Financial liberalisation and consumers' expenditure: 'FLIB' re-examined

Emilio Fernandez-Corugedo[*]
and
Simon Price[**]

[*] Bank of England.
E-mail: emilio.fernandez-corugedo@bankofengland.co.uk

[**] Bank of England.
E-mail: simon.price@bankofengland.co.uk

This paper represents the views and analysis of the authors and should not be thought to represent those of the Bank of England or Monetary Policy Committee members. We are grateful to Geoffrey Williams for providing us with the data and TSP progammes for the Caporale and Williams (1997) paper, to Roy Cromb and Ian Bond for extensive comments and suggestions on previous versions of this paper, to seminar participants at the Bank of England and to two anonymous referees.

Copies of working papers may be obtained from Publications Group, Bank of England, Threadneedle Street, London, EC2R 8AH; telephone 020 7601 4030, fax 020 7601 3298, e-mail mapublications@bankofengland.co.uk

Working papers are also available at www.bankofengland.co.uk/wp/index.html

The Bank of England's working paper series is externally refereed.

ISSN 1368-5562

Contents

Abstract

This paper examines whether the methodology used in the papers by Darby and Ireland and Caporale and Williams continues to explain UK consumption behaviour. We update Muellbauer and Murphy's proxy for financial liberalisation (FLIB) and re-examine a forward-looking consumption model which uses FLIB as a variable affecting the proportion of liquidity-constrained individuals. We find that this implementation of the model, incorporating joint hypotheses about consumption behaviour and the measurement of financial liberalisation, is not robust and is not able to give a consistent picture of the number of people who were liquidity constrained in the 1990s.

JEL classification: C6, D91, E21.

Summary

The failure of consumption models to predict the fall in the United Kingdom's savings ratio in the late 1980s and its rise in the early 1990s led some economists to look at models of forward-looking consumers who may be unable to borrow. A theoretical weakness in these early papers is that they assumed that the proportion of liquidity-constrained individuals does not change. In the United Kingdom, increased competition in the lending market in the 1980s eased restrictions on borrowers, and is likely to have reduced the number of credit-constrained consumers. So models that assume that the proportion of constrained individuals remains constant through time may not match UK experience. To address this shortcoming, some economists have specified forward-looking consumption functions that assume that the proportion of credit-constrained consumers is inversely related to proxies for financial liberalisation. Their results suggest that this methodology is able to explain UK consumption data.

This paper examines whether recent UK consumption behaviour can indeed be explained using this methodology. To this effect we update a specific proxy for liberalisation (FLIB) suggested by Muellbauer and Murphy (1993). FLIB is defined as the sum of the constant and the residuals in a regression of the loan to value ratio on the house price to income ratio, the nominal post-tax mortgage rate and a two-year moving average of the post-tax mortgage rate. We then re-examine a forward-looking consumption model which uses FLIB as a variable identifying the proportion of liquidity-constrained individuals. We find that this implementation of the model, which inevitably embodies joint hypotheses about consumption behaviour and about the measurement of financial liberalisation, is not robust and does not give a plausible picture of the number of people who were liquidity constrained in the 1990s.

We argue that one possible explanation for these results is that the liberalisation proxy is unable to depict accurately the consequences of UK financial deregulation in the 1990s. FLIB's behaviour in the 1990s suggests that all the liberalisation that occurred in the 1980s was reversed the following decade, which seems implausible. This in turn means that, by assuming that the proportion of constrained agents in the economy is a function of FLIB, the consumption model examined in this paper does not derive a plausible measure of this key variable. We argue that the mapping from the FLIB index of liberalisation to the proportion of constrained consumers is somewhat arbitrary and that some of the assumptions made to derive a functional form for an estimatable UK consumption function might account for the failures encountered in this paper.

Finally, we attempt to explain the behaviour of FLIB in the 1990s. We identify the sharp reduction in the nominal interest rate as the main factor accounting for FLIB's reversal over the 1990s. We also argue that lending institutions may have changed the emphasis of their lending criteria towards loan to income ratios after liberalisation.

1 Introduction

The failure of consumption models to predict the fall in the United Kingdom's savings ratio in the late 1980s and its rise in the early 1990s led some economists, drawing on US studies by Hayashi (1982) and Campbell and Mankiw (1989, 1991), to look at models of forward-looking consumers who may be unable to borrow. A theoretical weakness in these papers is that they assume that the proportion of liquidity-constrained individuals does not change. In the United Kingdom, increased competition in the lending market in the 1980s eased restrictions on borrowers and it is likely to have reduced the number of credit-constrained consumers. Thus, models that assume that the proportion of constrained individuals remains constant through time may not be able to explain the behaviour of consumption accurately in the United Kingdom.(1)

Some economists have argued that changing financial liberalisation may account for some of the behaviour of consumption in the 1980s. Muellbauer and Murphy (1993) found support for the hypothesis that 'illiquid assets [...] have become more spendable with the financial liberalisation of the 1980s' using their financial liberalisation (FLIB) variable constructed from the *residuals* of an equation for the loan to house value ratio for first-time buyers. Darby and Ireland (1994) found that the degree of financial liberalisation, measured by FLIB had a significant role in a forward-looking consumption function estimated over the period 1969 Q1 to 1990 Q2. Caporale and Williams (1997) extended Darby and Ireland's sample to 1995 Q4 and showed that FLIB continued to be significant. The aim of this paper is to examine whether the methodology employed by Darby and Ireland and Caporale and Williams continues to describe UK consumption behaviour accurately when the sample is extended to 1998 Q4.(2)

It is crucial to understand what exactly is meant by 'financial liberalisation'. The literature can be vague. Some authors use a very broad definition, taking liberalisation to mean changing demand and supply factors that lead to an increase in credit availability. In this context, financial liberalisation is an endogenous event influenced by many variables such as deregulation, a benign economic environment, better credit rating systems, etc. Other authors interpret liberalisation in a narrower context where only changes to exogenous factors (ie deregulation) affect the availability of funds. In this paper, financial liberalisation is interpreted in this narrow context: because FLIB is modelled as the *residual* in an equation for the loan to value ratio, it is *assumed to depict exogenous factors and not endogenous lenders' behaviour.*(3)

The structure of the paper is as follows. Section 2 examines what impact liberalisation is likely to have on consumption behaviour and looks at some of the proxies used by different authors. Section 3 derives three measures of liberalisation. Section 4 explains the theoretical arguments

(1) Financial liberalisation and liquidity constraints are not the same thing. Liquidity constraints arise when consumers who would like to borrow are not able to. Liberalisation, in its broadest context, represents the situation where financial institutions make more credit available to consumers and firms – see below for more. Thus, although financial liberalisation can affect the probability that a consumer be liquidity constrained, the opposite is not true: ie liquidity constraints are endogenous, whereas financial liberalisation is taken to be exogenous.

(2) This is of course a joint hypothesis and failure may follow from either an unappropriate proxy or the particular consumption specification.

(3) Although FLIB is derived only from the housing and mortgage markets, it is treated as a proxy for the extent of financial liberalisation in the whole economy.

behind the consumption function we estimate. Section 5 presents the estimation results of the consumption equation of Section 4. Section 6 explores the reasons behind FLIB's behaviour in the 1990s. Section 7 concludes.

2 Liberalisation; theory and measurement

2.1 Liberalisation, liquidity constraints and consumption

Since the 1970s economists have been aware that consumers who cannot borrow at any time (ie who face 'hard liquidity constraints') may engage in *precautionary saving* to buffer themselves against those (bad) draws in income which would force such consumers to borrow (Grossman *et al* (1979)). Carroll and Kimball (2001) gave some of the theoretical reasons behind that effect: 'when relevant liquidity constraints (that is, constraints that have some positive probability of binding) are added to the standard optimal consumption problem with quadratic utility, the resulting value function exhibits prudence'(4) (page 1). Carroll and Kimball also derive conditions under which hard constraints increase prudence in the value function and therefore lead to (increased) precautionary saving for the class of utility functions that exhibit hyperbolic absolute risk aversion (HARA).

In a similar vein to Zeldes (1989) and Deaton (1991) who looked at credit rationing, Scott (1996) used numerical simulations to examine the implications for consumption for agents who face imperfect capital markets. Scott examines the 'consumption behaviour of risk-averse individuals in the presence of an upward sloping interest rate schedule(5)' (page 1). He finds that 'for even moderate levels of risk aversion [...] the threat of having to pay high borrowing rates means that consumers rarely borrow. Instead, they accumulate precautionary balances and so avoid the threat of having to pay penal interest rates in bad income states of the world' (page 1). Fernandez-Corugedo (2000) gave the theoretical reasons behind Scott's results and compared the theoretical implications of soft and hard constraints. Fernandez-Corugedo found that as the soft constraint tightens, the level of precautionary savings can increase implying that financial liberalisation could reduce the level of precautionary savings and increase the level of consumption. Thus, at least from a theoretical point of view, we should expect to observe financial liberalisation to lead to an increase in UKconsumption over the 1980s. Nonetheless, the most important theoretical aspect to come out of these papers is that when examining liquidity-constrained consumers, what matters is not only whether agents are constrained today, but whether agents face the possibility of being constrained at any point in their lives. In this respect the current state of financial liberalisation may or may not play an important role when it comes to consumption behaviour.

Another important implication of liberalisation was pointed out by Carroll and Dunn (1997). We know that if financial liberalisation causes a relaxation in the probability of being liquidity constrained, precautionary savings decrease. This means that consumers will hold a lower level of

(4) See Kimball (1990a, 1990b) for the exact definition of prudence.
(5) Borrowing constraints of this kind are termed soft liquidity constraints; the more consumers borrow, the higher the penalty they have to pay.

buffer-stock savings, leaving them more exposed to shocks in the economy. Thus, in a liberalised economy, uncertainty should play a bigger role in consumption decisions than in an economy that is not liberalised.

