Money supply and economic activity in South Africa – the relationship updated to 2010

Introduction

In the eighties and early nineties a number of attempts were made to measure the relationship between various measures of money supply growth and the growth in GDP, GDE, Household Consumption Expenditure and Consumer Prices between 1966 and 1993. (82, 1984,1989, 1990b, 1993) This earlier work on the relationship between money economic activity and prices was concluded in 1990 with an attempt to separate monetary causes and effects. That is to estimate whether the money to expenditure and income link was stronger than the income to money link, given the accommodative nature of money supply responses. It was reported that the money to income link was stronger than the reverse income to money influence, using a vector auto-regression approach. (1990a). The purpose of this paper is to update this analysis to include the past twenty years of data to establish whether or not money still matters for the SA economy in the way it did.

Earlier conclusions and implications

Our earlier calculations had demonstrated that the growth rates of the narrower measures of money were more highly correlated with the growth in GDP and especially of Gross Domestic Expenditure (GDE) and Household Consumption spending than with wider measures of money growth. The linkages between money supply growth and inflation was found to be a statistically weak. It was explained that, given the openness of the SA economy to exports and imports, the money supply would affect aggregate demand or GDE much more directly than GDP. It was also understood that changes in the exchange rate independently of domestic demand (exchange rate shocks) could influence the trend in consumer prices.

The intention was to provide a complete analysis of the extent to which published Reserve Bank monetary measures correlated with Reserve Bank measures of economic activity. It was argued that there was little empirical evidence for the Reserve Bank view that broader measures of the money supply (M3) would be a superior target to narrower definitions (M0) for the purposes of monetary policy. The Reserve Bank had pronounced in 1988 that

"….As a practical matter, movements in M0 over the past several years have been found to correlate relatively poorly (more so than other monetary aggregates) with movements in macro-economic variables such as nominal gross domestic product or the

general price level…" (SARB Quarterly Bulletin, March 1988 p.16-17) as quoted in Barr and Kantor (1989 p. 292).

It was well appreciated in this body of work that a reduced form econometric approach was inappropriate for addressing the issue of the endogeneity of the supply of money in the South African context. It was understood that the operating procedures of the SA Reserve Bank accommodated the demands for cash by the public and the banks at the policy determined discount or repo rate and that this could make the supply of central bank money and the money supply broadly defined as more the effect of than the cause of economic activity.

In an analysis of the the De Kock Commission Report (1986) a full model of the money supply process was set out and solved for the equilibrium overdraft rate and the broad money supply. It was demonstrated that were it the official intention to achieve money supply objectives with interest rate settings, the authorities would have to estimate accurately the income elasticity of the demand for money, but also the many other elasticities identified in the two reduced form equations - a clearly formidable task.

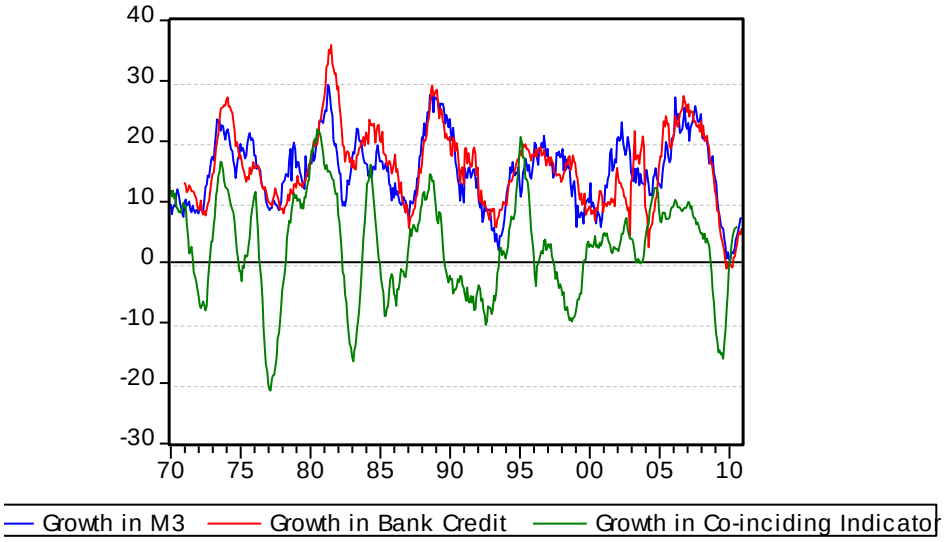
Some monetary history in charts and tables

