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# Money, lending and spending: a study of the UK non-financial corporate sector and households

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*Many empirical studies over the past three decades or so have reported estimates of the determinants of consumption, investment and the demand for money. This article summarises recent Bank work that seeks to understand more fully the demand for bank and building society loans, and the interactions between these borrowings and the demand for money and decisions to consume and invest. This work aims to enhance our understanding of the links between the monetary sector and real spending decisions.*

## Introduction

The main aim of this article is to assess whether the data on bank and building society lending to private non-financial corporations (PNFCs) and households contain information that could improve our understanding of the links between monetary policy and aggregate demand.

There is a long tradition of modelling monetary conditions in the economy by focusing on the demand for money, ie banks' liabilities. But monetary policy is implemented via changes in short-term interest rates, and these are thought to affect aggregate spending partly through changes in the demand for loans, ie banks' assets.<sup>(1)</sup> Loans are usually taken out in order to finance some form of spending, so lending and spending should be related, at least to some degree.

We examine lending for two reasons. First, the demand for bank loans can be thought of as an intermediate variable that interest rate decisions will influence. Higher interest rates affect spending, partly by reducing the demand for loans. So the behaviour of lending is part of the transmission mechanism of monetary policy. Second, data on M4 lending are produced every month, along with those on the money aggregates, and ahead of the national income accounts. The latter are available only on a quarterly basis, and initial releases may be subject to considerable subsequent revision. It is useful to know whether the lending data contain timely information about the likely course of spending that is additional to the information contained in the money data. Even if 'credit' does contain such additional information, it will not remove the need to study 'money', but rather will complement such work.

The article reports results for the PNFC and household sectors.<sup>(2)</sup> It shows that it is possible to model successfully

the interaction between M4 lending to PNFCs, their money holdings, and investment spending. It also reports estimates of the interactions between *unsecured* M4 lending to households, and their money holdings and consumption spending.

## A credit channel?

Recent academic literature has suggested that there is a 'credit channel' of monetary policy (see, for example, Bernanke and Gertler (1995)). We do not formally test for the existence of such a credit channel, but draw on the ideas raised in the literature to explain why an understanding of the determinants of credit might help us to understand better the transmission mechanism of monetary policy. Consider firms, for example. Small and medium-sized enterprises (SMEs) are typically more dependent on bank finance than large firms, because the latter can often borrow more easily and on better terms through securities markets. Prudent banks will limit their exposure to any specific firm, so firms will generally not have unlimited access to bank lending; hence the available supply of bank loans will be an important influence on these firms' spending, in addition to any effect from market interest rates.

Two variations on the credit channel story identify respectively a 'balance sheet channel' and a 'bank lending channel'. The first links the determinants of lending to observable characteristics of the financial health of the borrowing firms, and the second suggests some influences on lending flows originating within the banking system.

Banks typically have an ongoing relationship with the companies to which they lend, and they use information about a company's financial position obtained through this banking relationship to determine the loan facility they will offer. The nature of this relationship gives rise to what is

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(1) See 'The transmission mechanism of monetary policy', *Bank of England Quarterly Bulletin*, May 1999, pages 161–70.

(2) This work is reported more fully in two *Bank Working Papers*: Brigden and Mizen (1999), and Chrystal and Mizen (forthcoming).

known as the balance sheet channel. Factors that are easily monitored, such as cash flow, financial wealth, previous loan payments history and outstanding debt, will affect the ability of a company to obtain loans; as will the value of collateral that firms are able to offer.

The extent to which SMEs are dependent on banks for finance, rather than on retained profits (internal sources) or securities markets (other external sources), gives rise to the bank lending channel. This channel refers to the extent to which factors internal to the banking industry influence the willingness of banks to lend; for example, capital losses on overseas lending or changes to the amount of regulatory capital required. These types of shift in loan supply, via the bank lending channel, may lead directly to changes in aggregate spending.

Factors affecting banks' readiness to extend credit to firms are also likely to influence the demand by firms to take up such credit. As the economy moves into an upturn, firms will demand more credit from banks to finance an expansion of production, whereas in a downturn they will reduce their demand for credit as activity declines. Firms will invest when they wish to expand their capital stock; bank credit will help to finance this expansion of capacity. Hence measures of real economic activity, as well as measures of financial health, are likely to be associated with increasing demand for bank credit in the long run. As indicators of firms' financial health affect both firms' willingness to borrow and banks' willingness to lend, we cannot easily distinguish empirically between demand-side and supply-side explanations using time series data.

Households are also affected by the availability of credit. The spending of credit-constrained households will be limited by current income, whereas the unconstrained can borrow against future income. In practice, different individuals face a range of differing degrees of credit availability, and changes in the supply of credit influence how much spending can exceed current income. Credit variables appear to have a significant influence on consumer spending (see Astley and Haldane (1995) and Bacchetta and Gerlach (1997)), and have been used empirically in consumption functions in models intended for forecasting (see Church *et al* (1994)).

Many households simultaneously hold positive money balances and some debt. This may seem odd, because the interest rate on debt is higher than the interest rate on savings deposits. But where households wish to consume the services of large durable goods, such as cars and houses, over time (and where there may be inefficient rental markets), it may be quite rational to finance the purchase of the durable good with a loan. At the same time, a working

balance of money will be required to finance regular consumption patterns that are normally smoother than income receipts.