The preceding arguments suggest that if liberalisation had occurred, then it should have led some consumers to reduce their level of precautionary savings and therefore result in an increase in aggregate consumption as well as making consumers more responsive to shocks in the economy. The immediate consequence of this is that, unless aggregate consumption functions are able to depict financial liberalisation accurately, such specifications will not be able to explain the behaviour of consumption.

2.2 Measurement of proxies for liberalisation

2.2.1 Background

As we have mentioned above, only the narrow definition of 'liberalisation' is synonymous with 'deregulation', our preferred definition – see footnote 3. The most recent round of deregulation in financial services in the United Kingdom began in 1979 with the removal of exchange controls and continued in 1980 with the abolition of the corset on bank lending and legislation which increased competition in the mortgage market. Restrictions on building societies were relaxed progressively, giving building societies increased access to the money markets so that their lending was less constrained by retail savings deposits. The 1986 Building Society Act enabled new mortgage lenders to enter the market. In 1989 building society demutualisations – where mutual institutions switched to the regulatory regime governing banks – were led by Abbey National. In the early 1990s, the Building Society Commission's (BSC) tightening of prudential controls and the adverse experiences by lenders with repossessions, may have affected liberalisation measures based on credit availability.

Thus, we would expect a measure of liberalisation to increase rapidly in the early 1980s and slow somewhat thereafter. It might also decrease over the recession of the early 1990s following the recommendations made by the BSC.

2.2.2 Liberalisation proxies

Several liberalisation proxies have been used in the literature. There are two major problems with many of these: first, their behaviour in the 1990s suggests that liberalisation reversed significantly; and second, all apart from FLIB, are endogenous measures of liberalisation, that is, they are affected by factors other than liberalisation.

The ratio of the stock of personal sector consumer credit to GDP

Bayoumi (1993) suggested that the ratio of the stock of personal sector unsecured consumer credit to GDP could be used as a proxy for the extent of financial deregulation, as increased competition in the lending markets as a result of financial liberalisation should have resulted in increased consumer debt.

Chart 1 shows that this ratio rose through the 1980s, decreased in the early 1990s and rose in the latter part of that decade. Thus, it appears, that this ratio is able to identify some of the events of

liberalisation and could describe the behaviour of credit availability, particularly in the early 1990s' recession. However, the increase in this ratio in the 1990s suggests that credit conditions were much looser in the 1990s than in the previous decade where most of the liberalisation process was supposed to have taken place. But fundamentally, this measure cannot be an accurate proxy for financial liberalisation because it reflects not only liberalisation but other aspects of economic conditions such as income, interest rates, inflation and ownership of liquid and illiquid assets.

Interest differential between deposit and borrowing rates

Scott (1996) uses the interest differential between deposit and borrowing rates (the 'spread') to show the impact of financial liberalisation. This differential should represent increased competition in the credit market, which should have led lending firms to increase their deposit rates to attract additional funds needed to offer increased borrowing to customers at favourable rates. Thus interest differentials should decrease as imperfections in the credit market are reduced with liberalisation.

Chart 2 shows that during the 1980s, the interest differential between deposit and mortgage borrowing rates decreased significantly. However, as argued by Muellbauer (1997), because the series was at its lowest level in the 1970s and not in the 1980s, it cannot be tracking liberalisation appropriately. Moreover, note that the increase in the spread over the late 1980s and early 1990s suggests that by 1992 all liberalisation had reversed. Of course there are problems with comparisons between the 1970s and 1980s, which is indicative of the fact that the spread may be an endogenous proxy for liberalisation: first, the 1970s were a period of very high nominal but negative real rates which may have affected the spread; second, there was a shift in the monetary regime from 1979 onwards, which is likely to have affected the spread as interest rates rose quickly; and third, it is possible that regulation, by denying credit to higher-risk borrowers, reduced the required spread for lenders.

Loan to value and loan to income ratios

Loan to house value ratios (*lvrs*) and loan to income ratios (*lirs*) (Breedon and Joyce (1992) and Brookes *et al* (1994)) have been used as an indicator of lending quality in the literature on mortgage defaults (see Charts 3 and 4). We see that both the *lirs* and *lvrs* for first-time buyers (*FTBs*) and former owner-occupiers (*FOOs*) increased over 1981-84, coinciding with the beginning of liberalisation. But thereafter, their behaviour was different. *lirs* for both *FTBs* and *FOOs* continued to increase until 1990, dropped somewhat during the recession of the early 1990s, and showed a slight upward trend thereafter. *lvrs* for both *FTBs* and *FOOs* stayed constant over the second part of the 1980s and then diverged with *FTBs* showing a downward trend and *FOOs* increasing in the early 1990s and staying roughly constant after that. Which is a better measure? Because the behaviour of *lvrs* over the mid to latter part of the 1980s does not seem to be consistent with liberalisation, *lirs* appear to be better direct proxies for financial liberalisation.[(6)]

(6) The upward trend in the loan to income ratios in the late 1990s probably reflects increasing house prices. For a given level of income, lenders would presumably be willing to increase the size of the collaterised loan as house prices increased. But this emphasises the endogeneity of the measure. *lvrs* are also endogenous proxies for liberalisation; see the discussion on FLIB below to see how different economic variables may affect the *lvr*.

The distribution of *lvrs* (Muellbauer (1997)) (see Chart 5) can provide further information about the ease of credit in the mortgage market; in particular the behaviour of borrowers who have high *lvrs* (above 90%). The most interesting behaviour in these series occurs in the 1990s. Note that during the recession of the 1990s, the proportion of people that had *lvrs* of 100% or above decreased significantly from around 34% in 1989 Q4 to 3.5% in 1993 Q2. Because the proportion of individuals with *lvrs* of 90% to 94% remained roughly constant over the 1990-93 period (around 12% to 15%), we see that most of the borrowers moved from the 100%+ group to the 95%-99% group which increased from 24% in 1989 Q4 to 42.8% in 1993 Q2. Interestingly, as the economic environment has improved we have not seen an increase in the proportion of *lvrs* of 100%+. What we observe however, is that at the beginning of the period of expansion, 1995-97, the proportion of individuals taking *lvrs* between 95%-99% increased from 51.1% in 1995 Q1 to 55.3% in 1996 Q2, but then fell back in 1998 and 1999.

Mortgage equity withdrawal (*MEW)*

Miles (1994) used *MEW* (Chart 6) to proxy for the effects of financial deregulation on the savings equation proposed by Pesaran and Evans (1984). *MEW* proxies an increase in credit availability in the lending market. It is constant over the 1970s, increases from 1980 to a peak in 1989 and then drops until 1995, subsequently fluctuating around a constant trend. Because *MEW* is lower in 1991-95 than in the 1970s, it does not seem to be an appropriate proxy for the level of financial liberalisation because it suggests that the environment was more liberal in the 1970s than in the 1990s. Moreover, *MEW* is likely to be affected by variables other than liberalisation. *MEW* may be thought of as a good short-term proxy for credit availability, although the negative values in the early 1990s have to be interpreted with caution.

FLIB

However, as we have been arguing and Muellbauer (1997) has argued forcefully before us, a common shortfall of all these proxies is that apart from whatever shape they may have over different periods, other factors apart from liberalisation influence their behaviour. If we can model the endogenous components of endogenous liberalisation proxies, the unmodelled residual is 'liberalisation' and should proxy exogenous supply factors. This is FLIB.[7]

Muellbauer and Murphy (1993) use a model which assumes that lenders have a target level for the debt-service to income ratio, presumably as this relates to affordability and ability to repay. Specifically,

$$TARGET_t = debt - service_t = \left(MRT_t \times \frac{DEBT_t}{Y_t} \right) \quad \textbf{(1)}$$

which we can write as

$$LVR_t = \frac{TARGET_t}{MRT_t \times \left(\frac{HP_t}{Y_t} \right)} \quad \textbf{(2)}$$

or

$$lvr_t = target_t - mrt_t - \frac{hp_t}{y_t} \quad \textbf{(3)}$$

(7) Muellbauer and Murphy (1993) argue that *lvrs* for *FTBs* are a good indicator of financial liberalisation. Nonetheless, there are problems using this measure because (at the aggregate level) we only easily observe the average *lvr* realised by *FTBs* rather than the ratios for given types of borrowers.

where lower-case letters denote the log of the variables and lvr is the loan to value ratio, mrt is the post-tax nominal mortgage rate, hp denotes house prices, and y is nominal income. The target level at time t is interpreted as an indicator of the underlying degree of credit availability.

Muellbauer and Murphy argue that equation **(3)** overstates the sensitivity of the *lvr* to fluctuations in the interest rate and the house price to income ratio, ie the target level of debt-service to income will not be invariant to these and will therefore represent an endogenous proxy for liberalisation. For instance, lenders will allow debt-service burdens to be unusually high if interest rates are unusually high and are expected to decrease and borrowers and lenders are likely to take into account the information in real interest rates about the burdens of debt-service payments. Chart 7 shows the realised debt-service ratio for *FTBs*.

Muellbauer and Murphy allow for less than full variability with mortgage rates and house price to income ratios and they also introduce the real after-tax mortgage rate:[8]

$$lvr_t = target_t - a \cdot mrt_t - b \cdot (\frac{hp}{y})_t + c \cdot ARMT_t + D_1 + D_T \qquad \textbf{(4)}$$

where $ARMT$ is the two-year moving average of the real post-tax mortgage rate and $a, b < 1$. Dummy variables and the residuals of this equation represent the effects of the deregulation process. The dummy variables are included for the periods 1972-73 and from 1981 onwards and are supposed to pick up changes in the target rate. Thus, the coefficients in **(4)** are effectively being determined by the period 1969 Q1-1980 Q4 (excluding 1972 Q1 to 1973 Q4). By modelling *lvrs* as suggested by **(4)** we are trying to remove the effects of the most important factors that can affect this variable other than liberalisation. Muellbauer and Murphy then define

$$FLIB_t = target_t + residual_t + D_t \; t = 1, \ldots, T \qquad \textbf{(5)}$$

Darby and Ireland (1994) and Caporale and Williams (1997) use **(5)** to define their FLIB measures. Using data from 1969 Q1 to 1998 Q4 on *lvrs* for *FTBs* and *FOOs*, we estimate **(4)** to obtain two measures of financial liberalisation, $FLIBFTB$ and $FLIBFOO$, that are defined by **(5)**.

