"Financial Development and the Velocity of Money Under Interst-Free Financing System: An Empirical Analysis "

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ABSTRACT

This study attempts to empirically examine the impact of financial development on velocity of money under interest-free financing in the Sudan over the period 1992 to 2012, which witnessed significant changes in the structure of financial sector after implimination of the interest-free Islamic banking and financing sytem in the country. This study employed the recent econometric techniques such as volatility model in VAR framework, and Johansen cointegration test. Prior knowledge of a set of explanatory variables such as per capita income, financial development (DD/CU); narrow money supply (M_1); and rate of return (margin of murabahah instrument) under interest-free financing as a substitute to rate of interest, also we add inflation, and the spread of commercial bank branch-network. The results show that the velocity of narrow money (VM_1) was volatile and persistence in mid 1990s and seems to be more stable and predictable after 2000. The paper confirms the existence of a unique and statistically significant relation between measure of financial development and velocity of narrow money. The Johansen cointegration test result indicates that the existence of long run relationship between velocity of money VM_1, on the dependent variables. Furthermore, the VAR result showed that the changes in dependent variables are significantly to influence the changes in velocity of money in the long run in Sudan. The results show that it is important for the central monetary authorities to take into account both stages of financial development in forecasting VM_1 for designing effective monetary policy in the Sudan.

Key-words: Financial Development, Velocity of Money, Interest-free financing, Empirical Analysis

1. Introduction:

Traditionally, the velocity of money (V), also called velocity of circulation and, much earlier, currency; is the average frequency with which a unit of money is spent on new goods and services produced domestically in a specific period of time. Velocity has to do with the amount of economic activity associated with given money supple. When the period is understood, the velocity may be presented as a pure number; otherwise it should be given as a pure number over time. Here, the relationship between money, output and prices is the cynosure of monetary theory and policy alike. Analytically, what lies at the heart of this relationship is velocity of money, that is, the ratio of nominal income to the stock of money (Jadhav, 1994). The central monetary authorities in the developed and developing countries strive to control money supply not for its own sake, but for regulating the flow of spending in economy with a view of containing inflationary pressures. However, the flow of spending depends not only on money supply but also on its turnover, or the velocity of money, which is not under the direct control of the central monetary authorities.

Any given quantity of money might be spent faster of more slowly, that is, velocity of money might rise or fall (Jadhav, 1994). It is well known, that velocity of money plays a fundamental role in macroeconomic analysis and has profound implications for economic stability. The objective of this paper, therefore, attempts to estimate empirically the impact of financial development on velocity of money, whereafter, the forbidding of the interest rate or usury system and the subsequent implementation of interest-free financing (profit-loss-sharing scheme) system in the Republic of the Sudan, and attention to growth of monetisation and changes in monetary habits and the effect of holding money. This study covers the period from 1992 to 2012 that witnessed significant changes in the structure of the financial sector (institutions, instruments and markets). The period covers the separation of the country into two countries, namely, Republic of the Sudan (our case study) and Republic of South Sudan (the new admitted country to the UNO) the political instability, and also it is the period linked to export of oil in the late 1990s and the Sudan Structural Strategy Programme. This paper is

divided into many sections: Introduction comes first, in the second; we look at the lively debate of the Monetarist-Keynesian Schools of thought. Thirdly, financial development, and then we review the related economic literature in the fourth section. The fifth section gives the main issues of this paper, sixthly; the empirical work, its evidence, results and the presentation of esitimation. Lastly, we conclude with the findings and suggestions.

2 Keynesian-Monetarism Debate:

Keynesian and Quantity theories are two competing explanations of the aggregate money demand. The monetarists think that the stability of income velocity of money (V) is important, whereas Keynesian have criticized the notion of stability of velocity of money. Monetarists believe that velocity of money is relatively stable and changes therein are highly predictable. Neo-Keynesians are less confident and argue that either contention is an exaggeration. The Quantity Theory of Money, in one form or another, was generally held explanation of changes in money income until development of the income-expenditure approach pioneered by Keynes. It is common now to speak of conflict between Keynesians on one hand, and quantity theorists or Monetarists on the other, despite the fact that modern Monetarists accept much of the Keynesian analysis and many contributions of the Monetarists are accepted by those labelled as Keynesians.

