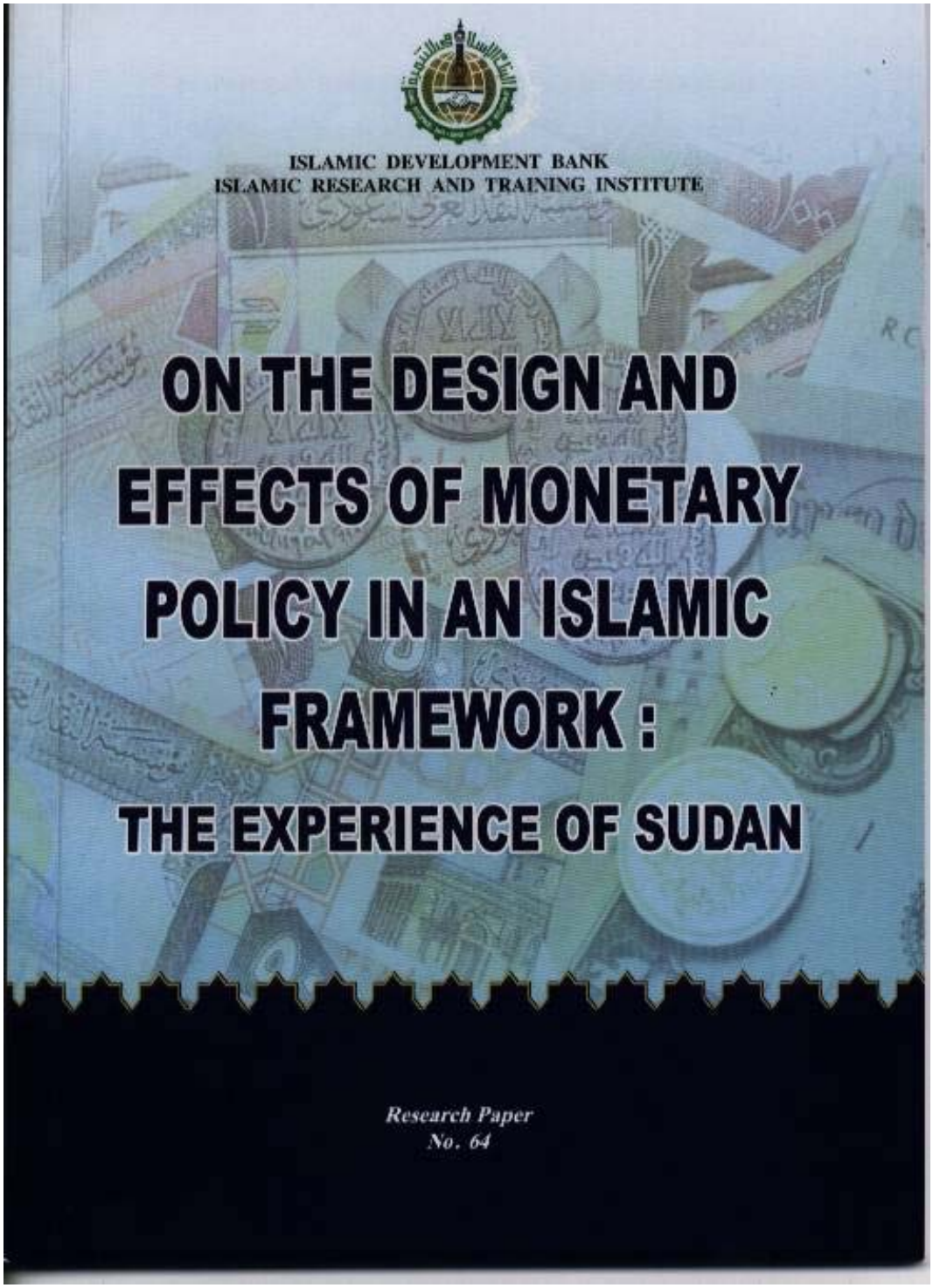
ISLAMIC DEVELOPMENT BANK
ISLAMIC RESEARCH AND TRAINING INSTITUTE
ON THE DESIGN AND EFFECTS OF MONETARY POLICY IN AN ISLAMIC FRAMEWORK :
THE EXPERIENCE OF SUDAN
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ON THE DESIGN AND EFFECTS OF MONETARY POLICY IN AN ISLAMIC FRAMEWORK: THE EXPERIENCE OF SUDAN

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FOREWORD

The main aim of the Islamic Research and Training Institute (IRTI) of the Islamic Development Bank (IDB) is to conduct research in the areas of Islamic banking and finance, Islamic economics and economic cooperation among IDB member countries. Recently, IRTI research has concentrated on empirical aspects of Islamic economics and finance. While economic policy in general and monetary and financial policies in specific may have important implications for the development and performance of an Islamic financial system, adoption of Islamic principles of finance would also significantly impact on the design and efficiency of monetary policy. Research indicates that financial development in an interest-free system is likely to be more conducive to economic stability and growth because the real sector determines the rate of return on financial assets and the application of profit-and-loss-sharing based instruments ties finance more closely to real investment. This can reduce the dangers of financial liberalization and encourage authorities to adopt a market-oriented indirect monetary policy to induce economic stability and sustainable growth in real output.

The present study analyzes the experience of Sudan with monetary policy before and after the full adoption of Islamic modes of finance in 1990 using an empirical model that attempts to explain the determinants of monetary growth and its effect on major policy objectives including real output growth and inflation. The author underscores the low level of financial deepening in Sudan before and after the shift to interest-free finance coupled with strict credit control and high economic instability emanating mainly from excessive inflationary finance during most of the period considered.

Econometric findings confirm that government spending and inflation are the key determinants of monetary expansion, whereas financial variables had no significant impact on real output and a certain rate of anticipated monetary growth causes prices to rise by a greater proportion. In view of the heavy costs of high inflation and the potential real output cost of monetary trgeting, the study recommends inflation

targeting as a framework for a more efficient design and implementation of monetary policy in Sudan. It argues that inflation targeting is also justifiable in terms of the *Shariah* requirement of preserving the value of money, the lack of flexible instruments of monetary control for efficient monetary targeting, and the move towards an equity-based interest-free financial system. The study recommends market-based indirect monetary policy as a means of promoting economic stability as well financial deepening that fosters real output growth.

I hope that the publication of this research will contribute to a better awareness and understanding, among researchers, policy-makers and other stakeholders, of the opportunities and constraints arising from economy-wide adoption of Islamic principles of finance, with particular reference to the design, implementation and effects of monetary policy. I also hope that the paper will stimulate further research in this important area.

Bashir A. Khallat
Acting Director, IRTI

ON THE DESIGN AND EFFECTS OF MONETARY POLICY IN AN ISLAMIC FRAMEWORK: THE EXPERIENCE OF SUDAN

1. INTRODUCTION[1]

The effectiveness of monetary policy in developing countries depends on a number of important conditions including adequate integration of money and capital markets and the availability of a sufficient set of instruments for indirect monetary management. Empirical studies of monetary policy can therefore play a significant role in policy design and evaluation in different countries. In view of the unique nature of Islamic finance, these studies might be particularly important for Muslim countries in which the entire financial system operates according to *Shariah* principles that disallow the use of interest-based financial instruments.

The move towards complete eradication of interest rates in Sudan in 1990 coincided with drastic economic changes including a sharp decline in real output growth due largely to natural factors, political instability and policy mistakes. Meanwhile, government expenditure escalated because of war and creation of numerous regional and local governments, among other things. With the lack of suitable financial market instruments such as treasury bills, the financing of budget deficits relied almost entirely on money creation resulting in hyperinflation and near currency collapse in the foreign exchange market. During this time, monetary and credit policies were used to accommodate the needs of government and/or mitigate the impact of expansionary fiscal policy (Elhiraika, 1998 and Kireyev, 2001). Tight monetary control and regulation of banks led to a notable financial disintermediation.

In early 1997, some important policy shift took place when it was concluded that unguided fiscal expansion was no longer bearable.

1 The author would like to thank two anonymous referees and the participants at IRTI Staff seminar for their helpful comments and discussions. Any remaining errors are the responsibility of the author alone.

Subsequent fiscal restraint's measures induced remarkable reductions in inflation rates, relative stability of the exchange rate, and a shift in the direction of indirect monetary policy. However, monetary policy still lacks flexibility and continues to rely heavily on direct instruments to accommodate fiscal requirements with no clear microeconomic targets to foster financial development (Elhage *et al*, 2000). Being heavily dominated by banks, the financial system of Sudan lacks sophistication with a market concentration on short-term financing. The banking system suffers from problems of chronic excess liquidity, while the stock exchange market, which was officially launched in 1995, is still very narrow. Recently some new financial instruments have been introduced with the hope of developing alternative sources of deficit financing and improving monetary management. These instruments comprise Government *Musharaka* Certificates (GMCs) that are used to assist in financing budget deficits and managing bank short-term liquidity and the Central Bank *Musharaka* (participation) Certificates[2] (CMCs) that are also intended to assist in promoting efficient monetary management.

In this study, we develop an econometric model to analyze the reaction function of the monetary authority and investigate whether the information contained in monetary aggregates such as broad money is really important for such objectives as macroeconomic stability and growth in 1970-2001. This helps us to assess the performance of monetary policy before and after the full adoption of Islamic financial principles in Sudan. The study also aims to contribute to the ongoing debate on the design and effects of an Islamic monetary policy in Sudan given the constraints imposed by the state of the financial system and Islamization. Moreover, the study is particularly important in view of the fact that despite extensive research on the theoretical aspects of Islamic finance and its implications for monetary management, quantitative empirical evidence on policy experiences is extremely limited in size and depth (see e.g. Darrat, 2001).

