

EMPIRICAL ANALYSIS OF MACROECONOMIC INSTABILITY AND ECONOMIC GROWTH IN SUDAN

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ABSTRACT

This study investigates how macroeconomic instability has been deterring economic growth in Sudan over the period 1969-2016. We constructed a macroeconomic instability index (MII) from major economic and policy indicators of Sudan. The MII shows that the economic performance of Sudan has been chronically unstable. The study then uses dynamic econometric methods of cointegration and vector error correction modeling (VECM) to empirically investigate the short run dynamics and long run equilibrium relationships of macroeconomic instability indicators and economic growth. Cointegration analysis shows existence of a long run equilibrium relationship of macroeconomic instability and economic growth. Empirical findings from estimation of a VECM shows that in the short run GDP instability is affected significantly by unemployment, velocity of money, exports, trade openness and financial development respectively. In the long run, GDP growth is found to be influenced significantly negatively by unemployment, velocity of money, trade openness and financial development, but only positively and significantly by exports. The study finds unidirectional causality running from unemployment to GDP with no feedback effect. Exports, overall trade openness and financial development are found to be Granger causing GDP growth. Recommendations are provided accordingly.

Key words: *Macroeconomic Instability; Unemployment; Financial Development; Export; Trade Openness; Vector Error Correction; Sudan*

INTRODUCTION

Most low income countries including Sudan suffer from chronic macroeconomic instability reflected by low and volatile rates of economic growth, low levels of capital formation, low levels of public capital spending due to lack of public savings and inefficient utilization of foreign capital inflows. Conceptually, macroeconomic instability refers to the phenomenon that makes the macroeconomic environment less predictable and can take the form of volatility of leading macroeconomic variables or they are perceived as unsustainable in their behaviour which predicts future volatility and as a result hampers resource allocation decisions, investment, and impede growth (Montiel and Servén 2006). On the other hand, macroeconomic stability means manageable fiscal and balance of payments deficits and low inflation to encourage the holding of financial assets (Thirlwall, 2004).

Theoretical arguments against macroeconomic instability can be discussed through four components.

First, macroeconomic instability and uncertainty; Fischer (1993) conceptualizes macroeconomic instability in terms of two types of uncertainty – policy induced uncertainty and temporary uncertainty. Policy-induced macroeconomic uncertainty reduces the efficiency of the price mechanism which affects output. It is associated with high inflation or instability of the budget or current account, which reduce the productivity and its rate of increase. Temporary uncertainty reduces the rate of investment, suggesting that investment would be lower at times when uncertainty is high, and its presence should therefore be more noticeable in the time series data. According to Fisher, the macroeconomic framework can be described as stable when:

- i. inflation is low and predictable,
- ii. real interest rates are appropriate,

- iii. fiscal policy is stable and sustainable,
- iv. the real exchange rate is competitive and predictable, and
- v. the balance of payments situation is viable, which are all conducive to growth.

For policy interventions, macroeconomic stability is required for the success of any liberalization and financial reform and adjustment policies (Turtelboom 1991). Theoretically, Alesina and Tabellini (1989) demonstrated that governments in Low Income Countries often create fiscal uncertainty that generates capital flight, low investment and over-accumulation of external debts, which retard economic growth. Macroeconomic stability requires growth, investment and productivity and that weak performance of economic growth is related to the macroeconomic instability and where macroeconomic instability is high inequality in income distribution is also high (Hausmann and Gavin 1996) – referring to security stability and growth in Latin America.

Second, macroeconomic instability and the foreign sector; macroeconomic in(stability) is affected largely by the performance of the foreign sector as one of the major sectors of the economy. In particular, trade balance deficit interaction with macroeconomic variables such as the real exchange rate in each country is one of the basic indicators determining the degree of international competition and volatility of real exchange rate indicates an imbalance in the economy on the one hand, and on the other hand, it is due to further instability and leads to disastrous consequences (Elahi et al., 2016). David (1976) provides theoretical arguments against macroeconomic instability in terms of export instability in particular. He argues that exports instability affect inflation and lead to business miscalculation which lower aggregate investment and economic growth; it renders development planning ineffective and lead to low economic growth; it leads to

discontinuous import of capital goods, low investment and thus low economic growth. However, David L. notices that a change in the availability of foreign capital inflow is a more significant constraint to economic growth than a change in the availability of export proceeds, but if export instability is transmitted to the rest of the economy, this would be reflected by a high degree of instability in the GNP. Ghosh and Ostry (1994) find that export instability has negative effects on the external balance in developing countries. However, it is not only exports stability that is important for economic growth and its stability, but also exports structure, exports diversification and types of products to be exported, World Bank (1999), Bleaney and Greenaway (2001), Meilak (2008) and Hesse (2008). It has been argued that countries with commodity concentration are adversely affected by volatility in market prices through swings in foreign exchange revenues. In this regard, it has commonly been suggested that a broadening of the export base through a more diversified national trade portfolio can help in maintaining stability in export receipts, thus fostering long-term economic growth.

Third, macroeconomic instability and investment; some of the theoretical arguments against macroeconomic instability focus on its detrimental effects on private investment and productivity and thus economic growth. Some empirical studies used aggregate investment (Bleaney 1996) – for developing counties, or private investment (Cardosa 1993) – for Latin American countries in explaining the effects of macroeconomic instability on economic growth. It has been found that macroeconomic instability has negative effects on both private and public investment and therefore economic growth, but where the rise of macroeconomic uncertainty is the main cause for reduction in private investment, the reduction in the fiscal and political ability of the government is the principal reason for the decrease in public investment.

Fourth, macroeconomic instability and inflation; stable prices, low and staple inflation rates are basic requirements for macroeconomic stability, since the general inflation reflects the absorption capacity of economy in the interaction of the main factors of supply-side and demand-side shocks. For this connection, investigation of the nature and causes of inflation has been a concern for policy makers due to its effects on other macroeconomic variables such as production, exchange rates, investment, employment and consumption. On the supply side, with the increase in production cost, including increasing wages, cost pressure is created that leads to soaring price of manufactured goods. On the demand side, when the money market is in imbalance, increase in nominal money demand result in increases in prices. From these connections and transmissions, inflation is considered a good index of monetary and financial status although it may be affected by the price control measures (Elahi et al., 2016). With price controls, inflation can be considered an endogenous variable and to deal with this endogeneity, Cukierman et al., (1992) use measures of central bank independence as an instrument for inflation concluding that even after instrumenting with the better indicators of central bank independence, there remains a significant negative relationship between inflation and economic growth.