The Quantity theory of money is often associated with assumption of constant V- that V is something of natural constant. In Fisher's version V was interpreted as a transactions velocity ($MV_T=P_TT$) and taken to be determined by payments practice and structural feature of the economy influencing the use of money as the medium of exchange, (Gupta, 2001). The quantity theorist hold that changes in quantity of money do not affect velocity, as in the words of Irving Fisher: "No reason has been, or so far as it is apparent, can be assigned, to show the velocity of circulation of money... should be different, when the quantity of money... is great, from what it is when the quantity is small", (Fisher, 1911). Quantity theorists consider V constant, but Liquidity Preference (Keynes) disagrees and attacks that view, arguing that k (or V) is highly unstable, particularly in periods of substantial unemployment. In such a period changes in money supply would not affect spending. Thus, an increase would simply result in an offsetting increase in k (V), leaving money income unchanged. The quantity theorists consider it inaccurate to accuse them believing that k or **V** are constant. Freidman argues: "[The] quantity theorist need not and generally does not mean that... the velocity of circulation of money is to be regarded as numerically constant over time." (Friedman, 1956).

3 Financial Development in Sudan:

Gurley and Shaw explicitly have stressed the importance and increasing role of the financial intermediaries: "*Financial institutions whose principal function is the purchase of primary securities and creation of claims on themselves***"** (Gurley and Shaw, 1960), in the process of economic growth (the nature and causal relation between financial development and economic growth), and they argued that financial intermediation increases the amount of funds available for investment (credit-supply function to finance investment), they showed that sophisticated financial system of the developed countries also facilitates the flow of funds from savers to investors. Gurley and Shaw have studied the financial markets in relation to financial institutions, which consists the monetary system that is composed of policy bureau and banking bureau, the monetary bureau issuing the instructions to the banking bureau concerning money stock. Shaw and McKinnon (1973) have both separately, underlined the critical importance of the financial deepening of the less-developed-countries. In their views most stagnant economies of the developing countries suffer from shallow finance of the financial repression characterized by slow growth, while Thirlwall (1974) has argued mainly from Keynesian view-point, still thinks that moderately inflationary policies can accelerate economic growth in the developing countries. Attempt has been made to qualify the relationship between economic growth using dependent variables, which encompassed all economic activities, financial, fiscal and monetary variable as explanatory or causal arguments, though the causal literature among these variables has been accurately established, but the indirect connections enhancing economic activities cannot brushed aside. The main issues involved in financial development and velocity of money in Sudan, which came into prominence for democratic character and economic and structural adjustments.

a. Banking Policies and Financial Reforms:

The financial sector is central to the mobilisation of savings for investment. The financial intermediation role of banking system, however, has been constrained by narrow capital base coupled with low levels of deposits, high rate of return, and increasing non-performing of loans. Central Bank of Sudan has initiated a restricting programme, which aimed at consolidating the banking sector as well as over hauling the accounting system and banking operations among others. The government has requested for a financial sector assessment programme from the IMF, which could form the basis of a comprehensive banking sector reform plan. The banking policies and financial reforms in the Sudan were intrrupted by the political interference. The financial system reached its ever-worst situation in 1980s and 1990s that left the IMF with only one option tha was to declare the Sudan as a non-cooperative member and subsequently suspended the Repulic for almost seven years. Recntly, and due to globalisation of economy and liberlisation process, and the application of Basle Committee's recommendations the CBS adopted the following steps to promote and develop a healthy banking system: (i) Development of Banking System and Financial Reform, (ii) Foreign Exchange Market, (iii) Finance, the Liquidity Management, (iv) Banking Operations and Technology and, (v) Islamisation of Basnking Activities. In brief, we study and highlight these steps and policies. Central Bank of Sudan issued its last monetary policy for the year 2002 to complete the comprehensive banking system policy for the 1999-2002 issued in December 31, 1998. The policy targeted at implementing the ongoing aims of developing the banking and financial institutions, bolstering up and developing the banking system, organizing foreign exchange market, improving and developing banking transactions through introduction of sustainable technological methods. Moreover, the Bank issued the Monetary and Credit Policy for the year 2002 which primarily aimed at increasing GDP growth rate and maintaining the stability of the exchange rate of the Dinar, which is changed once more to the Sudanese pound in 2005.

b. Islamic Financing:

