

The result of the exercise confirms the consistency of the relationship between economic activity and prices in South Africa over the extended period 1966-1999. The results are very much in line with those presented before. The closest statistical relationships are found between growth in the narrow money supply and growth in GDE and Consumption Expenditure. While the measures of money supply for the earlier period were largely unchanged, the national income statistics and of prices have been revised significantly, giving rise to somewhat different estimates from those obtained in the published estimates for the same overlapping periods.

It should be noted that the results that adjust for autocorrelation have much higher R-squared values than those which do not adjust for autocorrelation. This is because the model with autocorrelation fits is effectively using the lagged dependent variable as an additional explanatory variable. Thus, for example, in the case of GDP growth rates, the model fits against growth in monetary measures are effectively also including lagged growth rates of GDP as an explanatory variable. It can thus be argued that the fits, without autocorrelation adjustment, provide a clearer comparative standard for measuring the various relative magnitudes and effects of the different monetary measures across different periods of time.

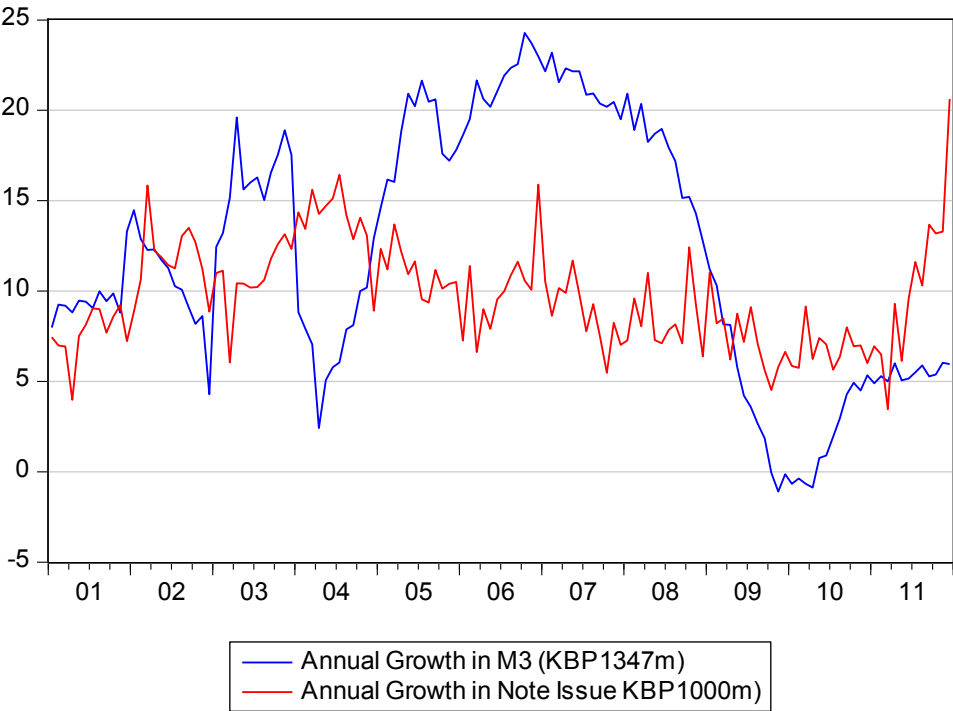
Focusing on the results without the autocorrelation adjustment, it is seen that the monetary measures fit economic activity very satisfactorily over the extended period 1967-1999. The best fits to be obtained from the narrowest measure of the money supply, the M1 measure. As was noted in the earlier work, the relationship between the growth in expenditure, GDE or Household Consumption, has remained consistently more than that between the growth in money supply and GDP. The links between inflation and the monetary measures have remained statistically rather weak ones, as may be seen. The trade independent exchange rate movements have continued to interrupt the money supply and aggregate expenditure and in turn output and price level linkages. The best statistical relationships between narrow money and expenditure and output as measured by the F statistic, are found over the period 1967 to 1981, the focus of the original work may be seen. The goodness of fit and significance of the coefficients of the models are weaker for the period 1982-1999, a period that includes the economically very turbulent and inflationary mid eighties and early nineties.