Collectively, variables of macroeconomic instability operate together and manifest themselves in terms of systematic and persisting investment-savings gap, government budget gap and foreign resources gap. Such resource gaps reinforce one another in a negative dynamic way affecting aggregate investments, productivity, inflation, exchange rate and economic growth and complicate setting and implementation of sustainable economic policies. It has been thought that with a dual resource gap at least, foreign capital flows do not only contribute to supplement low domestic saving but also

foreign exchange. However, while macroeconomic management of capital inflows is central to successful short-run macroeconomic policy, financing the external debt and dealing with profit transfers abroad from foreign capitals are crucial challenges since foreign savings are not necessarily sustainable. This has typically been the case of Sudan where unsustainable growth has been associated with unsustainable current account deficit (Elwasila SEM, 2011). Other evidences also showed that after triggering a typical exchange rate based stabilisation programmes the short-run benefits to financial liberalisation in capital dependent countries could help macroeconomic stabilisation, but in the long run, increasing external debt and denationalisation of domestic enterprises and privatisation can lead to balance of payments difficulties through the effects of net transfer of profits abroad, which together act to restrain economic growth (Frederico 2001). For example, as from the experiences of Brazil and Mexico, the positive aspects of capital flows can be offset by the negative ones such as those related to an increase in the stock of external debt, the rapid denationalization of enterprises, and low impact of FDI over export-industries, Pattillo, Helene and Luca (2004). It is a fact that small open economies are generally credit constrained and credit constraints have major implications on investments and ability to respond to external shocks such as interest rates and commodity price shocks. Luis (2004) presents a dynamic model for a small open economy to analyse the role of credit constraints in terms of financial market imperfection in the generation and amplification of economic instability. The author concludes that credit constraints play a role in the amplification and transmission of external shocks. And when debt is denominated in terms of the foreign good, the effects of increases in the world interest rate or loss of confidence by foreign investors are

magnified; output and investment present more recessionary patterns.

The problem of this study stems from the observation that the economic environment of Sudan has been unstable over the past four decades with volatile major macroeconomic indicators including GDP growth rate coupled with uncertain macroeconomic policy. The question of this study is stated as; how unstable prices, money demand and unemployment interact with the perceived positive effects of exports, trade openness and financial development on capital accumulation and economic growth of Sudan in the long run? In order to address this question this study sets the following objectives:

- i. Investigate the source and effects of macroeconomic instability on economic growth of Sudan.
- ii. Draw some macroeconomic policy implications and provide recommendations to promote economic growth.

LITERATURE REVIEW AND METHODOLOGICAL FRAMEWORK

Literature Review

It is generally agreeable that a stable macroeconomic framework is conducive to growth. But, this agreement needs to be supported by empirical evidences. Fischer (1993) presents cross-sectional and panel regressions showing that growth is negatively associated with inflation, large budget deficits, and distorted foreign exchange markets, and that the evidence suggests that the causation runs from macroeconomic policy to growth. Fischer identifies two main channels through which inflation affects growth.

- (i) Inflation which reduces growth by reducing investment and productivity;
- (ii) Budget deficit which reduces both capital accumulation and productivity.

However, as Fischer noted while low inflation and small deficits are not necessary detrimental to high growth even over long periods, high inflation is not consistent with sustained growth. Fuentes, Larraine and Schmidt-Hebbel (2006) have used inflation rate as an index for the macroeconomic instability in Chile. But, macroeconomic instability index (MII) is a relatively more comprehensive criterion of the macroeconomic instability. In fact, an increase in MII means an increase in one or more indexes of macroeconomic instability, such as increase in inflation rate; change in exchange rate, public deficit ratio to GDP and foreign debt ratio to GDP (Ismihan, 2003). Ismihan et al., (2002) investigate macroeconomic instability, capital accumulation and growth in Turkey over the period 1963-1999 using cointegration and impulse response analysis. They find that macroeconomic instability in Turkey is chronic and increasing and has negatively affected capital formation and economic growth, a serious impediment to the public investment, especially, in infrastructure, and even reversed the complementarity between public and private investment in the long-run. Fuat L., K. et al. (2008) analyze the effects of economic growth represented by GDP and real effective exchange rate on current account deficit for Romania and Turkey using structural vector autoregressive VAR analysis between 1997-2007. They find that the shock of economic growth has revealed 82% of variance fault estimation for Turkey and 79% for Romania and thus the changeability of economic growth is the most important reason for national current account deficit for both countries. Ibrahim and Mucuk (2014) analyze the relationship between economic growth and current account deficit for Turkey using quarterly time

series data including 2002-2013. Their empirical findings show that current account deficit affects economic growth negatively. Funda and Ucar (2015) examine the relationship between the current account deficit and economic growth in Turkey applying Granger causality and VAR analyses on quarterly data for 1999-2014. They find a unidirectional correlation from growth rate to current account deficit. The impulse-response functions show that a shock of one standard deviation on the growth rate has effect on the current account deficit.