Most household debt is secured on housing, but this article focuses on unsecured debt. It is likely that most unsecured household borrowing finances either unusually high current spending that will be paid for later, or the purchase of durable goods.<sup>(1)</sup> Borrowing to finance the purchase of durable goods enables the services of the goods to be consumed over time, while paying off the capital cost. The borrowing usually occurs almost simultaneously with the act of spending: a loan facility may be arranged prior to the spending taking place, but in most cases the loan itself is activated in the process of paying for the good, such as by the extension of an overdraft or an increase in credit card debt.

Increased borrowing could be 'in distress', ie to maintain consumption in the face of an unanticipated fall in income, but borrowing may also allow early consumption in the face of unchanged or rising income. For example, a consumer may finance a holiday to be repaid out of future income, repay excess Christmas spending in January and February, or temporarily overdraw an account in anticipation of a pay rise or bonus in the near future.

The supply of bank lending to specific households is likely to be driven by the same types of variables as bank lending to firms. Though households typically do not construct balance sheets for their bank managers, the amount of credit will be conditional on measurable indicators of ability to repay, such as disposable income, liquid savings, previous loans history and outstanding debts. And, as with firms, those with the largest assets and income are likely to be those able to sustain, and therefore demanding, the largest loans. So some of the factors driving supply are also likely to drive demand.

## Modelling lending

We are not aware of any previous attempts to estimate a structural model of the interactions between money, credit and spending for the main sectors of the UK economy.<sup>(2)</sup> In this article we examine this interaction for the PNFC and household sectors. We hypothesise that, just as there are demand functions for specific asset classes (such as money), so there are likely to be demand functions for specific classes of debt, and we attempt to model these simultaneously with the relevant expenditure functions.

The approach adopted to the study of 'credit' builds on earlier work in the Bank which focused on 'money'. The key innovation is the addition of a lending equation for the household and PNFC sectors. The econometric method

(1) Two points are worth noting. First, around 84% of the stock of bank and building society lending to individuals at the end of 1999 was secured on housing, and most of this has been built up directly to finance house purchases. Second, it is possible that some individuals borrow in order to finance speculative securities transactions, though such behaviour is likely to be a tiny part of aggregate personal sector activity. In this article we study only lending not secured on housing, though secured lending may also be used to finance non-housing consumption (mortgage equity withdrawal).

(2) Though causality tests in a VAR context are available in Dale and Haldane (1995).

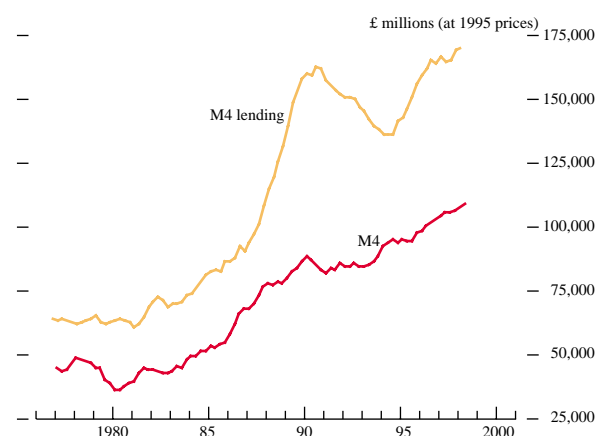
adopted uses the encompassing VAR technique proposed by Hendry and Mizon (1993), and applied to US money demand by Hoffman and Rasche (1996) and UK money demand by Thomas (1997a,b). The approach is a variation on the SVAR work outlined in Chapter 5 of *Economic models at the Bank of England*. This facilitates the estimation of long-run behavioural equations corresponding to familiar macroeconomic relationships, such as the consumption function, sectoral money demand functions, and the investment function. It then provides a framework for estimating dynamic interactions between variables. Thomas (*op cit*) modelled investment and money simultaneously for PNFCs, and consumption and money simultaneously for households. We have added lending to Thomas's system, so that we can study how lending influences spending, and how money and lending interact in different sectors. We first discuss our empirical model for PNFCs' money, lending and investment. This is followed by the results for the household sector.

### Private non-financial corporations

Investment by firms can be financed from either internal or external sources, and among external sources there is a choice (for some) between bank borrowing and issuing securities. In this study we look only at bank finance and its links with investment. This is because we are particularly interested in the determinants of bank lending and its leading indicator properties. However, a comprehensive study of the links between corporate borrowing and investment would need to incorporate other forms of borrowing.

PNFCs' real money balances and bank lending follow different patterns over the cycle. Chart 1 shows the real value (at 1995 prices) of PNFCs' money holding (M4) and bank lending to PNFCs (M4L) from 1977 to 1998. PNFCs' money holding and bank borrowing follow a similar trend, but the latter is much more cyclical. It grew much faster

**Chart 1**  
PNFCs—real M4 and M4 lending



than PNFCs' money balances from mid-1987 to mid-1990, but fell sharply in the recession of the early 1990s. As the economy recovered in the mid-1990s, lending to PNFCs picked up sharply. Bank lending to UK companies is clearly pro-cyclical. In contrast, PNFCs' money holding displays a relatively steady upward trend throughout the 1980s and 1990s. This suggests that lending is much more closely related than money to the cycles in economic activity, and so may provide better information about the prospects for domestic spending.