The Islamic financial system employs the concept of participation in the enterprise, utilising the funds at risk on a profit-and-loss-sharing (PLS) basis. This by no means implies that investments with financial institutions are necessarily speculative. This can be excluded by careful investment policy, diversification of risk and prudent management by Islamic financial institutions. It is possible, that investment in Islamic financial institutions can provide potential profit in proportion to the risk assumed to satisfy the differing demands of participants in the contemporary environment and within the guidelines of the Shariy'ah. The concept of PLS principle as a basis of financial transactions, it is a progressive one as it distinguishes good performance from the bad and the mediocre. This concept therefore encourages better resource management. Islamic banks are structured to retain a clearly differentiated status between shareholders' capital and clients' deposits in order to ensure correct PLS principle according to Islamic Law. Fundamentally, the interest free financial institutions organised their operations on the basis of PLS principle, which is permitted in Islam, or would rather to say, the whole practice of Islamic finance is based on modes that do not involve interest. As a general rule, they involve the carrying out of investment and/or the purchase of goods, services and assets. Theoretically, there are a large number of Islamic modes of financing. We will limit ourselves here to a very brief review of the basic modes being used by Islamic banks in the Sudan, emphasizing at the same time that the door is opened to devise new norms, provided that they confirm to the rules of the Shariy'ah. Therefore, offer a wide range of services of financing including *mudarabah, musharakah, murabahah, Ijarah, Istisnaa', Bai' Salam,* and *al-qard al-Hasan*, as all are modes of financing, (Choudhary, 1989).

4. Review of Literature:

The literature on the velocity of money is enormous, with vast majority of research efforts directed at the behaviour of velocity of money-income and in relation to per capita income in developed countries. Relatively, little systematic analysis of impact of financial development on velocity of money under interest-free Islamic financing developing economies exists. Such studies are potentially important as inappropriate monetary policies can deprive a country part of the benefits of its development effort. Governments in developing countries relied heavily on domestic monetary policies to finance large expenditures of their development, process

in the 1970s and 1980s. This is particularly true for the Sudan, which witnessed both rapid increases in monetisation of economy and massive development expenditures. There have been much discussion on the velocity of money, right from the Classical through the Keynesian and to even the modern quantity theory with basic references to the work done in international differences of velocity of income by Doblin (1951), and Latane (1954). Several theoretical and empirical studies relating to the velocity of money have been made, that is, Bordo and Jonung (1987), Friedman and Schwartz (1963 and 1982), Short (1973), Jadhav (1994), Darrat (1988) Driscoll and Lahiri (1983), Breton (1968) among others. Here, we are going to highlight only literature that related to interest-free financing and other that related to financial development in developing countries, such as:

Darrat (1988) has studied the historical behaviour of velocity of money in Tunisia under the Islamic interest-free banking system. Explaining the differences between Islamic banking system and the contemporary system with the main purpose of empirically testing the hypothesis that the financial system becomes more stable without interest-bearing assets. His paper focuses on Tunisia as the case study with cross-section data from 1960-1984. In this study, he explains and investigates the historical behaviour of velocity of money in Tunisia, and said: "…study of historical movements of velocity in Tunisia over the estimation period indicates that the velocity of interest-bearing money stock (VMI) has undergone a dramatic change over the years…the behaviour of non-interest velocity of money (VMNI) appears to have been smooth stable. Indeed, for all practical purposes, VMNI appears to be almost a constant." (Darrat, 1988). He concluded that: "In contrast to the interest-based system, an interest-free monetary system is found to exhibit a well-behaving and smooth velocity of money." (Darrat, 1988).

The study of Maysami and Nie (1999) focusses on historical records of interest and non-interest velocity of money in Iran, Pakistan and Sudan during 1966 to 1994 for thirty years. Where, Pakistan and Sudan show similar patterns on interest bearing money is greater than that of interest-free money. Velocity of interest-free money in Pakistan ans Sudan, stnad at 8.14 and 3.90 respectively, are much stable as compared to velocity of interest-bearing money that stands at 15.82 and 18.72. The results of the study indicates that the removal of interest may lead to better implimentation of monetary policies.