Some reservations remain about the use of FLIB, particularly within a consumption equation. First, liberalisation is proxied by unexplained events in the housing market and may not pick up economy-wide liberalisation. Not all consumers who may benefit from liberalisation are involved in the housing market: individuals, who may or may not own a house, may be denied credit by other lending institutions when they wish to borrow to purchase goods other than housing. Second, we do not have information about the credit conditions for each type of individual in the economy, we only have data at an aggregate level – we do not know how many borrowers were borrowing voluntarily within the maximum lenders would have allowed. Third, we are still not sure if the measure is picking up exogenous movements in regulatory conditions ('liberalisation') or unmodelled endogenous lender behaviour, possibly cyclical. Muellbauer and Murphy[9] themselves provide some evidence of this endogeneity by saying that 'it seems likely that (since

(8) For a given nominal mortgage rate a decrease in the real rate implies that inflation has increased, eroding the debt to income ratio. Lenders might then allow higher debt-service to income ratios, and the target level should therefore increase. We should therefore observe a negative relationship between the real mortgage rate and the target level of the debt-service to income ratio.

(9) In their paper, Muellbauer and Murphy do not refer to liberalisation as an endogenous or exogenous event.

1988-9) credit has tightened a little in response to the Building Society Commission's tightening of prudential controls and with the adverse experiences by lenders with repossessions', (page 10).

3 Estimating FLIB on recent data

This section discusses the data and the econometric techniques used to estimate FLIB using equation **(4)** and the results obtained.

3.1 Data

The best long-run data series for *lvrs* is for building societies for both *FTBs* and *FOOs*. These data are easily available for the period 1969 Q1 to 1995 Q2. After 1995 Q2, the only series which is easily available is the aggregate for both building societies and other lending institutions.[(10)] Muellbauer and Murphy argue that to use only building societies data would be inappropriate and that these series must be adjusted for the behaviour of banks: in the late 1980s, the *lvr* of building societies (both for all buyers and for first-time buyers) fell, whereas, at the same time they state that the *lvr* of banks rose sharply for all buyers. So it is possible that the aggregate *lvr* of all lenders increased. Darby and Ireland (1994) and Caporale and Williams (1997) make the adjustment suggested by Muellbauer and Murphy, but do not report the data series.

We use data from loans made by building societies from 1969 Q1 to 1995 Q2 and then link to the figures for banks and building societies combined. This will make our results different from those found in other papers (but as we shall see below the differences are small).

Charts 8 and 9 plot the house value to income ratio and the nominal interest rate against the loan to value ratio for *FTBs*. These two variables appear to be negatively correlated to the loan to value ratios over the periods 1969-72, 1974 to 1980 and for the most part of the 1990s, consistent with the predictions of **(3)**.

3.1.1 Estimation results

We estimate equation **(4)** using least squares for the period 1969 Q1 to 1998 Q3. From Table A[(11)] a measure of financial liberalisation (termed FLIBFTB), based on the prediction errors from equation **(4)** using data for *FTBs* is derived.[(12)] This measure is supposed to take account of the effect of financial liberalisation on those agents in the constrained group who move into the unconstrained group as financial services become available to them on easier terms. The

(10) The CML publishes data constructed from the Survey of Mortgage Lenders (SML) questionnaire, on the average value of loans taken by *FTBs* and *FOOs* and on the average value of property purchased. Until 1993, this questionnaire only included the responses of building societies, thereafter, the SML started to include other mortgage lending institutions (eg banks) without publishing each separately. CML have sent us a cd rom which includes disaggregated data for the period 1993 Q1 to 1995 Q2. Thus there is a break in coverage for building societies in 1995. The total is only available from 1993. In order to construct a continuous series, one would have to make arbitrary assumptions about the pre-1993 data which we have chosen not to do.

(11) In this table and all subsequent tables, t-statistics are reported in parentheses.

(12) These equations are interpreted as super-consistently estimated long-run relationships. In common with other authors, we are unconcerned with short-run dynamic misspecification, although this certainly exists: *LM (4)* tests for autocorrelation reveal for the equation for FTBs, $\chi^2(4) = 16.1$ and for FOOs, $\chi^2(4) = 19.9$.

prediction errors from the second equation shown in Table A give FLIBFOO, obtained using data for *FOOs*. FLIBFOO allows a new credit channel, equity withdrawal (Caporale and Williams (1997, page 8[13])).

Table A: Estimation results for the loan to value ratio

1969 Q1-1998 Q3		
Dependent variable:	$lvrFTBs$	$lvrFOOs$
Variable		
$Constant$	0.47 (11.1)	0.93 (18.7)
mrt	−0.19 (−15.7)	−0.37 (−11.7)
hpy	−0.31 (−9.7)	−0.58 (−11.0)
$ARMT$	−0.0016 (−3.4)	−0.00013 (−0.2)
Adjusted R^2	0.945	0.945
Durbin-Watson	1.177	0.925

The coefficients of the three explanatory variables[14] in the equations for *FTBs* and *FOOs* calculated using quarterly data have the expected signs and are comparable to those reported in Muellbauer and Murphy (1993):[15]

$$lvr = \underset{(3.8)}{1.25} - \underset{(-8.8)}{0.11}mrt - \underset{(-5.5)}{0.20}hpy - \underset{(-3.2)}{0.0019}ARMT$$

Using the methodology of Section 2, we obtain three measures of liberalisation that look similar to those of Caporale and Williams (see Charts 10 and 11).[16] [17]

Turning to a comparison between FLIBFTB and FLIBFOO in terms of the profiles (Chart 12), we find that the biggest difference between these two measures occurs after 1992; reflecting the differences in the underlying *lvrs*. The measures appear to be negatively correlated over this period. Moreover, there appear to be differences in the levels from 1987 onwards. This suggests that, either one of our indices of liberalisation, (or even both) cannot measure financial

(13) Miles (1994) has suggested that equity withdrawal dominates the effect of additional mortgage holdings largely because the proportion in the unconstrained group is much larger.

(14) Lower-case variables denote the logarithm of the variable.

(15) The exception being the coefficient on *ARMT* in the equation for former owner-occupiers which is effectively zero.

(16) Caporale and Williams obtained three measures of financial liberalisation using Muellbauer and Murphy's techniques. Two of those measures are derived by Caporale and Williams using annual data and interpolated to obtain two quarterly smooth measures. The other measure was derived from quarterly data. In comparison, our two smooth measures of financial liberalisation are obtained from the quarterly estimates and using Hodrick-Prescott filters to remove some of the variability inherent in the data. The value of the penalty parameter which controls the smoothness of the series was set to 160, as larger values of this parameter produced very smooth series that would lead to a loss of information when estimating the consumption specification.

(17) We are not sure why the scaling is different for the FLIBFOO measure. Caporale and Williams do not report the results of estimating equation **(4)** and in their paper there is no evidence that they normalise their FLIB indicators like Muellbauer and Murphy do. Since the scaling for our FLIBFTB is similar to the one obtained by Caporale and Williams, we are not able to explain why differences in FLIBFOO exist, given that we use the same methods to estimate both our FLIB measures.

liberalisation appropriately. We find it hard to provide an intuitive explanation for the behaviour of both FLIB measures over the 1990s.[18] In Section 6 we provide a possible explanation for the behaviour of FLIB over the recent data period.

4 The quasi-differencing approach to consumption

Our ultimate aim is to determine whether the methodology used by Darby and Ireland (1994) continues to explain UK consumption behaviour. Darby and Ireland divide consumers into two groups: forward-looking decision-makers who base their decisions on the present discounted value of lifetime resources, and consumers who are unable to obtain credit and are reduced to consume out of their disposable income. They then make the strong claim that FLIB can be used to estimate the proportion of constrained individuals in a consumption equation.

If consumers are forward looking and capital markets are perfect, consumers will make decisions about their consumption based on the present discounted value of their expected lifetime resources:

$$C_t^u = \omega \left(A_t^u + H_t^u \right) + \varepsilon_t \qquad \textbf{(6)}$$

where

$$H_t^u = Y_t^u + \phi_t E_t \left[\sum_{i=1}^{T} \left(\prod_{j}^{i} \phi_{t+j} \right) Y_{t+j}^u \right] \qquad \textbf{(7)}$$

where C denotes consumption, A the stock of physical and financial assets held by the consumer, Y is labour income, H is the present discounted value of future post-tax labour income (human capital holdings), ω is the marginal propensity to consume out of total wealth, ε is an error term that represents 'transitory consumption' and ϕ is a discount factor that is allowed to be different from the interest rate. Superscripts u in **(6)** and **(7)** relate to unconstrained agents. These two equations represent the solution to the standard intertemporal maximisation problem (eg Flavin (1981) and Caballero (1990)).

Some consumers do not face perfect capital markets and are denied credit. These agents are constrained to consume out of their current disposable income:

$$C_t^c = YD_t^c = CG_t + \lambda_t (YD_t - EC_t - IP_t) \qquad \textbf{(8)}$$

where CG denotes current grants, YD is post-tax disposable income for all agents, EC are employers' contributions and IP are interest payments. Superscripts c denote constrained consumers.