Given its supply side and demand side manifestations, macroeconomic instability requires intervention through both monetary and fiscal policies. Particular attention has been given to inflation is the most common indicator of macroeconomic instability and it has become a main policy target. Under inflation targeting, low and stable inflation is explicitly and directly targeted as the main objective of monetary policy in particular. Although other goals such as full employment or low fluctuations in the exchange rate can also be pursued as a secondary objective, but the problem is that other frameworks of monetary policy are trying to indirectly affect inflation by targeting exchange rate. Ravn and Sola (2002) investigated the asymmetric effects of monetary policy on the economy of the US using seasonal data after the war and study the effect of positive and negative and small and big monetary policy shocks on production using regime switching models. Their results show that only small negative monetary policy shocks have real effects on production. Yet, effectiveness of monetary policy is affected by external shocks more than internal performance, particularly in small open economies. For example, inflation in import dependent countries changes with shocks of international prices particularly energy prices. In this regard, Brown and Yücel (2002) studied the impact of changes in oil prices on the economies of oil-importing

countries concluded that the increase in oil prices with increased costs and reduced productivity leads to the creation of economic cycles and affects inflation, employment and investment. Angers and Aristos (2008) conducted a study on OECD countries on the adoption of inflation targeting policy concluded that in countries that adopt targeting policy, average inflation declined when the policy was implemented, and that this policy helped to stabilise inflation. Meshkin (2008) argues that inflation targeting is used as a successful monetary policy in emerging economies and improves the functioning of the monetary policy in developed countries. Kuzin and Tober (2004) studied the asymmetric effect of monetary policy in Germany using data from 70 seasons ending in the first season of 2003 and concluded that Germany's economy is more sensitive to the reduction of interest rather than its increase. They also used Markov switching models to test the effectiveness of monetary policy showing that the effects of monetary policy during the depression was significantly higher than during the boom. Elahi N., et al. (2016) use 18-year experience of inflation targeting framework adopted by industrial and developing countries to investigate the relationship between monetary shocks on the real exchange rate and the trade balance. For the developed countries the results indicate that macroeconomic policies has been properly implemented in the long term with improvement in the real exchange rate stabilisation policy and trade expansion and trade balance. The results also showed a positive relationship between GDP and the real exchange rate and existence of a liquidity shock but inflation increases the real exchange rate. For developing countries, they show that liquidity and rising prices and inflation do not move in a same direction. in other words, monetary policy are only marginally raised in the economy and changes in the quantity of money is heavily influenced by exogenous factors such as the deficit,

the volatility of oil-related income for oil-producing developing countries.

Jean-Paul Azam (2000) investigates inflation and macroeconomic instability in Madagascar over the period 1983-1998 and finds high correlation between high inflation and its high variability and the real effective exchange rate. This was confirmed by the empirical findings on the relationship between inflation, competitiveness and macroeconomic instability. Sanchez-Robles (2006) investigates the effects of macroeconomic instability in terms of inflation, public deficit, public expenditures and market distortions on economic growth of Spain over the period 1962 to 1995. The author finds that inflation rate, total public expenditure and public deficit as percentages of GDP affect economic growth negatively in the long-run. Market distortions in forms of foreign exchange and oil market were also found to affect economic growth negatively. Sarat et al., (2011) assess the linkages of financial stability with economic growth and inflation, output, interest rate and a banking sector stability index constructed from capital adequacy, asset quality, management efficiency, earnings and liquidity indicators in India using a VAR model. They find a statistically significant bi-directional Granger block causal relationship between macroeconomic indicators and financial stability. In other words, enhanced financial stability associates with higher growth accompanied by softer interest rates and without much threat to price stability in the medium to long term on one hand and on the other hand, greater economic stability or higher output growth enhance financial stability. Higher inflation or price instability adversely affects financial stability, but financial stability contributes to the effectiveness of monetary transmission mechanisms. Importantly, with financial stability, output growth could become more persistent and inflation less persistent. Sahoo and Das (2012) used the ARDL bounds test approach to

examine the impact of government budget deficit on the current account deficit for India over the period 1971 to 2010. Their empirical results show a strong linkage between budget deficit and the current account deficit, supporting the Keynesian view with unidirectional relationship running from budget deficit to current account deficit.

Hassan et al. (2012) constructed a macroeconomic instability index from inflation, exchange rate, budget deficit and terms of trade from annual time series data on Iran over the period 1974-2008. They used it in a neoclassical endogenous growth model, and found that macroeconomic instability has negative effect on economic growth in Iran after establishing a long term equilibrium relationship between macroeconomic instability and outcome variables. Overall, stable policy framework is a vital means to secure a more stable overall macroeconomic environment (Montiel and Servén 2006).

Macroeconomic Instability in Sudan (1969-2016)

Over the past five decades, the performance Sudan economy at the aggregate level has been characterised by various manifestations of macroeconomic instability. The performance of the foreign sector has been dismal as since early 1970s the value of exports of goods and service has been lacking behind to meet the imports of goods and services requirements. External resource gap has been reflected in the persistent deficit of the current account balance and as a result manifested in excessive foreign borrowing and accumulation of large external debt increased from 296 US\$ million in 1970 to 37 US\$ billion in 2010 and to more than 50 US\$ billion in 2016. Thus, sustained growth cannot be envisioned without a resolution to the debt problem and poverty reduction and that it is extremely unlikely for Sudan to achieve a sustainable external debt position without generous debt relief within

the framework of available international initiatives, including HIPC's initiative (IMF, 2012, 2014 and 2016). Given the connection between saving-investment gap and exports earnings for imports reflected largely in the current account deficit, Sudan has been experiencing a dual resource gap since the late 1960s. In addition to the dual resource gap, Sudan economy has also been facing fiscal insolvency in terms of government budget gap. For Sudan economy over the period 1970-2016 the saving-investment gap is estimated at -6.31 percent of GDP. Foreign resources gap has been the largest and the dominant estimated at -8.21 percent. The lowest gap has been the government budget gap estimated at -3.44 percent. These gaps have been associated with high volatility and persistently unstable major macroeconomic indicators since the late 1960s. Economic growth rate has been slow, low and volatile averaging from 15.7% in 1975 dropping to -6.3% in 1985, increased to 6% in 1995 peaked to 12% in 2007, dropped to -3% in 2012 and slowly increased to 3% in 2015. For the whole period of five decades 1969-2016, economic growth rate averaged just 4.3%. Thus, macroeconomic performance characterised by triple resource gaps expose the economy to severe need for foreign capital inflows as a way to help adjustments in the balance of payments deficit and assist in stabilising and fostering economic growth. But such poor and volatile economic performance reflected as well as unstable prices and exchange rate makes it unlikely to attract sufficient and sustainable foreign capital flows and ultimately makes the macroeconomic environment less predictable and less favourable. These in turn reflect poorly designed and ineffective macroeconomic policies both monetary and fiscal policies. With regard to policy interventions, Since 1992, with the declaration of economic liberalisation, the government has been trying to unify official exchange rates and market rates, a move that required a devaluation of the