Hind (2003), in her study that identify the factors which determine the velocity of money in Sudan in the period (1970-2000); the study used analytical and statistical approaches to estimate velocity of money as a function of national income, per-capita income, inflation rate, money balance, currency ratio outside the bank system and the number of commercial banks branches. The study finds out that 98% of the total changes in velocity of money where explained by the explanatory variables. Also there is a positive relationship between the explanatory variables, where there is a negative relationship between dependent and the real money balance variable. The policy implication showed that the expansionary policies, which aimed at increasing the National income, such policies at the end, will lead to inflation. Whereas the policies which increase bank infrastructure have a positive effect increasing the credit feelings, and so decreasing the use of money as a mean of payment which will lead to decrease use of money outside the bank system.

Abdul Karim et al (2010) examine the volatility of money velocity function in Malaysia by using the quarterly time series data. Their study employed the recent econometric techniques such as volatility model in ARCH and GARCH framework, Johansen co integration test and Vector Error Correction Model (VECM). The results show that the velocity of money for M1 (V1) and M2 (V2) are volatile and persistence rather than M3 (V3). The Johansen co- integration test result indicates that the existence of long run relationship between velocity of money V1, V2 and V3 on the dependent variables, such as bond interest rate, deposit rate and income. Furthermore, the VECM result showed that the changes in dependent variables such as bond interest rate, deposit rate and income are significantly to influence the changes in velocity of money for V2 and V3 in the long run. Conversely, in the short run, a change in the national income has only significantly to cause the changes in the velocity of money V2 and V3, while the interest rate has significant effect to cause the velocity of money V3.

Meanwhile, Gill (2010) uses co-integration techniques to identify the determinants of income velocity of money (VM) in Pakistan. The analysis covers narrow money (M2). The co-integration results support a positive relationship of VM with economic growth indicating an increasing VM over time in time of high growth in Pakistan. Financial development, as measured by its proxies and prices as measured by CPI affects VM positively. So, having an increasing VM with these variables, the potential adverse impact of expansionary monetary policy is not likely to be small in Pakistan. On the other hand interest rate also has positive impact on VM. The results show that it is important for the monetary authorities to take into account both stages of economic and financial development in forecasting VM for designing effective monetary policy in Pakistan.

Mustafa (2010) empirically, studied and estimated the behavioural explanation of income velocity of money function in case of the Sudan over the period 1985 to 2004. A simple monetary model was formulated to serve the purpose; and the study chooses the gross domestic product money supply; and rate of return under interest-free Islamic banking as a substitute to rate of interest which is prohibited, also we add banks offices and inflation, the behaviour of velocity of narrow money (V_1) was unstable with average of 8.72 and always higher than velocity of broad money (V_2) which stands at 5.8 and seems to be more stable and predictable. From this analysis it is clear that the income velocity of broad money stock is declining faster and more steadly falling than that of the income velocity of narrow money, surprisingly, the empirical evidence is significant..

Akinlo (2012) investigates the impact of financial development on the velocity of money in Nigeria from 1986 to 2010. His study confirms the existence of a unique and statistically significant relationship between velocity of money and measures of financial development. The error-correction results show that current exchange rate has statistically significant negative effect on velocity of money in Nigeria. Per capita income has statistically significant relation with velocity of money, which clearly supports the quantity theory. The results show that money issuing authorities cannot obtain additional leverage by issuing more money without generating high inflationary pressure. The results also show the importance of financial sector innovations for velocity.

Based on the above literature, we can say that there are some studies about velocity of money in developing countries, however, no in depth study has ever been done in the area of financial development and interest-free velocity of money in Sudan because of probably lack of sufficient information. The main contribution of this study is to make financial development and interest-free velocity of money to determine the performance and classifications of Sudanese monetary policies. Like any other study, this study is also not without its limitations. One of its limitations that it does not include all the components of money supply such as time deposits and other deposit, investment deposits in Sudan, because the data were unavailable to the researcher, and also the broad money supply which is behaving awkwardly .

5. Issue of the Study:

The link of money supply (M) and gross domestic product (GDP) annual growth rate has always been much weaker, because the velocity of money (VM**)** is volatiled and largely unpredictable. It can still be said that with reforms velocity of money (VM) is stabilised and then moved slowly to decreasing path in the Sudan. Considering Fisherian Equation of Exchange: MV=PT, where, M is money supply, V is the velocity of M and Y is aggregate nominal income. Assume, as usual, that primarily, the central monetary authority's goal is to stabilise aggregate nominal income, that is, to make GDP high enough to promote full employment, but not so high as to cause inflation. If V is temporally stable, and if M is under control of the central monetary authorities, then policy actions become very effective. If on the other hand, V is temporal changes then the link between policy actions and economic activity will be weakened. Note further that, an unstable velocity could lead to financial and economic instability as the potential for erroneous monetary actions causes. This study deals with the present situation of income velocity of money in case of Sudan. Hence, we attempt to estimate empirically the impact of financial development on velocity of money under interest-free financing.