Total consumption in the economy is equal to the sum of consumption by constrained and unconstrained agents:

$$C_t = C_t^u + C_t^c = (1 - \lambda_t) C_t + \lambda_t C_t \qquad \textbf{(9)}$$

(18) This prompts the question whether these measures of liberalisation are exogenous, or whether the method used is appropriate. The results may be explained by a failure of equation **(4)** to remove the most important factors that can affect the *lvr* other than liberalisation, or because the difference between the *lvrs* for the two different types of buyers have not been modelled appropriately, and should therefore be modelled differently.

where λ_t is the proportion of credit-constrained consumers, which is allowed to vary over time.[19] This proportion is assumed to be influenced by the degree of liberalisation:

$$\lambda_t = \exp(-\alpha_0 - \alpha_1 FLIB_t) \qquad \textbf{(10)}$$

This functional form, first suggested by Darby and Ireland (1994), ensures that λ_t is bounded between 0 and 1 if α_0, $\alpha_1 > 0$. As FLIB increases, the proportion of constrained individuals falls. To formulate an aggregate consumption function the method of quasi-differencing (Hayashi (1982)) can be used to eliminate the unobserved human capital term.[20] This procedure yields:

$$\begin{aligned} C_t &= \phi_t(C_{t+1} - Yd^c_{t-1}) + Yd^c_t + \omega\left(A^u_{t-1} + \phi_t A^u_t + Y^u_t\right) + \upsilon_t \qquad \textbf{(11)} \\ \upsilon_t &= -\phi_t\varepsilon_{t+1} + \varepsilon_t + \omega e_t \\ E_t(\upsilon_t) &= 0 \end{aligned}$$

Substitution of **(8)** into **(11)** yields:

$$\begin{aligned} C_t = {} & \phi_t(C_{t+1} - CG_{t-1} + \lambda_{t-1}(YD_{t-1} - EC_{t-1} - IP_{t-1})) \qquad \textbf{(12)} \\ & + CG_t + \lambda_t(YD_t - EC_t - IP_t) \\ & + \omega\left(A^u_{t-1} + \phi_t A^u_t + Y^u_t\right) + \upsilon_t \end{aligned}$$

where the discount rate is assumed to take the following form

$$\phi_t = \frac{1}{1 + r_t + m_t},\ m_t = \mu_0 + \mu_1\lambda_t \qquad \textbf{(13)}$$

m denotes the mark-up charged by lending institutions to borrowers and r is the real interest rate. The mark-up is assumed to decrease with the number of unconstrained agents. Darby and Ireland (1994, pages 5-6), give two explanations for the introduction of this mark-up. First, the less likely are future constraints, the longer the effective horizon of forward-looking consumers, so the discount factor applied should be higher. Second, lenders observe only current and past income and have few other ways of judging individuals' expected future income. Because (rational) agents who want to borrow to smooth their consumption expect higher income in the future and lenders cannot observe this expectation, borrowers are likely to be denied credit. On the other hand, those (rational) agents who can borrow, but do not do so must have lower than average income growth (else they would want to borrow to smooth their consumption). This lower income growth can be incorporated into the behaviour of forward-looking consumers if future income is discounted at a higher rate.

Note that while the quasi-differencing approach renders a consumption equation that resembles an Euler equation, it is actually a version of **(6)**, a structural equation.

---

(19) It is here where this approach differs from that used by Campbell and Mankiw (1991) and others who assume that the proportion of constrained consumers is constant through time.

(20) The idea of using forecasted aggregate labour income is appealing but fraught with difficulty, partly because it is individual not aggregate income that matters for consumption. (See Bakhshi (2000) for a recent attempt to forecast aggregate labour income in the United Kingdom.) The method of quasi-differencing (either backward or forward) allows us to substitute out unobservable human capital.

5 A quasi-differenced specification for the United Kingdom: results using FLIB

5.1 Data issues and reservations

We follow the same data manipulation techniques suggested by Caporale and Williams to estimate the system comprising equations **(10)**, **(12)** and **(13)** and we compare our results with theirs over an equivalent sample period, 1970 Q1 to 1995 Q4.[(21)] We then estimate **(10)**, **(12)** and **(13)** over the longer period 1970 Q1 to 1998 Q3 to examine the effects that the eleven extra observations have on the estimated consumption function.

Before reporting the results of the econometric estimation, the reader must be made aware that questions remain about this general approach to modelling constraints. First, although the functional form given to λ constrains it to lie between 0 and 1 and implies that initial episodes of liberalisation will have a stronger effect on the proportion of constrained individuals than subsequent episodes, it is not clear that the relationship between liberalisation and the proportion of constrained individuals should take this form.[(22)]

Second, the model assumes that the measure of credit availability in the housing market is a good proxy for the degree of credit availability in the whole economy; it therefore ignores the possibility that episodes of financial liberalisation feed on to consumption indirectly, through income-type effects – for instance, as reduced deposits on mortgages enable individuals to consume more out of other goods.[(23)] It is therefore difficult to say whether the FLIB measure is acting as a proxy for credit availability, whether it is picking up other effects, or a combination of both.

Third, λ itself may be misinterpreted. Cochrane (1989) has suggested that consumers are not significantly worse off if they follow a rule of thumb such as consuming their current income instead of their permanent income. Such people are not constrained.

Fourth, there is a problem about future constraints. This model is a restrictive model of liquidity-constrained households, because it assumes that agents are always in the same regime, which precludes the possibility that agents who are not constrained today may be constrained in the future. This is dealt with indirectly via the introduction of a mark-up on the rate of interest used by those individuals who are not constrained. We have reservations about this approach. As mentioned above, those individuals who own a house may still be constrained. And as Mariger

(21) Our dataset runs between 1969 Q1 and 1998 Q4, whereas Caporale and Williams's runs from 1968 Q1 to 1996 Q1, so direct comparison is not possible. The reason for this is due to revisions made by the ONS in 1998 which did not allow us to go beyond 1969 Q1 and made our data look somewhat different from that used by Caporale and Williams. Because we use instruments that are lagged four periods, our estimated equation starts in 1970 Q1. Our choice of 1998 Q4 is warranted by our wish to avoid using the most recent ONS data, which is often subject to revisions. Closer examination revealed that there are small differences between our data and the data used by Caporale and Williams. The most notable differences were found in the series for the population of working age, the consumer deflator's series and net financial wealth. (See footnote 27 for more.)

(22) We tried to use different functional forms, such as the logistic, which would constrain λ to be between 0 and 1 but found that convergence was even more difficult to achieve.

(23) Meen (2000) gives evidence of US studies that suggest that the presence of a downpayment constraint may have a number of effects on tenants who wish to become owner-occupiers. One of those effects is that constraints may alter the savings behaviour of agents. 'One response [to the downpayment constraint] is to increase savings (reduce consumption) in order to meet the constraint more quickly. Alternatively, households may reduce savings (increase consumption) because of a discouragement effect.'

(1986), Zeldes (1989), Carroll and Kimball (2001), and Fernandez-Corugedo (2000) show, individuals who are constrained now or could be constrained in the future do not necessarily consume all of their income now, as they may wish to save today to guard themselves against future contingencies.

5.2 Econometric methodology

The system comprising equations **(10)**, **(12)** and **(13)** is non-linear and it involves expectations of future variables. Under rational expectations, the realisation of a variable is an unbiased estimator for the expected value of that variable, thus substituting the future expected values of variables by their actual realisations creates an errors-in-variable problem which induces a correlation between the error term in the estimated equation and the realisation of the expected variable. This also produces the possibility of an MA error process. To avoid this problem we can estimate this equation using GMM even though this method is not robust when there is a near unit root in the equation.[(24)] To overcome the stationarity problem we scale both sides of **(12)** and the instruments[(25)] by lagged real income to induce stationarity.[(26)]

5.3 Estimation results

The results of estimating the system comprising equations **(10)**, **(12)** and **(13)** for 1970 Q1 to 1995 Q4 are shown in Tables B and C. Table D shows the results of estimating **(10)**, **(12)** and **(13)** over the longer period 1970 Q1 to 1998 Q3. There are two main results. First, the coefficient that represents the marginal propensity to consume out of total wealth, ω, is significant in all equations and it has a plausible size (between 3% and 4% annually[(27)]). Second, the coefficients that help us determine the proportion of individuals that are liquidity constrained (α_0 and α_1) and also the extent of the mark-up on the discount factor for expected income flows of the unconstrained individuals (μ_0 and μ_1), though having the expected sign and size are mostly insignificant. Looking at the residuals of each of the equations we find that the equation is not able to explain the data for the period 1990-91.

Essentially, these consumption models[(28)] are not robust on UK data.[(29)] Although Sargan's test

(24) GMM is based on estimating moments which should not be time dependent, so stationarity is a requirement.
(25) The instruments used in the estimations are exactly the same as those used by Caporale and Williams, ie being four lags on each of the following variables: consumption, disposable labour income, FLIB, employers' contributions to pension funds, interest payments, total assets and total financial debts.
(26) For this to make sense statistically, there must be a cointegrating relationship between consumption and real income which is arguably not the case. Another reason for using this scaling is to correct for problems of heteroscedasticity. Equation **(12)** is estimated using the GMM(MA=1) procedure in TSP with the same instruments and the same adjustments to the data as in Caporale and Williams.
(27) This is close to the annualised real rate of interest in the United Kingdom.
(28) Our TSP programmes are not able to replicate Caporale and Williams's results completely when we use their data, even though Williams kindly provided us with his original programmes and data. The results obtained are nonetheless very similar.
(29) Another indication that these models are not robust is the following experiment. We estimate the consumption equations using Caporale and Williams's data, but our FLIB proxies and also using our data and Caporale and Williams's FLIB proxies over the period 1970 Q1 to 1995 Q4. For all regressions, all coefficients are numerically different from those reported in Tables B and C and are also mostly insignificant (the exception being the dummy variable and the marginal propensity to consume).