The study finds that there has been no significant change in the effects of monetary policy before and after Islamization. It also finds that government spending and inflation are the key determinants of monetary expansion, that financial variables have no significant impact on real

2 Government and Central Bank *Musharaka* certificates are also respectively known as *Shihama* and Shamum.

output, and that when inflation is high agents overreact to anticipated monetary growth by means of a more than proportionate adjustment in prices. Thus, high inflation inflicts heavy economic costs. We recommend inflation targeting as a framework for a more efficient design and implementation of monetary policy in Sudan. Inflation targeting is also justifiable in terms of the *Shariah* requirement of preserving the value of money, the lack of flexible instruments of monetary control for efficient monetary targeting, and the move towards an equity-based financial system.

The next section reviews the literature on Islamic monetary theory and policy. In section 3, we specify an empirical model comprising the monetary authorities' reaction function and the output and price effects of monetary policy. Section 4 gives a background to the economy of Sudan covering economic performance and policy, while section 5 presents and discusses the results of the model. Finally, section 6 concludes.

2. LITERATURE REVIEW

The adoption of an Islamic monetary system has important theoretical, operational and policy consequences. There has been extensive theoretical work on monetary theory and policy from Islamic perspective over the last 40 years. But, comprehensive empirical work in this field is scanty largely due to limited economy-wide application of Islamic principles of finance (see e.g. Darrat, 2001). Existing theoretical research concentrated on how an Islamic monetary policy operates and how it affects the real economy in general and the stability of the financial system in specific (e.g. Al-Jarhi, 1987, and Khan, 1992). We discuss in this section the role of monetary policy in the macroeconomic models of an Islamic economy and then focus on the sources and management of liquidity in this economy.

2.1 Monetary Policy in Islamic Macroeconomic Models

A common feature of the theoretical models developed to explain the nature and role of monetary policy in an Islamic context is the assumption of an equity-based banking system in which depositors are treated as if they were shareholders of banks. The return to depositors

depends on the actual profit/loss generated by banks and the nominal value of deposits, being treated as capital, is not guaranteed. Consequently, an Islamic banking system may be more conducive to financial stability than an interest-based one because deposits can be used to absorb losses resulting from real shocks. As suggested by some scholars (e.g. Al-Jarhi, 2001), banking and financial stability may also be achieved by applying a 100 percent reserve system that yields similar results to a 100 percent equity-based system. This means that the more the use of equity in Islamic banks, the less the need for reserves. This explains the fact that investment deposits with Islamic banks attract a zero reserve requirement. According to Khan (1992:329), a Profit-and-Loss-Sharing (PLS) based banking system eliminates possible discrepancy between liabilities and assets because the return on liabilities is directly related to the return on assets that are in turn based on real investment activity. This implies that the rate of return in the financial sector will be determined by the real sector.

Monetary policy may still be used in the Islamic system to influence the allocation of resources or to achieve certain targets such as price stability. Khan and Mirakhor (1987) develop a short-run macroeconomic model of an Islamic economy in which all credit consists of *Mudaraba* transactions and monetary policy has the same effects whether the authorities choose to influence money supply or the flow of Mudaraba financing. This can be done, for instance, by changing the Profit-and-Loss-Sharing (PLS) ratio. They explain that the use of flexible interest rates in a traditional economy yields exactly the same results given a closed economy or an open economy with a fixed exchange rate regime. This is so because Mudaraba financing is the counterpart of domestic credit that is the relevant instrument of monetary policy in such an economy. Khan and Mirakhor (1987:181) conclude that there is no fundamental change in the way monetary policy affects an Islamic economy compared to a traditional one. This conclusion was reinforced by Khan's (1992) ISLM model of an Islamic economy. However, these models are based on rather restrictive assumptions that do not allow for investigation of potential long-run effects of an equity-based financial system on savings and investment behavior and thereby on the real economy. In addition, the models do not take account of important dynamic factors such as the relationship between monetary and fiscal policy and the monetary and real effects of changes in the exchange rate.

Mirakhor and Zaidi (1992) developed a more comprehensive Islamic macroeconomic model of monetary policy to analyze the link between financial and real sectors in an open economy with a flexible exchange rate regime. According to this model, monetary policy can affect the rates of return on financial and real assets and thereby affects real investment demand, output and the balance of payments. Both short-term and long-term effects can be investigated. The monetary authorities cannot directly set financial rates of return and are constrained by both substitution possibilities among domestic (real and financial) assets and by offsetting international capital flows (Mirakhor and Zaidi, 1992: 396). Yet, the authorities can alter the rate of return on physical assets, by, for instance, the selling and buying of financial assets (securities) held by the central bank. This leads to portfolio adjustments and eventually influences the stock of money, which in turn affects the rate of investment[3]. A change in the rate of investment will affect private spending, output and prices. Both savings and investment are likely to increase in an Islamic system such that the effect on the current account position is ambiguous. The long-run implications of Islamic finance for international capital flows depend on what happens to domestic savings and investment. Meanwhile linking international capital flows to real investment ensures that enough resources will be generated for repayment of foreign loans. Also, as already indicated, an equity-based Islamic banking system is likely to be more capable of absorbing certain types of macroeconomic shocks since the liabilities of economic units consist of equities and fluctuations in capital flows are dampened.

Again, it follows that the rate of return depends on the real sector and hence Islamic banking tends to reduce the vulnerability of the economy to fluctuations in capital inflows and/or a sharp slowdown of new investment concomitant with uncertainty among investors. In addition to dampening fluctuations in capital flows, an equity-based PLS banking system can also facilitate a more efficient transfer of resources between the tradable and non-tradable goods sectors, and this has the potential to reduce the effects of exchange rate changes on the economy.

Therefore, monetary policy can well be relied upon to stabilize an open Islamic economy. However, among other things, the effectiveness

3 The investment rate is assumed to be a positive function of the ratio of the market value of firms to the replacement cost of their physical capital (the q-ratio).

of this policy hinges on the ability of the authorities to control monetary aggregates and their linkages to ultimate policy goals. In this connection, Darrat (2001) provides the only available comprehensive empirical test of the relative efficiency of monetary policy before and after Islamization[4] in Iran and Pakistan. Using data for 1960-1998, Darrat (2001:341) concludes that in both countries the introduction of Islamic banking improved or at least did not hamper macroeconomic performance, led to smoother behavior of velocity, provided a more controllable monetary environment, and strengthened the linkage between policy instruments and the main policy goal of price stability. However, as noted by discussants, Darrat's (2001) analysis does not provide convincing evidence or explanation as to the point that changes in the behavior of variables considered and linkages between policy instruments and policy goals are the result of elimination of the interest rate. Nonetheless, it stands that the introduction of Islamic banking had no significant inverse effects on these variables.

It is important to note that none of the theoretical models discussed above explicitly deals with the nature of sources of liquidity in general and the effects of deficit financing in an Islamic system in specific. Understanding the sources of liquidity is paramount in assessing the effectiveness of Islamic tools of monetary control.

2.2 Sources and Management of Liquidity in an Islamic Framework

Broadly speaking the main objectives of monetary policy in an Islamic framework are the same as those in a traditional economy, i.e. providing the liquidity needed for a growing economy while preserving price stability. It is argued by some economists that policy instruments, which may be direct or indirect, can also be similar in the two systems. For example, Siddiqi (2003) explains that the only significant difference relates to the use of the discount rate, which is generally ineffective and rarely used in developing countries. Meanwhile, it is possible for the central bank in an Islamic system to apply the PLS rate in connection

4 Darrat (2001) took the starting date for Islamic monetary systems as 1979 for Pakistan and 1984 for Iran.

with a refinancing facility[5] and this may eventually influence PLS rates set by banks.

In a fractional reserve system, the supply of money consists of the monetary base created by the central bank and credit money created by the lending of private banks. If a 100 percent reserve requirement applies, banks cannot create credit money and the entire money supply will consist of base money. Consequently, direct monetary policy that involves the selection and control of the money supply growth rate as an endogenous variable may be effectively applied. The alternative to this is indirect monetary policy that relies on such market tools as the rate of interest in achieving its ultimate goals.

In an Islamic economy, monetary policy is more likely to depend on the stock of money rather than the rate of return, which is mostly determined in the real sector. Hence, "the Islamic central bank should gear its monetary policy to the generation of a growth in money supply which is adequate to finance the potential growth in output over the medium and long-term within the framework of stable prices and other socio-economic goals of Islam" (Chapra, 1985:189). Chapra explains that the policy should aim at providing an adequate, realistic and sustainable growth in money supply and that this does not imply a monetarist approach because government[6] intervention may be desirable to achieve certain output and employment objectives or external balance.

Therefore, the basic source of money in an Islamic system is high-powered money created by the central bank using PLS modes of finance to increase money supply when required and to provide necessary finance to the government (Siddiqi, 2003). In this system, external capital flows will be tied to equity. Under a partial reserve system part of the liquidity created by the central bank will be received and used by

5 For example, the BOS provides funding to banks that face genuine liquidity shortages in the form of *Qard Hassan* for one week and to a maximum of 10 percent of the banks' deposits. Should the bank needs financing for more than one week, the BOS requires a share in the bank's profit. Also the BOS provides refinancing facilities to banks in the form of restricted Mudaraba relating mainly to liquidity shortages due to seasonal factors or the financing of priority sectors.

6 Many other Islamic economists (e.g. Siddiqi, 2003) corroborate that the state can play a proactive role in an Islamic framework by using monetary policy to achieve these and other targets.

commercial banks to finance more liquid investment in the form of *Murabaha* for instance. “To the extent that the money supply comprises demand deposits and some inferior money substitutes, the direct linkage between money supply and production possibilities will have become weaker” (Siddiqi, 2003:82-83). To avoid inflation or deflation, the authorities must ascertain that monetary expansion on the basis of PLS instruments and demand deposits is in line with fluctuations in aggregate output.

