The determination of the monetary aggregates

The aim of monetary policy is to defeat inflation, and interest rates are set to meet that aim.[1] *For the growth of the narrow measure, M0, a target range is set as a yardstick for policy. But for broader measures, where relationships have proved to be more complex, targets have not been set since 1986/87. This article describes the results of recent research in the Bank* [2] *which throws some new light on the various factors determining the growth of different measures of money (the 'monetary aggregates').*

Trends in the aggregates

The two aggregates considered here are M0 and M4. They are very different in their definition, size and behaviour. M0 is a narrow aggregate consisting of notes and coin in circulation (over 99% of the total) and bankers' operational balances at the Bank of England. M4 is a broad measure of money consisting of the private sector's holdings of cash, and sterling deposits held by the private sector at both banks and building societies. The stock of M4 outstanding at the end of June this year was £455 billion or almost £8,000 per head of the population. In contrast, the stock of M0 was only £18 billion in June or about £320 per person. Put another way, M0 is equivalent to under two weeks' national income, whereas M4 is equivalent to nearly ten months'.

Since the aim of policy is to bear down on the growth of money GDP[3] and hence on inflation, the relationships between the aggregates and money GDP are of particular interest. They are summarised in Charts 1 and 2 which show the aggregates' 'velocity of circulation', ie the ratio of a year's money GDP to each aggregate. The velocity of M0 has risen relatively steadily over a long period of time (M0 has risen less than money GDP). That of M4 has been more variable, falling sharply in some years, rising in others. In the most recent years it has fallen (M4's growth has outstripped that of money GDP). Chart 3 shows the *change* in the aggregates' velocity.

Chart 1
The velocity of circulation of M0

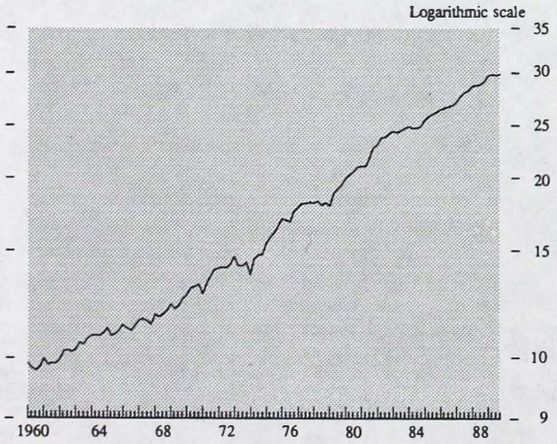


Chart 2
The velocity of circulation of M4

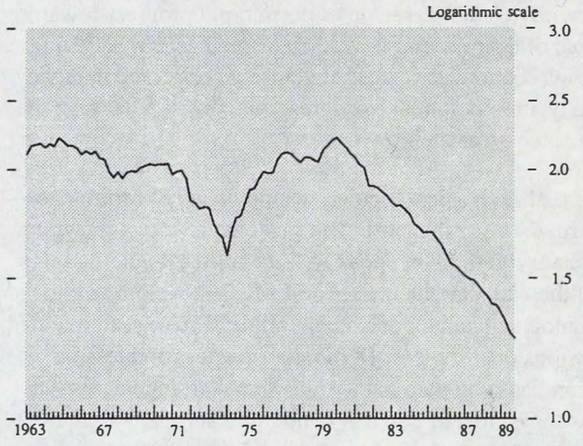
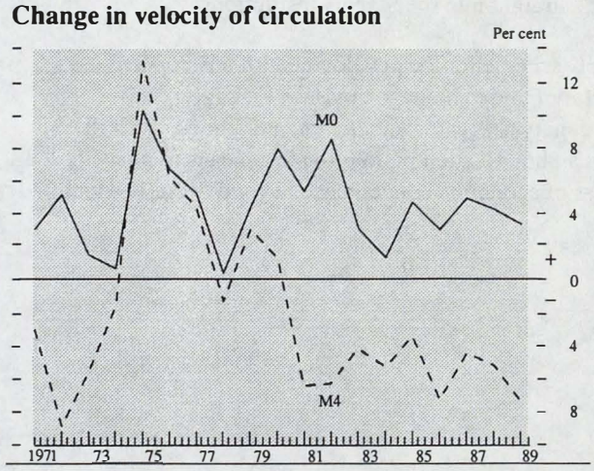


Chart 3
Change in velocity of circulation



The behaviour of M0

The long-run relative decline in the use of cash in the UK economy no doubt reflects broad social factors which have

