MONEY SUPPLY AND ECONOMIC ACTIVITY IN SOUTH AFRICA – THE RELATIONSHIP UPDATED TO 2011

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Abstract

This paper reconsiders the relationship between measures of money and measures of economic activity in the South African economy and the role of the Reserve Bank in moderating South African economic cycles. By using data for the past twenty years, the earlier analysis is updated and reassessed so that it is possible to see if the fundamental relationships between money, credit and economic activity have changed and whether the role of the Reserve Bank in managing economic activity has become more pivotal and constructive. One important difference noted is that broadly defined money (M3) does better in explaining economic activity between 2000 and 2011 than narrowly defined money. The opposite is true for the earlier sub-periods. The paper utilises a model of the money supply process to explain why the relationship between narrowly and broadly defined money changed after the year 2000 with regulations that encouraged the banks to reduce their demands for cash leading to an increase in the money multiplier. The paper concludes that 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, remains as elusive as ever.

1. 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 for the South African economy between 1966 and 1993 (Barr and Kantor (1982, 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

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vector auto-regression approach (Barr and Kantor (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 in those previous decades.

2. 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 Gross Domestic Product (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 were found to be statistically weak. It was explained that, given the openness of the SA economy to exports and imports[1], 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.[i]

The intention of this earlier work 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 1988:16-17) as quoted in Barr and Kantor (1989:292).

It was well appreciated in our 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, rather than the cause of, economic activity.

In an analysis of 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

[1] 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)).

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.

3. Some monetary history in charts and tables

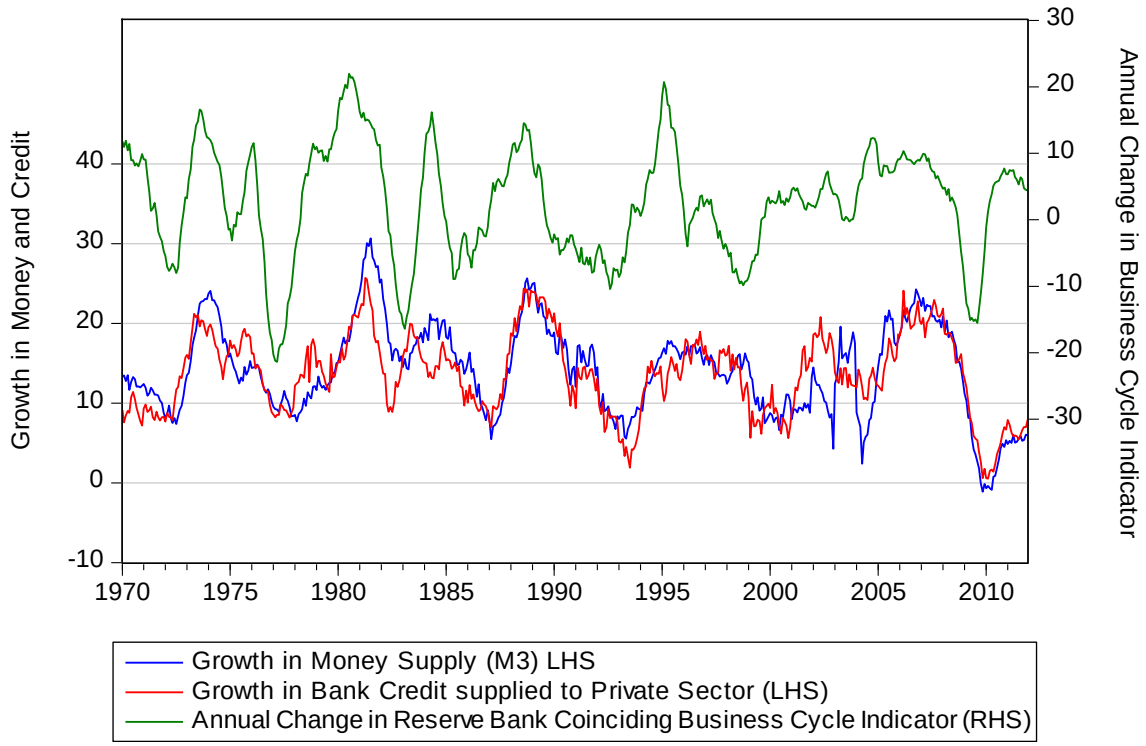
The highly variable and pro-cyclical behaviour of the money supply, and the high rates of inflation, over the extended period from 1966 to 2010 would seem to confirm the practical difficulties faced by the SA Reserve Bank in the attempts it presumably made to control the supply of money and bank credit, and moderate the money and credit cycles with interest rate settings. [2]

In the Figure 2 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 coinciding business cycle indicator published by the Reserve Bank[3] 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.