The literature on Islamic finance points out that proper monetary management requires effective control especially over the following major sources of monetary expansion:

1. **Fiscal deficits:** The government has the responsibility to maintain the price level and avoid unjust distribution in wealth (especially between lenders and borrowers and between capitalists and wage earners or between government and the public) that results from inflation. This means that deficit financing should under normal circumstances rely on real resources relating to the expenditure and revenue sides. Dependence on real resources is particularly important in the financing of government consumption expenditure, whereas government spending on projects may be financed through *shariah*-compatible profit-and-loss sharing instruments. While emergency borrowing may be justifiable by the need to face threats and to counter the effect of unexpected social and natural disasters, borrowing from the central bank (according to Chapra, 1985) should be limited within a non-inflationary framework. Government inability to raise funds through taxation and other real sources together with failure to curtail unnecessary spending is often the vital source of budget deficits. However, “an Islamic government must, if it wishes to be true to its name, eliminate both the sources of deficit” (Chapra, 1985: 191).

2. **Credit creation by private banks:** Besides control over reserve money growth, the authorities may in the extreme resort to a 100 percent reserve system in order to counter the disruptions caused by expansion in the demand deposits of commercial banks. This system has long been suggested and justified by many Islamic scholars on various *shari’ah* and economic grounds. In a comprehensive monetary model, Al-Jarhi (1987) concludes that

the absence of interest rates and deposits creation, produces a most optimal economic system, and this implies a 100 percent reserve ratio on bank deposits. According to Choudry and Mirakhor (1997:28), there are two types of Islamic financial models. One type discriminates between demand deposits and other deposits and argues that only demand deposits should attract a 100 percent reserve requirement, and the other type just suggests a positive reserve ratio to be applied to all deposits. However, in addition to the limitations mentioned previously, they summarize the problems of using reserve requirements in liquidity management in the following. First, applying a 100 percent reserve requirement on demand deposits only leads to over expansion of credit based on other deposits with a bias towards debt instruments. Second, with a full reserve system, the resources are used for safeguarding and cannot be used for liquidity management. Finally, this system can lead to financial disintermediation. In the case of fractional reserve requirements, the central bank has to employ a variety of means to regulate deposit creation in order to avoid inflationary pressures that arise when there is no offsetting growth in real output.

3. **Balance of payments surplus:** Domestic money supply is expected to increase in case of a balance of payment surplus that is fully or partly monetized. The government monetizes BOP surplus by spending it domestically. The opposite is true in the case of a BOP deficit. In either case, the government needs to have effective mechanisms for managing the effect of the BOP position on domestic liquidity. As mentioned before external flows should be tied to equity.

Other tools[7] of monetary control available in the Islamic system include quantitative and qualitative credit control, management of public demand deposits, open market operations in non-interest bearing assets, foreign exchange swaps involving local and foreign currencies, and refinancing facilities. Theoretically, the PLS and mark-up rates may be used to equate demand and supply for funds since variations in the PLS

7 See Choudhry and Mirakhor (1997) for a detailed general discussion on indirect tools of monetary control in an Islamic economy.

ratio, for instance, may invoke transfer of funds between demand and investment deposits.

However, as far as existing instruments are concerned, varying the PLS ratio and mark-up rates may be controversial because these rates are contractually fixed between the suppliers and users of funds. In principle, the rates are best determined by the market. However, should market imperfections ensue it may be desirable for the authorities to intervene in the interest of investors and healthy operation of the financial market. According to Siddiqi (2003) banking regulations in Sudan, Iran and Pakistan allow for regulation of these ratios. Yet, in all three countries, there is greater dependence on direct monetary control as well as lack of instruments for financing budget deficits. In effect, fiscal and monetary policies are closely related (see e.g. Sattar, 1989, and Haque and Mirakhor, 1998). The experience of Sudan shows that varying PLS ratios and mark-up rates are rather inadequate means for efficient counterbalancing of large changes in money supply (see section 4).

Choudhry and Mirakhor (1997) propose the conduct of open market operations with "variable dividend securities that are analogous to traditional securities" (p.29). They also discuss the problems of using monetary instruments effectively in Bangladesh and explain that Islamization coincides with liberalization and calls for the use of indirect tools of monetary control that influence the underlying supply and demand forces in the financial market. It is worth noting that, as research indicates, the effective use of these tools requires, among other things, a relatively independent monetary policy, adequately integrated money and capital markets that foster competition and efficient mobilization and allocation of resources, a regulatory framework to boost market conditions, and enhanced institutional and technical capacity of banks (see e.g. Page, 1993).

The foregoing discussion suggests that the primary concern of an Islamic monetary authority should be with maintaining the value of the currency. Hence, monetary growth in an Islamic context should be tied to achieving price stability and accommodating particularly the transaction demand for money which depends on real output (speculative demand is eliminated by the absence of interest rates). Also M2 may be used to counter domestic and external shocks. Growth in reserve money should be determined by economic conditions and not driven by deficit

financing needs. Increases in reserve money are best utilized when distributed between government (to finance projects) and as *Mudarabah* advances to commercial and specialized banks that finance desired activities. In this way, reserve money may also be used as a quantitative means of monetary control.

3. ANALYTICAL FRAMEWORK

3.1 Objectives and Design of Monetary Policy

Monetary policy has been increasingly used in developing countries to achieve a mix of overall economic objectives including price stability, high employment, economic growth, and financial sector's stability. Among other factors, the effectiveness of monetary policy depends crucially on the availability of a set of instruments, such as the rate of interest and open market operations that can be directly or indirectly controlled by monetary authorities. The availability of such instruments is limited by the level of financial development (see e.g. Page, 1993). Because of institutional constraints, lags and uncertainties concerning the efficiency of monetary policy, many developing countries considered it as a means to accommodate fiscal imbalances (see Killick and Mwega, 1993). Accordingly, monetary policy was often driven by fiscal objectives, and sometimes used in developing countries to achieve some broad objectives that are often contradictory.

However, with expanding scope for economic and financial liberalization in the 1990s, it is believed that monetary policy now plays a more active and precise role in economic policy and management (Kandil, 2001). First, monetary policy can be used to stimulate increased credit supply to public and private sectors and therefore accommodate the credit needs of an expanding economy. Second, monetary policy can be used to stabilize the economy by smoothing changes in aggregate expenditure. Third, monetary policy may also be used to offset or counter the effect of shocks on output and inflation. Extensive empirical evidence seems to indicate the significant role that monetary policy can play in determining the rates of output growth and inflation; the two most important policy objectives (see e.g. Jayaraman, 2002, Perez, 2003, and Panniza, 2002).

Recent research (Clarida *et al*, 1999, and Kandil, 2001) on monetary policy focuses on the specification and estimation of reaction functions to analyze the design and effects of monetary policy. This approach helps in identifying the intermediate targets (e.g. control of money supply) and the related factors on which the realization of ultimate policy objectives relies. These factors include such variables as international reserves, real income, the price level, and government expenditure.

The design of monetary policy varies according to changes in policy objectives, and hence the effects of monetary variables on real output and inflation may also vary. If priority is given to the finance of government spending, monetary growth varies positively with such expenditure. To maintain a real level of liquidity, real income and inflation should play a positive role in monetary growth. Monetary growth would react inversely to price inflation in order to achieve price stability. Conversely, promoting a desired level of international reserves requires that monetary growth and reserves change in the same directions. Domestic money supply is likely to expand with growth in international reserves, whereas a fall in them is expected to prompt the monetary authorities to slow down the rate of growth of domestic money supply. The effects of monetary policy can be examined by assessing the effects of monetary growth on real output and inflation using a simultaneous equation model.

3.2 Econometric Model

In assessing the design and effects of monetary policy, the typical endogenous variables of interest are monetary growth, real output growth and the inflation rate. The specification of the model below is based on the work by Clarida *et al*, 1999, Kandil, 2001, and Perez, 2003). However, the choice of explanatory variables, formation of expectation and adjustment lags depends on the characteristics of the economy being studied. Assuming that the reactions of the monetary authorities in the current period are based on the variables realized in the previous period, the monetary reaction function can be specified as follows:

$$\Delta m_t = \alpha_0 + \alpha_1 \Delta ir_{t-1} + \alpha_2 \Delta p_{t-1} + \alpha_3 \Delta y_{t-1} + \alpha_4 \Delta g_{t-1} + \alpha D90 + \varepsilon_1 \qquad (1)$$

Where m = broad money supply (M2), ir = international reserves, p= price level, y = real output, g = nominal government spending, D = a dummy variable taking the value of 1 for the period 1990-2001 and zero otherwise and ε is a white noise error term. All variables are in log form and the operator Δ denotes annual change in the variable (see Appendix 1 for definition and measurement of variables). In developing countries, governments often resort to money creation to finance budget deficits and manage liquidity in such a way as to achieve a desired level of reserves. Monetary growth is hypothesized to vary positively with growth in international reserves and government spending, whereas the coefficients on real output growth and price inflation may take either sign depending on the policy stance.

Real output and liquidity will vary in the same direction when monetary policy is accommodative in the sense that expansion in money supply accommodates the need for increased credit by government and the private sector to raise output. Likewise, accommodative policy implies a positive relationship between money and price. Conversely, when monetary policy is used to stabilize real output growth (to counter shocks) or price, both the output growth and inflation variables will be inversely related to monetary growth. This means that the monetary authorities have to reduce the rate of monetary expansion in order to lower aggregate demand and output or curtail price increases.

Economic theory (see e.g. Kitchen, 1997) indicates that the rate of interest is the appropriate measure of the opportunity cost of holding money. Meanwhile, it might be interesting to use the rate of interest that prevailed prior to the full adoption of Islamic modes of finance in order to investigate whether its abolition had any significant impact on ultimate policy objectives. However, in view of the fact that the rate of interest was always administratively fixed below its free market level, and that banks had the option not to use it since the incorporation of the first Islamic bank in 1978, it is arguable that the inflation rate is a better measure of the opportunity cost of holding money. This argument is further justifiable given the narrow size of the banking system, which makes physical assets very close substitutes to money.

