan but the estimated coefficient is highly significant. This result indicates – as we have mentioned before - that, forces outside the financial sectors may have influenced the

growth in real GDP. The time trend which is significant shows that there has been an upward trend in real GDP, much of which could be explained in terms of the impact of the package's success of the structural adjustment program and the export of oil. The dummy variable is negative and significant indicating that the implementation and adoption of financial sector reforms might cause adverse effects on real GDP as these reforms has not done gradually.

Table 4: Long-Run Estimates of Model 1: Autoregressive Distributed Lag Estimates

Repressor	*Coefficient*	*t-value*	*P-value*
INV	0.200	4.1184	[0.023]
GEX	-0.396	-5.0467	[0.010]
TROP	0.0011	0.038	[0.970]
M3Y	-0.3939	-5.679	[0.050]
CONST	19.484	13.6857	[0.011]
TREND	0.01724	5.2638	[0.019]
D90	-0.10594	-2.3003	[0.032]

Note: (1) Dependent variable is Y_t (2) We use in this model the variable M3Y as a proxy for financial development (3) ARDL (1, 1, 2, 0, 1) is selected based on Schwarz Bayesian Criterion

For model 2, credit provided by the banking sector over GDP is used instead of M3Y as a financial variable. However, these replacements produce no significant change in the results obtained above in model 1 (see Table 5). The investment variable again is significant and with low positive coefficient value. Government spending still has the expected negative sign but with marginal significant value.

The empirical finding with regard to the variable capturing the financial sector developments indicates that the coefficient of credit to the private sector by banks is negative and insignificant. This result implies that increases in the credit of the private sector by banks will not boost private investment as the theory suggests which in turn will propel economic growth. The specific finding of the negative impact of credit on real GDP for Sudan may be attributed to the fact that the institutional environment surrounding their private sector may be characterized by a lack of strong business and professional organizations. An additional reason for this may be that banks through which credits to the private sector are channeled, lack of personnel with experience and expertise in credit analysis. Thus, overall we do not have the expected positive impact but instead we derive a negative impact on the growth performance.

Table 5: Long-Run Results of Model 2: Autoregressive Distributed Lag Estimates

Repressor	*Coefficient*	*t-value*	*P- value*
INV	0.117	3.77	[0.001]
GEX	-0.234	-1.876	[0.051]
TROP	0.014	1.914	[0.690]
CBS	-0.047	-1.711	[0.101]
CONST	3.507	2.939	[0.000]
TREND	0.0017	0.450	[0.026]
D90	-0.489	-0.01	[0.986]

Note: (1) Dependent variable is Y_t (2) We use in this model the variable CBS as a proxy for financial development (3) ARDL (1, 1, 2, 0, 1) is selected based on Schwarz Bayesian Criterion

The empirical investigation regarding the short-run dynamics is important for policymakers because the signs and magnitudes of the short-run dynamics provide the direction and movements of variable. Thus, we estimate the error correction model to examine the short-run dynamics. The results are reported in Table (6) and (7) for both model 1 and model 2.

Tables (6) and (7), shows that the error term EC_{t-1} is statistically significant in each model with the expected negative sign. This confirms once again, the existence of the co- integration relationship among the variables of these two models. The coefficients of ECt_{-1} are equal to (-0.37) and (-0.20) for models (1) and (2) respectively and imply that deviations from the long-term growth rate in GDP are corrected by 37 percent in model (1) and 20 percent in model (2) between two successive time periods. This means that the adjustment takes place relatively quickly in model 1 and 2.