6.Explanatory Variables and Sources of Data:

In the Sudanese context, for the much of the post bank nationalisation (1970/1971) period, and Islamisation (1983), monetisation spurred by rapid commercial and Islamic bank branch expansion and financial sophistication are reflected in the rate of money substitutes relative to money which appears to be a dominant characteristic of the evolution of the Sudanese financial system. Attention has been focused on institutional variables, such as, a decline in population per bank-branch, but due to globalisation process specifically in 2001-2004 where the number of bank offices decreased instead of increasing their branches number that may imply greater spread of banking network, and hence, higher of monetisation that is expected to be negatively correlated with velocity of money. And a fall in the share of monetary asset in gross household savings in financial assets signifies greater financial sophistication that is believed to be positively correlated with velocity of money, and hence, the coefficient corresponding to this variable is expected to be negative.

The research adopted an analytical approach whereby time series analysis was used to establish the trend in the velocity of money. In the Sudan, money stock (M^S) is defined as narrow money (M_1) which is defined as currency in circulation plus demand deposits, while financial development is represented by its proxies, that the ratio of CU/DD, since there is no theoretical presumption in the use of a particular definition of money, we use narrow money supply. Per capita income represents the output (Y). Accordingly, one measure of income velocity of money could be defined, that is, VM_1 corresponding to narrow money. This section examines the effect of financial development on velocity of interest-free money supply. As it is typically not the case in most developing countries, all demand deposits in the Sudan are non-interest bearing. While on the other hands profit-loss-share scheme (PLS) money supply (1992-2012) is defined as the public's time and savings deposits with commercial banks, well known as investment deposits. In this paper also we use the following additional variables: (i) The annually average rate of Murabahah margin (MR) as profit-loss-share scheme of interest-free Islamic Banking System, these variables are used as a replacement to interest rate (which is prohibited), (ii) inflation rate (changes in price), whose influence is on velocity. In the same manner as the interest rate works in velocity, when the anticipated rate of change of prices rises, therefore, higher the cost of holding money also that increases as of velocity and vice-versa. (iii) The number of bank branches is also considered as a determinant of velocity, which undoubted requires some elaboration. Velocity is partly determined by the financial arrangements in an economy, but in developing economy monetary habits may undergo substantial changes during the development process, (Cameron and Patrick, 1967). Therefore, the recent expansion of bank-branch in the Sudan (1990s and 2000s) is expected to have an impact on velocity of money-income as whole. The Sources of data are: (i) Central Bank of Sudan Annual Reports (ii) Quarterly Financial and Economic Bulletins (iii) Central Bureau of Statistics, Government of the Sudan; and (iv) the International Financial Statistics various issues (IMF). Econometric Views (eviews 5.1) is the software programme used for running the statistical regression. The reason behind adopting the year 1992 as starting date from the fact that this was the full year after the implementation of Islamic laws in the Sudan.

7. Empirical Analysis and Results of the Study:

7.1 Descriptive analysis:

The Descriptive statistics of the data is available in Table 1. Comparing standard deviation to the mean value it can be seen that there is significant volatility in velocity measure, as well as in variables that are candidates for explaining such volatility in velocity.

Table No. 1

	VM1	Y	RR	FDEV	DP	BO
Mean	3.44E-07	1990.167	20.74762	0.845833	36.66190	601.4762
Median	2.89E-07	1460.431	18.00000	0.850218	14.30000	599.0000
Maximum	5.61E-07	7283.529	36.00000	1.189305	130.3000	705.0000
Minimum	1.88E-07	16.85315	10.40000	0.568922	7.200000	525.0000
Standard Deviation	1.28E-07	1940.847	8.233506	0.174304	42.67123	60.88400
Skewness	0.463852	1.242946	0.347342	0.051624	1.264656	0.333329
Kurtosis	1.706889	4.030156	1.857275	1.916335	2.958617	1.768290
Jarque-Bera	2.216175	6.335773	1.564854	1.036866	5.599243	1.716349
Probability	0.330190	0.042092	0.457295	0.595453	0.060833	0.423935
Sum	2.216175	6.335773	1.564854	1.036866	5.599243	1.716349
Sum Sq. Dev.	0.330190	0.042092	0.457295	0.595453	0.060833	0.423935
Observations	21	21	21	21	21	21