The extent to which monetary growth impacts on output and price depends on whether agents are able to predict changes in monetary policy. If agents can fully anticipate and adjust to such changes,

monetary policy would have no significant effect on output and that monetary policy would be inflationary. When agents fail to anticipate or fully adjust to changes in monetary policy, aggregate demand and real output growth will be affected at least in the short-run. Therefore, the monetary policy reaction function can be used to decompose the effect of monetary growth into anticipated and unanticipated components. After estimating equation 1, the fitted value of the broad money's growth rate represents the anticipated component (m_a), whereas the residuals give the unanticipated one (m_u). Accordingly, we specify, the empirical output growth and inflation equations as follows:

$$\Delta y_t=\beta_0+\beta_1\Delta m_{at}+\beta_2\Delta\, m_{ut}+\beta_3\Delta g_t+\beta_4\Delta er_t+\beta_5\Delta ex_t+\beta_6 D90+\varepsilon_2 \qquad (2)$$

$$\Delta p_t=\delta_0+\delta_1\Delta m_{at}+\delta_2\Delta m_{ut}+\delta_t 3\Delta g_t+\delta_4\Delta er_t+\delta_5 D90+\varepsilon_3 \qquad (3)$$

Where er is the nominal exchange rate defined as the domestic currency price of foreign currency, ex is the rate of growth of exports[8] of goods and services, and all other variables are as defined above. Equations 2 and 3 account for the output (demand) and supply (price) effects of monetary policy with broad money changes being a major source of demand shift. In general economic theory predicts positive signs on the broad money and government spending variables in the output equation, but the exchange rate variable can be positive or negative depending on the usual output elasticities. Price inflation is envisaged to depend directly on monetary growth, government spending and the exchange rate.

As already mentioned, predictable changes in money to which agents can fully adjust will affect only price (and not output). In this case, money is neutral in the long-run. Inability to anticipate and/or adjust to monetary changes implies that monetary policy will have real short-run effects. Hence, depending on supply constraints and the speed of adjustment, the effects of monetary growth are broken down into real and inflationary effects. It is to be noted that the above model does not capture the important distribution effects of money-triggered price inflation or the direct effect of inflation on real output. These effects can be very significant especially at high and unpredictable inflation rates. Khan and Senhadji (2001) use data for 140 developing and industrial

8 Theoretically, we expect a high correlation between exports and the exchange rate. Should this be true, each of them will be entered separately.

countries for 1960-98 to demonstrate that inflation rates above 11-12 percent are likely to slow down output. To examine the link between inflation and output and in view of possible high correlation between money and price, we added the inflation variable to equation 2 at the estimation stage jointly with money as well as separately. We discuss the estimation techniques and results of the model in section 5.

4. ECONOMIC PERFORMANCE AND POLICY

4.1 Macroeconomic and Financial Indicators

Over the period 1970-2001, economic policy and performance in Sudan varied widely. With regard to economic performance and policy shifts this period can be divided into three distinct sub-periods: 1970-79, 1980-89 and 1990-2001. The economy grew rapidly between 1971-78 when relatively large foreign capital inflows were used to finance investment especially in irrigated agriculture and manufacturing. As shown in Table 1, real GDP grew at the average rate of 5.2 percent per annum in 1970-1979, the rate of exchange was stable and the average inflation rate was the lowest in the entire period considered. Yet, almost all indicators were beginning to show worsening macroeconomic and financial fundamentals toward the end of this sub-period. Government deficit and broad money grew at faster rates whereas GDP growth slowed down remarkably.

In the late 1970s, the government had to resort to the IMF for help to manage mounting internal and external imbalances and to mobilize badly needed foreign resources. Weak economic performance and relatively high inflation rates characterized most of the period 1980-1989 that started with a series of devaluations associated with deteriorating terms of trade and falling export earnings at time of rising aggregate demand for goods and services. Both government spending and broad money were rapidly expanding at the same average annual rate of 37 percent. The 1980s also witnessed the worst droughts and flood disasters in Sudan's recent history as well as the start of civil war in 1983 and its intensification toward the end of the period. Among other things, these led to a political change that brought the present government to power in

1989. In 1990-1996, there was no clear macroeconomic program[9], policies or proper management.

Unprecedented monetary growth at time of trade embargo, economic sanctions, political instability and heavy fighting in the Southern and the Southwestern parts of the country led to a series of economic crises. During this sub period, nominal government spending[10] grew at almost 100 percent per year, and budget deficit averaged 9 percent of GDP. To finance the deficit, money supply expanded at the average rate of 80 percent and the inflation rate jumped to 103 percent per year while the domestic currency depreciated[11] at the rate by 99.6 percent. Meanwhile, the period 1991-1999 witnessed the highest rate of growth in money supply, which grew at the compounded rate of 4400 percent. According to Kireyev (2001) this phenomenal expansion in broad money was attributable to growth in reserve money at the rate of 3900 percent, while the money multiplier was stable contributing just 12 percent to M2 growth.

Attempts to reduce macroeconomic imbalances during 1990-1996 were undermined by a highly distorted tax system that was characterized by widespread exemptions and weak tax administration, weak expenditure controls and debt management, the absence of non-inflationary debt instruments, and inadequate monetary instruments (IMF, 1999:7). With the help of the IMF, a program of economic reform was more seriously implemented in 1997-2001. The main elements of the program consisted of realignment of macroeconomic policies by means of reducing the fiscal deficits[12], tightening and reorienting monetary policy to lower the rate of inflation, eliminate most credit controls, and introduce new instruments for indirect monetary control. The program also aimed at reforming the rate of exchange.

9 Loosely defined economic programs during this period lacked government commitment and policy coordination.

10 The notable decline in the ratio government expenditure to GDP is attributable to large-scale privatization since around mid 1990s and removal or reduction of government subsidies especially for health, education and public amenities.

11 The US dollar appreciated against the domestic currency at the rate of 244 percent.

12 By eliminating government subsidies, and improving tax administration, budget management and monitoring.

As a result of the reform program, there had been notable economic recovery in terms of the unification and relative stability of the exchange rate, declining inflation rate and a doubled real output growth rate in 1997-2001. At the same time, both reserve and broad money growth slowed down to about half their levels during the 1990-1996 crises era. Oil exploitation and favorable weather conditions partly contributed to this improvement. But lending to government is still high accounting for 68 percent of domestic credit, whereas the sharp fall in velocity seems to indicate that public perception of economic uncertainty is still unfavorable. Broad money as a ratio[13] of GDP dropped to 10.8 percent in 1997-2001 suggesting significant reduction in financial intermediation. In most developing countries this ratio is about 50 percent or more.

Overall there appears to be a strong relationship between monetary growth, government spending, inflation and changes in the exchange rate (see Figures 1 and 2). But, real output growth has no clear relationship with any of the financial variables considered. In fact, deficit-driven monetary expansion with a financially repressed banking system cannot be expected to have a strong direct influence on real output. Moreover, it is worth mentioning that unlike the theoretical *Musharaka*-based models, the Islamic banking and financial system in Sudan is debt-based in the sense that debt contracts and instruments dominate the activities of this system (see Sid Ahmed, 2000:117-118).

Consequently, Sid Ahmed (2000) argues that monetary policy's prior concern should be with the proper management of money creation, and not with liquidity control at subsequent stages (stage of deposit creation through multiple credit expansion), though the latter is also important. In practice, however, the priorities of monetary policy were frequently ill-specified or turned upside down. Instead of constraining government borrowing which has been the most important source of liquidity creation, the government focuses on quantitative and qualitative control of bank finance. This fails both stabilization and growth

13 As measures of financial development, the use of monetary aggregates, as King and Levine (1993) and Demirguc-Kunt and Levine (1996) note is not straightforward. For instance, for a developed economy, as opposed to a developing one, high M2/GDP ratio may be a symptom of financial underdevelopment while a low M2/GDP ratio may indicate a high degree of sophistication of financial markets which allows individuals to economise on their money holdings (Bencivenga and Smith, 1991). Thus for Sudan the low money-GDP ratio is obviously an indication of serious financial disintermediation.

objectives (see Elhiraika, 1998) by limiting the availability of funds to investors while failing to check excessive monetary growth caused by public sector borrowing.

Table 1: Some Macroeconomic and Financial Indicators 1970-2001 (1982 =100)

Indicator	1970-1979	1980-1989	1990-1996	1997-2001 (Reform period)
Exchange rate change*	3.7	29.7	244	16.3
Reserves (current million US$)	45	23	61.8	145.2
Inflation rate (change in CPI)	16.6	35.9	103.5	18.53
Overall Budget deficit (% GDP)	0.7	-4.0	-8.9	-1.0
Government expenditure (% GDP)	19.3	19.44	11.21	9.44
Growth in Government spending	18.9	37.3	98.4	33.3
Broad money (% GDP)	23.6	33.2	23.4	10.8
Growth in broad money	25.5	37	80.1	30.1
Growth in reserve money (C+R)	27.7	40.4	71.2	30
Reserve Money (% M2)	64	72	63.2	59.2
Government share in total domestic credit	66.8	66.7	71.6	67.6
Gross domestic investment (%GDP)	15	14.4	16.6	18.2#
Real GDP growth rate	5.2	3.5	3.73	6.4

Source: Bank of Sudan Reports (various editions).
Notes: * This is the rate at which US$ rose against the domestic currency.# For 1997-1999.

To date, Sudan has no proper quantitative framework (model) for overall liquidity management, and recent reforms are still evolving. The financial system of the country has been underdeveloped before and after Islamization, whereas destabilizing fiscal policy and repressive monetary stance seriously limited the scope for financial development. The country lacks tools for effective indirect monetary control. Although a range of Islamic financial products (e.g. *Murabaha*, *Ijara*, etc.) is available for the financing of public sector's projects that yield competitive identifiable returns, the pace of developing adequate *Shari'ah*-compliant general government financing instruments is quite slow. As explained below, uncertainty surrounds the future of CMCs and GMCs as general financing instruments.