The main component of domestic spending for which PNFCs are responsible is investment. We focus here on gross fixed investment, ie total investment excluding inventory accumulation. It is likely that bank borrowing is used partly to finance inventory accumulation, but we do not attempt to explain changes in inventories. We do however use firms' own perceptions of whether their inventory levels are 'excessive' as one of the explanatory variables in our model.<sup>(1)</sup> This enables us to pick up a relationship between inventories and bank borrowing, as well as a relationship between inventories and money holding if one exists.

The modelling approach adopted was to estimate a system of equations that determine simultaneously each of the three (endogenous) variables of interest. These are real gross domestic fixed capital formation ( $i_t$ ),<sup>(2)</sup> real money holding (M4) of PNFCs ( $m_t$ ), and real M4 lending to PNFCs ( $l_t$ ). The explanatory variables used are: real GDP at market prices ( $y_t$ ); a measure of the proportion of firms reporting more than adequate stocks of finished goods, taken from the CBI monthly survey ( $s_{itt}$ ); PNFCs' real financial wealth ( $w_t$ ); PNFCs' real retained earnings ( $\pi_t$ ); the real user cost of capital ( $c_{kt}$ ); the spread of the M4 deposit rate over three-month sterling Libor ( $r_{dt}$ ), referred to as the 'deposit spread'; the spread of the interest rate on bank lending to companies over Libor ( $r_{lt}$ ), referred to as the 'lending spread'; and the real value of mergers and acquisitions ( $ma_t$ ). All except interest rates are converted to natural logarithms, and estimates are for the sample period 1978 Q1–1998 Q1.

Real GDP measures the general level of economic activity, and this is likely to influence the demand for investment goods and the demand for bank borrowings. The CBI survey question on stocks can be thought of as a barometer of confidence about future demand prospects and is indicative of outturns in the recent past relative to expectations. If firms consider themselves 'overstocked', they are likely to be relatively pessimistic about demand prospects and may be less willing to undertake further investment in fixed capital. They may also need to undertake distress borrowing. Total financial assets measure the liquidity of the sector, which will be related to money holdings and bank borrowing. Undistributed earnings are a

(1) Chart 1.2 on page 4 of the May 1999 *Bank of England Inflation Report* shows that there is a high correlation between PNFCs' stock-output ratios and their net M4 borrowing (change in loans minus change in deposits). Here we are looking at the stocks of borrowing and money holding separately and over a longer period.

(2) The results reported here use whole-economy gross domestic fixed capital formation, but similar results can be obtained using business investment.

measure of the supply of internal finance, which is an alternative to bank finance. The real user cost of capital is an indicator of the cost per period of raising capital in the financial markets. The deposit spread and the lending spread are, respectively, the return on retail deposits relative to wholesale money market rates and the cost of bank borrowing relative to money market rates.

Estimation takes place in two stages. The first stage identifies long-run relationships between the levels of the variables listed above. The second stage estimates the determinants of the growth rates of investment spending, money holding and lending. The second stage uses as one of the explanatory variables the deviations of actual levels of investment, money and lending from their long-run relationships. The coefficients on these deviations indicate how quickly adjustments take place to return each variable involved to its long-run equilibrium level.

The estimated long-run relationships for the PNFC sector are:

$$i_t = y_t - s_{ut} - 2.813c_{kt} \quad (1)$$

$$m_t = 0.5i_t + 0.5w_t + 0.5s_{ut} + 11.204r_{dt} + 0.107ma_t \quad (2)$$

$$l_t = 0.5i_t + w_t + 0.5s_{ut} - 0.5\pi_t + 4.432r_{dt} + 0.107ma_t \quad (3)$$

Equation (1) shows that investment is proportional to real GDP in the long run, and is negatively related to the survey measure of more than adequate stocks, and to the cost of capital.<sup>(1)</sup> The former captures the effects of excess capacity<sup>(2)</sup> and lack of business confidence about planned investment, while the latter captures the normal inverse relationship between quantity demanded and price.

Equations (1) to (3) explain long-run investment, money demand and demand for bank lending, but (2) and (3) both contain investment as one of the explanatory variables, which itself depends on other variables. To obtain expressions for money and bank lending that do not rely on investment, we substitute out for investment using equation (1) to obtain:<sup>(3)</sup>

$$m_t = 0.5y_t - 1.407c_{kt} + 0.5w_t + 11.204r_{dt} + 0.107ma_t \quad (4)$$

$$l_t = 0.5y_t - 1.407c_{kt} + w_t - 0.5\pi_t + 4.432r_{dt} + 0.107ma_t \quad (5)$$

Equation (4) can be thought of as the PNFCs' long-run money demand function. The stock of PNFCs' M4 deposits varies positively with GDP, financial wealth, the bank

deposit rate, and mergers and acquisitions activity. It is negatively related to the cost of capital.