exchange rate of more than 2000 percent in 2008 resulting in steady decline in the value of the Sudanese pound with the gap between official and market exchange rates has been widening since 2012. Even earlier, all internal and external imbalances were of a permanent nature and resulted in high indebtedness, mounting debt services and the long term characteristic and distortions of the balance of payments crisis all made economic adjustments inevitable, because financing the deficit was not a sustainable alternative (Wohlmuth and Hansohn, 1986). However, some of the adopted fiscal policies have not been effective. For example, Suleiman (2005) concludes that the stability attributes of the fiscal sector show that the elasticity of the tax system is relatively low which negatively impact the work of build-in stabilisers and hence amplify the macro fluctuations. However, the author noted that the use of the cyclically adjusted fiscal indicators can improve the efficiency of decision-making and enhance the macroeconomic stabilisation role of the tax system. The poor performance of the tax system provides explanation for the relatively low government spending with a danger due to the rise in windfalls from the booming oil sector which may provide lack of incentive to develop tax bases and/or improve the existing ones.

In countries facing macroeconomic instability such as Sudan, monetary policy in particular is supposed to play important role on money supply, inflation and on exchange rate, and accordingly economic growth. Unstable price levels can be controlled by inflation targeting monetary policy. Sudan has been suffering from episodes of hyperinflation as the result of weak economic and financial policies, including considerable monetary and fiscal expansion, severe import restrictions, extensive price and wage controls and constraints on the private sector. Yet implemented policies resulted in a large and active parallel market for goods and services and foreign exchange, and

inflation averaging 40 percent in the first half of the 80s reaching 130 percent in 1991 and 140 percent in 1992. The liberalization policy adopted in 1992, aimed to address the economic and financial situation with market-friendly policies abolishing almost all price and profit controls, with the exception of petroleum, sugar and wheat. But inflationary pressure exceeded 150 percent by 1996 (Central Bank of Sudan, CBOS, various issues). Since 1997, Sudan embarked on a comprehensive structural reform programme with the assistance of the IMF with subsequent Staff- Monitored Programmes (SMPs). Over the 1999-2010, Sudan's macroeconomic performance was satisfactory, indicated by an average real growth of 6 percent and modest fiscal and external deficits at about 2 percent of GDP and 4 percent of GDP, respectively. However, inflation remained high at an average averaged 23 percent over the period 2012-2016. Under the SMPs, the CBOS has gradually dismantled restrictions and liberalized the financial system and introduced new instruments of indirect monetary policy management instruments including (i) a reserve requirement on foreign currency deposits and reduction of that requirement on local currency deposits; (ii) the introduction of Central Bank Musharaka Certificates (CMCs) and the elimination of cost-free loan to banks and public enterprises; (iii) opening a financing window with uniform rules of access, serving also as lender-of-last-resort (Moriyama 2008). The CBOS continued to intervene in the market to maintain exchange rate and macroeconomic stability. As for inflation, Moriyama (2008) finds that a permanent increase in money supply growth and nominal appreciation of exchange rate by one percentage point would raise inflation by 0.32 and -0.63 over 12-months and 0.48 and -0.73 over 24-months, respectively. Onour (2015) finds that during the period 2008–2013 the effect of the parallel market rate for foreign exchange on domestic inflation rate jumped from 5% to

37%. He shows the effect of domestic money growth defined as growth in government spending on domestic inflation rate increased from 63% to 67% and the impact of imported inflation on domestic inflation rate increased from 10% to 27%. Such results indicate the transmission effect of the two variables, parallel market rate, and imported inflation on domestic inflation are unstable revealing the high sensitivity of the economy to external shock. Thus, given that the inflation of imported goods directly affects increase of domestic inflation, it is evidently important to reduce import dependence and move towards a free economy that could reduce inflation.

Empirical time series studies on causes and effect of macroeconomic instability in Sudan are rare. On the effect of external debt, Abdelmawla and Mohammed (2005) show that debt services burden have negatively impacted Sudan economic development and worsened the social problems over the period 1978-200. They showed that export earnings have a significant positive impact while external debt and inflation had negative impact on Sudan's economic growth. Osman (2016) showed that during the period (1973 - 1993) the weighted average of the elasticity of exports and imports were (0.073) and (0.163) respectively, and (0.465) and (0.231) respectively for the (2002-2012) period. Thus, based on Marshall-Lerner approach, the sum of these elasticities in the two periods was less than one, indicating that devaluation had worsened the Sudan's balance of payments deficit. The author explain these findings by the structural rigidities characterising Sudan economy and the high inelastic nature of the supply of the agricultural products that dominate Sudan exports during the first period coupled with the essential nature of the imports and the absence of domestic substitutes. Ebaidalla (2013) investigates the effects of volatility of the real exchange rate on economic growth, foreign direct investment and the trade balance over the period 1979-

2009. Their empirical results shows that volatility of the real exchange rate has detrimental effect on economic growth and inflows of FDI, but it has positive effect on the current account balance suggesting that the flexibility of exchange rate enhances the adjustments in the balance of payments in response to external shocks.

STATISTICAL, AND ECONOMETRIC ANALYSIS

Definition and Description of Variables

Variables of macroeconomic instability are dynamically interrelated. Thus, in order to take care of the joint endogeneity problem in terms of simultaneously and potential reverse causation associated with time series data, the model to be estimated should be dynamic – described as the set of explanatory variable includes a lag of the dependent variable and include some explanatory variables that are potentially jointly endogenous (in the sense of being correlated with the error term). Rather than the focus on cross-country sides pioneered by Romer (1986), in order to make further progress in defining a stable and sustainable macroeconomic framework, an argument has been made that it is necessary to undertake more detailed case studies of individual countries, based on structural models. Little et al. (1992) investigates the boom, crisis and adjustments from the macroeconomic experience of developing countries. In terms of methodology also there is a need to use different factors simultaneously which have been emphasized by Fisher (1993), and Sahay and Goyal (2006) in order to determine macroeconomic situation and its performance. Our study comes in this line as it tries to address the causes and consequences of macroeconomic instability in Sudan over the period 1969-2016, using a host of factors representing both the supply and demand sides as well as linking the nominal monetary side with the real output side of the economy.