Aside from Sudan, Malaysia also attempted to introduce Islamic financial instruments for general government funding purposes. So far the Malaysian experience is limited to benevolent loans (Qard Hassan) from banks to government (see Sundararajan *et al*, 2001). Borrowing from the central bank remains the most important source of general government financing in countries that do not allow dealing in interest-based instruments. The central bank of Iran is considering the introduction of a National Participation Paper (NPP) and government Mudaraba certificates as s*hari'ah* compliant tools of government financing as well as monetary management. However, both NPPs and government Mudaraba certificates encounter serious problems relating to valuation and measurement of their rates of return (see Haque and Mirakhor, 1999 and Sundararajan *et al*, 2001:101).

Figure 1: Money, Output and Prices

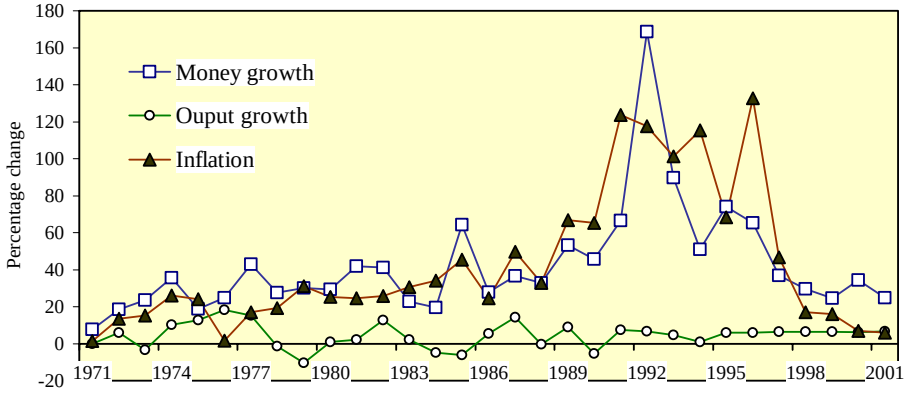
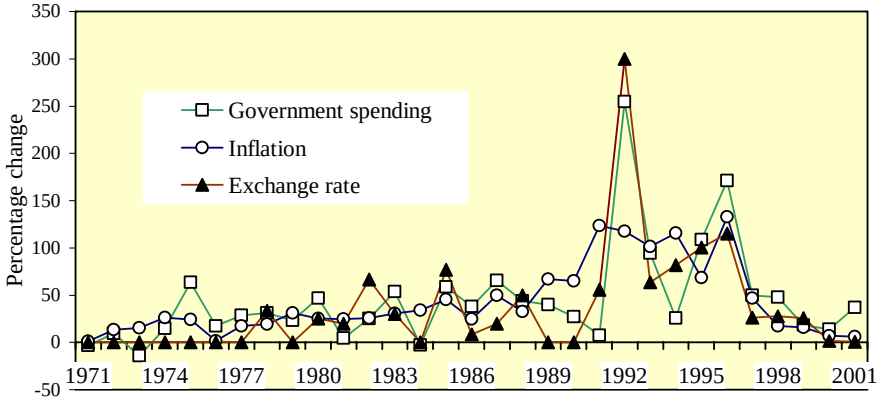


Figure 2: Government Spending, Inflation and Exchange Rate



4.2 *Nature and Instruments of Monetary Policy in Sudan*

The use of monetary policy in Sudan has always aimed for both stabilization and growth objectives. However, although growth requires increased mobilization and efficient utilization of funds, monetary policy was generally repressive because of preoccupation with the inflation that was largely the results of issuance of domestic currency to finance budget deficits. The objectives and design of monetary and credit policies have changed over time, from loosely stated objectives and lax control in the 1970s to comprehensive regulation during much of the 1980s and 1990s.

4.2.1 Monetary policy prior to Islamization

This period extends from 1970 to 1989. Up to the end of the 1970s the government pursued a pronounced central planning approach in which the financial sector was subjected to nationalization of banks and later heavy repression. Accordingly, there was no clear and independent monetary policy. Monetary policy continued to play a limited role throughout the rest of this sub-period.

Before the complete shift to the Islamic regime, the instruments[14] of monetary policy consisted of nominal interest rates, qualitative and quantitative credit control, cash reserve ratios of commercial banks, and cash margins on certain loans and bills. Because of the underdeveloped nature of the financial market the interest rate was not considered as an important instrument of monetary policy and changes in the reserve ratio were quite infrequent and ineffective due to excess liquidity in the banking system (Elhiraika, 1998). Consequently, monetary control relied chiefly on ceilings and selective credit control techniques besides moral suasion. Between 1970 and 1990 nominal deposit rates varied between 6 percent and 24 percent while lending rates ranged between 10 percent and 27 percent. With the inflation rate ranging between 1 percent and 67 percent, real interest rates were negative for most of this period. The legal reserve ratio was raised from less than 10 percent in the 1970s to 12.5 percent in 1985 and 18 percent in 1988.

14Treasury bills were used by government to raise funds for public expenditure and not considered as a tool of monetary management. There was no secondary market for these bills.

Since around 1984 credit ceilings on overall bank credit were implemented restricting credit by individual banks to between 50 percent and 70 percent of their total loanable resources. Whereas a minimum 10 percent share for development lending represented the only restriction on bank credit prior to 1986, since then commercial banks were required to direct 60 percent of lending to priority or productive sectors. This leaves a maximum of 30 percent of overall bank credit for foreign trade financing, and 10 percent for local trade and other loans. The policy of differential interest rates and discriminatory credit was apparently simple to design, but too complex and costly to monitor and more importantly generally ineffective because inflation was rising while real output growth plummeted.

4.2.2 Monetary policy after Islamization

The move towards full application of Islamic modes of finance in the first half of the 1990s coincided with the introduction of drastic measures that aimed at comprehensive and direct control of the financial market. The most significant measures seem to be the result as well as the cause of macroeconomic mismanagement. Excessive rise in government spending and inflationary financing led to high inflation and rapid exchange rate depreciation by 1991. The government attempted to tighten monetary policy through direct restrictions on credit and to fully and immediately replace the Sudanese Pound with a new currency, the Sudanese Dinar, with one Dinar replacing 10 Pounds. The process of currency change, however, involved restrictions[15] on the amount of money that depositors may withdraw from all types of accounts including checking accounts. Although reversed in less than a year, this policy shook public confidence in the financial system that dramatically shrunk and remained quite small in size up-to-date. There was a run on deposits and the cash withdrawn from banks was kept outside the financial system or used to acquire foreign currency as a preferred repository of purchasing power.

15 According to Osman (2001), these restrictions were necessitated by the fact that the quantity of the new currency was not sufficient for a once and for all replacement of the old currency. However, with lack of transparency, the policy was perceived by the public as an attempt by the government to reduce private spending and hence aggregate demand so as to combat inflation and reduce the pressure on the exchange rate.

Subsequent economic uncertainty and weakened banks' ability to mobilize savings and finance investment implied sharp decline in real output as well as a vicious policy circle involving high fiscal and balance of payments deficits leading to inflation, currency substitution and exchange rate depreciation, and further tightening of monetary and credit policies in 1990-1996. As mentioned previously with the help of the IMF, various policy reform measures were introduced in 1997 and since then most financial and economic indicators have improved at least in relative terms. The instruments of monetary policy sine 1990 comprised:

1. Profit and loss sharing ratios, which replaced interest rates, were used to specify the distribution of realized profit between banks and borrowers on the one hand and between banks and depositors on the other. The banks' share in borrowers' profits was fixed at 48 percent, of which 44 percent to be distributed to depositors. The exact rate of return to each party cannot be determined ex-ante. During 1990-1996, the BOS used to issue detailed directives regarding discriminatory PLS ratios and the minimum customer's contribution under *Musharaka* contracts as well as discriminatory mark-up rates under *Murabaha* contracts as means of both quantitative and qualitative credit control. For local trade, the *Musharaka* ratios varied between 25 percent in 1991 and the maximum of 80 percent in 1997. Among all sectors, local trade financing attracted the highest rates. These rates were lowest for priority sectors where they varied between 10 percent and 45 percent over the same period. Since 1999, the *Musharaka* ratio has been left for banks to determine. Meanwhile, discriminatory mark-up rates for *Murabaha* varied between 35 percent and 45 percent in 1991-1997, and eventually unified at 36 percent in 1998, 20 percent in 1999, 18 percent in 2000 and 10 percent in 2001. Discriminatory *Musharaka* ratios and *Murabaha* mark-up rates were too complex to design and implement. Therefore, they are not considered as effective tools of dynamic monetary management.

2. Credit ceiling policy stipulated 80 percent of total bank ceiling for priority sectors, with 40 percent of the ceiling for agriculture alone. Priority sectors' share was further raised to 90 percent and agriculture to 50 percent in 1993. This policy continued although

overall credit ceilings were gradually relaxed as from October 1994, while the share of priority sectors also declined, though only slightly, by 2001.

3. Reserve requirements policy had often aimed at restricting bank credit. Thus, the legal reserve ratio was raised from18 percent in 1989 to 20 percent in 1990 and 30 percent in 1993, but reduced to 26 percent in 1997 and to 15 percent by 2001. In 2001, this rate was changed twice as a means of active liquidity management. However, since banks were still having excess liquidity the efficiency of this policy was uncertain. Commercial banks average reserves were 23 percent in 1999 and 32 percent in 2000.

4. Other instruments of indirect monetary control comprised margins on letters of credit, foreign exchange transactions, and directive regarding inter-bank lending.

As part of the economic and financial reform program that began in 1997, some existing instruments were modified and some new ones were introduced. For example, the BOS opened a liquidity-financing window in 1998 as an overdraft facility that also fulfils its function as a lender of last resort. A commercial bank that needs to borrow from the central bank may obtain a benevolent loan for up to two weeks and for a maximum of 10 percent of its current deposits. Should the bank needs financing for more than two weeks, the central bank will be entitled to a share in the bank's profit. Banks are also entitled to a restricted *Mudaraba* finance from the central bank in connection with their financing to priority sectors especially agriculture, which is characterized by pronounced seasonal flows. As mentioned under item 1 above, statutory limits on the *Musharaka* rate were eliminated by the end of the period under review, while the *Murabaha* mark-up was substantially reduced. Open market operations never existed during 1990-1997 because of lack of suitable securities.