Equation (5) shows the long-run determinants of the stock of bank lending to PNFCs. This varies in proportion to financial wealth, and is also positively related to GDP, the deposit spread, and mergers and acquisitions activity. Lending is negatively related to the cost of capital and to retained earnings. The latter indicates that bank lending to PNFCs falls as the alternative, and preferred, internal source of funds expands. Note that borrowing from securities markets is also available to firms. This is excluded from the present study but could be included to provide a more complete picture.

The second stage of our analysis looks at the growth rates of the investment, money and lending variables; it incorporates the deviations from the estimated equations (1), (2) and (3) discussed above. We refer to the fitted values of the long-run relationships for investment, money and lending as  $i^*$ ,  $m^*$  and  $l^*$  respectively, so the deviations of their actual values from the fitted values consistent with the long-run equations are labelled  $(i-i^*)$ ,  $(l-l^*)$  and  $(m-m^*)$ . In equations for the growth rates of investment, money and lending, the estimated coefficient on each of these terms indicates how quickly these variables revert to their long-run values.

The estimated dynamic equations appear in Table A, and the actual and fitted values for each of these equations are shown in Chart 2. The coefficient on the deviation term in the investment equation indicates that investment adjusts by about 16% per quarter towards its long-run equilibrium. In the same equation, the coefficients on both  $(l-l^*)$  and  $(m-m^*)$  are significant at the 5% level.<sup>(4)</sup> The negative coefficient on the lending deviation term indicates that when lending is above its long-run equilibrium, investment tends subsequently to fall, while the positive coefficient on the money deviation term indicates that excess money holding by firms is associated with higher investment. Lending adjusts by about 12% per quarter towards its long-run equilibrium, while money adjusts more slowly at 6% a quarter.

The influences of these deviation terms are supplemented by the influence of current and lagged changes in the other variables, as shown in Table A. Chart 2 shows that these equations do a reasonable job of tracking the data on the actual values of investment, lending, and money growth. More detailed diagnostic tests and further discussions of the equation specification are available in Brigden and Mizen (1999).

(1) Note that all round-number coefficients are restricted. Some restrictions are necessary to achieve identification. The over-identifying restrictions are not rejected by the data. See Brigden and Mizen (1999) for further details.

(2) It could be questioned whether a cyclical variable such as excess stocks should appear in the long-run relationships; however, this series is non-stationary in our sample. This may be because the sample period is shorter than ideal, but it may also reflect changes in inventory behaviour since the early 1980s.

(3) These can be thought of as 'reduced forms' which relate endogenous variables to exogenous variables only.

(4) Not all deviation terms appear in all equations. Some are excluded to satisfy the requirements of econometric identification, while others may be eliminated as they are insignificant. See Thomas (1997a) on this issue.

**Table A**  
Estimates of the dynamic structural model for PNFCS

Standard errors in brackets. Data period 1978 Q1 to 1998 Q1.

$$\Delta i_t = -0.1565(i-i^*)_{t-1} - 0.0923(l-l^*)_{t-1} + 0.0839(m-m^*)_{t-1} + 0.5430\Delta y_t - 0.4815\Delta c_{kt-1}$$

(0.0266) (0.0261) (0.0297) (0.2545) (0.2175)

$$- 0.7779\Delta r_{lt} - 0.9988\Delta r_{lt-1} + 0.2580$$

(0.7154) (0.5666) (0.1021)

$$\Delta m_t = 0.1631\Delta i_{t-1} + 0.4107\Delta l_{t-1} - 0.1246(l-l^*)_{t-1} + 0.0734(m-m^*)_{t-1} + 0.3466\Delta y_t$$

(0.0503) (0.0685) (0.0212) (0.0196) (0.1674)

$$- 0.2516\Delta y_{t-1} - 0.0418\Delta \pi_t + 0.0216\Delta \pi_{t-1} + 0.1796\Delta s_{ut} - 0.7787\Delta r_{dt} - 1.307\Delta r_{dt-1}$$

(0.1556) (0.0104) (0.0102) (0.0453) (0.4218) (0.4323)

$$- 0.7539\Delta r_{lt} + 0.0072\Delta ma_{t-1} - 0.3172$$

(0.3730) (0.0017) (0.0598)

$$\Delta m_t = -0.1233\Delta i_{t-1} - 0.1863\Delta l_{t-1} + 0.2812\Delta m_{t-1} - 0.0350(l-l^*)_{t-1} - 0.0632(m-m^*)_{t-1}$$

(0.0928) (0.1084) (0.0881) (0.0334) (0.0316)