The variables of the macroeconomic instability in Sudan in this study are defined as follows:

Gross Domestic Product GDP: is defined as the total value of all goods and services produced in the economy valued at current US\$. It assumed to affect and be affected by all other factors included in model as defined below.

Inflation INF: is defined as the change in consumer price index CPI, linking the real supply side and nominal demand side.

Unemployment UNE: is general unemployment defined as total unemployed of 14-64 years of age as percentage of the total labour force, representing the growth of the supply side. Unemployment is tied to inflation in the context of the well known Phillips curve, and to output growth, Lucas (1973).

Investment I: is the gross domestic investment – investment after exclusion of foreign direct investment, representing the growth of the demand side which has major influence on the supply side. Investment is the single variable that is mostly expected to be affected by all other causes and manifestation of macroeconomic instability measures included in this study as it is importance to economic growth is well known in the theoretical and empirical literature alike and in the neoclassical and Keynesian perspectives alike.

Velocity of money V: it represents the monetary side of the economy but stands for the nominal demand for money which is known to create about inflationary pressures in the economy.

Export X: either in value, or exports as percentage of GDP, representing the demand side which also determines the supply side. Export instability adverse effects on the economic growth of low income countries consist of at least two distinct but related parts. The first is that export instability is transmitted to the rest of the

economy through its effect on inflation and investment, and the second is that economic instability per se is detrimental to economic growth.

Trade openness TOP: is defined as sum of total value of exports and total value of imports as percentage of GDP, representing a net of demand side that affect the supply side, which also a reflection of economic planning and strategies toward inward looking or outward looking.

Domestic credit provided by private banks DCP: is the domestic credit provided by the private banks to the private sector, representing development of the financial sector, or so called financial deepening. It stimulates investment while also could help to curb some of inflation. The link between domestic investment I and DCP is the sense that I depends on willingness to save which in turns depends on the rate of interest (or what can stand for it), the existence of financial institutions, the range and availability of financial assets, and the rate of inflation INF. But in order for financial development to enhance economic growth it requires prior information on investment opportunities, monitoring investments and the implementation of corporate governance, trade diversification and risk management, mobilisation and accumulation of savings, and the exchange of goods and services. In such environment financial development causes an improvement in production and thus economic growth, Levine (2002).

Data on GDP, inflation, unemployment, domestic credit and exports is processed from the World Bank data base (World Bank, World Development Indicators, WDIs, 2016). V, I and TOP time series are generated by the author.

The econometric model to be estimated is written in a Log-linear (L) form as follows:

$$L(GDP) = \beta_0 + \beta_1 L(INF) + \beta_2 L(V) + \beta_3 L(UNE) + \beta_4 L(I) + \beta_5 L(X) + \beta_6 L(TOP) + \beta_7 L(DCP) + \mu \quad (1)$$

Descriptive Statistical Analysis

The time series data of the variables included in the study for the period (1969-2016) were descriptively analyzed. GDP, INF, V, I and X are positively and significantly skewed to the right while UNE is negatively skewed to the left. The maximum value of Kurtosis is recorded for velocity of money V of 6.19 followed by X of 7.75, INF of 4.78 and GDP of 4.42, while the minimum values of 2.30 and 1.87 are recorded for DCP and TOP respectively. From Jarque-Bera statistics and associated probability values some of the series are not normally distributed except TOP and much of this non-normality comes from Kurtosis rather than skewness. We calculated the MII for Sudan over the period 1969-2016 according to the formula in equation (2).

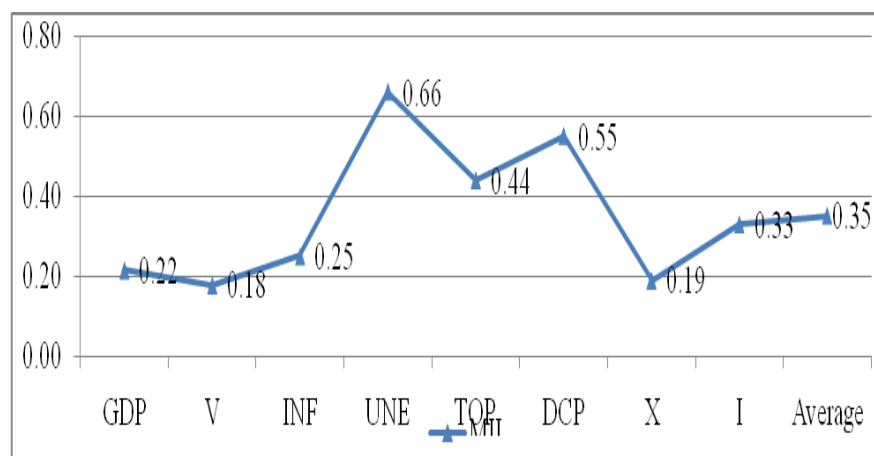
$$\begin{aligned}
 MII = & \beta_1 \left(\frac{GDP_t - \min GDP_t}{\max GDP_t - \min GDP_t} \right) + \beta_2 \left(\frac{INF_t - \min INF_t}{\max INF_t - \min INF_t} \right) + \beta_3 \left(\frac{VMC_t - \min VMC_t}{\max VMC_t - \min VMC_t} \right) \\
 & + \beta_4 \left(\frac{UNE_t - \min UNE_t}{\max UNE_t - \min UNE_t} \right) + \beta_5 \left(\frac{I_t - \min I_t}{\max I_t - \min I_t} \right) + \beta_6 \left(\frac{X_t - \min X_t}{\max X_t - \min X_t} \right) \\
 & + \beta_7 \left(\frac{TOP_t - \min TOP_t}{\max TOP_t - \min TOP_t} \right) + \beta_8 \left(\frac{DCP_t - \min DCP_t}{\max DCP_t - \min DCP_t} \right)
 \end{aligned} \quad (2)$$

$\beta_1 + \beta_2 + \beta_3 + \beta_4 + \beta_5 + \beta_6 = 1$

The closer the summed value of macroeconomic instability coefficients to zero the higher the macroeconomic stability, and the closer the value to 1 the

higher the macroeconomic instability. It appears that the highly unstable indicator has been unemployment, followed by domestic credit and trade openness and the average MII for the whole period was 0.35 as depicted in figure (1).