The highly variable and pro-cyclical behaviour of the money supply and the high rates of inflation over the extended period from 1966 to 2010 would seem to confirm the practical difficulties faced by the SA Reserve Bank in the attempts it presumably made to control the supply of money and bank credit and moderate the money and credit cycles with interest rate settings. 1

In the figure below we show the long history of money supply and credit growth using monthly data. These growth rates are compared in the figure to the annual change in the co-inciding business cycle indicator published by the Reserve Bank to make the pro-cyclicality of money and credit growth apparent. It will also be apparent that the growth in money and credit and its cyclicality have remained highly elevated since 2000.

[1] See for a recent explanation of the operating procedures of the Reserve Bank, *N Brink and M Kock,* 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

Fig 1. Annual growth in M3, the Note Issue and the Business Cycle in SA (Monthly data 1971-2010)



Source; SA Reserve Bank Data Base

This impression of rapid and highly variable money and credit supply growth is confirmed by the summary statistics provided in the Tables below. Yet while the generally rapid M3 and bank credit growth rates are very similar before and after 2000, two differences in the observed outcomes before and after 2000 should be noted. Firstly the growth in the note issue and the growth in the broader measure of money (M3) while very similar on average before 2000, diverge thereafter as the average growth in the note issue slowed down after the turn of the century. Secondly the average head line inflation rate after 2000 is significantly lower than before. Inflation targeting applied in SA after 2000 may therefore be regarded as successful in helping to reduce the average rate of inflation.

Yet it should be noted that while the average rate of inflation declined significantly after 2000, the inflation rate has remained very volatile. Indeed inflation became significantly more volatile after 2000 than in the earlier period. The standard deviation of the inflation rate was 3.06 % between January 2000 and December 2010. While the inflation

rate was much higher between 1971 and 1999 averaging 11.61% the Standard Deviation of the inflation rate was a similar 3.69% Thus the co-efficient of variation of inflation (the standard deviation divided by the lower mean) was 0.52 for the period 2000-2010 and much lower 0.32 on average between 1971 and 1999. We provide a full explanation of the divergent money supply trends below.

Table 1; Money supply growth and inflation 1971 -2010. [2]

Sample: 1971:01 2010:12				
	M3	NOTE ISSUE	BANK CREDIT	INFLATION
Mean	15.00	13.23	15.46	10.00
Median	15.10	11.75	15.48	10.04
Maximum	29.34	33.31	35.88	20.94
Minimum	0.14	1.61	-1.09	0.13
Std. Dev.	5.75	5.86	6.59	4.35
Observatic	468.00	468.00	468.00	468.00

Sample: 2000:01 2010:12				
	M3	NOTE ISSUE	BANK CREDIT	INFLATION
Mean	14.71	10.21	13.64	5.92
Median	15.03	9.91	12.75	5.77
Maximum	27.25	17.87	27.49	13.06
Minimum	0.14	2.90	-1.09	0.13
Std. Dev.	6.64	3.17	7.77	3.06
Observatic	132	132	132	132

Sample: 1971:01 1999:12

	M3	NOTE ISSUE	BANK CREDIT	INFLATION
Mean	15.11	14.42	16.18	11.61
Median	15.12	13.11	15.70	11.78
Maximum	29.34	33.31	35.88	20.94
Minimum	1.93	1.61	5.63	1.71
Std. Dev.	5.37	6.24	5.92	3.69
Observatic	336.00	336.00	336.00	336.00

Source; SA Reserve Bank Data Base

[2] Calculated monthly as annual year on year growth rates in money and the Consumer Price Index (CPI) The growth rates of M3 and the Note issue are compound growth rates Log/(x(x(-12))/.01 while headline inflation is calculated conventionally as a simple percentage (CPI-CPI(-12))/CPI(-12)/.01

In the tables below we summarize the results of the updated analysis that takes into account the full history of the relationship between alternative measures of money supply growth and economic activity and inflation between 1967 and 2010. The results are presented below in Table(2) and Table(3). Results are also presented for the period 1967-1981 to correspond with the earlier studies and for the periods 1967-1999 and for the period 2000-2010.

The measures of interest are the extent to which various monetary measures ranging from the narrowest monetary measure to the broadest monetary measure can be used to fit a range of measures of economic activity. Since the measures of economic activity are only available quarterly, all variables are considered at quarterly intervals. To render the variables stationary both the measure of economic activity and the measure of the monetary aggregate are computed in growth rate form and to remove any seasonality these growth rates are computed as year-on-year growth rates.