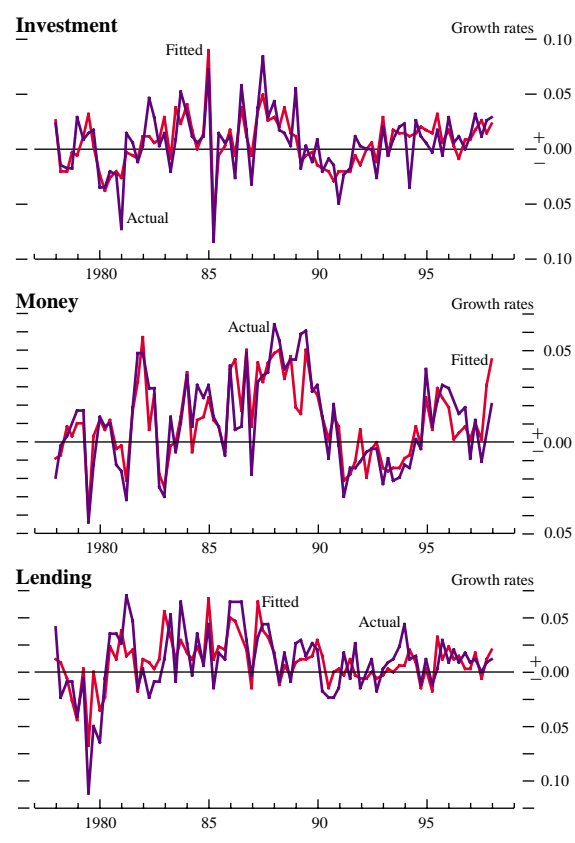
$$+ 0.8271\Delta y_t + 0.1708\Delta w_t + 0.5427\Delta c_{kt} + 0.5527\Delta c_{kt-1} + 3.1371\Delta r_{dt}$$

(0.2778) (0.0837) (0.2455) (0.2423) (0.7383)

$$+ 1.4435\Delta r_{dt-1} - 1.0273\Delta r_{lt-1} + 0.0084\Delta ma_t$$

(0.8026) (0.6413) (0.0031)

**Chart 2**  
Actual and fitted values for the dynamic structural model for investment, money and lending (PNFCS)



For PNFCS, the long-run level of lending is found to be heavily dependent on balance sheet items, such as real financial wealth and retained earnings, rather than on factors operating through the bank lending channel, such as the lending spread, which appears only in the short-run dynamics. A direct credit effect operates through ‘excess’

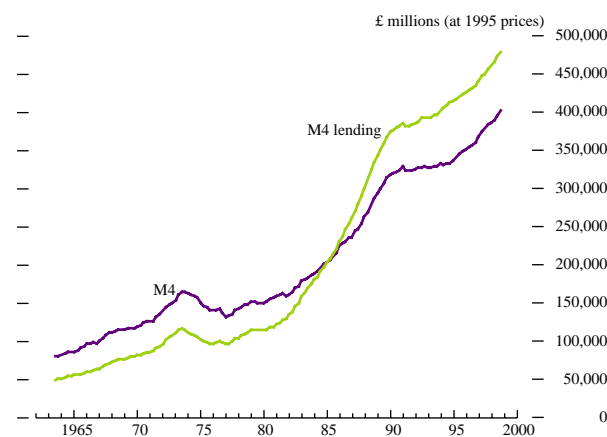
lending, which is associated with a decrease in investment, but the influence of the company balance sheet on banks’ willingness to lend and firms’ readiness to borrow supports both a supply-side ‘balance sheet channel’ and a demand-side interpretation.<sup>(1)</sup>

A key question is whether the inclusion of lending in the model adds significant explanatory power, particularly in relation to investment (which is a major component of domestic spending). There is sufficient evidence to support this view from the significance of the lending deviation term in the dynamic investment equation. This means that deviations of lending from its long-run equilibrium (as indicated by equation (2) above) add significant explanatory power to the investment equation, and so could improve investment forecasts. Of course, the decision to invest and the decision to borrow are made simultaneously, but the point is that ‘excess’ borrowing in one quarter helps to explain investment in the subsequent quarter, at least in this sample. In addition to this direct evidence, the lending deviation term is significantly linked to money, and money in turn has significant explanatory power in the investment equation. In short, we have found that when analysing investment, the lending data contain useful supplementary information to that found in the money data. It would be desirable in future to incorporate other forms of corporate borrowing into this analysis, but this does not detract from the fact that using bank lending provides an advance on using money data alone.

*Households*

Chart 3 shows the level of real household M4 holdings and of M4 lending to households since 1964. Until the early 1980s, households held deposits with the banking system that were substantially larger than their borrowings. However, M4 lending to households grew rapidly in the 1980s, following the liberalisation of financial markets. It settled down in the 1990s at a higher level than money holding but with a similar trend. Much of the increase in borrowing was housing-related, but there was also an

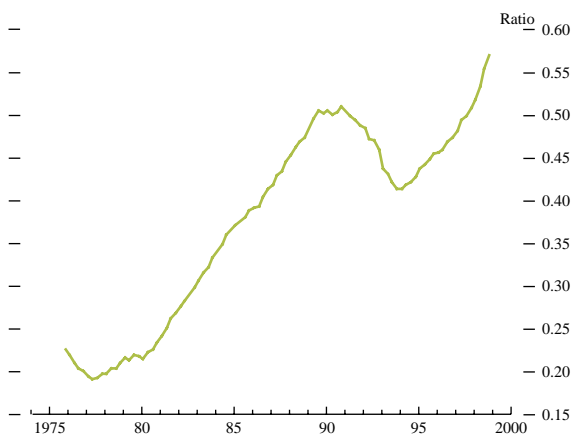
**Chart 3**  
Households real M4 and M4 lending



(1) This is consistent with a credit channel, although we recognise that the limitations of using sectoral time series data mean that the evidence may be consistent with alternative interpretations.

increase in unsecured credit, which is the focus of our study. Chart 4 shows unsecured M4 lending to the household sector as a ratio of consumers' expenditure. This ratio also rose rapidly in the 1980s. It fell in the early 1990s but has risen sharply again since 1994.