Table 6: Short-Run Dynamics of Growth and Financial Development: Model 1

Repressor	*Coefficient*	*t-value*	*P-value*
ΔINV	0.098	2.76	[0.011]
ΔGEX	-0.460	-1.876	[0.004]
ΔTROP	-0.001	-1.711	[0.970]
ΔM3Y	0.042	0.564	[0.515]
ΔCONST	5.810	2.939	[0.000]
ΔTREND	0,011	-0.450	[0.004]

Repressor	*Coefficient*	*t-value*	*P-value*
ΔD90	-0.106	-0.0176	[0.030]
ECM(-1)	-0.373	-4.142	[0.000]
R^2 0.75 S.E. of regression 0.035			
R-Bar-Squared 0.62 F.Stat. F (10, 22) 7.949 (0.000)			

Note: ECM - ARDL (1, 0, 1, 0, 2) Selected based on Schwarz Bayesian Criterion

Table 7: Short-run Dynamics of Growth and Financial Development: Model 2

Repressor	*Coefficient*	*t-value*	*P-value*
ΔINV	0.1174	3.77	[0.001]
ΔGEX	-02338	-1.8775	[0.73]
ΔTROP	-0.0138	-1.914	[0.068]
ΔCBS	-0.0472	-1.710	[0.100]
ΔCONST	3.507	2.939	[0.007]
ΔTREND	-0.0017	0.450	[0656]
ΔD90	-0.4899	-0.0176	[0.986]
ECM(-1)	-0.203	-2.562	[0.017]
R^2 0.79 S.E. of regression 0.033			
R-Bar-Squared 0.68 F. Stat. F (10, 22) 9.815 (.000)			

Note: ECM - ARDL (1, 0, 1, 0, 2) selected based on Schwarz Bayesian Criterion

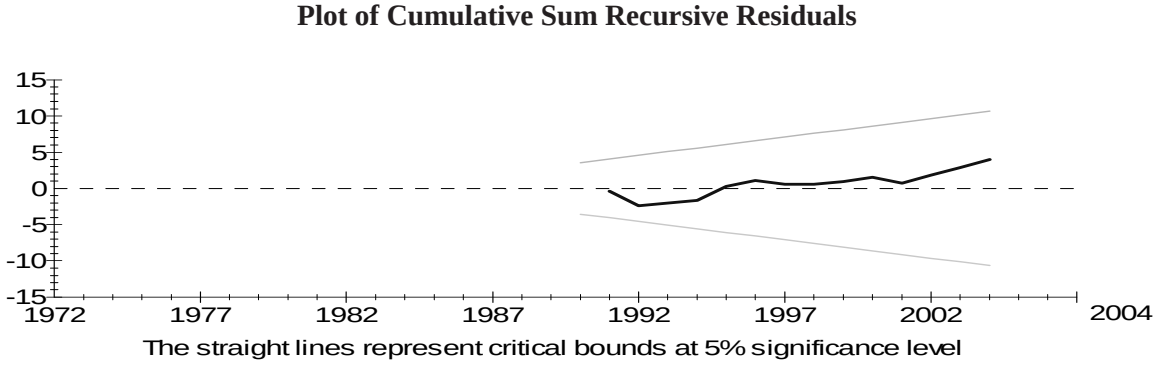
5.3. Testing for the Stability of the Model

To complement this study it is important to investigate whether the above long run and short run relationships we found are stable for the entire period of study. The stability of the model is evaluated using the cumulative sum (CUSUM) and the cumulative sum of squares (CUSUMSQ) of the recursive residual test for structural stability. A graphical representation of CUSUM AND CUSUMQ statistics are shown in figure 4 and figure 5. If the plot of the CUSUM and CUSUMSQ remains within the 5 per cent critical bound the null hypothesis that all coefficients are stable cannot be rejected. As it is clear from figure 4 and figure 5, the plots of both the CUSUM and the CUSUMQ are within the boundaries and hence these statistics confirm the stability of the long run coefficients of the RGDP function in model 1 and 2.