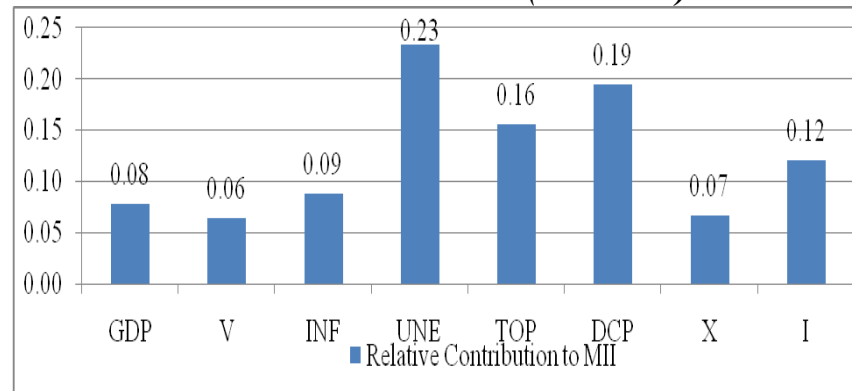
Figure 1
MII for Sudan (1969-2016)



Source: Author's Calculation

Unemployment contributes about 0.23%, followed by DCP (0.19), and TOP (0.16) to the overall MII as presented in figure (2).

Figure 2
Relative Contribution to MII in Sudan (1969-2016)



Source: Author's Calculation

Correlation analysis amongst the variables included in the study was carried out and the results are presented by the correlation matrix shown in table (1).

Table 1
Correlation Matrix

	GDP	INF	V	UNE	I	X	TOP	DCP
GDP	1.00							
	-0.13							
INF	(-0.87)	1.00						
	0.96	-0.10						
V	(21.89)*	(-0.67)	1.00					
	0.04	0.28	0.12					
UNE	(0.30)	(1.95)*	(0.83)	1.00				
	-0.15	0.19	-0.08	0.43				
I	(-1.03)	(1.28)	(-0.57)	(3.27)*	1.00			
	0.83	-0.25	0.72	-0.01	-0.17			
X	(9.95)*	(-1.75)	(7.00)*	(-0.06)	(-1.20)	1.00		
	0.07	-0.63	-0.00	-0.07	0.07	0.36		
TOP	(0.50)	(-5.44)*	(-0.00)	(-0.46)	(0.50)	(2.66)	1.00	
	0.18	-0.49	-0.01	-0.51	-0.38	0.35	0.50	
DCP	(1.26)	(-3.82)*	(-0.08)	(-4.01)*	(-2.75)*	(2.55)*	(4.80)*	1.00

t. statistic in parentheses, * indicates significance at 1% level; below the correlation coefficients are the P. values

Although direction of causation can't be established from these correlation coefficients, it is clear that these variables reinforce each other in a positive but mostly in a negative way, which necessitates more dynamic econometric analysis. Correlation coefficients of the independent variables indicate a problem of multicollinearity.

Econometric Analysis

In this study we investigate the dynamic effects of macroeconomic instability indicators on GDP growth in line with the theoretical and empirical literature. Macroeconomic instability is described as the volatility of inflation, unemployment, velocity of money, domestic credit finance and domestic investment, exports and trade

openness. For meaningful estimation of time series econometric models, the stationarity of the time series data needs to be established otherwise, estimation will be spurious. The Augment-Dickey Fuller ADF and Philip-Perron PP tests are carried out to check for stationarity of the time series of variables. All variables included in the study are found to be stationary at first difference as presented in Table (2).

Table 2
ADF and PP Tests for Stationarity

Variable	ADF at I(1)	PP at I(1)	Remark
	ADF	PP	
	Statistic Value	Statistic Value	
L(GDP)	-6.308*	-6.308*	Stationary
L(INF)	-8.821*	-9.476*	Stationary
L(V)	-7.752*	-8.975*	Stationary
L(UNE)	-6.850*	-24.111*	Stationary
L(I)	-6.678*	-13.728*	Stationary
L(X)	-5.862*	-5.871*	Stationary
L(TOP)	-8.454*	-8.338*	Stationary
L(DCP)	-5.055*	-5.069*	Stationary

* Indicates significance at 5% level of significance; Note that all variables are not stationary at level

Given that the study variables are found to be stationary of the order I(1) according to both the ADF and PP tests results, one of the best known analysis of time series data to proceed with is Johansen cointegration with vector error correction modeling VECM.

Cointegration and VECM

Cointegration. Existence of cointegration and a long run equilibrium relationship of the variables included in the study are tested using Johansen Cointegration

method (Johansen 1988). The Johansen cointegration test indicates 3 cointegrating equations using the trace statistics and 2 cointegrating equations using the Maximum Eigenvalue at 5% level of significance with the assumption of trend and no intercept. Cointegration is stronger with the assumption of trend and intercept as the trace statistic indicates 5 cointegrating equations and the maximum Eigenvalue indicates 4 cointegrating equations as presented in table (3).