**Chart 4**  
Unsecured M4 lending to households as a ratio of consumer spending



The variables used in our model for the household sector are: real consumer expenditure by households ( $c_t$ ); the stock of real M4 balances held by households ( $m_t$ ); the stock of real unsecured M4 lending to households by banks and building societies ( $l_t$ ); real net labour income ( $y_t$ ); household real net total wealth ( $w_t$ ), defined as housing wealth plus financial assets minus total debt; inflation ( $\pi_t$ ), measured as the annual rate of change of the consumer expenditure deflator; a deposit spread, measured by the difference between the retail deposit rate and base rate ( $r_{dt}$ ); and a credit spread of the credit card rate over base rate ( $r_{ct}$ ). Two additional stationary variables used are an aggregate measure of consumer confidence ( $conf_t$ ) and the percentage change in unemployment ( $\Delta u_t$ ), measured by the claimant count. All data except the inflation rate, interest rate spreads, and the change in the percentage unemployed are converted to natural logarithms. The sample period is 1978 Q1–1998 Q4.

As with the PNFC model, we estimate three long-run relationships between the variables—one for each of the endogenous variables  $c_t$ ,  $m_t$  and  $l_t$ :

$$c_t = -0.2m_t - 0.12l_t + 1.0y_t + 0.32w_t - 0.7\pi_t \quad (6)$$

$$m_t = 0.32l_t + 0.81y_t + 0.75r_{dt} \quad (7)$$

$$l_t = 0.85y_t + 0.77w_t - 1.5r_{ct} - 2.9\pi_t \quad (8)$$

As with the PNFC sector, there are interactions between consumption, money and lending.<sup>(1)</sup> The levels of real money and credit appear in the equation for household's real consumption. The inclusion of money in (6) can be

interpreted as indicating that money has a different impact on consumption in the long run than do other components of wealth. A higher stock of lending lowers consumption in the long run (for given wealth and labour income) as the debt has to be serviced.

Substituting out in order to have only exogenous variables on the right-hand side, we derive equations that can be thought of as a long-run consumption function, money demand function and credit demand function.

$$c_t = 0.69y_t + 0.18w_t - 0.17\pi_t - 0.15r_{dt} + 0.28r_{ct} \quad (9)$$

$$m_t = 1.08y_t + 0.25w_t + 0.75r_{dt} - 0.48r_{ct} - 0.9\pi_t \quad (10)$$

$$l_t = 0.85y_t + 0.77w_t - 1.5r_{ct} - 2.9\pi_t \quad (11)$$

Lending to households, equation (11), is positively related to income and wealth, although it is less sensitive to labour income and more sensitive to net wealth than is money demand. As the credit spread rises the stock of bank lending falls. The credit channel story suggests that these effects could represent the influence of the balance sheet (ie the importance of net wealth for credit provision) and bank lending channels (ie the dependence of households on banks and the stock of credit on the price of credit set by banks). But the results could also reflect demand factors—the negative effect of the credit spread is consistent with households undertaking less unsecured borrowing when credit rates rise relative to savings rates or rates on secured borrowing.

Equation (9) is the implied long-run consumption function. Real consumption has a plausible elasticity with respect to real labour income of 0.69, and is positively related to real net wealth. Both coefficients are smaller than those reported in equation (6), as the positive influence of income and wealth on money and credit feeds through to reduce the net effect on consumption. In theory, the sign of the impact of inflation on consumer expenditure is ambiguous. However, most previous studies have found that inflation reduces real consumption. This could be because inflation increases uncertainty or because households expect a tightening of future monetary policy with rising inflation. A further reason could be that households attempt to restore the real value of their savings balances after erosion by inflation.

The deposit spread has a negative effect on consumption, but surprisingly the credit spread has a positive effect. Notice that this effect does not come directly from any term in equation (6), rather it comes from the fact that lending appears in this equation with a negative sign and the credit spread appears in the lending equation with a negative sign. Both of these effects are highly plausible—borrowing is reduced by a widening in the credit spread, and consumption is reduced (in the long run) if debt is higher (because interest on the debt has to be paid out of

(1) Again some of these coefficients are restricted. Details can be found in Chrystal and Mizen (*op cit*).

disposable income, so sustainable consumption will be lower). So the positive effect of the credit spread on consumption arises because the higher is this spread, the lower is the stock of debt in the long run.

The money demand function, equation (10), has a coefficient on labour income close to unity and a smaller positive coefficient on net financial wealth. These are very similar to estimates on aggregate data provided by Hall, Henry and Wilcox (1989). As deposit spreads increase, households hold more money on deposit. The credit spread and inflation are both negatively related to long-run money demand.

As above, we can generate deviation terms from equations (6) to (8) and use these in the dynamic equations to indicate the influence of long-run forces. These equations are reported in Table B, and the actual and fitted values are shown in Chart 5. We refer to deviations from the long-run equations as (*c-c\**), (*m-m\**) and (*l-l\**) respectively. Our identification assumptions imply that (*c-c\**) appears in all three equations, (*m-m\**) appears in the equations for money and lending, and (*l-l\**) appears in the lending equation alone.