One important difference in the estimates should however be recognised. That is for the period 2000-2011, the growth in the broader measures of money, for example M3, is somewhat better related to measures of economic activity than did the growth in the narrow money supply and economic activity. Furthermore the statistical relationships between the growth in both the broad and narrow definitions of money and the growth in economic activity became consistently weaker over the past eleven years when compared with the earlier periods.

It should however be recalled, as shown in the tables above, that the relationships between growth in the note issue and the broader definitions of money changed over the years. Growth in narrow and broader money diverged more after 2000 than before. Average growth in M3 and Bank Credit significantly exceeding that of the growth in the note issue by an average four to five per cent per annum over this period. The correlation

the annual growth in the note issue and M3 measured quarterly also declined from 0.579 between 1966 and 1999 to 0.297 between 2000 and 2011.<sup>4</sup> (See figure below)

**Fig 2. Growth in Note Issue and Growth in M3 2000.1 - 2010.3**



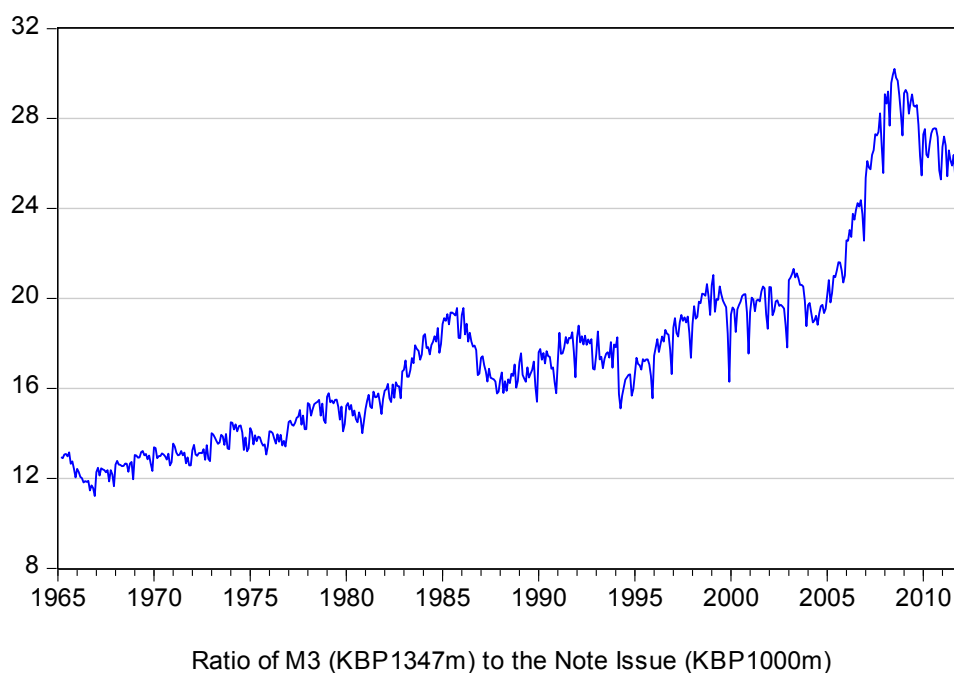
Source; SA Reserve Bank Data Base

Accordingly the money multiplier, measured as the ratio of the broadly defined money supply M3 to the note issue increased from an average of about 16 times between 1966 and 1999 to about 28 times by 2008. Since then as may be seen the ratio of M3 to the note issue has declined. (See below)

---

<sup>4</sup> Growth rates have been compound percentage rates of growth calculated quarterly as  $\text{Log}(x/x(-4))$  Or in the case of monthly data as  $\text{Log}(x/x(-12))$

**Fig.3 The money multiplier; Ratio of M3 to Note Issue 1966-2011 (Monthly Data)**



Source; SA Reserve Bank Data Base

#### *Explaining the Increase in the Money Multiplier*

The SA banks have held and continue to hold minimal amounts of reserves in excess of their required cash reserve holdings. They rather consistently borrow cash from the Reserve Bank to satisfy reserve requirements. Therefore in SA, M0 adjusted for reserve requirements becomes equivalent to the note issue. The Federal Reserve Bank of St Louis, the originator of the St Louis equations designed to identify how much money mattered for the US, defines the US Money Base as the sum of Notes plus cash reserves held by the commercial banks with the Federal Reserve system, less their required reserves.<sup>5</sup>