Table 3
Cointegrating Rank Test: Trace and Max-Eigen Value

H ₀	Trend				Intercept and Trend			
	Trace Statistic	0.05 Critical Value	Max- Eigen Statistic	0.05 Critical Value	Trace Statistic	0.05 Critical Value	Max- Eigen Statistic	0.05 Critical Value
r = 0	242.942	159.530*	76.508	52.363*	299.107*	187.470	86.427*	56.705
r ≤ 1	166.434	125.615*	60.556	46.231*	212.681*	150.559	60.660*	50.600
r ≤ 2	105.878	95.754*	39.870	40.078	152.021*	117.708	48.326*	44.497
r ≤ 3	66.007	69.819	26.291	33.877	103.695*	88.804	39.485*	38.331
r ≤ 4	39.716	47.856	20.907	27.584	64.209*	63.876	26.256	32.118
r ≤ 5	18.810	29.797	10.347	21.132	37.954	42.915	20.408	25.823
r ≤ 6	8.463	15.495	8.393	14.265	17.546	25.872	10.125	19.387
r ≤ 7	0.070	3.841	0.070	3.841	7.421	12.518	7.421	12.518

Note: Trend: Trace test indicates 3 cointegrating equations; Max-Eigen value test indicates 2 cointegrating equations at the 0.05 level. Trend and constant: trace indicates 5, max Eigen stat. indicates 4 cointegrating equations at 0.05 level; * denotes rejection of the hypothesis at the 0.05 level

VECM estimation. The series are found to be integrated at I(1) with at least two cointegrating equations and thus a long run equilibrium relationship is established among the variables of the study. When the series are integrated at the order of I(1), the direction of causality can be investigated by estimating a VECM (Engle and Granger, 1987) which caters for the short run dynamics and long run

equilibrium of the macroeconomic instability variables. We estimated an unrestricted VAR model in order to determine the suitable lag order that to be used in estimation of VECM. An optimal lag length of 2 is selected according to LR, FPE and AIC as presented in table (4).

Table 4
Lag selection criteria

Lag	LL	LR	FPE	AIC	SC	HQ
1	115.864	NA	1.42e-11	-2.305	0.264*	-1.347*
2	195.682	102.876*	8.84e-12*	-3.008*	2.1309	-1.092
3	248.952	49.719	2.94e-11	-2.531	5.177	0.342

Note: * indicates lag order selected by the criterion; LR: sequential modified LR test statistic (each test at 5% level); FPE: Final prediction error; AIC: Akaike information criterion; SC: Schwarz information criterion; HQ: Hannan-Quinn information criterion

Thus, a VECM is estimated at lag length of 2 and summary results of the model are presented in table (5) and represented by equation (3).

Table 5
VECM Summary Results

VECM Short Run Dynamic Coefficients				VECM Long Run Coefficients		
Variable	Coeff.	t. Stat.	Prob.	Variable	Coeff.	t. Stat.
ECT _{t-1}	-0.03	-2.843	0.005***	L(INF) _{t-1}	-3.04	-5.711***
D(L(GDP) _{t-1})	0.03	0.131	0.896	L(V) _{t-1}	-6.21	-3.934***
D(L(GDP) _{t-2})	0.32	1.605	0.110	L(UNE) _{t-1}	-26.33	-4.158***
D(L(INF) _{t-1})	-0.02	-0.521	0.603	L(I) _{t-1}	-1.14	-0.781
D(L(INF) _{t-2})	0.02	0.525	0.600	L(X) _{t-1}	5.51	3.713***
D(L(V) _{t-1})	-0.09	-0.640	0.523	L(TOP) _{t-1}	-8.73	-4.386***
D(L(V) _{t-2})	-0.29	-2.021	0.045**	L(DCP) _{t-1}	-5.32	-4.810***
D(L(UNE) _{t-1})	-1.06	-3.243	0.001***	C	83.33	
D(L(UNE) _{t-2})	-0.26	-0.919	0.359			
D(L(I) _{t-1})	-0.03	-0.340	0.734			
D(L(I) _{t-2})	-0.07	-0.862	0.390			
D(L(X) _{t-1})	0.01	0.114	0.910			
D(L(X) _{t-2})	-0.21	-1.899	0.059*			
D(L(TOP) _{t-1})	-0.54	-3.287	0.001***			
D(L(TOP) _{t-2})	-0.08	-0.393	0.695			
D(L(DCP) _{t-1})	0.56	3.160	0.002***			
D(L(DCP) _{t-2})	-0.02	-0.100	0.920			
C	0.08	2.866	0.005***			

R-squared = 0.66; Adj. R-squared = 0.45; SER = 0.140; SSR = 0.532; SD dependent = 0.190; DW = 2.31; F. Stat. = 3.134, P (0.000); LL = 36.019; AIC = -0.801; SC = -0.078

Diagnosis Tests	Test Stat.	P. Value
Autocorrelation:	Chi Square (205.243);	(0.135)
Heteroskedasticity:	Chi Square: 1266.32;	(0.195)
Normality: Joint	Jarque-Bera 157.061;	(0.000)
Stability:	VECM imposes 6 roots none of them is out the unit circle	

Note: ***, **, and * indicates significance at 1%, 5% and 10% significance level respectively

From the VECM results, in the short run, GDP is much influenced by unemployment with negative elasticity coefficient where an increase in unemployment by 1

percent leads to a decrease in GDP 10 percent. Trade openness is found to be growth retarding with negative elasticity coefficient of 0.54, an increase in exports and imports as percentage of GDP by 1 percent leads to decrease GDP by 5 percent. This is also confirmed by the coefficient between GDP and exports though at lag two. Financial development represented domestic credit is growth enhancing in the short run. The dependent variable GDP adjusts to long run equilibrium slowly by a factor of 3% each year due to any short run shocks in its macroeconomic determinants. This very low speed of adjustment indicates the high instability of GDP growth in Sudan. In the long run, GDP growth is also much negatively influenced by unemployment with the highest elasticity coefficient of 26.21. In addition, trade openness has a major negative effect on GDP in the long run with an elasticity coefficient of 8.73 and consistent with the finding for the short run. The effect of domestic credit finance though with high elasticity coefficient of 5.31 but it is negative means that it is growth retarding and contradicting its positive in the short run. In the long run, only exports have positive and significant effect on GDP contradicting the finding for the short run. Velocity of money has a long run negative and significant effect on GDP which is also consistent with the finding for the short run. Inflation has negative effect on GDP with an elasticity of coefficient of 3.04, although it has no significant effect in the short run. Investment has no significant effect on economic growth in the long run, though its elasticity coefficient is negative.