(1) See 'The Medium Term Financial Strategy', Chapter 2 of the *Financial Statement and Budget Report*, H M Treasury, March 1990.
(2) 'The long-run determination of the UK monetary aggregates', S G Hall, S G B Henry and J B Wilcox, Bank of England *Discussion paper* No 41.
(3) The total value of UK production, at current prices.

led to the fall in the proportion of the working population paid in cash and the rise in the proportion of people having current accounts with banks and building societies. Increased competition in the provision of financial services has made the use of current accounts more attractive (eg through the introduction of cheque guarantee cards and the payment of interest on current account balances) and technological change will also have allowed economies to be made in the use of cash (eg through the introduction of automated teller machines which allow cash to be obtained outside banking hours). The introduction of plastic payments media such as credit cards will have tended to have an influence in the same direction.

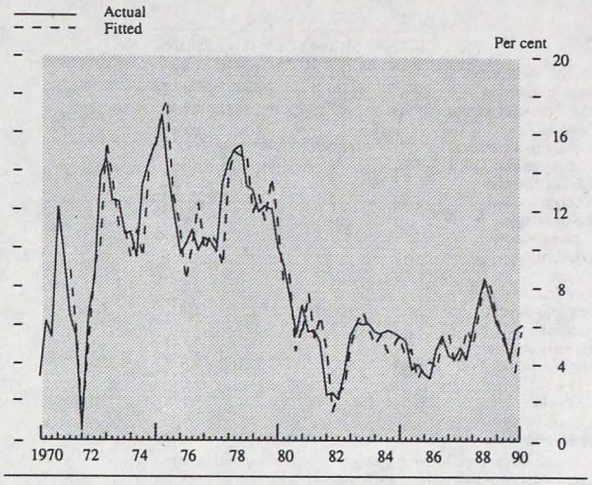
Although these changes may be easily observed, taken one by one they have not proved to be particularly helpful in explaining the year-to-year variation in the relative decline in cash usage. Recent Bank research has therefore concentrated on trying to measure the *incentive* to make innovations in the payments mechanism, rather than the manifestations of innovation themselves. Since cash bears no interest, high interest rates provide an incentive to economise on cash holdings. It is further supposed that some of the induced economies take forms which are not unwound when interest rates fall. It is unlikely for example that once automated teller machines are installed there would be a sharp reduction in their number if interest rates were to fall. According to this view, the process of innovation follows a trend, with the rate of increase of the trend determined by the level of interest rates. Clearly this is a very simple view which cannot encompass all the factors fostering change in the payments system. Nevertheless, it has proved reasonably successful in equations which seek to explain M0's behaviour.

The economic models suggest that the equilibrium level of M0 depends on the value of transactions (represented by consumers' expenditure, which moves closely with money GDP) and the path of innovation. If M0 is away from its equilibrium level it is gradually adjusted back towards it. Individuals may indeed adjust their cash holdings in the light of planned or expected *future* expenditure, but given that individual consumption is variable and seasonal, such plans and expectations may be formed at least in part by observation of past trends. Moreover, in adjusting their cash balances individuals may pass excess holdings to others in the private sector, causing them to readjust their holdings in turn. For the private sector as a whole adjustment might then be gradual, in the way that the models suggest.

The Bank equations suggest that a 1% increase in consumption will raise M0 by only 0.2% in the current quarter, but by 1% in the long run, with half the effect coming through in three quarters. A permanent 1% increase in interest rates will lower M0 by 0.1% in the current quarter, and in the long run will lower the *growth* of M0 by 0.5% per annum.

Velocity growth of M0 has fallen sharply recently at a time when interest rates might have been expected to produce the opposite result. However, the adjustment of velocity to new equilibrium levels can take time, and recent experience is not inconsistent with the predictions of the equation that there is likely to be a delay between a slowdown in consumer spending and the associated slowdown in M0 (see Chart 4). The implication of this is that, were interest rates and consumption growth to remain as at present, M0 velocity growth would move towards equilibrium, with a consequent slowdown in the rate of growth of M0.