This impression of rapid and highly variable money and credit supply growth is confirmed by the summary statistics provided in Table 1, 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.

[2] For a recent explanation of the operating procedures of the SA Reserve Bank, see 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.

[3] Series KBP7091m.



Source: SA Reserve Bank Data Base

Figure 1: Annual growth in M3, the note issue and the business cycle in SA (Monthly data 1970-2011)

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 mean) was 0,52 for the period 2000-2011 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 -2011 [4]

Sample: 1971:1 2011:2

	Note Issue (%)	M3 (%)	CPI (%)	Credit (%)
Mean	12,45	13,86	9,47	14,22
Median	11,12	14,07	9,95	14,35
Maximum	26,94	25,05	17,61	29,37
Minimum	3,49	0,89	0,43	-0,57
Std. Dev.	4,99	4,98	3,95	5,68
Observations	162	162	162	162

Sample: 1971:1 1999:4

	Note Issue (%)	M3 (%)	CPI (%)	Credit (%)
Mean	13,59	14,11	10,99	15,01
Median	12,81	14,28	11,49	15,08
Maximum	26,94	25,05	17,61	29,37
Minimum	3,49	3,45	1,94	6,04
Std. Dev.	5,27	4,58	3,24	4,95
Observations	116	116	116	116

Sample: 2000:1 2011:2

	Note Issue (%)	M3 (%)	CPI (%)	Credit (%)
Mean	9,56	13,25	5,64	12,23
Median	9,24	13,32	5,47	10,93
Maximum	14,70	22,37	12,04	23,66
Minimum	5,54	0,89	0,43	-0,57
Std. Dev.	2,49	5,88	2,83	6,88
Observations	46	46	46	46

Source: SA Reserve Bank Data Base

In Table 2 and Table 3 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 2011. 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 2000-2011.

[4] Calculated as annualised year-on-year continuously compounded growth rates. For quarterly data, this is computed as Ln (x/x(-4)) and for monthly magnitudes as Ln (x/x(-12))

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 continuously compounded growth rate form and to remove any seasonality these growth rates are computed as year-on-year growth rates.

The regression model on the quarterly data is of the form

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

where:

$$\%E_t = 100 * \mathrm{Log}_e\,(E_t / E_{t-4})$$
$$\%M_t = 100 * \mathrm{Log}_e\,(M_t / M_{t-4}),$$

and where E_t is the measure of economic activity at time t and M_t is the monetary measure at time t.

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). Tables 2 and 3 give the summary statistics for $\bar{R}^2$ (coefficient of determination adjusted for degrees of freedom), the F statistic and the Durbin-Watson (DW) statistic for ordinary least squares regressions for the indicated periods for the model estimations. The $\bar{R}^2$ 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 statistic gives a measure of the first-order autocorrelation of the fitted 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, the year-on-year growth rates will produce smooth variables and induce some autocorrelation in the regression residuals; such autocorrelation can lead to difficulties in interpretation. Thus in this analysis we give tables of results for the regressions both with and without an autocorrelation adjustment. Note, also, that this study is focused primarily at examining 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.

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 - 2011. 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 price indices 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 as an additional explanatory variable. Thus, for example, in the case of GDP growth rates, the model fits with growth rates of the monetary measures as independent variables are effectively also including 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 1967-2011, 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 $\bar{R}^2$ 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 much weaker for the period 1982-1999, a period that includes the economically very turbulent and inflationary mid-eighties and early nineties.