The introduction of GMCs and CMCs in the reform period is perhaps the most serious attempt for developing such instruments. These certificates were the outcome of a joint effort involving the BOS, the Ministry of Finance, and the IMF. CMCs were incepted in 1998 with the hope of developing tools of indirect liquidity management in the banking

sector. They represent a limited number of participation certificates (shares) issued by Sudan Financial Services (SFS) company on the basis of government ownership in nine commercial banks. The value of individual shares varies with changes in the value of the assets of the banks involved, and the company produces monthly information on the market for CMCs. The holders of CMCs are not shareholders, and their reward is determined by the face value of the shares plus capital gain or loss. In other words, the return to these banks depends on the difference between the buying and selling price. The risk of holding CMCs is presumably low given their diverse asset base represented by the nine banks.

As certificates of equal nominal value that is monthly revised, CMCs are negotiable, transferable and can be used to settle debt or as securities against finances. They are highly liquid and the BOS undertakes to repurchase them should there be no other buyer. CMCs can be used as tools for conducting open market operations. The BOS invites bidding from commercial banks for the buying or selling of CMCs. The selling (purchase) price of CMCs is the bidding or offer price at which the quantity demanded (supplied) by commercial banks is equal to the quantity the BOS wishes to sell (purchase). Thus the value of CMCs is market determined. In addition to helping the central bank in trying to control liquidity, CMCs provide an opportunity for commercial banks to manage their short-run liquidity fluctuations.

The value of CMCs sold to commercial banks, as depicted in Table 2, ranged between 1.1 percent and 2.2 percent of broad money (0.13 percent and 0.2 percent of GDP) in 1998-2001. Thus these certificates cannot be effectively used at the present as means of monetary control since they are too small to mitigate large liquidity fluctuations. Another important limitation of CMCs is that their high rates of return that exceed 30 percent per annum encourage commercial banks to buy them not just when there is excess liquidity but at the expense of extending finance to the private sector. Also CMCs began to trade at prices that are above face value and close to the fair market value of the underlying assets, and auctions for them are often oversubscribed (Kireyev, 2001:25). The scope for creating more CMCs is constrained by the limited value of their asset base. Even the sustainability of currently circulating certificates is questionable in view of envisaged privatization of state-owned banks and

other enterprises as part of an ongoing economic and financial reform program.

GMCs are also asset-based securities that rely on the accounting value of nine government-owned highly profitable corporations. They are managed by SFS Company and were first issued in 1999 by the MOF. In addition to their fixed nominal value (SD0.5 billion per share), GMCs holders are entitled to a share in the profits realized by the corporations concerned. The corporations are required to submit quarterly audited accounts, and the securities have a fixed one-year maturity. The primary objective of the securities is to mobilize non-inflationary finance for government deficit. They can also be used by the BOS as instruments of liquidity management. Similar to CMCs the price of GMCs is market-determined, and the government guarantees their repurchase at the fixed nominal value plus a profit share should there be no private buyer. GMCs are negotiable and transferable, and are available to banks and other financial institutions, private and public corporations and individuals.

The government and central bank *Musharaka* certificates are used in a reactive manner. Once the size of the deficit is determined, the authorities decide on how much GMCs financing is needed to finance the deficit and in what direction should CMCs change. *Musharaka* certificates are used either to assist in mobilizing funds for the government or to control liquidity in the hope of minimizing the effects of the deficit on prices and the exchange rate. Similar to CMCs, the circulation of GMCs is still limited. As shown in Table 2, the value of GMCs sold increased from 0.6 percent of broad money in 1999 to 10.1 percent in 2001 (from 0.1 percent of GDP to 1.4 percent, respectively). In line with CMCs, GMCs offer very high rates of return that exceed 30 percent per annum. This may lead to switching of savings from banks and individuals to government. Meanwhile, the assets base of the securities is going to decline with the pace of privatization. In addition to their fixed maturity, the accounting value of GMCs is too large to facilitate bulk selling and buying that enables their use as flexible means of monetary management. Both the primary and secondary markets for securities are presently thin and limited to the capital city. There is a need for further development of the securities market through the development of new securities, among other things. The questions raised above in

connection with the asset base of CMCs are equally valid in the case of GMCs.

Table 2: Evolution of Government and Central Bank *Musharaka* Certificates

Year	CMCs*			GMCs*		
	Amount SDbn	% of M2	% of GDP	Amount SDbn	% of M2	% of GDP
1998	4.86	2.3	0.2	-	-	-
1999	4.2	1.6	0.16	1.4725	0.6	0.1
2000	3.65	1.1	0.13	7.9265	2.2	0.3
2001	5.01	1.2	0.15	43.791	10.1	1.4

Source: Bank of Sudan Reports (1998 and 2001).
Note: * Certificates sold during the year. Each GMC = SD0.5 mn.
Each CMC = SD1 mn.

With substantial reductions in inflation rates, the relative liberalization of nominal rates of return on financial assets led to notable increases in real rates in 1997-2001. Also the emphasis of monetary policy has been generally shifted to price stability. However, unlike the case in other countries, despite financial reform the financial system is still weak and narrow, whereas growth in private sector credit is slow (Kireyev, 2001). Low bank lending to the private sector has been attributed to structural problems including under capitalization, fragmentation, and low profitability. Kireyev (2001) explains that enhancing the development role of banks is a long-term issue that has two important requirements. First, efficient bank restructuring in terms of amalgamation through mergers or liquidation, recapitalization, modification of banking laws to allow more flexibility in registration and loan collection ..., etc. Second, elimination of ceilings on bank credit and adherence to international standards of regulation and supervision. Therefore, the frequently declared growth objectives of monetary policy are rather unrealistic while as stated before focusing on the price objective needs a more efficient policy design and implementation with proper control over government borrowing from banks.

5. MODEL ESTIMATION AND DISCUSSION OF RESULTS

Generally speaking, it is difficult to obtain a consistent macroeconomic data set for a developing country like Sudan. Meanwhile, the significant shocks (including weather, internal displacement due to war and natural calamities, and economic embargo and sanctions due to political factors and so on) to which the economy of Sudan was repeatedly subjected may signify erratic movements in the macroeconomic variables of interest. However, financial aggregates that constitute the bulk of our variables are usually more accurately measured, and the Bank of Sudan together with the IMF has recently produced more consistent macroeconomic data for Sudan. In view of this important revision, some of the variables that used to be reported in the International Financial Statistics of the IMF are now discarded because of inconsistency. A complete set of data for all the variables used to estimate the model specified above was obtained from the BOS. The data on financial variables and output are consistent with those found in the IFS (see IFS, March 2003). Government expenditure is the only variable for which there is no complete information in the IFS.

With these concerns in mind, we have carefully investigated the time series properties of the variables considered before estimating the model. The investigation relied on stationarity and cointegration tests. The results of these tests are presented and discussed below.

5.1 Stationarity and Cointegration Tests:

Two of the most widely known unit root tests are used to test for stationarity: the Augmented Dickey-Fuller (ADF) test, and the Philips-Perron[16] (PP) test (with truncation lag/periods of serial correlation of 3). As shown in Table 3, both tests confirm that each of the series considered contains one unit root and is of integrated order (1). The only exception is the inflation variable for which ADF marginally rejects the existence of a unit root, while PP only marginally accepts the presence of unit root

16 While the ADF test corrects for higher order serial correlation by adding lagged differenced terms on the right-hand side, the PP test makes a nonparametric correction to the t-statistics of the lagged dependent variable's coefficient from the AR(1) regression to account for the serial autocorrelation in the error term (Eviews 3 Mannual).

at the 10 percent level. Accordingly we attempted to replace inflation level with inflation difference, which is highly stationary. However, there was no significant change in estimation results.

We applied the Johansen (1988) multivariate technique to each of the model equations with a maximum of two lags. With K endogenous variables, each of which has one unit root there can be from zero to k-1 linearly independent cointegrating relations. At least one cointegrating relation is needed for the model to be correctly specified (that is no further transformation is warranted) and fitted to the data. Table 4 contains the results of this test including the eigenvalue and trace tests. Both the maximum eigenvalue test and the trace test indicate the presence of at least 3 significant cointegrating vectors in the money growth equation, 1 vector in the output growth equation and 2 vectors in the inflation equation. None of the equations has exact K cointegrating vectors, and this substantiates the general validity of the unit root tests. Although the number of significant conitegrating relationships may be sensitive to the lag structure of the model, there is normally one vector that is consistent with the data. Accordingly, without further transformation of variables, the model was estimated using both the 2SLS method and the 3SLS system technique that correct for autocorrelation due to the use of dependant variables as regressors.

Table 3: Unit Root Test (Estimation Period 1971-2001)

Rate of change of (%):	**ADF test (constant included)**	**Phillips-Perron statistic (constant included)**
Broad money	-3.06*	-3.13*
Real output	-4.09**	-4.14**
International reserves	-6.16**	-6.59**
Exchange rate	-5.01**	5.16**
Government spending	-4.55**	-4.45**
Consumer Price Index	-2.51	2.63*
Inflation#	-7.8**	7.75**
Exports of goods and services		

Notes: * and ** denote that the test is significant at the 5% and 1% levels, respectively. Lags varied between 1 and 2. # represents difference in the rate of inflation. All the estimation uses Eviews3.