6. Conclusion and Policy Implications

The study attempts to evaluate the impact of financial development on real GDP in Sudan using a more robust econometric technique, the ARDL framework. Our findings suggest that that the financial development indicators does not have a direct impact on real output. These weak findings may be attributed to the inefficient allocation of resources by banks, along with the absence of an appropriate investment climate required to foster significant private investment and promote growth in the long run, and to the poor quality of credit disbursal of the banking sector in Sudan. Moreover, the econometric analysis of the model shows that the other macroeconomic variables provide little proof in explaining real GDP growth in Sudan. Although, the level of investment exerts a positive and statistically significant impact on real GDP in the long run, the relationship between them in term of elasticises remains very weak i.e. a one percent increase in investment leads to a respective real GDP increase of 0.20 only. Government spending variable appear with the correct sign but with mixed results in the short and long run. For example, government spending variable is statistically significant for model 1 in both the short and long run analysis, but it is insignificant in model 2. The results also showed that the error correction coefficients, which determine the speed of adjustment,

Figure 4: Plots of CUSUM and CUSUMQ Statistics for Stability Test (Model1)



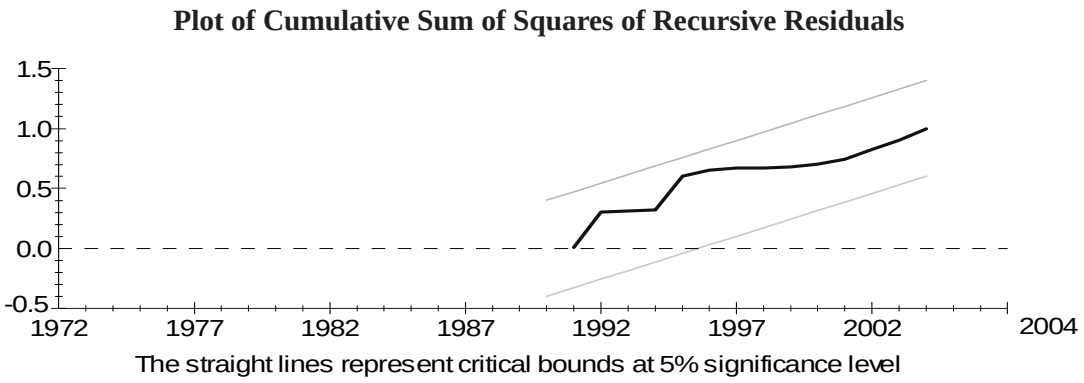
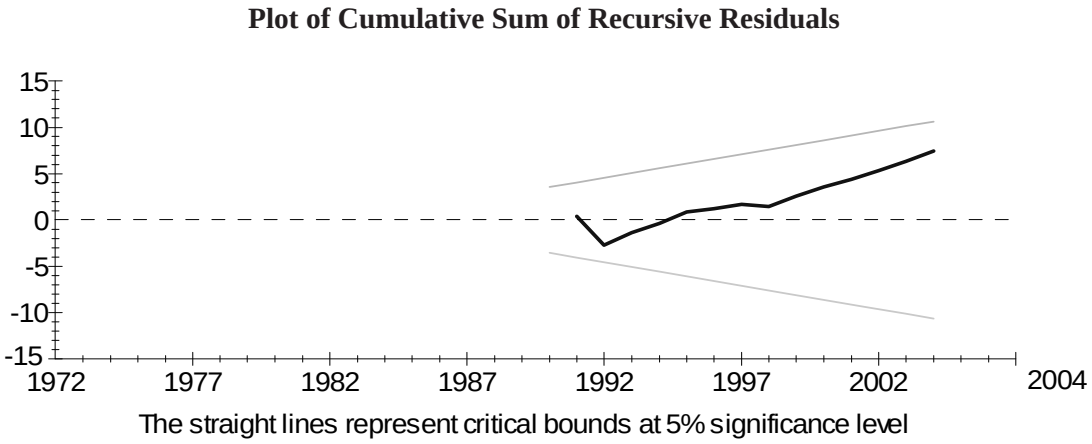
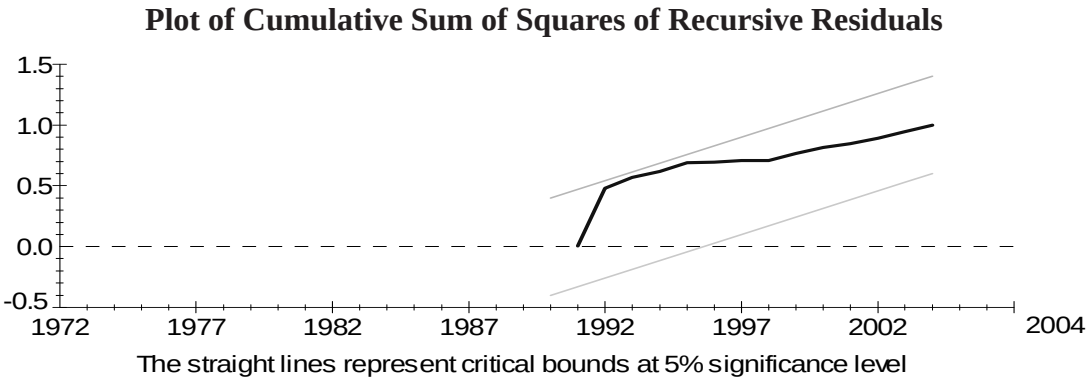