Table B: Smoothed FLIB; our results vs Caporale and Williams

Sample 1970 Q1-1995 Q4				
	CW's FLIBFTB	Our FLIBFTB	CW's FLIBFOO	Our FLIBFOO
Dum	−0.111 (−8.5)	−0.094 (−4.3)	−0.111 (−8.9)	−0.074 (−3.7)
α_0	1.585 (3.4)	1.334 (1.9)	1.967 (1.9)	1.217 (2.6)
α_1	8.706 (1.06)	10.987 (0.8)	−6.300 (−0.5)	3.915 (0.7)
μ_0	0.0428 (4.0)	0.00 (0.00)	0.036 (1.1)	0.00 (0.00)
μ_1	0.1265 (2.8)	0.133 (1.1)	0.218 (1.2)	0.149 (0.9)
ω	0.0183 (7.7)	0.0102 (4.1)	0.018 (7.3)	0.0131 (4.9)
R^2	0.939	0.885	0.933	0.841
Adjusted R^2	0.935	0.879	0.930	0.832
S.E. of regression	0.454E-06	0.625E-06	0.473E-06	0.804E-06
Durbin-Watson	2.06	2.085	1.949	1.81
Serial correlation	$\chi^2(4) = 5.03$	$\chi^2(4) = 2.14$	$\chi^2(4) = 5.12$	$\chi^2(4) = 1.06$

Table C: Quarterly FLIB1; our results vs Caporale and Williams

Sample 1970 Q1-1995 Q4		
	CW's quarterly FLIBFTB	Our quarterly FLIBFTB
Dum	−0.092 (−8.8)	−0.069 (−3.1)
α_0	1.537 (1.4)	1.095 (2.7)
α_1	2.279 (0.3)	3.016 (1.3)
μ_0	−0.00 (−0.00)	−0.00 (−0.00)
μ_1	0.617 (0.6)	0.135 (1.5)
ω	0.0149 (4.3)	0.0156 (7.9)
R^2	0.938	0.770
Adjusted R^2	0.935	0.758
S.E. of regression	0.564E-06	0.971E-06
Durbin-Watson	1.182	1.847
Serial correlation	$\chi^2(4) = 3.63$	$\chi^2(4) = 9.84$

Table D: Our consumption measures to 1998 Q3

Sample 1970 Q1-1998 Q3			
	FLIBFTB	FLIBFOO	Quarterly FLIBFTB
Dum	−0.093 (−4.1)	−0.083 (−4.0)	−0.069 (−3.0)
α_0	1.364 (1.9)	1.339 (2.6)	1.096 (2.7)
α_1	11.38 (0.8)	6.080 (0.81)	3.016 (1.3)
μ_0	−0.00 (−0.00)	0.00 (0.00)	−0.00 (−0.00)
μ_1	0.1389 (1.1)	0.143 (1.2)	0.136 (1.5)
ω	0.010 (4.1)	0.829E-02 (2.7)	0.0156 (7.6)
R^2	0.90	0.918	0.790
Adjusted R^2	0.895	0.914	0.781
S.E. of regression	0.597E-06	0.603E-06	0.941E-06
Durbin-Watson	2.083	1.71	1.849
Serial correlation	$\chi^2(4) = 2.37$	$\chi^2(4) = 2.63$	$\chi^2(4) = 1.4$

suggests that our instruments are appropriate in all our estimations, when we consider different instruments[30] to those suggested by Caporale and Williams our coefficient estimates change.[31]

We think a possible explanation why the models are not robust may be that they are missing key variables and may therefore be misspecified. A key missing variable is uncertainty. As mentioned in Section 2, with increased liberalisation and an ensuing lower level of savings, consumers might have been more exposed to uncertainty in the 1990s than before, so uncertainty may be an important missing variable (for more on uncertainty in terms of savings equations see Browning and Lusardi's (1996) excellent review of the literature). Related to this are the arguments put forward by Carroll (2000). Carroll argues that representative agent models may be misspecified if they are not able to match key microeconomic facts because they will suffer from aggregation bias. Key microeconomic variables include the income, wealth and age distributions. These arguments suggest that equations like **(6)** may be misspecified.[32]

The estimated equations allow us to determine the proportion of individuals that is liquidity constrained. Because the coefficients that determine the proportion of constrained individuals is insignificant in our data, we have to be cautious when interpreting the value of λ. Our estimates suggest that the proportion of individuals that is liquidity constrained varies between 4% in the late 1980s to 35% in the 1970s. The time series profile of λ is obviously determined by FLIB, but the level is given by the consumption equation.

Comparing our results with those of other authors,[33] we note that although our lower limits are

(30) Government expenditure, world GDP and oil prices (results are available on request).
(31) We thank a referee for pointing out to us the results in papers by Nelson and Startz (1990a, 1990b), which suggest that even with satisfactory Sargan test results, the instruments may have little predictive power, thus implying that the results may be sensitive to starting values and lead to relatively high standard errors of estimated parameters.
(32) Note that equation **(6)** is an approximation made by Hayashi (1982). Alternative approximations can be found in papers by Skinner (1988) and Zeldes (1989) who advocate different consumption specifications.
(33) These are available upon request.

smaller than those reported in the literature, our upper limits are not very different to those found by others who have suggested that the proportion of constrained individuals varies between 6% and 30%. However, comparing our results to those obtained using Caporale and Williams's data,[34] we find that apart from the 1970s – before liberalisation took place – there are no significant differences in the overall scaling and shape of the λ variables.

Given its functional form, λ is inversely related to FLIB. We see an increase in the proportion of individuals that is constrained in the mid to late 1990s; the levels in the late 1990s are close to those in 1981. This follows from the behaviour of FLIB.

6 Why has FLIB declined in the 1990s?

6.1 FLIB's underlying assumptions

In this section we attempt to give an explanation for the reasons behind FLIB's decline over the 1990s. To understand this decline one needs to understand the impact that Muellbauer and Murphy's adjustment for lenders' short-term flexibility on the debt-service to income ratio has on FLIB. Consider this adjustment:

$$target_t = target_0 + LIB_t + \alpha mrt_t + \beta \frac{hp_t}{y_t} - \gamma AMRT_t \qquad \textbf{(14)}$$

where LIB_t denotes the amount of liberalisation at time t compared to 0 and $target_0$ represents the initial target level before liberalisation began. Substituting equation **(3)** into **(14)** one obtains:

$$lvr_t = target_0 + LIB_t - (1-\alpha)mrt_t - (1-\beta)\frac{hp_t}{y_t} - \gamma AMRT_t \qquad \textbf{(15)}$$

To capture LIB, Muellbauer and Murphy introduce dummies in a version of **(15)** for all those periods that they think were less regulated than the base period. In their paper, which uses annual data to 1990, dummies are used for 1972-73 and from 1981 onwards, Muellbauer and Murphy estimate a version of **(15)** where $a = (1-\alpha)$ and $b = (1-\beta)$. Because FLIB is then defined as in **(5)** above, we can think of FLIB as the level of financial liberalisation at time t relative to the base period (ie the looseness of credit conditions).

It may be that FLIB does not perform well in the 1990s, because of the assumption that lenders' reactions to 'temporary' changes in the target level are unchanged during and after liberalisation. That is α, β and γ are the same now as they were in the 1960s and 1970s, the period which determines the equation coefficients.

This assumption is crucial. It implies that the effect that the house price to income ratio, nominal and real interest rates have on the *lvr* is unaffected by liberalisation. Relaxing the assumption that the slope coefficients are equal in the 1970s and the latter part of the 1990s has important effects on the estimation results for equation **(15)**. If one were to believe that **(15)** provides the true explanation for the behaviour of the *lvr*, one should expect this equation to hold always, if other

(34) The implied values of λ obtained from Caporale and Williams's dataset are smaller than the values of λ obtained by Caporale and Williams themselves, an indication that the consumption framework is sensitive to all variables, since the exclusion of four observations from Caporale and Williams's estimation sample is sufficient to alter their results somewhat.

things are equal, eg if liberalisation is not occurring. Thus, if we believe that there was no further liberalisation after 1990, we can estimate **(15)** over the 1990s to examine how sensitive this equation is to different periods and therefore how strong Muellbauer and Murphy's assumptions are. Table E reports the results of this exercise.

Table E: Sensitivity analysis for the loan to value ratio equation

Dependent variable: $lvrftb$				
	1969 Q1-1980 Q4	1988 Q1-1999 Q3	1990 Q1-1999 Q3	1994 Q1-1999 Q3
Variable				
$Constant$	0.47 (11.1)	0.69 (10.5)	0.76 (12.6)	0.82 (10.17)
mrt	−0.19 (−15.7)	−0.034 (−3.7)	−0.029 (−3.0)	−0.036 (−1.25)
hpy	−0.31 (−9.7)	−0.87 (−12.4)	−0.96 (−14.7)	−0.95 (−16.9)
$ARMT$	−0.0016 (−3.4)	0.0126 (2.0)	0.016 (2.8)	0.0007 (0.08)

Note that there exists a negative relationship between the *lvr* and both the nominal post-tax mortgage rate and the house price to income ratio in all the estimated equations in Table E, which is consistent with the picture portrayed in Charts 8 and 9. More important, however, is the change in the size of the slope coefficients either side of the financial liberalisation period: the coefficient associated with the house price to income ratio has tripled, whereas the coefficient on the nominal post-tax mortgage rate has decreased fivefold.(35) According to equation **(15)**, the change in both coefficients suggests that, in the short run, lenders now appear to adjust the target for the debt-service to income ratio much more forcefully to movements in the nominal post-tax mortgage rate than to the house price to income ratio. In Table E, for the original regression estimated over 1969 Q1 to 1980 Q4, the implied value of α is 0.81 and of β is 0.69 whereas, for instance, for the regression estimated over 1994 Q1 to 1999 Q3, α increases to 0.964 but β drops to 0.05. This provides evidence that equation **(15)** appears to have broken down.