Table 4: Multivariate Cointegration Tests

Equation		1	2	3
Variables		Δm_t, Δirt-1, Δp_{t-1}, Δy_{t-1} , Δg_{t-1}	Δy_t, Δm_{at}, Δm_{ut}, Δg_t, Δer_t, ΔEX_t	Δp_t, Δm_{at}, Δm_{ut}, Δg_t, Δer_t
Hypothesis		1971-2001	1971-2001	1971-2001
	Max Eigen.	0.751**	0.727**	0.774**
r = 0	Trace	100.04**	88.97**	114.59**
	Max Eigen	0.636**	0.63*	0.687**
r ≤ 1	Trace	61.09**	52.64*	72.96**
	Max Eigen	0.452**	-	0.597**
r ≤ 2	Trace	32.78*	-	40.44**
	Max Eigen.	0.5357*	-	-
r ≤ 3	Trace	15.93*	-	-

Notes: Max Eigen. = Maximum Eigenvalue. * and ** denote significance at 5 percent and 1 percent, respectively. Only significant values are reported here. Beta and alpha vectors are not shown for space consideration.

5.2 Discussion of Results:

Before estimating the model, we have examined the correlation between the dependent and explanatory variables. As shown in Table 5, there is a high positive correlation between monetary growth on the one hand and growth in government spending, growth in the exchange rate, and inflation on the other. There is also high and positive correlation among the latter group of variables. This indicates the fact that inflationary financing of budget deficits is often associated with exchange rate depreciation. Real output growth seems to have no robust correlation with any of the variables in the model.

All the equations were jointly estimated using two stages least squares method (2SLS). In the first stage, the fitted values of the dependent variables that appear as explanatory variables in other equations were obtained with monetary growth being divided into anticipated and unanticipated components. To improve model estimation, a three stage least square (3SLS) system estimation method was also applied. This is an appropriate technique when explanatory variables are

correlated with the error terms, and there is both heteroscedasticity and contemporaneous correlation in the residuals. The presence of lagged values of output and inflation in the monetary growth equation eliminates the need for lagged dependent values to account for possible persistence or adaptive adjustment in the model. However, when lagged values of regressors are not used, lagged dependent variables are included. We also estimated the model with and without the dummy variable DUM90 that takes the value of 1 for the period 1990-2001 and zero otherwise. This dummy is intended to capture the possible impact of complete elimination of interest-based instruments. Both 2SLS and 3SLS results are reported in Tables 6-8 below for each equation separately.

For all the equations in the model, the results of 2SLS and 3SLS are highly consistent. As in Table 6, money growth is positively and significantly influenced by inflation. A one percent increase in the price level would generate about a 0.5 percent rise in money growth. Also the results suggest a robust positive relationship between money growth and government spending. But in terms of magnitude the direct effect of government spending on money growth is about half the price effect. Since only inflation and government spending are important in determining monetary growth in Sudan, government expenditure is responsible for about 25 percent of explained variation in money stock. This is highly consistent with the fact that almost 90 percent of monetary expansion was due to growth in reserve money, which was in turn determined by the borrowing requirements of the government.

None of the variables considered had a significant impact on output growth, aside from growth in exports. But, the F statistics of 0.8 indicates a weak overall result for the real output growth equation. The overall coefficient of determination varied between 5 percent and 15 percent. This suggests that monetary growth whether anticipated or unanticipated has no important effect on real output. Adding inflation to the output equation with different lags indicated a negative but insignificant relationship between the two variables. The findings of the output equation are not surprising in view of the numerous exogenous shocks as well as erratic changes to which the economy of Sudan was subjected during the period considered. These influences included important policy shifts, civil wars, weather and other natural calamities. As economic theory suggests (see e.g. Mishkin, 1997) the absence of links between

real output and monetary expansion may be attributed to a number of factors. These include the weak economic and institutional infrastructure, and the size and nature of the financial system that influences the response of money demand and investment demand to changes in the opportunity cost of holding money. In an interest-based economy, monetary policy is more effective when the interest elasticity of demand for money is low and the interest elasticity of demand for investment is high. In a true Islamic economy, speculative demand for money is expected to be relatively limited because finance is tied to real assets and since the real sector determines the rate of return in the financial sector, speculative demand is also expected to be more stable. Hence, investment in real assets might be the only alternative to holding money and changes in the *Musharaka*/*Murabaha* rates or even broad money are likely to have no strong impact on output in the short-run.

The total assets of the financial system of Sudan amount to about just 15 percent of real output, and banks dominate the financial system. Moreover, the financial system was subjected to tight credit policy such that only about 50 percent of deposits were normally used to extend funds to the private sector. Meanwhile, monetary growth was largely driven by deficit financing needs, while government spending is overwhelmingly dominated by current expenditure. When the government creates money to finance consumption spending this will have little impact on real activity and may directly translate into high inflation rates that adversely affect output. The immediate policy conclusion of the findings for equation 2 is that monetary policy is ineffective in achieving growth objectives under such circumstances as those that characterized the economy of Sudan in the last three decades.

Economic theory predicts that agents fully adjust prices and wages when they are able to accurately anticipate monetary changes and when they are free to respond to these changes. Estimates of the inflation equation are reported in Table 8 and are generally consistent with our priori expectations. Over 70 percent of variation in inflation has been explained by the variables included in the model and the F-statistics indicates a robust relationship between inflation and the explanatory variables. Interestingly, the findings confirm that agents overreact to expected monetary growth in the sense that if they anticipate broad money supply to expand by 1 percent, they raise prices by more than 1

percent. But unanticipated monetary growth has no significant effect on inflation. Growth in government spending appears to be an important indicator of the direction of the price level. As government spending increases, inflation rises significantly. But the coefficient of variation between the two variables is small. This is possibly a reflection of the fact that the response of consumer prices to government spending[17] depends on the type and nature of expenditure financing.

Exchange rate depreciation has a significant but small positive impact on inflation. This is also theoretically correct because as the domestic currency depreciates, the value of imported inputs and consumer goods rises leading to subsequent increases in domestic price. This finding signifies that monetary policy is indeed effective as far as price stability is concerned. As explained in detail in section 5, inflation targeting may be a justifiable objective under the institutional and *shariah* constraints on monetary policy in Sudan. Inflation is largely perceived to be the result of policy action and price increases emanating from natural factors tend to wither out when these factors change. For example, grain shortages caused by inadequate rainfall normally lead to very high grain prices that stimulate over-supply of grain in the following season should rainfall return to normal. Consequently, grain price drop and on average grain price may remain unchanged over this weather cycle. Conversely, excess supply of reserve money for instance is likely to have a permanent effect on price.

17 It is worth noting that the bulk of government spending consists of employees' compensation and that once the government announces annual wage increases, market prices rise immediately even before the increases are effected.

Table 5 : Correlation Matrix

Variable	Δm	Δy	Δp	Δir	Δg	Δer	ΔEX	ΔInf
Δm	1							
Δy	0.0687	1						
Δp	0.741	-0.038	1					
Δir	0.333	-0.122	0.12	1				
Δg	0.854	0.05	0.45	0.43	1			
Δer	0.81	0.15	0.61	0.25	0.788	1		
ΔEX	-0.074	0.35	-0.094	-0.035	0.028	0.02	1	
ΔInf	0.082	-0.012	0.38	-0.171	0.012	0.015	0.0014	1

The dummy variable was insignificant in all cases indicating that there was no important change in the model before and after the full adoption of Islamic modes of finance. This is again unsurprising given the nature and role of monetary policy in Sudan and the static institutional and economic infrastructure of the country that remained substantially rigid throughout the period considered. The sign of the dummy was negative for monetary expansion perhaps indicating the slowdown of monetary growth rates since 1997 following their record high levels in 1990-1996. The positive dummy coefficient for output and inflation reflects GDP recovery in the 1990s but with somewhat persistent inflation.

Table 6: Monetary Growth: 2SLS and GMM 3SLS results (EP: 1972-2001)

	2SLS			3SLS	
Variable	**Equation 1**	**Equation 2**	**Equation 3**	**Equation 4**	**Equation 5**
Constant	11.81 (1.7)*	11.4 (1.52)	11.5 (1.7)*	10.6 (1.44)	11.98 (1.7)*
Δir	0.033 (1.2)	0.036 (1.28)	0.032 (1.13)	0.034 (1.24)	0.035 (1.25)
Δg	0.252 (3.21)**	0.228 (2.83)**	0.249 (3.1)**	0.26 (3.24)**	0.263 (3.34)**
Δy –Fitted	0.001 (0.0001)	0.299 (0.26)	0.06 (0.052)	0.081 (0.072)	0.027 (0.024)
Δp – Fitted	0.425 (3.66)**	0.572 (3.66)**	0.45 (3.31)**	0.432 (3.55)**	0.426 (3.2)**
DUM90	-	-	-2.78 (0.41)	-	-2.26 (0.337)
$\Delta mt\text{-}_1$	-	-0.16 (1.24)	-		
R^2	0.8	0.81	0.8		
F	25.1	19.8	19.4		
DW	1.5	1.33	1.5	$\sigma = 14.14$	$\sigma = 14.23$

Notes: ( ) Figures are the t-statistics. * and ** denotes significance at the 10% and 5% levels, respectively.

Table 7: Real Output Growth: 2SLS and GMM 3SLS Results

Variable	2SLS			3SLS	
	Equation 1	**Equation 2**	**Equation 3**	**Equation 4**	**Equation 5**
Constant	3.95 (1.1)	5.63 (1.5)	5.74 (1.5)	4.63 (1.2)	4.95 (1.3)
Δer	-0.0032 (0.29)	-0.0033 (0.29)	-0.003 (0.25)	-0.005 (0.45)	-0.005 (0.41)
Δg	0.042 (0.68)	0.068 (1.11)	0.069 (1.1)	0.05 (0.92)	0.058 (0.94)
Δm-Residuals	0.01 (0.092)	0.018 (0.154)	0.016 (0.134)	0.032 (0.28)	0.023 (0.2)
Δm-Fitted	-0.033 (0.26)	-0.09 (0.72)	-0.1 (0.693)	-0.053 (0.13)	-0.063 (0.65)
Δex	7.94 (1.7)*	-	-	-	-
DUM90	-	-	0.44 (0.89)	-	0.203 (0.1)
Δyt-1	-	0.22 (0.86)	-	-	
R^2	0.15	0.09	0.05		
F	0.82	0.53	0.26		
DW	1.7	1.73	1.7	$\sigma = 7.1$	$\sigma = 7.1$

Notes: ( ) Figures are the t-statistics. * and ** denotes significance at the 10% and 5% levels, respectively.