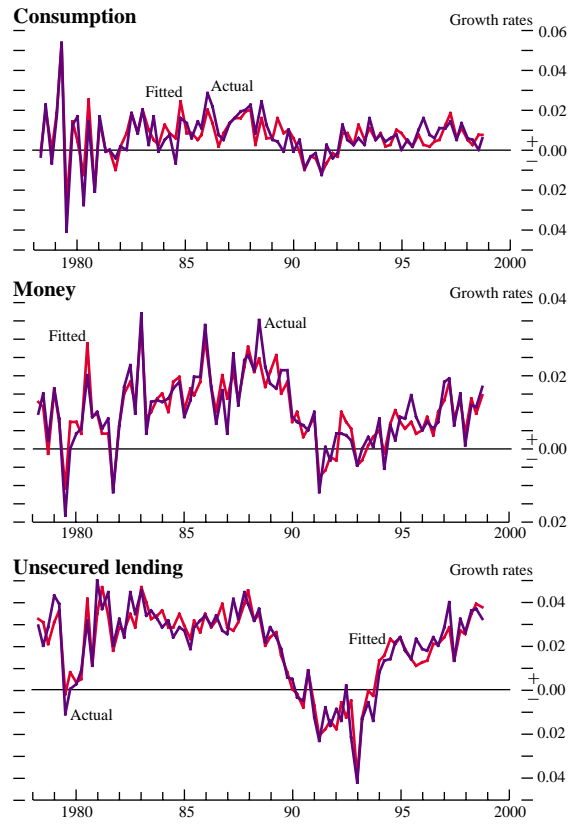
**Table B**  
Estimates of dynamic structural model for households

Standard errors in brackets. Data period 1978 Q1 to 1998 Q4.

$$\begin{aligned} \Delta c_t = & -0.47840\Delta c_{t-1} + 1.0720\Delta m_t + 0.21298\Delta m_{t-1} - 0.42172\Delta l_t + 0.16647\Delta l_{t-1} \\ & (0.10039) \quad (0.17877) \quad (0.13024) \quad (0.15033) \quad (0.11404) \\ & -0.19998(c-c^*)_{t-1} + 0.14894\Delta y_{t-1} - 0.21103\Delta r_{dt-1} - 0.18266\Delta r_{ct-1} - 0.00922\Delta u_t \\ & (0.04461) \quad (0.078614) \quad (0.18126) \quad (0.06852) \quad (0.004937) \\ & + 0.00947\Delta u_{t-1} + 0.00058 \text{ conf}_t - 0.00032\text{conf}_{t-1} - 0.15265 \\ & (0.00499) \quad (0.00020) \quad (0.00018) \quad (0.026576) \\ \\ \Delta m_t = & -0.13773\Delta m_{t-1} + 0.19201\Delta l_t + 0.07308(c-c^*)_{t-1} - 0.13878(m-m^*)_{t-1} \\ & (0.07729) \quad (0.04384) \quad (0.02143) \quad (0.02248) \\ & + 0.21249\Delta y_t + 0.03227\Delta y_{t-1} + 0.03701\Delta w_t + 0.03879\Delta w_{t-1} - 0.35582\Delta r_{dt} \\ & (0.04118) \quad (0.04356) \quad (0.01504) \quad (0.01989) \quad (0.10317) \\ & + 0.11334\Delta r_{dt-1} - 0.19330\Delta r_{ct} - 0.31999\Delta \pi_t - 0.12454\Delta \pi_{t-1} - 0.009379\Delta u_{t-1} \\ & (0.10146) \quad (0.04521) \quad (0.05263) \quad (0.06116) \quad (0.001702) \\ & - 0.000295\text{conf}_t + 0.045911 \\ & (0.000007) \quad (0.012100) \\ \\ \Delta l_t = & -0.45759\Delta c_{t-1} + 0.32978\Delta l_{t-1} + 0.31556(c-c^*)_{t-1} - 0.50685(m-m^*)_{t-1} \\ & (0.09673) \quad (0.08441) \quad (0.09312) \quad (0.07401) \\ & - 0.17603(l-l^*)_{t-1} - 0.48094\Delta r_{dt-1} - 0.38030\Delta r_{ct} - 0.52959\Delta \pi_t - 0.32658\Delta \pi_{t-1} \\ & (0.03225) \quad (0.17818) \quad (0.09175) \quad (0.10147) \quad (0.12426) \\ & + 0.00691\Delta u_{t-1} + 0.00058\text{conf}_t - 0.00054\text{conf}_{t-1} - 1.5292 \\ & (0.00366) \quad (0.00019) \quad (0.00019) \quad (0.26598) \end{aligned}$$

Taking the equations in reverse order is helpful, given that deviations of money and consumption from their long-run fitted values influence the dynamics of lending, and the deviation of consumption from its long-run value affects the dynamics of money. The adjustment speed of lending towards its long-run value is 18% per quarter. Excess money and consumption have a very strong influence on lending, with estimated adjustment speeds per quarter of 31% and 50% respectively. Excess money balances are associated with reduced lending, suggesting that excess money balances are used to pay off borrowing. Excess

**Chart 5**  
Actual and fitted values for the dynamic structural model for consumption, money and unsecured lending (households)



consumption leads to increases in lending, suggesting plausibly that a build-up of unsecured borrowing results from periods of abnormally high consumer spending. Past changes in lending have a positive influence on the contemporaneous change in lending, and increases in the cost of credit and the return on deposits (relative to base rate) reduce the growth rate of unsecured lending. The growth of lending is also affected negatively by inflation. Past changes in unemployment and the level of consumer confidence have a small but significant positive influence on credit.