Moreover, note that the coefficients on the real mortgage rates in Table E have the wrong sign (they are positive), another indication that the equation has broken down. In particular, FLIB appears to be driven by lower nominal interest rates – the fall in the 1990s was broadly matched by a similar reduction in the repayment required by lenders (Chart 13). But the FLIB equation assumes a less than full reduction – hence it indicates borrowing tightness, ie the fall in nominal rates has reduced the debt-service to income ratio which FLIB interprets as a tightening.

Consistent with all these results, note that the fall in the nominal interest rate in the 1990s (Chart 9), which is broadly matched by the fall in the debt-service to income ratio (Chart 7), implies that for **(2)** to be satisfied, the *lir* (debt to income ratio) must be roughly constant during that period (Chart 4).

(35) The coefficients on the house price to income ratio and on the nominal interest rate are not very different in the last three columns of Table E.

6.2 Targeting debt relative to income

Table E suggests that lenders' practices now seem to be based more on the *lir* than the nominal debt-service to income ratio. The closeness of α to 1 and of β and γ to 0 in the 1990s means that equation **(15)** is approximately:

$$lvr_t \approx target_0 + LIB_t - \frac{hp_t}{y_t} \qquad \textbf{(16)}$$

Note that the first two terms on the right-hand side of **(16)** represent the target level of the debt-service to income ratio in the 1990s. If we believe that LIB was roughly constant in the 1990s (ie that there was no further liberalisation), then the target level of the debt-service to income ratio can be written as:

$$\begin{aligned} target_{1990s} &\approx lvr_t + \frac{hp_t}{y_t} \approx \frac{loan_t}{hp_t} + \frac{hp_t}{y_t} \\ &\approx \frac{loan_t}{y_t} \end{aligned} \qquad \textbf{(17)}$$

Thus **(17)** suggests that in the 1990s lenders were paying more attention to the *lir* than the debt-service to income ratio when deciding on the amount to lend (ie the adjustments for 'short-term factors' in the target debt-service to income ratio in **(14)** are so extreme – the debt-service to income ratio appears to react very strongly to movements in the nominal interest rate – that it becomes inappropriate to specify the target in these terms).

The results in Table E suggest that the response of lending policies to temporary changes in variables that affect the target level has changed. Banks have entered the housing market and are likely to have different lending criteria to the ones building societies had in the 1960s and 1970s. Building societies themselves are likely to have changed their lending criteria following demutualisation, and because they are able to access wholesale finance. The economic environment might have changed lending perceptions: the 1970s are likely to have been contaminated by events such as high inflation, low and even negative real interest rates and a tax system which encouraged home ownership. Given increased lending in the 1980s and the subsequent slowdown in the early 1990s, lending institutions are likely to have learnt more about the nature of their lending activities. Better credit-rating systems and information technology are likely to have improved the information about borrowers that is available to lending institutions. It is therefore likely that liberalisation itself has affected the slope coefficients in **(15)**, which is indeed what we observed above.

But perhaps a key factor is that nominal interest rates have fallen substantially, as inflation has fallen. This has distorted the use of the nominal debt-service to income ratio as an indicator of lending target ratios.[36]

(36) Current research by one of the authors of this paper, provides an explanation for the importance of the *lir* above the *lvr*. Examination of the CML's micro dataset suggests that borrowers are more likely to be constrained by their *lir* in the south than in the north. The increase in the share of transactions in the south may suggest that at the national level, *lirs* may be becoming a better indicator of lending practices than *lvrs*. Moreover, the increase in the share of single borrowers, who have higher *lirs* than couples, may also suggest why *lvrs* are less significant at the aggregate level than *lirs*.

7 Conclusions

In this work we take a well-known measure of financial liberalisation and re-estimate it with recent data. We then apply this measure to a model of consumption that met with success when estimated in the mid-1990s. We report mixed results insofar as the coefficients of the consumption equations – especially those that are used to infer the proportion of agents that is constrained in the economy – have the expected sign and are similar in size to those previously reported in the literature. But in most cases the coefficients are insignificant. Our results suggest that the previous results for this estimated consumption equation are not robust, as different starting values and/or instruments lead to different estimated coefficients. This provides the main conclusion of our paper; the quasi-differenced model with a proxy for liberalisation cannot, on this evidence, substitute for the standard consumption model which regresses consumption on income, wealth and the rate of interest.

One possible explanation for the results of this paper may be the inability of the liberalisation proxy to depict financial deregulation in the 1990s accurately. FLIB's behaviour in the 1990s suggests that all liberalisation that occurred in the 1980s was reversed the following decade, which seems unlikely. This in turn means that, because the proportion of constrained agents in the economy is assumed to be a function of FLIB, the consumption model examined in this paper cannot estimate this proportion accurately.

We also attempt to explain the behaviour of FLIB in the 1990s. We identify the sharp reduction in the nominal interest rate as the main culprit for FLIB's reversal over the 1990s. We argue that the behaviour of lending institutions may have changed from targeting *lvrs* to *lirs* after liberalisation.

Some concerns remain. First, we use data for building societies only. Some of the behaviour of our financial liberalisation measures in the mid and late 1990s may be explained by the fact that we do not have data for banks. However, as the charts show, our measures of liberalisation are not dissimilar to those used by Caporale and Williams. A second concern is that measures of financial liberalisation do not take into account demographic effects. The effect 'baby boomers' had on credit markets would have been greatest during the 1980s and 1990s; standard lifecycle models of consumption would suggest that baby boomers would have been in debt in the 1980s and would have started saving in the 1990s. This implies that the average savings rate in the United Kingdom would have been decreasing in the 1980s (thus leading to an increase in the proportion of liquidity-constrained individuals) and rising in the 1990s (thus reducing the proportion of constrained individuals). These arguments provide not only a motivation for the introduction of an age distribution variable in the consumption equations, but also motivate the introduction of other micro data such as wealth and income distributions, as well as measures of uncertainty.

One significant shortcoming of the approach used in this paper is that it does not take into account the possibility of future constraints. If consumers are not constrained today, but face the possibility of being constrained in the future, they will act as if they are constrained today and save for the future to smooth their consumption. Thus, those agents that face the possibility of being constrained at some point in their lifetime may not consume all of their current income. This is an issue that has not been addressed in the empirical literature and which requires further research.

Another important concern relates to the endogeneity of financial liberalisation and credit availability, and the relationship between them. In the literature, the distinction between credit availability and financial liberalisation has been somewhat blurred with some authors taking both variables to describe the same phenomenon. Financial liberalisation is primarily an exogenous process that is only affected by policy shifts which have an impact on the economic environment (eg the removal of the Corset, the Building Societies Act, etc). Credit availability is, on the other hand, an endogenous variable which is affected by a number of variables one of which is financial liberalisation. Any variables that prompt lending institutions to offer more credit to consumers will increase credit availability (eg higher income, higher income growth expectations, lower unemployment, higher house prices to provide collateral, etc). Thus, episodes of liberalisation should lead to increased credit availability and not *vice versa*.