VECM equation is represented as follows:

$$\begin{aligned}
dLGDP = & -0.03LGDP_{t-1} - 3.04LINF_{t-1} - 6.21LV_{t-1} \\
& - 26.33LUNE_{t-1} - 1.24LI_{t-1} + 5.51LX_{t-1} - 8.73LTOP_{t-1} \\
& - 5.32LDCP_{t-1} + 0.03dLGDP_{t-1} + 0.32dLGDP_{t-2} \\
& - 0.02dLINF_{t-1} + 0.02dLINF_{t-2} - 0.09dLV_{t-1} - 0.29dLV_{t-2} \\
& - 1.06dLUNE_{t-1} - 0.26dLUNE_{t-2} - 0.03dLI_{t-1} - 0.07dLI_{t-2} \\
& + 0.01dLX_{t-1} - 0.21dLX_{t-2} - 0.54dLTOP_{t-1} - 0.08dLTOP_{t-2} \\
& + 0.56dLDCP_{t-1} - 0.02dLDCP_{t-2} + 0.08
\end{aligned} \tag{3}$$

Impacts on GDP growth and its volatility from external shocks are also assessed through the impulse response function (IRF) in accord with the estimated VECM. Table (6) shows GDP is largely explained by its own lagged shocks, followed by V, DCP, TOP, I and X, with the least contribution coming from Inflation and UNE.

Table 6
Impulse Response Function of GDP

Period	L(GDP)	L(INF)	L(V)	L(UNE)	L(I)	L(X)	L(TOP)	L(DCP)
1	0.140	0.000	0.000	0.000	0.000	0.000	0.000	0.000
2	0.161	0.029	-0.047	-0.025	-0.015	-0.019	-0.036	0.078
3	0.208	0.033	-0.119	0.002	-0.035	-0.043	0.014	0.079
4	0.233	0.020	-0.080	0.029	-0.058	-0.002	0.041	0.086
5	0.243	0.043	-0.118	0.012	-0.057	0.037	0.031	0.081
6	0.236	0.039	-0.093	-0.014	-0.043	0.042	0.061	0.073
7	0.249	0.022	-0.102	-0.013	-0.046	0.028	0.075	0.071
8	0.250	0.023	-0.112	0.003	-0.054	0.036	0.059	0.085
9	0.254	0.027	-0.120	-0.003	-0.051	0.041	0.067	0.082
10	0.256	0.026	-0.102	-0.009	-0.051	0.044	0.079	0.079
Cholesky Ordering	L(GDP)	L(INF)	L(V)	L(UNE)	L(I)	L(X)	L(TOP)	L(DCP)

Granger causality analysis. The long run causality is investigated by Granger causality test and results are summarized in table (7).

Table 7
Summary of Granger Causality Test

Null Hypothesis H_0 :	F. Stat.	Prob.	Remark and Direction of Causality
L(INF) does not Cause L(GDP)	1.438	0.249	NONE
L(GDP) does not Cause L(INF)	0.563	0.574	NONE
L(V) does not Cause L(GDP)	1.080	0.349	NONE
L(GDP) does not Cause L(V)	2.011	0.147	NONE
L(UNE) does not Cause L(GDP)	3.348	0.045	Reject H_0 : from UNE to GDP
L(GDP) does not Cause L(UNE)	0.164	0.850	NONE
L(I) does not Cause L(GDP)	0.099	0.906	NONE
L(GDP) does not Cause L(I)	0.148	0.863	NONE
L(X) does not Cause L(GDP)	3.311	0.047	Reject H_0 : from X to GDP
L(GDP) does not Cause L(X)	1.885	0.165	NONE
L(TOP) does not Cause L(GDP)	6.711	0.003	Reject H_0 : from TOP to GDP
L(GDP) does not Cause L(TOP)	0.583	0.563	NONE
L(DCP) does not Cause L(GDP)	3.748	0.032	Reject H_0 : from DCP to GDP
H_0 : L(GDP) does not Cause L(DCP)	1.323	0.278	NONE

The study finds unidirectional causality running from unemployment to GDP with no feedback effect, while domestic investment has no significant causal effect on GDP. Export is found to be Granger causing GDP growth and not the vice versa; and overall trade openness TOP is also found to cause economic growth. Financial development represented by private banks credit to firms is found to be Granger causing GDP growth whereas GDP does not feedback to financial deepening. The monetary

sector represented by inflation and the velocity of money has no significant causal effect on economic growth. These results are to large extent consistent with the findings of the VECM and IFR.

DISCUSSIONS AND RECOMMENDATIONS

The study has investigated the sources of economic growth instability in Sudan over a period of 48 years using annual time series data. According to the findings of the estimated VECM, the major sources of GDP instability are found be unemployment, trade openness, domestic credit finance, exports, velocity of money and inflation respectively. Investment has no significant effect on economic growth, but its elasticity coefficient is negative. Overall macroeconomic instability indicated by unstable, inflation, unemployment, demand for money, domestic credit to the private sector, exports, trade liberalization have major negative effects on economic growth particularly in the long run. Granger causality analysis indicated that GDP is affected by unemployment, exports, trade openness and financial development respectively but not by investment and the overall measure of trade openness. The monetary sector performance indicated by inflation and the velocity of money has no significant causal effect on economic growth. In view of the effects of exports and trade openness, economic growth can be understood as balance-of-payments constrained in the sense of the Post Keynesian theory, McCombie and Thirlwall (1994) and Thirlwall (2002) in that the negative effects of exports and trade openness operate in highly distorted, unstable and unsustainable balance of payments position over the past five decades. In other words, economic growth in Sudan cannot be sustained without viable balance of payments.

Upon the findings and discussions, the study recommends the followings:

- I. Unemployment should be reduced by investing in labor intensive sectors, namely the agricultural sector.
- II. The government should ensure the necessary infrastructure including effective institutional structure, legislations, and policies and deepening the financial sector in order to stimulate savings and provision of domestic credits finance.
- III. Exports need active government policies to be promoted and diversified while imports should be controlled which also serve to control imported inflation, and contribute to improve the country's' balance of payments.
- IV. Exchange and prices should be stabilized with aims of promoting savings, investment, economic growth and demand for money. In order to make this effective there is a clear need for close fiscal-monetary policy coordination and effective institutions.

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