In the dynamic equation for money, the adjustment speed to excess money balances is 14%, slightly higher than the 11% reported by Thomas (1997a), but slower than the adjustment speed of unsecured credit. A smaller adjustment speed on money balances is consistent with the view that money is used as an inventory or buffer stock to ‘mop up’ shocks to financial resources coming from either unexpected income or unplanned spending. Excess consumption has a positive effect on the dynamics of money balances, as it did on lending, although the adjustment speed, at 7%, is a quarter of the rate recorded for the lending equation. Contemporaneous adjustments to lending have a positive effect on current changes to money balances in these results, suggesting that when households borrow to spend they also run up money balances, reversing the effect in subsequent quarters. Changes to income and wealth increase money balances, although changes to deposit rates have a perverse

negative effect on money balances. Higher unemployment reduces money growth, again supporting the idea that money is a buffer stock. Also money growth is negatively related to confidence and inflation. Both these effects support the view of money holdings as being to some extent precautionary.

Lastly, the consumption equation implies that 20% of the difference between actual consumption and its long-run fitted value is eliminated in each quarter. Consumption growth is negatively related to its own lagged value, which appears contrary to the idea of consumption smoothing, but this result may simply be an offset to the strong positive influence from current and lagged money growth. It could also result from the inclusion of durables in our consumption data. Consumption is negatively related to lending growth but this is unwound in the following quarter. Growth of labour income is associated with a contemporaneous increase in consumption growth. Higher deposit and credit spreads over base rates lower consumption growth with a lag. The former reflects the attractiveness of saving over consumption while the latter is associated with the higher costs of borrowing to pay for consumption. The change in the rate of unemployment has a small negative contemporaneous impact on consumption growth, as does consumer confidence.

Thus one key feature of our equations for households appears to be the rapid speed of adjustment towards the long-run fitted values. This suggests that adjustments to restore long-run desired positions are quickly implemented so disequilibria do not persist for long, but while they do exist they are a major determinant of changes in household spending. Other details of the specification and testing of this model are discussed in Chrystal and Mizen (*op cit*).

A second key feature of these results is that the addition of lending does appear to add significant explanatory power. The lending deviation term does not appear in the consumption equation in this case, but lending growth is significant in the consumption equation. Lending growth is also a significant determinant of money growth, which itself is a significant determinant of consumption growth. In addition to these dynamic effects, lending is significant in the long-run equation for consumption. The combined impact of all these effects gives the clear message that lending does influence the path of household consumption.

One important limitation of the present study is that it excludes household borrowing via loans secured upon housing. Some such secured loans are undoubtedly used from time to time to finance non-housing consumption in the form of mortgage equity withdrawal (MEW) and are a substitute for unsecured credit. The incorporation of MEW must, however, await future research. For the present we are content to have shown that the study of one component of

bank credit adds useful information to that available from the study of 'money' alone.

## Summary and conclusions

This article demonstrates that it is possible to estimate relationships that explain lending to firms and households, and that lending is driven by the same factors that drive the more intensively researched categories of money demand, consumption and investment. The results show that there are identifiable interactions between credit, money and spending in the United Kingdom, and that there are econometric advantages from estimating these relationships simultaneously. These results also offer some helpful insights for the interpretation of monetary data. Money and credit are related to spending at the sectoral level. The long-run values of money, spending and lending are driven by a small number of explanatory variables. Deviations from long-run fitted values have a significant impact on spending growth in the PNFC and household sectors.

So what might this evidence add to our understanding of the transmission mechanism of monetary policy? We can be confident in the prediction that excess money growth would eventually lead to higher nominal spending and then inflation. But the interpretation of 'excess' lending is not obvious, *a priori*, as it could signal either a future cut in consumer spending or an imminent spending increase. In the former case, borrowing would be used to sustain short-term (committed) consumption in the face of declining income, but this could not be sustained forever, and spending cutbacks would follow. Alternatively, a pick-up in borrowing could indicate an increase of confidence in future income growth, and credit growth would then be an indicator of future inflationary pressure. It could be that both of these forces work together. Evidence from Dale and Haldane (1995) suggests that individuals react to some degree almost immediately to a monetary tightening, ie higher interest rates, by cutting both spending and borrowing. However, firms might extend their credit lines to finance rising stocks and constant wage bills, in the face of falling final demand.

The results reported above do not fully resolve this issue. But they have improved our understanding of the links between money and credit and the spending decisions of households and firms. There do appear to be significant interactions between lending to firms and households, and money, consumption and investment. The estimated system of equations potentially gives a framework that helps us to interpret the likely impact of observed credit growth on future spending. These estimates are tentative and require further empirical verification. Notwithstanding these reservations, channels that involve credit as well as money balances appear to matter for the transmission mechanism of monetary policy.



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