Chart 1: Personal sector unsecured debt to post-tax labour income

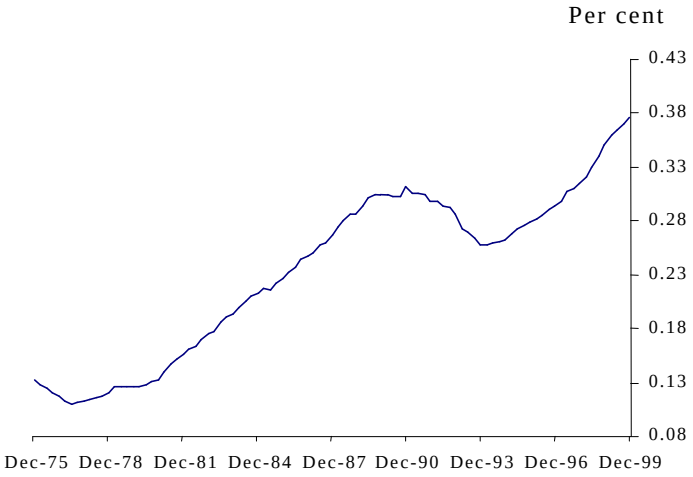


Chart 2: Building society spreads

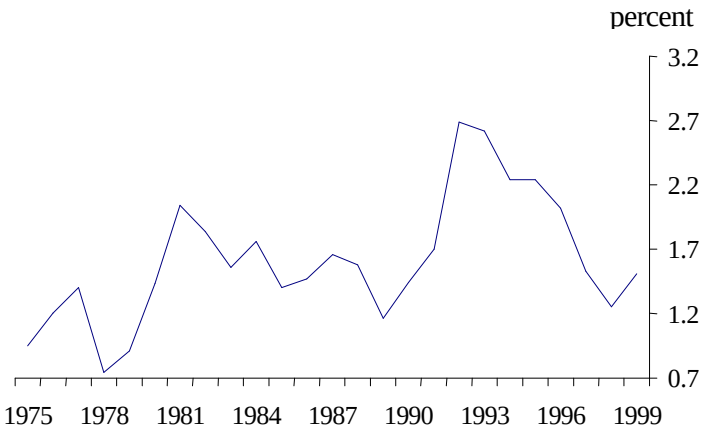


Chart 3: Loan to value ratios

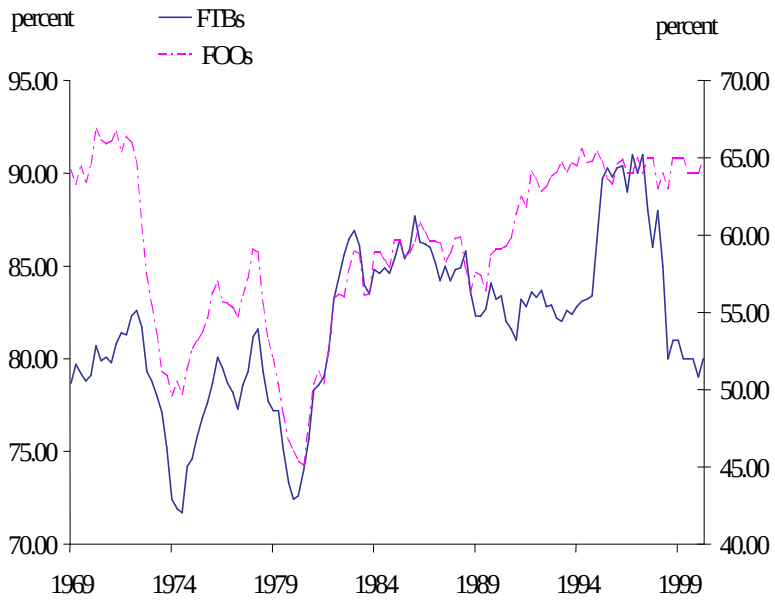


Chart 4: Loan to income ratios

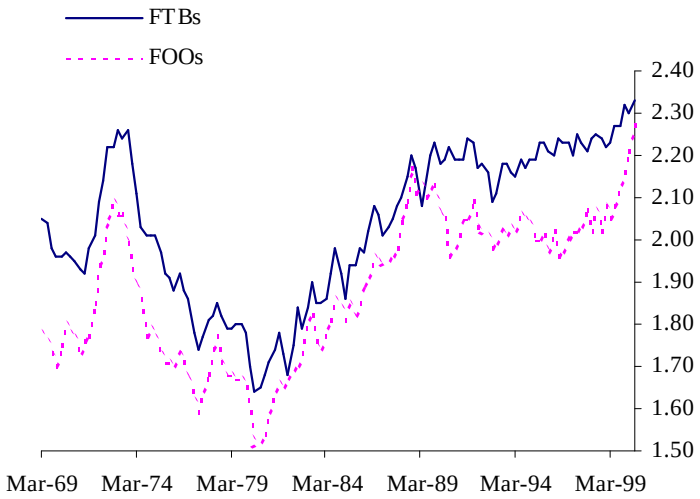


Chart 5: Distribution of loan to value ratios for FTBs

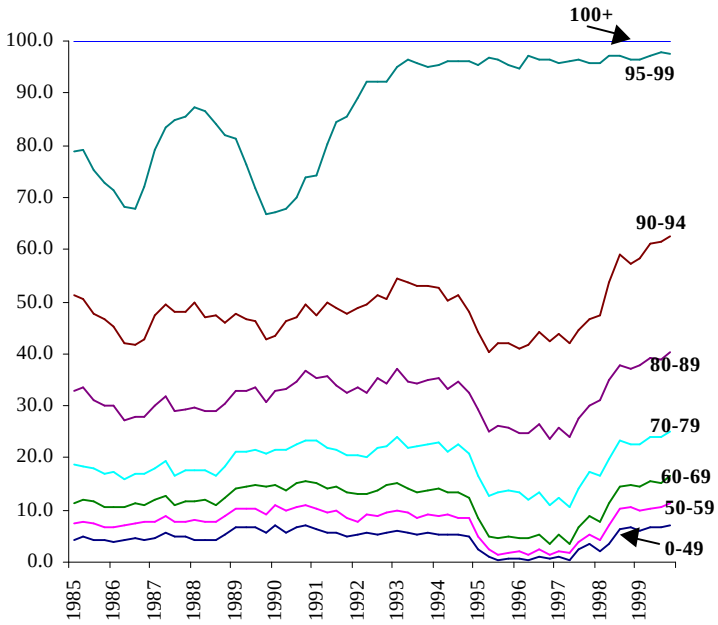


Chart 6: Mortgage equity withdrawal

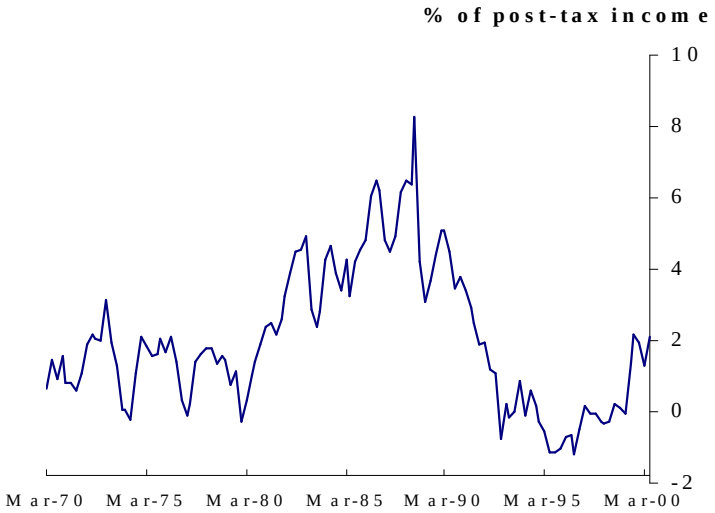


Chart 7: Debt-service to income ratio

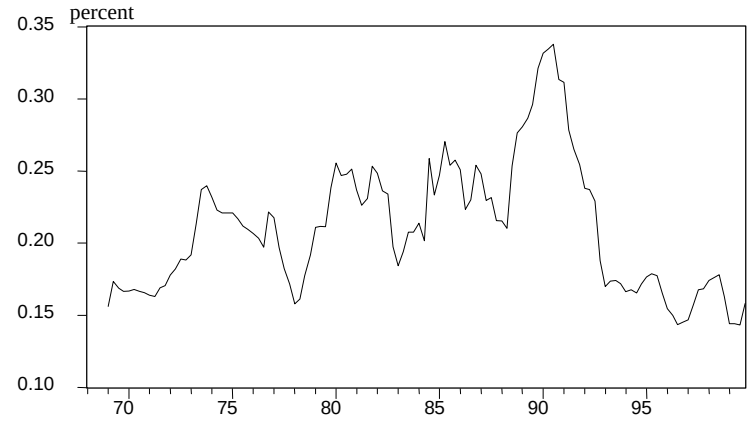


Chart 8: Log of the loan to value and house price to income ratios

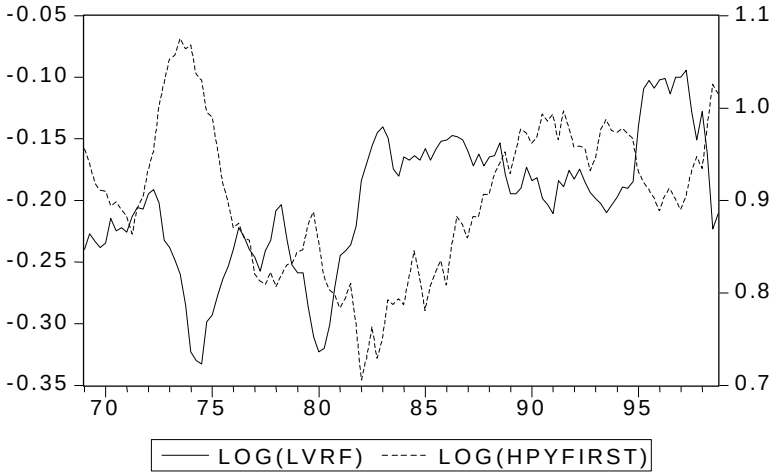


Chart 9: Log of the loan to value ratio and nominal interest rates

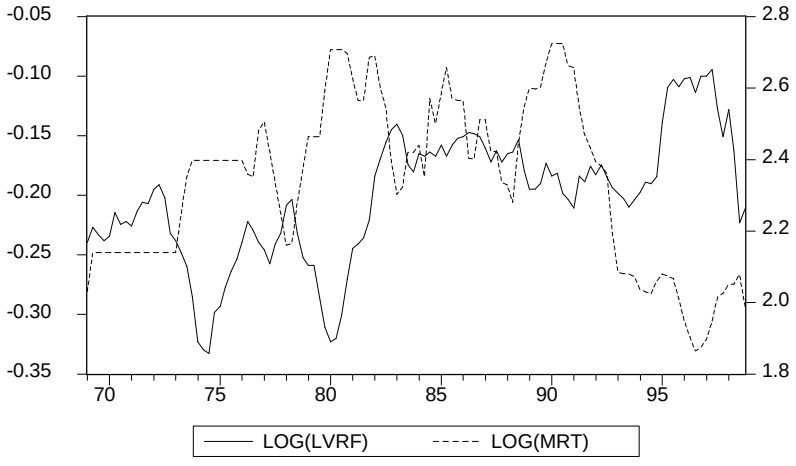


Chart 10: Our FLIBFTB measure and Caporale and Williams's

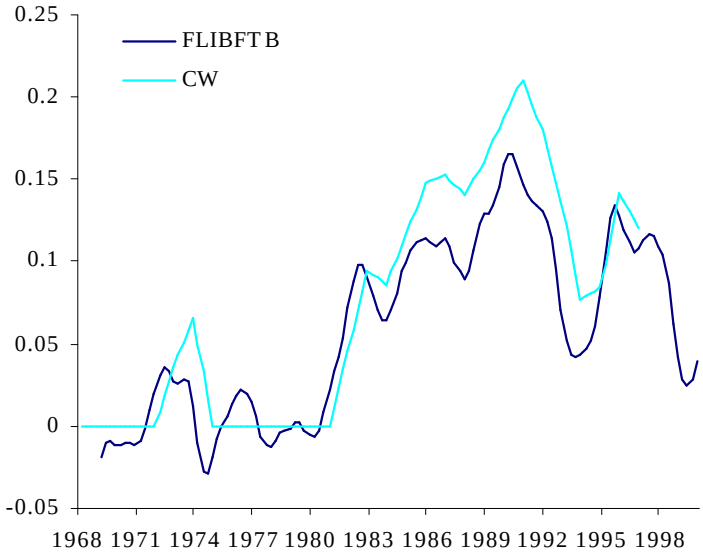


Chart 11: Our FLIBFOO measure and Caporale and Williams's

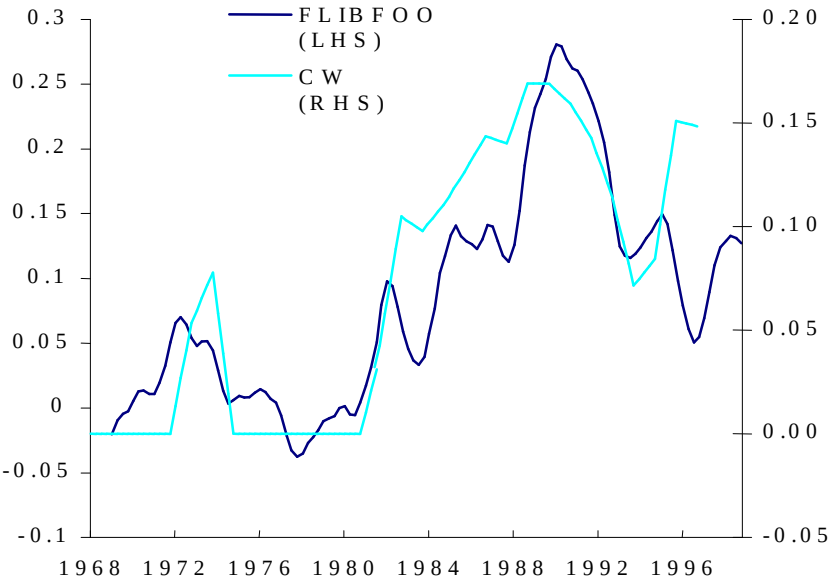


Chart 12: Our smooth FLIB measures

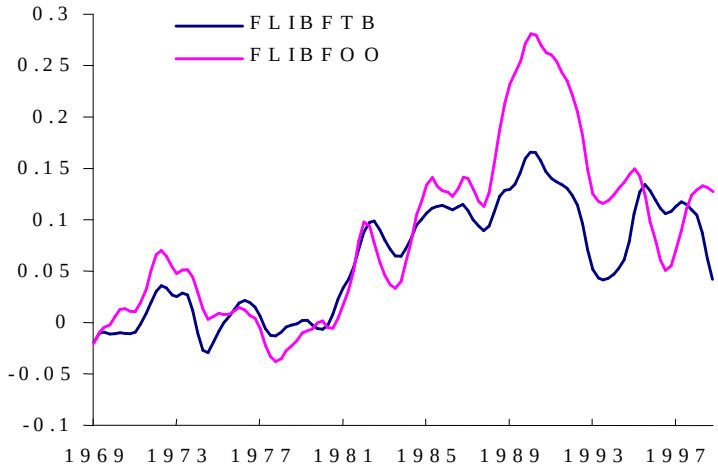
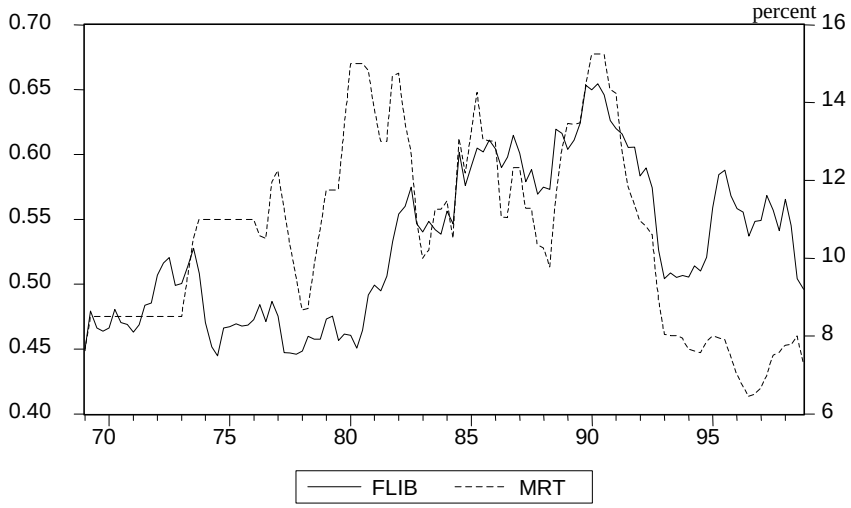


Chart 13: Quarterly FLIBFTB and the nominal interest rate



References

Bakhshi, H (2000), 'The sensitivity of aggregate consumption to human wealth', *Bank of England Working Paper no. 108*.

Bayoumi, T A (1993), 'Financial deregulation and household saving', *Economic Journal*, Vol. 103, pages 1,432-43.

Breedon, F J and Joyce, M A (1992), 'House prices, arrears and repossessions: a three equation model for the UK', *Bank of England Quarterly Bulletin*, May, pages 173-79.

Brookes, M, Dicks, M and Pradhan, M (1994), 'An empirical model of mortgage arrears and repossession', *Economic Modelling*, Vol. 11, No. 2, pages 134-44.

Browning, M and Lusardi, A (1996), 'Household saving: micro theories and micro facts', *Journal of Economic Literature*, Vol. 34, pages 1,797-855.

Caballero, R J (1990), 'Consumption puzzles and precautionary saving', *Journal of Monetary Economics*, Vol. 25, pages 113-36.

Campbell, J Y and Mankiw, N G (1989), 'Consumption, income and interest rates: re-interpreting the time series evidence', in Blanchard, O J and Fischer, S (eds), *NBER Macroeconomics Annual*, MIT Press, Cambridge, MA.

Campbell, J Y and Mankiw, N G (1991), 'The response of consumption to income: a cross country investigation', *European Economic Review*, Vol. 35, pages 723-67.

Caporale, G M and Williams, G (1997), 'Revising forward looking consumption and financial liberalisation in the United Kingdom', *Discussion Paper No. 22-97*, London Business School.

Carroll, C D (2000), 'Requiem for the representative consumer? Aggregate implications of microeconomic consumption behavior', *American Economic Review, Papers and Proceedings*, pages 110-15.

Carroll, C D and Dunn, W E (1997), 'Unemployment expectations, jumping (S,s) triggers, and household balance sheets', in Bernanke, B S and Rotemberg, J (eds), *NBER Macroeconomics Annual*, MIT Press, Cambridge, MA.