Sources: computed by authors

7.2 The presentation of Estimation:

Macro time series data tend to exhibit either a determistic and/ or stochastic trend and are therefore non-stationary, this is, the variable under consideration have means, variances and covariances that are not time invariant. Some researchers may use direct application of ordiary-least-square and generalized least square to non-stationary data that may produce regressions which are misspecified or spurious in nature (Eangle and Granger, 1987). Threrfore, all the variables that are used in the study were tested for unit root using Augmented-Dickey-Fuller test ADF (Dickey and Fuller 1981) and also Kwiakowski-Phillips-Schmidt-Shin KPSS (1992) as an additional test to help in providing remedy to the limitation of ADF.

Table 2 : Unit roots tests of stationarity with constant and linear trend 19912012

variables	ADF		KPSS	
	level	first difference	level	first difference
Vm1 constant	-1.852769	-3.68448	0.186894	0.381481
constant and linear trend	-2.622577	-4.34757	0.145189	0.159634
per constant	5.169059	-0.799551	0.616981	0.495364
constant and linear trend	3.039894	-1.803836	0.181722	0.145218
RR constant	-1.373724	-3.265293	0.448633	0.234695
constant and linear trend	-0.47932	-3.310903	0.119547	0.110592
DP constant	-2.269643	-1.972457	0.434065	0.343951
constant and linear trend	-1.925136	-4.03736	0.162356	0.066033
BO constant	-2.815143	-3.174186	0.164037	0.162772
constant and linear trend	-1.815358	-2.952783	0.096102	0.161992
FDEV constant	-1.957488	-6.024142	0.350847	0.182101
constant and linear trend	-3.571638	-5.629604	0.110356	0.152289

10% black, 5% blue, and 1% red.

Note: Critical values for ADF are: respectively (constant only);-3.831511, -3.029970, and -2.655194 respectively. (constant only); -4.532598, -3.673616, and -3.277364 (constant and linear) at 1%, 5%, and 10% level respectively. However, the critical values for KPSS tests are 0.739000, 0.463000, and .347000 (constant only), 0.216000, 0.146000, and 0.119000 (constant and linear) at 99%, 95% and 90% level of significance respectively.

Table 2 presents the results of ADF and KPSS tests with and without trend. All the variables are non-stationary at level but become stationary after the first difference. The variables are integrated of the order one; so that we use the Johansen-Juselius cointegration test to identify any cointegration relationship among the variables.

Table no. 3: Sample (adjusted): 1994 2012
Included observations: 19 after adjustments
Trend assumption: Linear deterministic trend
Series: VM1 Y RR FDEV DP BO
Lags interval (in first differences): 1 to 1
Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. Of CE (s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.992950	224.7012	95.75366	0.0000
At most 1 *	0.952258	130.5620	69.81889	0.0000
At most 2 *	0.863421	72.76505	47.85613	0.0001
At most 3 *	0.582864	34.93885	29.79707	0.0117
At most 4 *	0.475664	18.32635	15.49471	0.0182
At most 5 *	0.273068	6.059521	3.841466	0.0138

Trace test indicates 6 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

1 Cointegrating Equation(s): Log likelihood 27.95082

Normalized cointegrating coefficients (standard error in parentheses)

VM1	Y	RR	FDEV	DP	BO
1.000000	-3.61E-10	-3.18E-08	7.21E-07	-1.08E-08	5.51E-09
	(2.0E-11)	(3.8E-09)	(7.9E-08)	(6.1E-10)	(2.9E-10)

Note: Negative signs are considered positive cointegration vector

According to the results of the Johansen-Juselius cointegration test that there is a long-term cointegration relationship among the variables as it has been presented in table 3. According to the results, the per capita income (y) has a significant positive sign with VM_1 that is according to the quantity theory of money. Fry (1988) indicates that the sign of association between VM_1 and real income (negative or positive) depends upon the stages of economic development especially the stage of financial development (FDEV). At the early stage, velocity should fall with the growth of income but at a later on stage, velocity and income become positively correlated. The coefficient of financial development (FDEV) has a significant positive sign. Interest-free Rate as it is proxies by mudharabh margin also showing positive significant sign. The increase in rate of return leads to a decrease in of demand of money thus velocity increases. The coefficient of inflation also has positive significant sign. At the times of rising prices, velocity of circulation rises as the payment pattern and shopping habits change.