An explanation for this structural change after 2000 is therefore called for. The reason for the slower growth in the supply of notes compared to the growth in M3 and in bank credit can be found in the reduced demand for notes exercised by the banks themselves. This reduced demand for notes followed a decision taken by the Reserve Bank in 2002 not to allow the notes held by the banks to qualify as required cash reserves. The banks were allowed to phase

---

<sup>5</sup> See Richard G. Anderson and Kenneth A. Kavajecz, *A Historical Perspective on the Federal Reserve's Monetary Aggregates: Definition, Construction and Targeting*. <http://research.stlouisfed.org/aggreg/>

in the replacement of deposits at the Reserve Bank for cash in their tills ATM's and vaults between 2002 and 2004.<sup>6</sup>

The policy of the Reserve Bank is to meet the demand for notes as expressed by the public and the banks. As mentioned previously the Bank has never adopted any explicit targets for the money supply or the money base. A slower rate of increase in demands for notes by either the public or banks would lead automatically mean a slower rate of increase in the supply of cash to the system.

Using the model of the money supply process, we can show below how a reduction in the demand for notes by the banking system, other things remaining the same, will lead to an increase in the money multiplier, that is in the ratio M3/Note issue or M3/Money Base. It may be seen below that the ratio of notes held by the banks to their deposit liabilities declined significantly after '02 while the ratio of their cash reserves held as deposits with the Reserve Bank moved strongly in the opposite direction as we show below. The ratio of notes to deposits issued by the banks declined from about one and half per cent of their total deposits issued in '02 to about half of one per cent by '10. The ratio of the deposits held by the banks at the Reserve Bank increased from less than 1 per cent in '02 to about 2.5% by late '10. The share of the note issue held by the banks declined over the same period from about 25% of the issue to about 15%. Over the same period, as mentioned, the money multiplier that is the ratio of M3/Note Issue increased from about 17 times in '00 to about 28 times by '08. In more recent years the money multiplier appears to have stabilised and then declined.

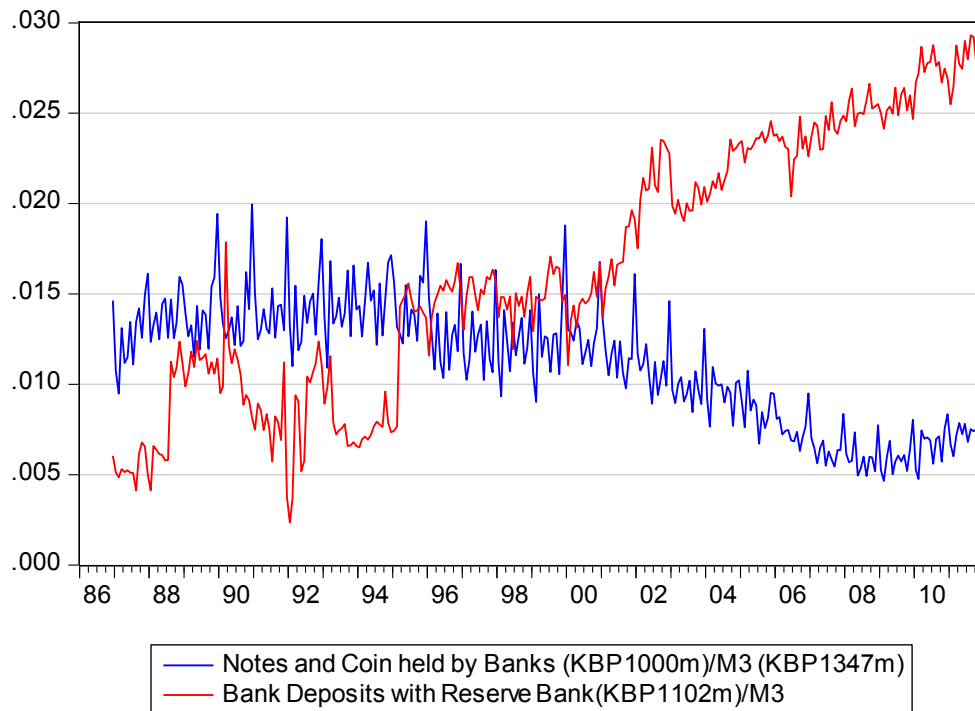
It is not clear that such an increase in the money multiplier was anticipated when the regulation to exclude notes from classification as required reserves was introduced. Nor is it clear that such an increase, even if anticipated, would have been of concern to the Reserve Bank, given its modus operandi to accommodate, rather than to attempt to control directly the notes or deposits it supplies to the system.