Chart 4
Change over four quarters in quarters in M0: actual and fitted

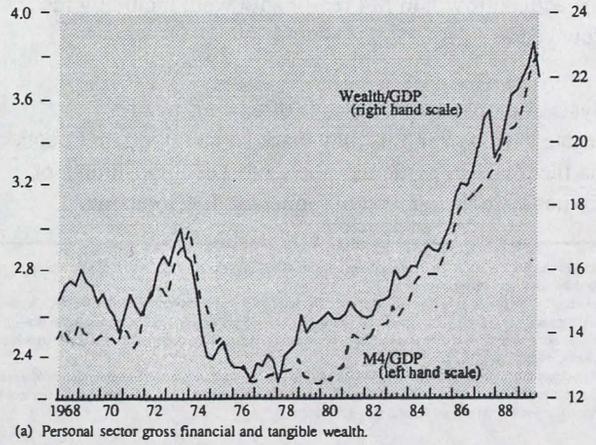


The demand for M4

M4, the main broad money aggregate considered for policy purposes, includes sterling liabilities of both banks and building societies. Such broad aggregates have proved to have complex relationships with ultimate policy goals, such as price inflation, which has made them unsuitable for use as targets. One reason for these complex relationships is that broad monetary aggregates include deposits that are likely to be held for savings rather than spending purposes.

The 1980s witnessed a rapid increase in the value of wealth holdings, well in excess of the growth in nominal GDP (see Chart 5). Table A shows the various forms in which the

Chart 5
Ratio of money and of wealth to GDP[a]



(a) Personal sector gross financial and tangible wealth.

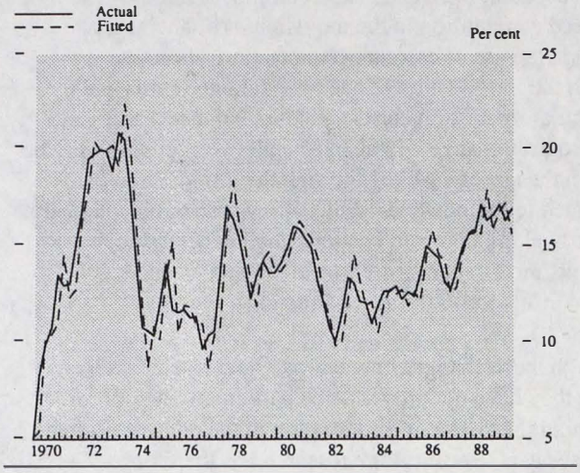
Table A
Personal sector wealth

End-year	1979		1989	
	£ billion	Share(c)	£ billion	Share(c)
(1) Tangible wealth (a)	417.2	*62.8*	1,392.0	*55.3*
of which, housing	*270.6*	*40.7*	*1,044.0*	*41.5*
(2) Gross financial wealth	246.9	*37.2*	1,123.0	*44.7*
of which:				
Equity in insurance and pension funds	*78.0*	*11.7*	*497.8*	*19.8*
Liquid assets (b)	*98.8*	*14.9*	*331.6*	*13.2*
Shares	*31.6*	*4.8*	*157.8*	*6.3*
Long-term public sector debt	*11.9*	*1.8*	*33.0*	*1.3*
Unit trusts	*2.4*	*0.4*	*23.2*	*0.9*
Other	*24.2*	*3.6*	*79.6*	*3.2*
(3) Gross financial and tangible wealth	664.1	*100.0*	2,515.0	*100.0*
(4) Financial liabilities	77.7		393.3	
(5) Net financial and tangible wealth	**586.4**		**2,121.7**	

(3) = (1) + (2)
(5) = (3) - (4)

(a) Bank estimate.
(b) Notes and coin, bank and building society deposits, and national savings.
(c) Shares of total gross financial and tangible wealth in percentage terms.

Chart 6
Change over four quarters in M4: actual and fitted



personal sector holds its wealth. Around one half of total gross wealth consists of tangible wealth, mainly in the form of housing. The remainder consists of various financial assets such as investments in life assurance and pension funds, individual share ownership, public sector debt and deposits at the banks and building societies. The sharp increase in broad money holdings was probably due, in part, to individuals and companies re-distributing their gains in wealth into more liquid forms at the banks and building societies: indeed, over the last decade M4 deposits have risen broadly in line with total gross wealth. If the demand for broad money were to be analysed purely as a transactions demand, the history of the 1980s would give the impression of an unstable money demand relationship. However, the Bank's research has shown that by including a wealth variable to capture portfolio behaviour a stable and reasonably predictable relationship can be found for broad money[1] (as indeed Chart 5 would suggest).