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The model is of the form

$$\%E = \beta_0 + \sum_{i=1}^{4} \beta_i * \%M_{t-i}$$

Where: $\%E_t = 100 * Log_e\,(E_t / E_{t-4})$

$\%M_t = 100 * Log_e\,(M_t / M_{t-4})$

For the monetary measures we use M1, M2, M3 and notes in circulation. For the measures of economic activity we use GDP, GDE and Household Consumption. We also include a measure of inflation (based on the consumer price index). The tables give the summary statistics for R2 (adj. dof), F and the Durbin-Watson (DW) statistics for ordinary least squares regressions for the indicated periods for the model estimations. The R2 (adj. dof) and F statistics are parallel measures of model fit and give, respectively, a measure of the (least-squares) degree of fit and the overall statistical significance of the monetary aggregates in explaining the economic activity variable. The DW gives a measure of the first-order autocorrelation of the residuals.

It should be noted that while computing these economic activity and monetary measures in growth rate form is necessary to render the variables stationary and thus remove any possibility of spurious correlations arising, such growth rates transformations will tend to induce some autocorrelation in the residuals. Regressions between smooth variables will generally produce autocorrelated residuals and these may lead to difficulties in interpretation. Thus in this analysis we give tables for the regressions both with and without an autocorrelation adjustment. Note also that this study is looking primarily at the relative levels of explanation of measures of economic activity by different measures of money across different time periods and as such it is the (relative) overall measures of fit that are important rather than the estimates of the individual beta coefficients in the model.

Table 2. Money and Economic Activity 1967.1-2010.3 (Quarterly data) without an autocorrelation adjustment

		M1G	M1G	M1G	M1G	M2G	M2G	M2G	M2G	M3G	M3G	M3G	M3G	NOTESG	NOTESG	NOTESG	NOTESG
		67.1–81.3	67.1–99.4	'00.1–'10.3	67.1–'10.3	67.1–81.3	67.1–99.4	'00.1–'10.3	67.1–'10.3	67.1–81.3	67.1–99.4	'00.1–'10.3	67.1–'10.3	67.1–81.3	67.1–99.4	'00.1–'10.3	67.1–'10.3
GDPG	R2-bar	0.280	0.028	0.643	0.073	0.209	0.121	0.134	0.144	0.330	0.209	0.257	0.175	0.533	0.337	0.009	0.328
	D.W.	0.549	0.394	1.150	0.386	0.478	0.456	0.721	0.449	0.550	0.509	0.835	0.458	0.656	0.597	0.553	0.564
	F-stat	8.524	2.250	26.255	5.587	6.112	6.986	3.169	10.756	10.517	12.560	5.851	13.327	26.083	24.561	1.123	30.631
GDEG	R2-bar	0.555	0.087	0.627	0.138	0.460	0.228	0.242	0.228	0.514	0.264	0.319	0.234	0.753	0.544	0.196	0.522
	D.W.	0.782	0.439	0.947	0.445	0.627	0.502	0.712	0.507	0.646	0.526	0.754	0.498	1.194	0.871	0.587	0.816
	F-stat	25.098	5.181	24.552	10.301	17.478	12.538	5.462	18.093	21.488	16.685	7.549	18.748	67.903	56.324	4.411	67.357
HHG	R2-bar	0.673	0.086	0.686	0.160	0.584	0.263	0.255	0.273	0.614	0.327	0.428	0.222	0.740	0.573	0.241	0.572
	D.W.	0.927	0.284	0.383	0.255	0.683	0.362	0.465	0.324	0.665	0.380	0.486	0.278	0.856	0.596	0.334	0.535
	F-stat	40.704	5.101	31.638	12.019	28.162	16.606	5.799	22.802	31.799	22.233	11.482	17.510	63.741	63.053	5.452	82.104
CPIG	R2-bar	0.283	0.038	0.380	0.091	0.530	0.261	0.120	0.239	0.650	0.253	0.275	0.159	0.405	0.326	0.195	0.293
	D.W.	0.178	0.115	0.342	0.108	0.345	0.166	0.238	0.147	0.516	0.179	0.302	0.126	0.228	0.177	0.348	0.167
	F-stat	8.640	2.727	9.573	6.773	22.797	16.394	2.902	19.253	36.894	15.784	6.314	11.974	15.995	23.366	4.400	26.097