It is made clear with the aid of the money supply model presented below that the banks could meet the demand for bank deposits and the demand for bank credit that grew so strongly between '02 and '08, in part by reducing their real demand for notes as an alternative to increasing their demands for cash reserves held as deposits with the Reserve Bank. It should also be noted that consistently with a decline after 2008 in the ratio of M3 to the Note Issue shown above in Figure 3 the Banks after 2008 have tended to increase their holdings of notes and coin relative to their deposit liabilities represented by M3 and to the Notes issued by the Reserve Bank. ( See Figures 4 and 5 below)

---

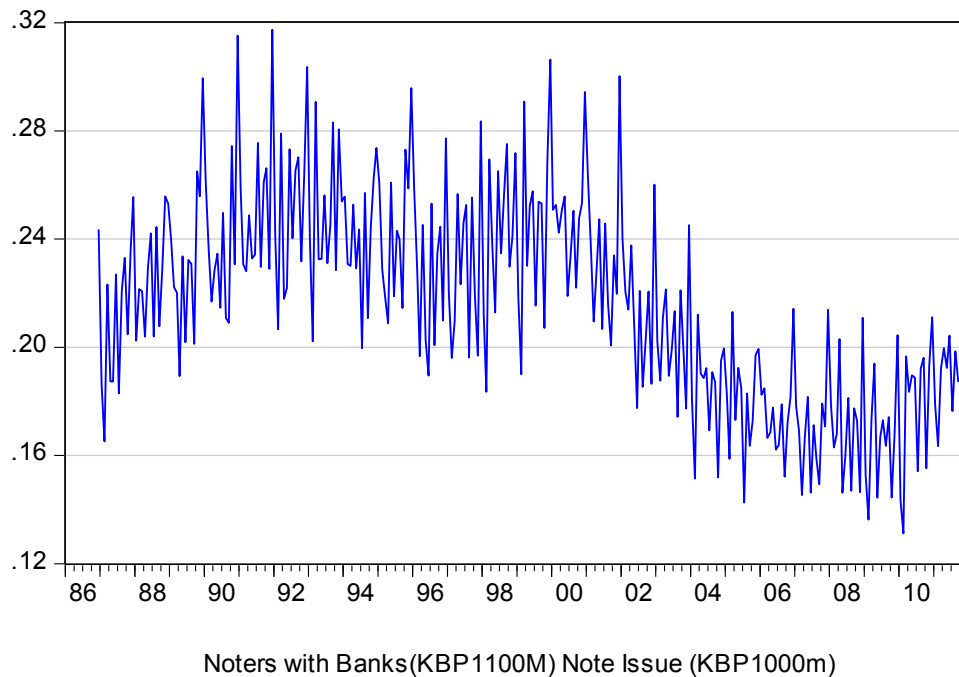
<sup>6</sup> *Brink and Kok in their paper (2009) note that "The last change to the cash reserve ratio was made in 2001, when the qualifying of vault cash as part of banks' cash reserves was phased out over a period of four years" No explanation for this change in policy was provided in the paper.*

**Fig 4. SA Banks; Ratio of Notes held to M3 and the Ratio of Bank Deposits at Reserve Bank to M3**



Source; SA Reserve Bank Data Base

**Fig 5. Ratio of Notes held by Banks to Total Note Issue**



Source; SA Reserve Bank Data Base

*Explaining the money supply process in South Africa- with an emphasis on the role of the demand for notes*

The model of the money supply process presented below and the derivation of the money multiplier (equation 10) will indicate the important role played by the ratio of notes held by banks to their deposit liabilities. It can be easily seen in equation 10 that a large decline in the ratio of notes held by the banks ( $n_b$ ) will be associated with an increase in the money supply, broadly defined, and in the money multiplier, the ratio of the money supply, broadly defined, to the money base. ( $M/MB$ ) (see equation 11)

*A Model of the Money Supply Process in South Africa*

The model consists of six exogenous and eight endogenous variables in eight equations. From this model we find the solution for the ratio of broad money supply over the money base as a function of purely exogenous variables. This allows us to find the derivative of this ratio with respect to a change in the share of money held in notes and coins.