Carroll, C D and Kimball, M (2001), 'Liquidity constraints and precautionary savings', *NBER Working Paper*, No. 8496.

Cochrane, J H (1989), 'The sensitivity of tests of the intertemporal allocation of consumption to near-rational alternatives', *American Economic Review*, Vol. 79, pages 319-37.

Darby, J and Ireland, J (1994), 'Consumption, forward looking behaviour and financial liberalisation', *International Centre for Macroeconomic Modelling Discussion Paper No. 20*.

Deaton, A S (1991), 'Saving and liquidity constraints', *Econometrica*, Vol. 51, pages 1,221-48.

Fernandez-Corugedo, E W (2000), 'Soft liquidity constraints and precautionary savings', *mimeo*, Bank of England.

Flavin, M (1981), ‘The adjustment of consumption to changing expectations about future income’, *Journal of Political Economy*, Vol. 89, pages 974-1,009.

Grossman, S, Levhari, D and Mirman, L J (1979), ‘Consumption under uncertainty’, in Green, J R, Green, J R and Scheinkman, J (eds), *General Equilibrium, Growth and Trade: Essays in Honor of Lionel McKenzie*, New York Academic Press.

Hayashi, F (1982), ‘The permanent income hypothesis: estimation and testing by instrumental variables’, *Journal of Political Economy*, Vol. 90, pages 895-916.

Kimball, M S (1990a), ‘Precautionary saving in the small and in the large’, *Econometrica*, Vol. 58, pages 53-73.

Kimball, M S (1990b), ‘Precautionary saving and the marginal propensity to consume’, *NBER Working Paper*, No. 3403.

Mariger, R P (1986), ‘Consumption behaviour and the effects of government fiscal policies’, Harvard University Press.

Meen, G (2000), ‘Why do mortgage markets matter?’, *LBS Economic Outlook*, pages 12-17.

Miles, D (1994), *Housing, financial markets and the wider economy*, John Wiley and Sons.

Muellbauer, J (1997), ‘Measuring financial liberalisation in the UK mortgage market’, *mimeo,* Nuffield College.

Muellbauer, J and Murphy, A (1993), ‘Income expectations, wealth and demography in the aggregate UK consumption function’, unpublished paper presented to HM Treasury Academic Panel, University of Oxford.

Nelson, C R and Startz, R (1990a), ‘Some further results on the exact small sample properties of the instrumental variables estimator’, *Econometrica*, Vol. 58, pages 967-76.

Nelson, C R and Startz, R (1990b), ‘The distribution of the instrumenal variables estimator and its t-ratio when the instrument is a poor one’, *Journal of Business*, Vol. 63, pages 5,125-40.

Pesaran, M and Evans, R (1984), ‘Inflation, capital gains and UK personal savings 1953-1981’, *Economic Journal*, Vol. 94, pages 237-57.

Scott, A (1996), ‘Consumption, ‘credit crunches’ and financial deregulation’, *Centre for Economic Policy Research Discussion Paper*, No. 139.

Skinner, J (1988), ‘Risky income, life-cycle consumption and precautionary saving’, *Journal of Monetary Economics*, Vol. 22, page 237-55.

Zeldes, S P (1989), ‘Consumption and liquidity constraints: an empirical investigation’, *Journal of Political Economy*, Vol. 97, pages 305-46.