Table No. 4. Dependent Variable: D(LOG(VM1))
Method: Least Squares
Sample (adjusted): 1993 2012
Included observations: 20 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LOG(Y))	0.609054	0.081598	7.464071	0.0000
D(LOG(RR))	0.112149	0.143477	0.781648	0.4474
D(LOG(FDEV))	-0.117406	0.162018	-0.724645	0.4806
D(LOG(DP))	-0.000127	0.048348	-0.002635	0.9979
D(LOG(BO))	-0.712787	0.452909	-1.573796	0.1379
C	-0.165498	0.031519	-5.250707	0.0001

R-squared	0.817773	Mean dependent var	0.011089
Adjusted R-squared	0.752692	S.D. dependent var	0.181939
S.E. of regression	0.090478	Akaike info criterion	-1.724090
Sum squared resid	0.114608	Schwarz criterion	-1.425370
Log likelihood	23.24090	F-statistic	12.56546
Durbin-Watson stat	2.260893	Prob(F-statistic)	0.000092

Table no 6; provides the results for the financial development-velocity of income relationship for the period of this study, i.e., 1992 to 2012. The estimated results that presented in the table no. 6 performed reasonably well; whereas, the value of R^2 is high stands at 81.77%. and F-statistics which is against the null is significant at 1% and the error of the estimate (SEE) relatively small. The Durbin-Watson (DW) statistics are satisfactory 2.26, although they must be treated with caution due to inclusion of lagged dependent variable and also the absent of other variables that are related to interest-free Islamic financing modes.

Table No. 5. Vector Autoregression Estimates
Sample (adjusted): 1994 2012
Included observations: 19 after adjustments
Standard errors in ( ) & t-statistics in [ ]

	VM1
VM1(-1)	0.261174 (0.22730) [1.14903]
VM1(-2)	-0.174326 (0.27229) [-0.64022]
C	7.99E-07 (3.3E-07)

	[2.43257]
BO	-1.22E-09 (5.3E-10) [-2.28361]
DP	-1.96E-09 (8.4E-10) [-2.34496]
FDEV	-5.47E-08 (1.1E-07) [-0.48707]
RR	2.12E-08 (5.9E-09) [3.58056]
Y	-2.20E-11 (9.3E-12) [-2.37104]
R-squared	0.931539
Adj. R-squared	0.887973
Sum sq. resids	1.98E-14
S.E. equation	4.24E-08
F-statistic	21.38225
Log likelihood	300.7842
Akaike AIC	-30.81939
Schwarz SC	-30.42173
Mean dependent	3.58E-07
S.D. dependent	1.27E-07

Table no 6, represents the results of Vector Autoregression (VAR) where, the value of R^2 is so high almost 93.15 % that shows strong relationship among the variables. Result showed that the changes in dependent variables are significantly to influence the changes in velocity of money in the long run in the Sudanese context.