**Table 3: variables in the Model of the Money Supply process**

<b>Endogenous Variables</b>	<b>Symbol</b>	<b>Exogenous Variables</b>	<b>Symbol</b>
Broad Money Supply	<b>M</b>	Foreign Assets	<b>FA</b>
Money Base	<b>MB</b>	Net Domestic Assets	<b>NDA</b>
Notes and Coins	<b>N</b>	Required Reserve ratio	<b>k</b>
Total Reserves by Commercial Banks	<b>CR</b>	Excess Reserves	<b>CR<sup>E</sup></b>
Total Required Reserves	<b>CR<sup>R</sup></b>	Government Securities	<b>GS</b>
Borrowed reserves	<b>BR</b>	Government Deposits	<b>GD</b>
Total Deposits	<b>D</b>	<b>Parameters</b>	
Free Reserves	<b>CR<sup>F</sup></b>	Share of money held as notes and coins	<b>n</b>
		Share of money held as notes and coins by the public	<b>n<sub>p</sub></b>
		Share of money held as notes and coins by banks	<b>n<sub>b</sub></b>

Equations:

$$MB \equiv N + CR \quad (1)$$

$$MB \equiv FA + NDA + BR \quad (2)$$

$$NDA \equiv GS - GD \quad (3)$$

$$CR \equiv CR^E + CR^R \quad (4)$$

$$CR^R = kD \quad (5)$$

$$CR^F \equiv CR^E - BR \quad (6)$$

$$M \equiv N + D \quad (7)$$

$$N = nM \quad (8)$$

$$D = (1 - n)M \quad (9)$$

Clearly  $n = n_p + n_b$  and some simple algebraic manipulation allows us to write money as a multiplier times the sum of Foreign Assets (FA) and Net Domestic Assets (NDA) net of free reserves ( $CR^f$ ).

$$M = \frac{1}{n_p(1-k) + n_b(1-k) + k} (FA + NDA - CR^F) \quad (10)$$

We may then derive the ratio of Money to Money Base as

$$\frac{M}{MB} = \frac{1}{n_p(1-k) + n_b(1-k) + k} \left( \frac{FA + NDA - CR^E + BR}{(n_p + n_b)N + CR} \right) \quad (11)$$