Figure 5: Plots of CUSUM and CUSUMQ Statistics for Stability Test (Model 2)





had an expected and highly significant negative sign. Also, both models have passed all the diagnostic tests for autocorrelation, functional form, normality of the residuals and heteroscedasticity, and support the overall validity of the short run model.

As mentioned earlier, the financial sector reform conducted in Sudan in the early 1990s was mainly to accumulate financial savings to finance productive investment endeavours and hence promote long term economic growth. But, the Sudanese experience of financial reform show that enhanced investment has not taken place yet, and that growth performance is far from being satisfactory in a country where 40 percent of the population lives below the national poverty line.

One of the most obvious implications of our results is that if Sudan is to realize its target growth rate it needs to create a stable political and economic climate conducive to investment. It follows from this that political stability and policies designated to raise investment are a precondition for Sudan's economic success.

Endnotes

[1]Sudan's financial system consists of the central bank of Sudan (CBOS); 25 commercial banks, 16 of which are completely or mostly privately owned, and seven state-owned commercial banks. The sector also includes four specialized state-owned banks, two investment banks and a number of non-bank financial intermediaries (NBFIs), mainly insurance companies.

[2] First attempts to reform the financial sector shown by the considerable attention that was given within the framework of the first economic plan to the importance of the financial sector for allocating credit for development projects. The second major development was the nationalization of the banking system in may 1970 with the aim of making credit available to high priority sectors of the economy, which previously had limited access to investable funds. The third development was the adoption of the "Open-Door Policy" in 1977 to attract foreign investment and as a result both foreign and joint-venture commercial banks have been increased.

[3] The government launched the Economic Reform and Structural Adjustment Program (1990-202). The program included a variety of measures such as commodity price liberalization, privatization of some state-owned enterprises, reduced taxation of the corporate sector and, providing The program included a variety of measures such as commodity price liberalization, privatization of some state-owned enterprises, reduced taxation of the corporate sector and, providing incentives to foreign investment.

[4] For instance, the ratio of broad money to GDP is about 10 percent in Sudan, compared with 30 to 40 percent in Kenya and Tanzania, and 50 to 90 percent in GCC countries.

[5] WDIs provide the most reliable and comprehensive set of hard and soft data on the MENA countries. They document the problem of insufficient data for MENA countries over the past twenty years. All data on per capita GDP growth rate, domestic investment, trade openness, inflation, government spending, and the two financial development indicators are taken from World Bank's Development indicators 2007 CD-ROM.

[6] The choice of this approach is based on its various advantages over the conventional multivariate co integration procedure. This includes its suitability for small sample size like ours (for details of its advantages and application, see Pesaran and Pesaran (1997), Vita and Abbot (2002), and Chang et al. (2005).

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