8. Concluding Remarks:

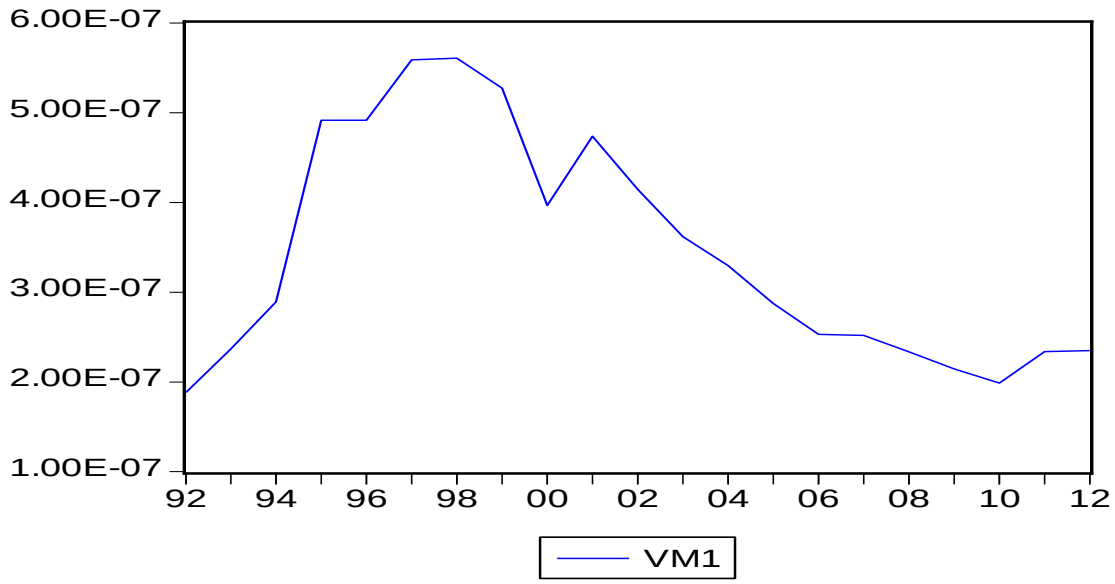
This study attempts to empirically examine the impact of financial development on velocity of money under interest-free financing in the Sudan over the period 1992 to 2012, which witnessed significant changes in the structure of financial sector after implimination of the interest-free Islamic banking and financing sytem in the country. The assumption that velocity of money is stable or constant yields that monetarist conclusion that exists of a predictable link between money stock and output; the empirical evidence demonstrated a stable velocity from 1992 to 2012 but is shown a pyramid shape during 1994–2001 and subsequently downtrend from the year 2002 to 2010 (figure 1). The results show that the velocity of narrow money (VM_1) was volatile and persistence in mid 1990s and seems to be more stable and predictable after 2000. Change in quantity of money would produce predictable changes in output; hence, the monetary authorities can bring the desired changes in output by controlling money supply. The survey of the few selected economic literature abounds in studies of influence of financial development on velocity of money in developing economies suggests that, there is, considerable scope for research in this area, and explaining the factors that might be systemically affecting the evolution of velocity of money income. Therefore, the Sudanese case is not an exceptional one, deep and further studies are needed with regard to this matter with consider to Islamic financing system. We

observed that VM_1 was rising during 1994 to 2001 and that coincided with then high inflation and annually double-increase of money supply by Central Bank of Sudan (CBS). It has come to the conclusion that the velocity of narrow money is declining slowly; this due to certain issues, such as growth in banking sector, ratio of demand deposits to currency etc.

This study employed the recent econometric techniques such as volatility model in VAR framework, and Johansen cointegration test, so as to identify the significant macroeconomic variables that are considered to generate larger or smaller variation in the velocity of money. Prior knowledge of a set of explanatory variables such as per capita income, financial development (DD/CU); narrow money supply (M_1); and rate of return (margin of murabahah instrument) under interest-free financing as a substitute to interest rate, also we add inflation, and the spread of commercial bank branch-network.

The study confirms the existence of a unique and statistically significant relation between measure of financial development and velocity of narrow money. The Johansen cointegration test result indicates that the existence of long run relationship between proxy for financial development affects the velocity of money positively that means the economy of Sudan is operating at the later stage of financial development so the role of FDEV is important in forecasting income velocity of money as financial development has a significant influence on VM_1. Inflation has a direct and significant influence on the variance of velocity. It is the behaviour of the VM_1 that determines the degree of command that monetary authority has over the monetary institutes to carry economic growth, without fuelling inflation. The interest-free rate proxies by margin of murabahah instrument rate has a significant and positive relation with velocity of money so when the interest rate increases demand for money decreases so velocity is increasing. Interest rate represent the opportunity cost of holding money as this cost increases the money holders wish to lend it so more turnover of money so there is a consider able interest rate sensitivity in borrowing and lending behaviour, but under Islamic financing system interest is replaced by modes of financing. So we can conclude that VM_1 has relation with economic growth, inflation, interest rate and financial development; on the dependent variables. Furthermore, the VAR result showed that the changes in dependent variables are significantly to influence the changes in velocity of money in the long run in Sudan. The results show that it is important for the central monetary authorities to take into account both stages of financial development in forecasting VM_1 for designing effective monetary policy in the Sudan.

Figure no. 1



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