Partially differentiating  $\frac{M}{MB}$  with respects to  $n_b$  gives

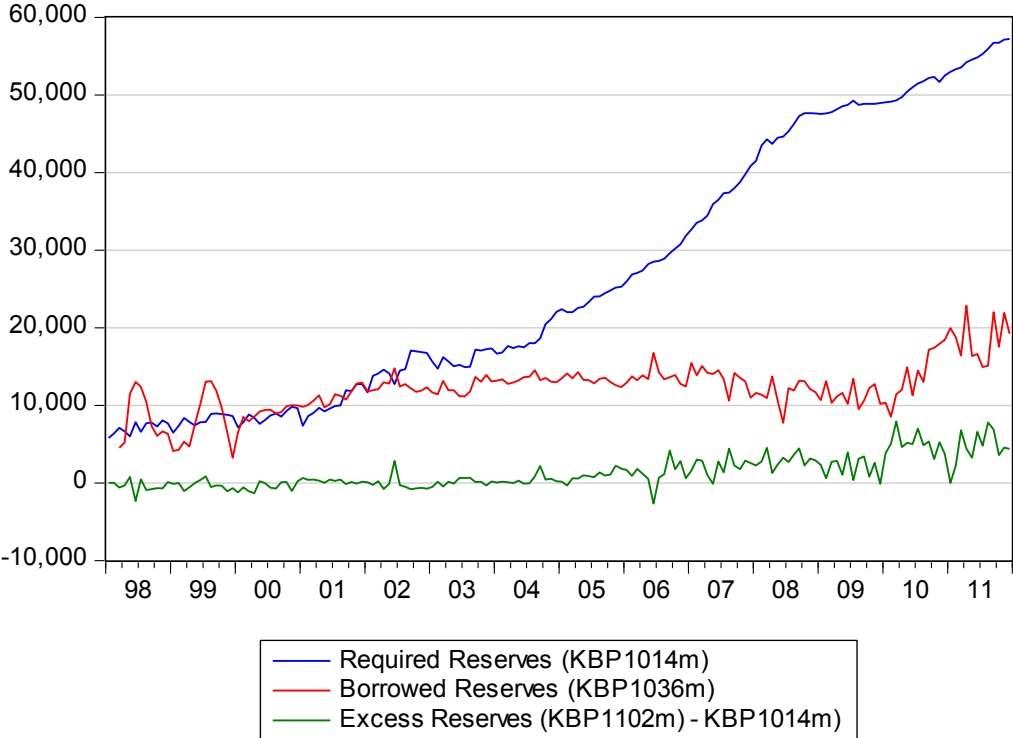
$$\frac{\partial \left( \frac{M}{MB} \right)}{\partial n_b} = \frac{-1(1-k)}{(n_p(1-k) + n_b(1-k) + k)^2} \left( \frac{FA + NDA - CR^E + BR}{(n_p + n_b)N + CR} \right) - \frac{1}{(n_p(1-k) + n_b(1-k) + k)^2} \frac{N(FA + NDA - CR^E + BR)}{((n_p + n_b)N + CR)^2}$$

Since both factors are negative,  $\frac{\partial \left( \frac{M}{MB} \right)}{\partial n_b} < 0$

A number of implications can be drawn from this money supply model can be made. Firstly, as mentioned before, it has not been the practice of the SA commercial banks to hold significant excess cash reserves. Unlike their US counterparts after the Global Financial

Crisis, SA banks have continued to hold minimum amounts of cash in the form of deposits at the Reserve Bank in excess of the legal requirement of them to satisfy their cash to deposit ratios. SA banks however consistently borrow cash from the Reserve Bank. Thus free reserves (equation 6) in the model, the difference between excess and borrowed reserves, are consistently negative. (see figure below)

**Fig 6. Composition of SA Bank Reserves (R million)<sup>7</sup>**



Source; SA Reserve Bank Data Base

This dependence (at the margin) of the commercial banks on cash supplied by the Reserve Bank is intentional. It helps make the central bank’s discount rate, or in modern terminology, its repurchase or the repo rate, effectively the bench mark short term rate of interest in the money market. Therefore because almost all of the deposits held by the banks at the Reserve Bank, its cash reserves, are required reserves (equations 4 and 5) the money base in South Africa or M0, (equation 1) if adjusted for reserve requirements then reduces to the Note Issue. The so called high powered money in the system, the quantity that is powered up to M3 is then Note Issue rather than M0 that consists of the Note Issue plus the cash reserves of the banks held with the Reserve bank that are consistently almost entirely required reserve holdings.

<sup>7</sup> Note on Reserve Bank Data sources. Required Reserve Balances, Reserve Bank Data Bank Series KBP1014m, Borrowed Reserves, Series KBP1036m which is described as South African Reserve Bank Total Liquidity Provided, Excess Reserves iare defined here defined as the difference between Reserve Bank Series KBP1102m described as Assets of Banking institutions. Deposits with the SARB and Series KBP1014m described as South African Reserve Bank liabilities. Deposits Required reserve balances The series KBP1014 KBP1036 and KBP1102m date back only to March 1998.



This adjustment for required reserves is consistent with monetary theory that regards the excess supply of money over the demand to hold money, not the money supply itself, as influencing aggregate demand and so the price level. Or in other words excess cash reserves held by the banks matter for the economy because they may lead to more bank lending and an increase in the money supply via the deposit money multipliers. Required reserves are in effect frozen on the books of the commercial banks.