Table 2: Money and economic activity 1967.1-2011.2 (Quarterly data) without an autocorrelation adjustment

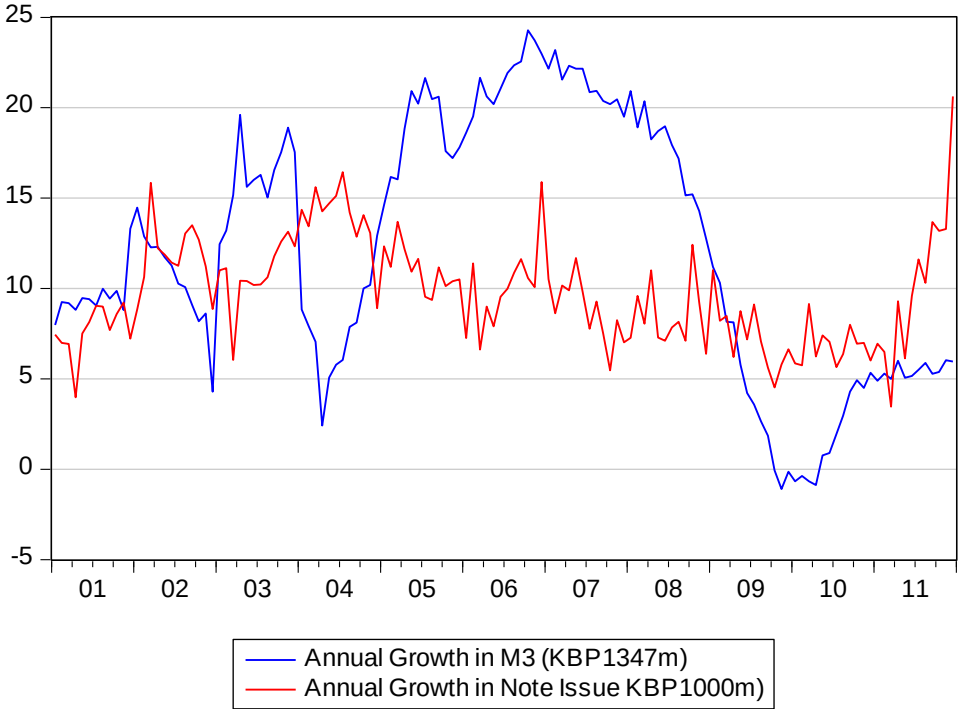
		M1G	M1G	M1G	M1G	M2G	M2G	M2G	M2G	M3G	M3G	M3G	M3G	NOTESG	NOTESG	NOTESG	NOTESG
		67,1–‘11,2	67,1–81,4	82,1–99,4	‘00,1–‘11,2	67,1–‘11,2	67,1–81,4	82,1–99,4	‘00,1–‘11,2	67,1–‘11,2	67,1–81,4	82,1–99,4	‘00,1–‘11,2	67,1–‘11,2	67,1–81,4	82,1–99,4	‘00,1–‘11,2
GDPG	R2-bar	0,074	0,275	-0,031	0,586	0,143	0,210	0,075	0,094	0,174	0,328	0,105	0,235	0,325	0,533	0,321	-0,014
	D.W.	0,389	0,557	0,466	1,032	0,449	0,490	0,554	0,707	0,457	0,569	0,565	0,787	0,566	0,683	0,779	0,549
	F-stat	5,733	8,477	0,295	22,239	10,829	6,215	2,921	2,555	13,407	10,584	3,773	5,600	30,750	26,536	12,182	0,793
GDEG	R2-bar	0,139	0,529	-0,011	0,604	0,224	0,460	0,073	0,191	0,230	0,513	0,063	0,294	0,520	0,760	0,368	0,144
	D.W.	0,447	0,745	0,549	0,919	0,507	0,629	0,607	0,697	0,497	0,646	0,603	0,730	0,814	1,207	0,902	0,572
	F-stat	10,543	23,105	0,741	23,847	18,078	17,756	2,863	4,539	18,619	21,720	2,593	7,259	67,883	71,613	14,787	3,531
HHG	R2-bar	0,167	0,675	-0,008	0,693	0,288	0,597	0,062	0,284	0,237	0,624	0,091	0,423	0,579	0,746	0,418	0,255
	D.W.	0,253	0,909	0,285	0,378	0,323	0,675	0,304	0,462	0,278	0,644	0,302	0,467	0,534	0,830	0,560	0,323
	F-stat	12,802	41,932	0,806	34,803	24,840	30,136	2,567	6,945	19,293	33,589	3,366	11,991	85,710	66,482	17,998	6,129
CPIG	R2-bar	0,098	0,299	0,081	0,387	0,258	0,540	0,053	0,136	0,180	0,659	0,012	0,289	0,304	0,419	0,155	0,093
	D.W.	0,108	0,178	0,148	0,333	0,147	0,348	0,125	0,239	0,126	0,515	0,122	0,308	0,168	0,226	0,147	0,272
	F-stat	7,405	9,382	3,085	10,473	21,551	24,104	2,316	3,361	13,942	38,933	1,286	7,095	27,970	17,099	5,346	2,546