Table 8: Inflation: 2SLS and GMM 3SLS Results

	2SLS				3SLS	
Variable	**Equation 1**	**Equation 2**	**Equation 3**	**Equation 4**	**Equation 5**	**Equation 6**
Constant	-11.8 (1.46)	-11.25 (1.44)	-6.54 (0.85)	-11.8 (1.5)	-6.01 (0.8)	-11.3 (1.44)
Δm-Fitted	1.1 (7.21)**	1.1 (6.22)**	1.12 (7.16)**	1.1 (7.2)**	1.1 (6.9)**	1.05 (6.2)**
Δm-Residuals	0.001 (0.003)	-0.001 (0.01)	-0.22 (0.69)	-0.1 (0.26)	-0.26 (0.8)	-0.09 (0.296)
Δg@	0.18 (2.4)**	0.164 (2.1)**	-	0.183 (2.5)**	-	0.169 (2.2)**
Δert-1	-	-	0.036 (1.92)*	-	0.036 (1.91)*	-
DUM90	-	4.96 (0.514)	-	-		4.86 (0.51)
Δpt-1	-0.05 (0.21)	-	-	-		
R^2	0.72	0.73	0.71			
F	21.9	17.21	21.13			
DW	2.22	2.18	2.29	σ = 21.2	σ = 22.0	σ = 21.1

Notes: ( ) Figures are the t-statistics; @ Lagged by one period in the case of 3SLS estimation; * and ** denotes significance at the 10% and 5% levels,respectively.

To sum up, the empirical results suggest that in a developing country like Sudan, monetary policy is significantly driven by fiscal imbalances and is therefore hardly independent. Given the prevailing institutional constraints and state of financial development, monetary growth appears to have no important effect on real activity, but strongly affects prices. Government spending that depends significantly on money creation also has no important impact on output but precipitates economic instability.

The efficiency of monetary policy remained unchanged after the introduction of Islamic modes of finance. Besides being consistent with the general conclusions of the monetary policy's models discussed in section 2, this finding indicates that either there was no important change in the instruments of monetary policy after the Islamization or that monetary tools were never effective. (As a matter of fact the only important change in instruments was the abolition of interest rates that were never considered as effective tools of monetary policy). The lack of significant shifts in the nature and effects of monetary policy in Sudan may be attributed to the fact that the effect of Islamization works through long-run changes in the savings-investment process. This in turn requires significant improvements in the financial systems, which are yet to be seen. In fact, as mentioned previously the financial system of Sudan was more severely oppressed after Islamization than it was in the 1980s period.

The above findings raise a number of policy questions relating to the appropriate role of monetary policy in an Islamic framework in general and in Sudan in specific, and the alternatives to inflationary financing of the government. Since the real sector effects of an Islamic monetary system depend on its long run influence on the behavior of savers and investors, the primary focus of monetary policy should be on preserving the value of money. Indeed, on the basis of the findings of this study, we recommend that the BOS's monetary policy should squarely focus on inflation targeting besides proper banking supervision and regulation. Bringing inflation under control is critical because high inflation distorts prices, discourages investment, stimulates hoarding, currency substitution and capital flight. In addition, inflation can inhibit growth, make economic planning difficult, and extreme inflation leads to

social and political instability (Debelle *et al*, 1998)[18]. Inflation targeting requires the authorities to concentrate on inflation as a target instead of intermediate targets such as monetary aggregates and the exchange rate.

It can be gauged from the Sudanese experience that price stability is a major contribution that monetary policy can make to economic growth and that short-term manipulation of monetary policy to achieve other goals may be both inefficient and contradictory with price stability. Meanwhile, inflation targeting forces the monetary authorities to be forward looking and tighten policies before inflation creeps. Using a representative measure of aggregate price such as the consumer price index, the central bank forecasts the future path of inflation. Monetary policy adjustment depends on the difference between forecast and target inflation rates. Thus, unlike the conventional procedure for determining policy objectives and design, inflation targeting can improve the design as well as the performance of monetary policy.

The requirements of inflation targeting are summarized by Debelle *et al* (1988) in the following. First, relative central bank independence in determining inflation targets and instruments of monetary policy. This requires low government borrowing from the central bank, a broad revenue base for the government to reduce its deficit and a relatively well-developed financial market to enable the selling and buying of government securities. Second primary focus of monetary authorities on the inflation target because simultaneous targeting of other indicators such as economic growth, exchange rates and wages dilutes efforts and weakens monetary policy. When integrated into the overall macroeconomic policy, inflation targeting improves transparency and accountability. The fact that credible and effective inflation targeting reduces policy flexibility and discretion should not be of major concern in Sudan because this is generally the case under an Islamic financial system.

18 Debelle et al (1998) provide a comprehensive review of the justification and requirements of inflation targeting and its applicability to developing countries. The arguments they raised are very relevant to the case of Sudan. They pointed out that successful inflation targeting in New Zealand and Canada encouraged five other industrial countries with poor record in fighting inflation and monetary policy credibility to follow suit. These are the United Kingdom, Australia, Finland, Sweden, and Spain.

However, in addition to relative freedom on the part of the central bank, inflation targeting requires an economic structure that is stable and easy to model. These seem to be the most difficult conditions for a developing country to avail. In view of the experience of many developing countries with high inflation and subsequent massive disruption in the 1970s and 1980s, other conditions should be better understood and accepted in countries like Sudan. These conditions include eradication or adequate control of the fiscal causes of inflation, a relatively low (one-digit) inflation rate, financial deepening, and a market-based exchange rate policy. Under such circumstances, the central bank would be relieved from targeting any variable but inflation, and be fully accountable for failing to achieve its target.

6. CONCLUSION

This study intended to analyze the experience of Sudan with monetary policy under conditions of full adoption of Islamic modes of finance since 1990. An empirical model was developed to examine the efficiency of monetary policy before and after this shift. The model also attempted to explain the determinants of monetary growth and its impact on major policy objectives in terms of real output growth and price inflation.

The analysis shows that monetary policy has always been closely linked to budget deficit financing and that government spending and inflation are the key determinants of monetary expansion. Meanwhile, monetary growth as measured by changes in broad money has no impact on real output growth, but always exaggerates inflationary pressure in the economy. Both currency depreciation and government spending contributed to high inflation that reached triple digits in the 1990s, resulting in huge economic disruptions. Yet, there appears to be no significant change in the behavior of the variables considered in the periods before and after Islamization. In addition to lack of effective instruments of indirect monetary management, the analysis indicates that direct monetary control prevailed throughout the period 1970-2001 because the government had a strong desire to manipulate and direct financial resources. Among other things, this led to sustained financial underdevelopment.

The finding of no significant change in the design and effects of monetary policy before and after the full adoption of Islamic banking principles in Sudan is consistent with the predictions of theoretical macroeconomic models of monetary policy in an Islamic context. These models argue that the core difference between conventional and Islamic financial systems is in fact the rates of return in the latter are determined by real activity. While the short-run effects of monetary policy are likely to be similar under the two systems, an equity-based Islamic financial system is expected to have a greater positive impact on savings and investment behavior in the long-run. This will in turn stimulate faster output growth. The Islamic system is also considered to be more conducive to financial and economic stability. Obviously, the long-run benefits of this system are conditioned on the ability of the authorities to provide a favorable macroeconomic environment and promote necessary institutional reform and development.

It has been argued that inflation targeting is a more feasible monetary policy objective than monetary or output targeting given the uncertainties regarding the transmission mechanism and the weak financial development in Sudan besides the general *Shariah* and economic constraints. The presumption that Islamic finance is by virtue biased towards growth and development is not supported by the Sudanese experience so far, and excessive monetary growth is indeed destabilizing. It is rather unrealistic to depend on the bank-dominated financial system in Sudan to stimulate output. Efforts for the liberalization of the economy and the financial sector, in connection with the financial reform program that began in 1997, should be seriously pursued. The program implies a shift from direct to more indirect monetary policy. Up-to-date it is not clear how effective this shift would be, and some important questions about the sustainability of some (e.g., in relation to instruments for government financing and liquidity management) reforms remains unanswered. However, in view of the fact that direct monetary policy was never effective, we strongly support the move to indirect monetary management.

It is also worth noting that the use of indirect instruments is more desirable from the viewpoint of enhancing financial development and instilling commercial behavior amongst fund suppliers and users. In this respect, we argue that *Musharaka* ratios and *Murabaha* mark-up rates

should be left to market forces to determine. This will encourage competition and efficiency in the banking sector. Meanwhile, the cost of monetary management in relation to the design and enforcement of these rates is not easy to justify.

The paper underscores the need for the ongoing financial reform program in Sudan to have a significant impact on the conduct of monetary policy as regards institutions' building. This together with fiscal reform and political stability, that can boot central bank autonomy, would increase the efficiency of an inflation targeting policy. The application of Islamic modes of finance and financial liberalization should be viewed as complementary steps.

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Appendix 1: Definition of Variables:

Δm = rate of growth of nominal broad money stock comprising currency in circulation, demand deposits and savings and time/investment deposits.

Δy = real GDP growth rate at 1982 Price.

Δir = rate of change of international reserves (in US$)

Δg = rate of growth of nominal government expenditure

Δer = average exchange rate defined as the domestic currency value of US$.

Δp = Consumer price inflation measured annual percentage change in the consumer price index.

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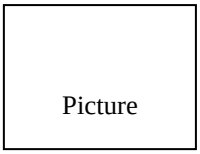

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