Table 3. Money and Economic Activity 1967.1-2010.3 (Quarterly data) with an autocorrelation adjustment

		M1G	M1G	M1G	M1G	M2G	M2G	M2G	M2G	M3G	M3G	M3G	M3G	NOTESG	NOTESG	NOTESG	NOTESG
		67.1–81.3	67.1–99.4	'00.1–'10.3	67.1–'10.3	67.1–81.3	67.1–99.4	'00.1–'10.3	67.1–'10.3	67.1–81.3	67.1–99.4	'00.1–'10.3	67.1–'10.3	67.1–81.3	67.1–99.4	'00.1–'10.3	67.1–'10.3
GDPG	R2-bar	0.803	0.728	0.800	0.749	0.794	0.732	0.755	0.749	0.801	0.736	0.755	0.752	0.813	0.746	0.705	0.756
	D.W.	2.123	2.063	2.116	2.067	2.141	2.092	1.843	2.079	2.050	2.086	1.833	2.109	2.373	2.131	1.835	2.113
	F-stat	47.429	70.698	34.635	104.397	44.980	72.033	26.925	104.470	47.006	73.494	26.831	105.958	58.497	82.608	21.076	113.574
GDEG	R2-bar	0.816	0.711	0.761	0.723	0.792	0.724	0.746	0.730	0.803	0.730	0.744	0.731	0.848	0.757	0.719	0.761
	D.W.	2.289	2.318	2.295	2.320	2.410	2.371	1.869	2.330	2.473	2.387	1.779	2.363	2.099	2.298	1.961	2.272
	F-stat	51.535	65.024	27.740	91.486	44.313	69.061	25.617	94.781	47.354	71.329	25.423	95.219	74.759	87.795	22.440	116.809
HHG	R2-bar	0.828	0.805	0.927	0.839	0.808	0.806	0.872	0.838	0.819	0.811	0.885	0.841	0.847	0.837	0.867	0.856
	D.W.	2.249	2.090	2.034	2.046	2.260	2.108	1.229	2.041	2.170	2.151	1.242	2.078	2.361	2.230	1.306	2.165
	F-stat	56.035	108.153	107.842	181.772	48.878	109.018	58.091	180.142	52.699	112.737	65.917	184.572	74.037	144.276	55.786	217.412
CPIG	R2-bar	0.945	0.922	0.905	0.932	0.945	0.925	0.898	0.934	0.941	0.923	0.905	0.934	0.947	0.934	0.878	0.935
	D.W.	2.643	1.708	0.954	1.476	2.708	1.737	0.756	1.505	2.558	1.732	0.849	1.541	2.366	1.635	0.678	1.421
	F-stat	195.122	306.925	81.164	472.767	197.004	320.440	74.728	490.971	183.491	314.727	81.090	493.279	237.490	393.575	61.590	528.315

The result of the exercise confirms the consistency of the relationship between money, economic activity and prices in South Africa over the extended period 1966 - 2010. The results are very much in line with those presented before. The closest statistical associations are found between growth in the narrow money supply and growth in GDE and Household Consumption Expenditure. While the measures of money supply for the earlier period are largely unchanged, the national income statistics and of prices have been revised, sometimes significantly, giving rise to somewhat different estimates from those obtained in the earlier published estimates for the same overlapping periods.

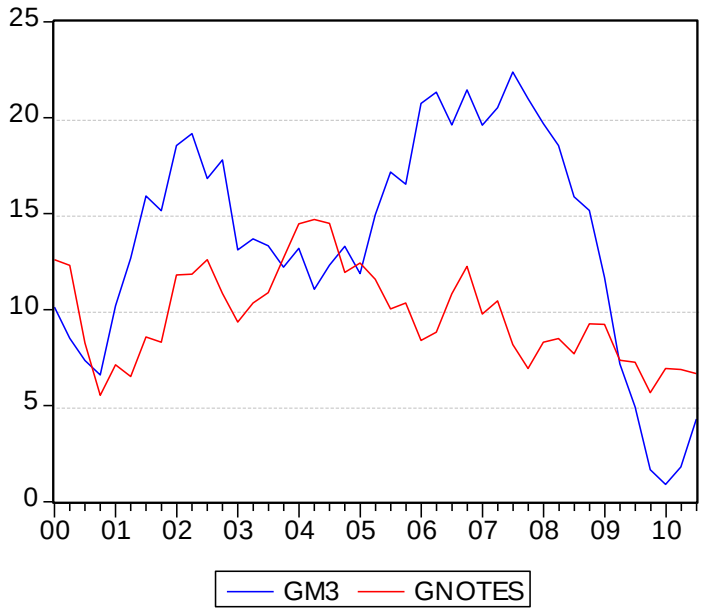
It should be noted that the results that adjust for autocorrelation have much higher fits than those which do not adjust for autocorrelation. This is because the model with autocorrelated fits is effectively using the lagged dependent variable are an additional explanatory variable. Thus, for example,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