Table 3: Money and Economic Activity 1967.1-2011.2 (Quarterly data) with an autocorrelation adjustment

		M1G	M1G	M1G	M1G	M2G	M2G	M2G	M2G	M3G	M3G	M3G	M3G	NOTESG	NOTESG	NOTESG	NOTESG
		67,1–‘11,2	67,1–81,4	82,1–99,4	‘00,1–‘11,2	67,1–‘11,2	67,1–81,4	82,1–99,4	‘00,1–‘11,2	67,1–‘11,2	67,1–81,4	82,1–99,4	‘00,1–‘11,2	67,1–‘11,2	67,1–81,4	82,1–99,4	‘00,1–‘11,2
GDPG	R2-bar	0,751	0,803	0,641	0,818	0,751	0,791	0,647	0,763	0,754	0,799	0,642	0,774	0,757	0,81	0,651	0,729
	D.W.	2,073	2,121	2,404	2,019	2,085	2,115	2,443	1,736	2,111	2,031	2,383	1,738	2,119	2,331	2,37	1,782
	F-stat	107,22	48,144	26,345	41,369	107,331	44,952	27,05	29,933	108,815	46,995	26,459	31,909	116,421	58,221	27,533	25,214
GDEG	R2-bar	0,724	0,808	0,661	0,768	0,731	0,79	0,672	0,735	0,731	0,801	0,666	0,757	0,761	0,851	0,72	0,713
	D.W.	2,321	2,308	2,379	2,164	2,325	2,419	2,303	1,798	2,355	2,47	2,349	1,693	2,271	2,126	2,125	1,888
	F-stat	93,443	49,83	28,63	30,737	96,487	44,741	30,108	25,959	96,896	47,641	29,322	29,074	118,749	77,557	37,432	23,411
HHG	R2-bar	0,843	0,833	0,817	0,923	0,841	0,814	0,814	0,868	0,845	0,825	0,819	0,891	0,858	0,853	0,823	0,863
	D.W.	2,044	2,248	2,138	1,951	2,037	2,254	2,141	1,223	2,073	2,168	2,159	1,287	2,16	2,362	2,231	1,327
	F-stat	189,44	58,859	64,448	108,514	187,753	51,76	63,078	60,375	192,488	55,849	65,044	74,221	225,452	78,525	66,824	57,613
CPIG	R2-bar	0,933	0,948	0,937	0,913	0,936	0,948	0,937	0,892	0,936	0,944	0,936	0,905	0,937	0,949	0,935	0,884
	D.W.	1,479	2,68	1,565	0,907	1,507	2,746	1,533	0,835	1,543	2,598	1,511	0,85	1,423	2,402	1,455	0,676
	F-stat	493,769	214,278	211,297	95,865	513,403	213,554	211,951	75,31	515,852	196,993	209,232	86,331	548,556	250,883	205,798	69,645

One important difference in the estimates should however be recognised. That is for the sub-period 2000 -2011, 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 economic activity. Furthermore the statistical relationship between the growth in both the broad and narrow definitions of money and the growth in expenditure became consistently weaker over the past eleven years when compared with the earlier periods.