### *Conclusions*

It will be clear from the tables and figures shown above that broadly defined money supply growth and the growth in the supply of bank credit has remained as highly variable and as highly pro cyclical since '00 as it was before. The era of inflation targeting has not brought less variable money supply and bank credit supply growth. It has however brought lower inflation on average but not less variable inflation, especially if the co-efficient of variation of the inflation rate is the appropriate measure of volatility.

The ability of the SA Reserve Bank to moderate the money and bank credit cycles, utilising interest rates as the primary instrument of monetary policy, seems as elusive as ever. The supply of money and credit in South Africa appears to respond primarily and endogenously to demands for cash and credit, given interest rate settings. Adjustments to these policy determined interest rates appear to lag well behind the demands for extra credit and the cash to satisfy such demands in both directions.

Or in other words policy determined interest rates are set too low to restrain the money and credit supplies when the money and credit cycles have gained momentum and then remain too high when demands for credit and money slow down to prevent the growth in money and credit from slowing down precipitately.

It would appear that the surge in money and credit growth between 2003 and 2008 was accommodated by an unexpected reduction in demands for cash by the banks rather than, as would be more usual, by an increase in the supply of cash reserves made available by the Reserve Bank to the banks. The apparent unpredictability of the demands by the banks for notes, in the face of changes in the composition of qualifying cash reserves, represents an additional complication when setting interest rates to be (hopefully) consistent with appropriate money and credit supply objectives.

The evidence in the form of still highly variable and pro-cyclical money and bank credit cycles suggests that the task of stabilising the money and credit cycle, utilising interest rate settings, remains as elusive as ever and beyond the capacity of monetary policy in South Africa. The operating procedures of the Reserve Bank continue to prove incapable of effectively moderating, in an effectively contra cyclical way, the money and credit cycles.

## References

ANDERSON, RICHARD G AND KAVAJECZ, KENNETH A, (2011) A Historical Perspective on the Federal Reserve's Monetary Aggregates: Definition Construction and Targeting. <http://research.stlouisfed.org/aggreg/>

BARR, G.D.I. and DIETZSCH, C.H. (1980). The direction of causality between money and income - the South African case. *Studies in Economics and Econometrics*, 7, 24-29.

BARR, G.D.I. and KANTOR, B.S. (1982). Money and economic activity: Some alternative results. *South African Journal of Economics*, 50, 375-377.

BARR, G.D.I. and KANTOR, B.S. (1984). Interest rates, exchange rates and the money supply in South Africa. *The Investment Analysts Journal*, 23, 45-50.

BARR, G.D.I. and KANTOR, B.S. (1989) Money and economic activity - A response to the Reserve Bank, *South African Journal of Economics*, 57(3), 292-298.

BARR, G.D.I. and KANTOR, B.S. (1990a) The Application of a vector autoregressive model to money income and price links in the S.A. Economy, *Journal for Studies in Economics and Econometrics*, 14(1), 39-49.

BARR, G.D.I. and KANTOR, B.S. (1990b) Money and economic activity, a response to the Reserve Bank: a reply. *South African Journal of Economics*, 58(3), 368-369.

BARR, G.D.I. (1990c) A vector autoregressive model - reply. *Journal for Studies in Economics and Econometrics*, 14(3), 89.

BARR, G.D.I. and KANTOR, B.S. (1993) The Money-Income Causality Debate in South Africa: Comment. *South African Journal of Economics*, 61(1), 84-86.

BARR, G.D.I and KANTOR, B.S. (2002), The South African Economy and its Asset Markets: An Integrated Approach, *SAJE*, 70, 1, 53-77.

BRINK N and KOK (2009), Central bank balance sheet policy in South Africa and its implications for money-market liquidity, *South African Reserve Bank Working Paper*, WP/10/01, December 2009

KANTOR, BS (1986) The de Kock Commission report: A Monetarist perspective, *SAJE*, 54(2), 94-107.

The Final Report of the de Kock Commission of Enquiry into Monetary System and Monetary Policy in South Africa. RP/70/1984

---

<sup>i</sup> *The relevance of the openness of an economy to monetary policy options was identified by what was known as the monetary approach to the balance of payments; a research programme associated in particular with Harry G. Johnson; see, for example, Jacob A. Frenkel and Harry G Johnson (eds. The Monetary Approach to the Balance of Payments, George Allen and Unwin Ltd. (1976)*