Chart 6 shows how well an M4 equation estimated over the period from the first quarter of 1969 to the fourth quarter of 1989 fits the actual data from that period. In the original research the equation was estimated only up to the second quarter of 1987 and so excluded the more recent period, which has witnessed a sharp fall in share prices and a subsequent modest recovery, as well as sharp variations in the rate of change in house prices. The updated equation fits the actual growth in M4 reasonably well, including the last few years.

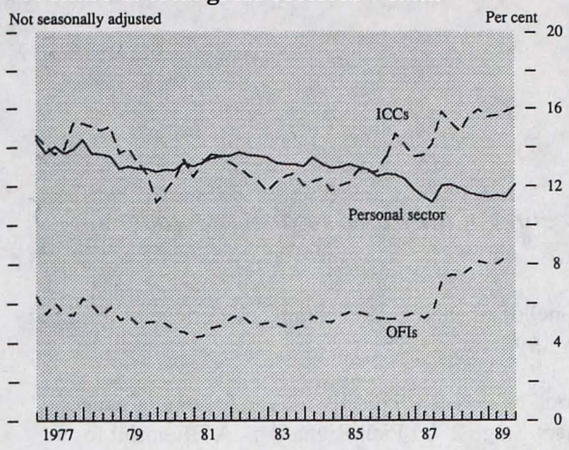
Analysis of monetary variables is often confined to aggregates. However, this may mask some important effects within the total. In particular, the sectoral composition[2] of broad money in the context of monetary developments during the 1980s may be important in a number of ways. First, if the reasons for holding money vary from sector to sector, as seems likely, then disaggregation will yield additional insights. A somewhat surprising result of the research into aggregate M4, for example, was the finding that, aside from an effect of falling share prices, interest rates and other financial prices appear to play no *direct* role in aggregate asset holdings.[3] While this may be a reflection of problems in measuring appropriate interest rates on the components of money and competing assets over a period of financial innovation, it more probably reflects the fact that different rates are appropriate for different sectors of the economy.

The flow of funds between sectors may also provide a better insight into the transmission of monetary policy. M4 deposits of the personal sector are more likely, for example, to be held in preparation for spending on goods and services than are deposits held by other financial institutions, such as life assurance companies and pension funds. Since the latter hold liquid assets mainly as a form of liquid savings, rapid growth in their money holdings is not necessarily a precursor to a sharp upsurge in inflation. In fact for most of the 1980s OFIs' holdings of M4 deposits have grown more quickly than either personal or ICCs' deposits—the consequences of this growth for inflation may prove less severe than would otherwise be the case.

Perhaps the most compelling reason for analysing M4 by sector is that holdings of M4 appear to depend mainly on the particular sector's total asset position. Chart 7 shows that there has been a reasonably close, if not precise, relationship between sectoral M4 deposits and total gross sectoral wealth.[4]

(1) The wealth variable included in the equation for total M4 is gross financial and tangible wealth of the personal sector, which accounts for about two thirds of total national wealth.
(2) Holdings by the personal or household sectors, by industrial and commercial companies (ICCs) and by financial institutions other than banks and building societies (OFIs). See 'Financial change and broad money', in the December 1986 *Bulletin*, pages 499–507.
(3) Interest rates have powerful *indirect* effects via income, expenditure and wealth: see 'The interest rate transmission mechanism' in the May 1990 *Bulletin*, pages 198–214.
(4) Preliminary research at the Bank on M4 holdings of the personal sector has found evidence of a stable money demand equation which includes relative rates of return across different assets. However, the most important factor found affecting the sector's demand for money is total personal gross (or net) financial and tangible wealth.

Chart 7
M4 share of total gross sectoral wealth[a]



(a) Financial and tangible wealth for the personal sector; financial wealth for ICCs and OFIs.

The approach to M4 outlined in this note suggests that there are reasons for expecting the recent slowdown in the growth in the value of wealth holdings (resulting mainly from falling house prices) to lead after a time to a fall in the growth of broad money. However, the Bank's research suggests that the private sector takes a long time to adjust broad money holdings to desired levels. For example, although the aggregate equation suggests that a 1% decline in wealth eventually results in a 0.8% fall in M4 holdings, it takes two years for the full effect to come through and only one third of the effect comes through in the first six months. The timing of the effect on M4 following a decline in wealth may be uncertain, particularly since the equation was estimated over a period when housing wealth was generally rising. Nonetheless, if there were not to be some further slowdown in M4 growth over the remainder of the year, both the level and the rate of change of the M4/wealth ratio would move well outside past experience.