It should however be recalled, as shown in the Tables 1, 2 and 3 above, that the relationship between growth in the note issue and the broader definitions of money changed over the past eleven years. Growth in narrow and broader money diverged more after 2000 than before, with the average growth in M3 and Bank Credit significantly exceeding that of the growth in the note issue by an average of 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 2000 and 2011. [5] (See Figure 2 below)

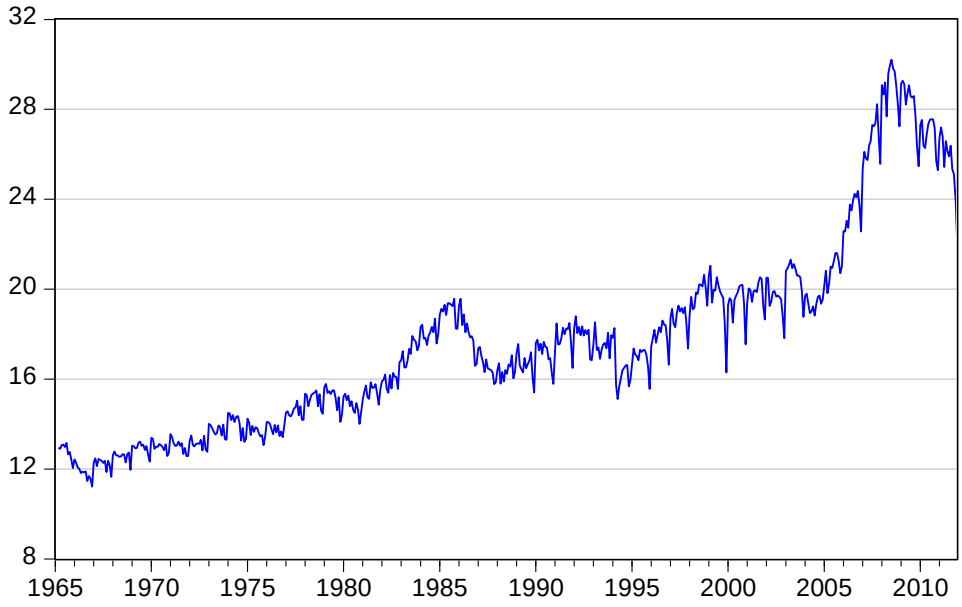


Source: SA Reserve Bank Data Base

Figure 2: Growth in note issue and growth in M3 : 2000.1 - 2010.3

[5] Growth rates have been calculated as continuously compounded percentage rates; for quarterly data as Ln(x/x(-4)) and in the case of monthly data as Ln(x/x(-12))

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 between 1966 and 1999 to about 28 by 2008. Since then, as may be seen, the ratio of M3 to the note issue has declined; see Figure 3 below.



Ratio of M3 (KBP1347m) to the Note Issue (KBP1000m)
Source: SA Reserve Bank Data Base
Figure 3: The money multiplier: Ratio of M3 to note issue :1966-2011

4. 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, and will, if necessary, 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.[6]

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

[6] 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/

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 in the replacement of deposits at the Reserve Bank for cash in their tills ATM's and vaults between 2002 and 2004.[7]

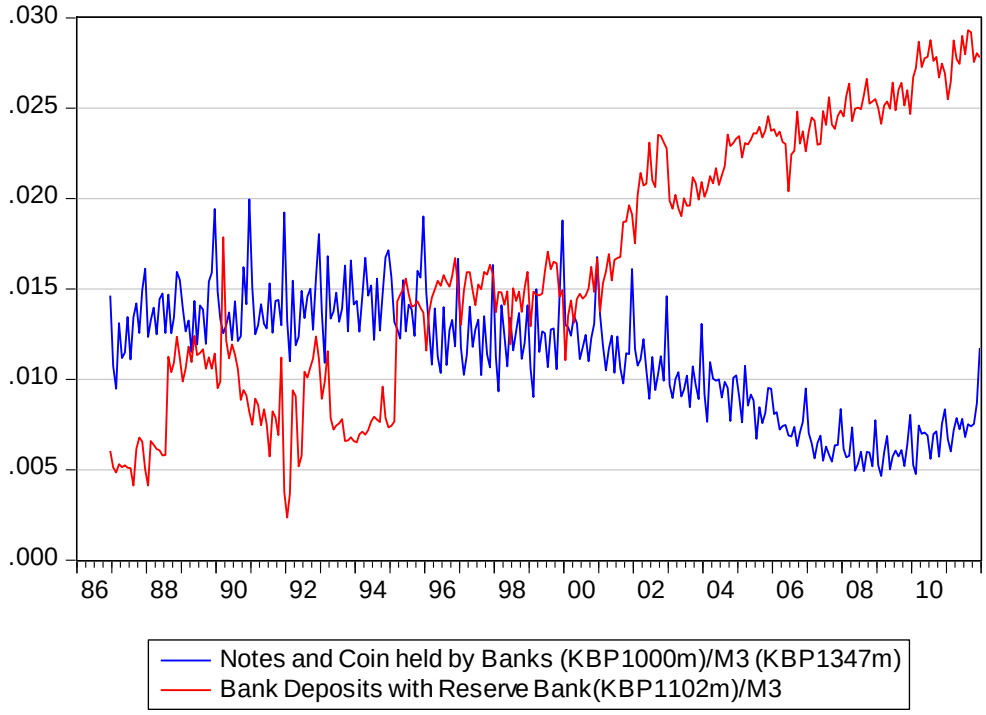
The policy of the Reserve Bank is to meet the demand for notes as expressed by the public and the banks. As mentioned previously the Bank has never adopted any explicit targets for the money supply or the money base. A slower rate of increase in demands for notes by either the public or banks would lead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