Focusing on the results without the autocorrelation adjustment, it is seen that the money measures fit economic activity very satisfactorily over the extended period 67-2010, with the best fits to be obtained from the narrowest measure of the money supply, the note issue. As was noted in the earlier work, the relationship between the growth in money and expenditure, GDE or Household Consumption, has remained consistently more significant than that between the growth in money supply and GDP. The links between money and inflation have remained statistically rather weak ones, as may be seen. The trade balance and independent exchange rate movements have continued to interrupt the money supply to aggregate expenditure and in turn output and price level linkages. The best statistical fits for the relationship between narrow money and expenditure and output as measured by R squared and the F statistic, are found over the period 1967 to 1981, the focus of the original studies, as may be seen. The goodness of fit and significance of the coefficients of the models is not quite as strong for the period 1967-1999 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 sub-period ‘00 -’10, the growth in the broader measures of money, for example M3, became somewhat better related to measures of economic activity than did the growth in the narrowly defined money supply and expenditure. Furthermore the statistical relationship between the growth in the broad and narrow definitions of money and the growth in expenditure became statistically less significant over the past ten years and more.

It should however be recalled, as shown in the tables above, that the relationship between growth in the note issue and the broader definitions of money changed over the past ten years. Growth in narrow and broader money diverged more after '00 than before with the 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 between the annual growth in the note issue and M3 measured quarterly also declined from 0.579 between 1966 and 1999 to 0.297 between '00 and '10. 3 (See figure below)

Fig 2. Growth in Note Issue and growth in M3 '00.1-'10.3

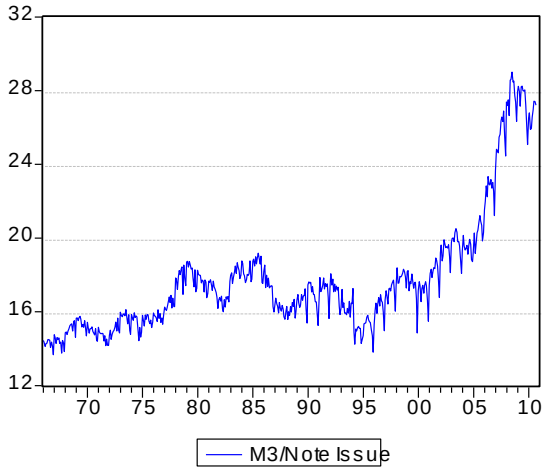


Source; SA Reserve Bank Data Base

[3] Growth rates have been compound percentage rates of growth calculated quarterly as Log(x/x(-4))/.01

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 '08. It would appear that this multiplier has stabilised at about the 28 times. (See below)

Fig.3 The money multiplier; Ratio of M3 to Note Issue 1966-'10 (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.4

[4] 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/

An explanation for this structural change after '00 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 '02 not to allow the notes held by the banks to qualify as required cash reserves. The banks were allowed to phase in the replacement of deposits at the Reserve Bank for cash in their tills ATM's and vaults between '02 and '04.5

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 where after the money multiplier appears to have stabilised and declined moderately.