Using the model of the money supply process developed below, we can show 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 in Figure 4 that the ratio of notes held by the banks to their deposit liabilities declined significantly after 2002 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 2002 to about half of one per cent by 2010. The ratio of the deposits held by the banks at the Reserve Bank increased from less than 1 per cent in 2002 to about 2,5% by late 2010. 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 in 2000 to about 28 by 2008. 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.

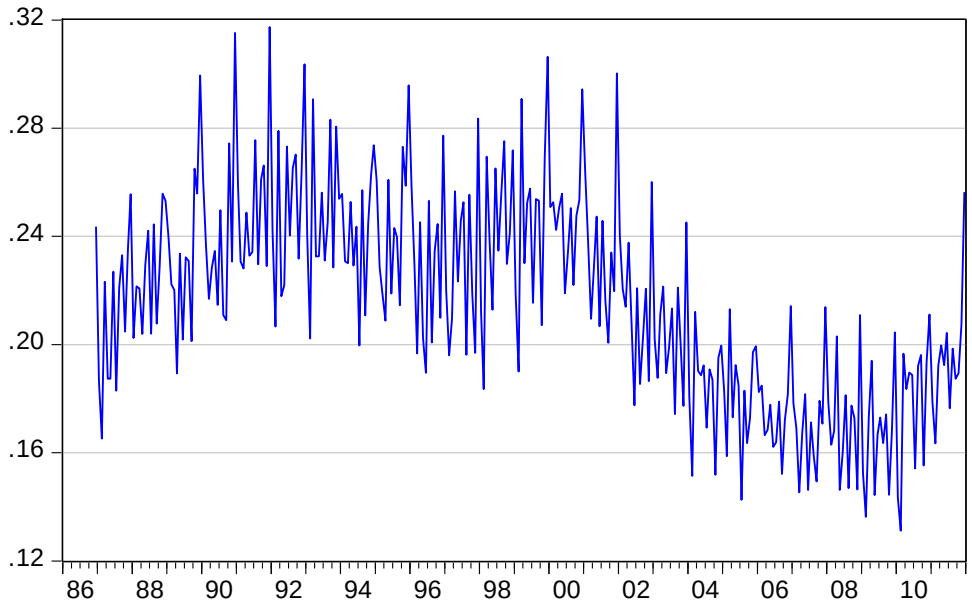
It is made clear with the aid of the money supply model presented below that the banks could meet the demand for bank deposits and the demand for bank credit that grew so strongly between 2002 and 2008, in part by reducing their real demand for notes as an alternative to increasing their demands for 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).

[7] 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.



Source: SA Reserve Bank Data Base

Figure 4: SA Banks: Ratio of notes held to M3 and the ratio of bank deposits at Reserve Bank to M3 : 1986 - 2011



Noters with Banks(KBP1100M) Note Issue (KBP1000m)

Source: SA Reserve Bank Data Base

Figure 5: Ratio of notes held by banks to total note issue : 1986 - 2011

5. 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).