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

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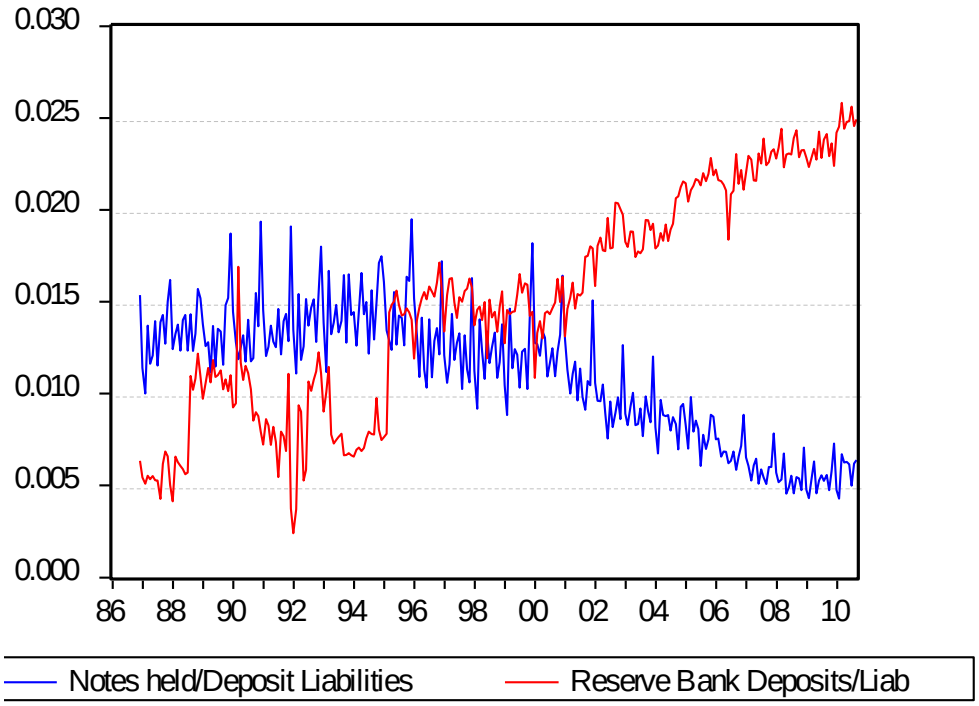
[5] Brink and Kok in their paper (2009) note that "The last change to the cash reserve ratio was made in 2001, when the qualifying of vault cash as part of banks' cash reserves was phased out over a period of four years" No explanation for this change in policy was provided in the paper.

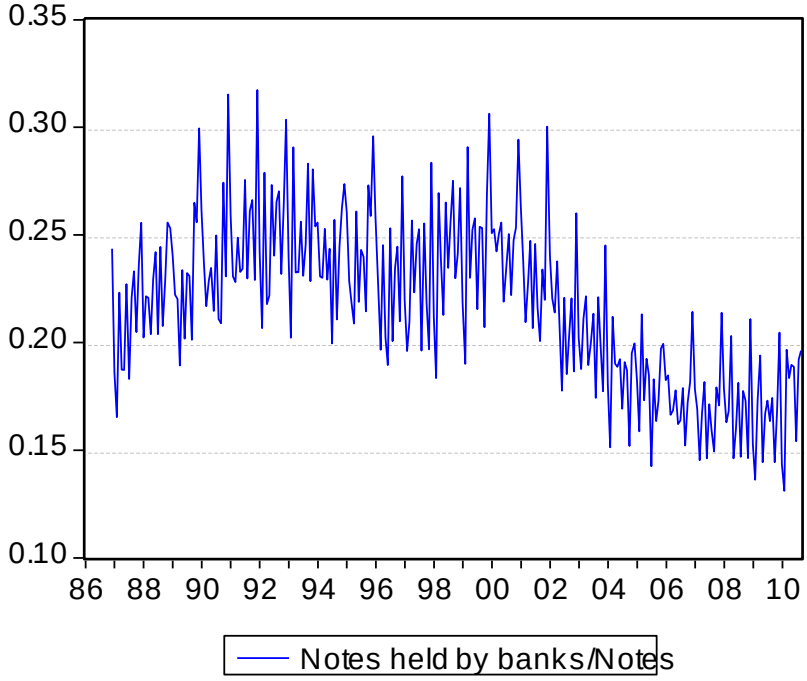
alternative to increasing their demands for cash reserves held as deposits with the Reserve Bank.

Fig 4. SA Banks; Ratio of notes held and deposits at Reserve Bank to Deposit Liabilities.