6. 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 4: Variables in the model of the money s0upply process

Endogenous Variables	Symbol	Exogenous Variables	Symbol
Broad Money Supply	**M**	Foreign Assets	**FA**
Money Base	**MB**	Net Domestic Assets	**NDA**
Notes and Coins	**N**	Required Reserve ratio	**k**
Total Reserves by Commercial Banks	**CR**	Excess Reserves	$\mathbf{CR^E}$
Total Required Reserves	$\mathbf{CR^R}$	Government Securities	**GS**
Borrowed reserves	**BR**	Government Deposits	**GD**
Total Deposits	**D**	**Parameters**	
Free Reserves	$\mathbf{CR^F}$	Share of money held as notes and coins	**n**
		Share of money held as notes and coins by the public	$\mathbf{n_p}$
		Share of money held as notes and coins by banks	$\mathbf{n_b}$

Equations:

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

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

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

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

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

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

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

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

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

Clearly $n = n_p + n_b$ and some simply 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).

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

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

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

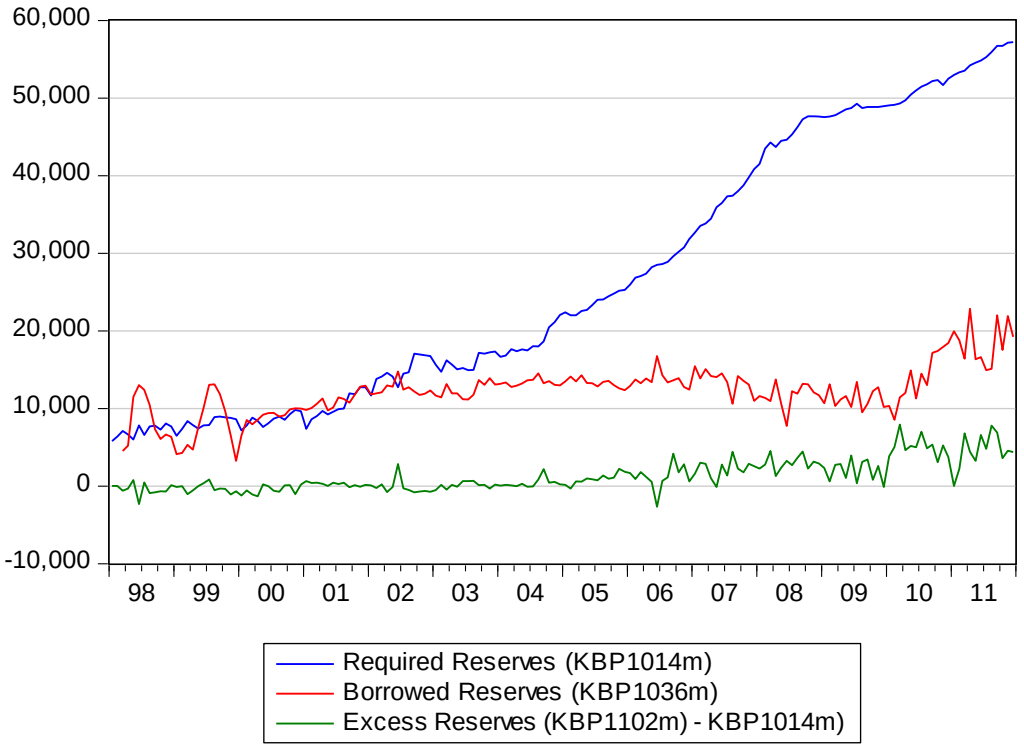
Partially differentiating $\frac{M}{MB}$ with respects to n_b gives

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

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

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. 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) i.e. the difference between excess and borrowed reserves, are consistently negative (see Figure 6).



Source; SA Reserve Bank Data Base

Figure 6: Composition of SA bank reserves (R million)[8]

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), constitute required reserves (equations 4 and 5), the money base in South Africa (M0), (equation 1), if adjusted for reserve requirements, will reduce to the Note Issue. Thus, the so-called high powered money in the system, the quantity that ultimately yields M3 is thus the Note Issue rather than M0. M0 comprises the Note Issue plus the cash reserves of the banks held with the Reserve bank, which are almost entirely required reserve holdings.

This adjustment for required reserves is consistent with monetary theory that regards the excess supply of money over the demand to hold money, rather than the money supply itself, as influencing aggregate demand and so the price level. Or, in

[8] 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 (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.

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. In contrast, required reserves are, in effect, frozen on the books of the commercial banks.

7. 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.

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