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 15) 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 15 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 equations 16 to 19)

A model of the money supply process in South Africa

$$MB = N + CR \tag{1}$$

$$MB = FA + NDA + BR \tag{2}$$

$$NDA = GS - GD \tag{3}$$

$$CR = CR^E + CR^R \tag{4}$$

$$CR^R = kD \tag{5}$$

$$CR^F = CR^E - BR \tag{6}$$

$$M = N + D \tag{7}$$

$$N = nM \tag{8}$$

$$D = (1 - n)M \tag{9}$$

Insert (9) in (5):

$$CR^R = k(1 - n)M \tag{10}$$

Merge (2), (4), (6) and (10):

$$nM + k(1 - n)M + CR^F = FA + NDA \tag{11}$$

$$n = n_p + n_b \tag{12}$$

Insert (12) in (11):

$$(n_p + n_b)M + k(1 - n_p - n_b)M + CR^F = FA + NDA \tag{13}$$

$$M[n_p(1 - k) + n_b(1 - k) + k] = FA + NDA - CR^F \tag{14}$$

$$M = \frac{1}{n_p(1 - k) + n_b(1 - k) + k}(FA + NDA - CR^F) \tag{15}$$

$$\frac{M}{MB} = \frac{1}{n_p(1-k) + n_b(1-k) + k}[\frac{FA + NDA - CR^F}{FA + NDA + BR}] \quad (16)$$

$$\frac{M}{MB} = \frac{1}{n_p(1-k) + n_b(1-k) + k}[\frac{FA + NDA - CR^E + BR}{(n_p + n_b)N + CR}] \quad (17)$$

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

$$-\frac{1}{[n_p(1-k) + n_b(1-k) + k]} \frac{N[FA + NDA - CR^E + BR]}{[(n_p + n_b)N + CR]^2} < 0 \quad (18)$$

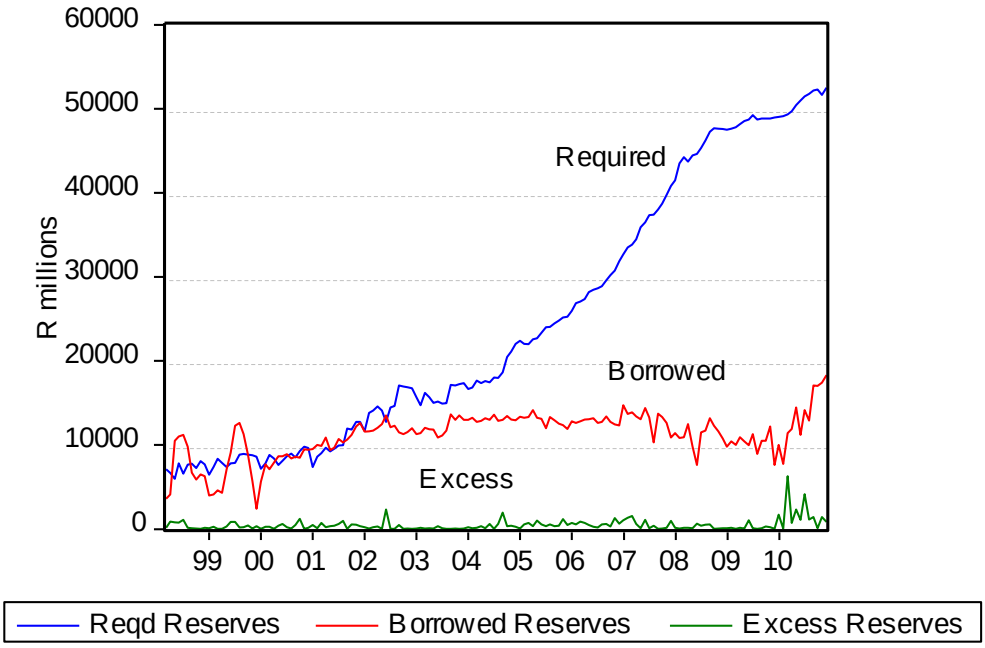
$$\frac{\delta(\frac{M}{MB})}{\delta n_b} < 0 \quad (19)$$

Where:
M = Broad Money Supply
MB = Money Base
GD = Government deposits
GS = Government securities
BR = Loans to commercial banks
NDA = Net Domestic Assets
FA = Foreign Assets
N = Notes
n_b = Ratio of money supply held in notes by banks
n_p = Ratio of money supply held in notes by the public
CR = Total reserves held by commercial banks
CR^R = Required reserves
CR^E = Excess reserves
CR^F = Free reserves
k = Required reserve ratio
D = Bank Deposits

A number of observations about 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 as per 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)[6]



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.

[6] Note on data sources. Required Reserve Balances, Reserve Bank Data Bank Series KBP1014m, Borrowed Reserves, Series KBP1025m, Excess Reserve Series KBP1013m. The statistics for excess and borrowed reserve 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.

Conclusion

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 '03 and '08 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.

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