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No 22

Econometric Modelling of the Financial Decisions of the UK Personal Sector: Preliminary Results

by

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The object of this Technical Series of Discussion Papers is to give wider circulation to econometric research work being undertaken in the Bank and to invite comment upon it; any comments should be sent to the authors at the address given below. The views expressed are their own, and not necessarily those of the Bank of England. The authors would like to thank John Flemming, Stephen Hall and Kerry Patterson for helpful comments on earlier drafts. Any remaining errors are the responsibility of the authors. Cuthbertson acknowledges support of the ESRC under grant B0023148.

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CONTENTS

Abstract

A development of the AIDS model is used to explain personal sector holdings of a set of liquid assets, capital uncertain assets and liabilities. The Granger-Engle procedure is applied to a system of equations to establish a long-run co-integrating vector. A two step systems approach is then used to model short-run behaviour using an interdependent error-feedback system. Preliminary empirical results are encouraging and demonstrate the practicality of the Granger-Engle approach in a systems framework.

I INTRODUCTION

In this paper we model the main financial decisions of the UK personal sector using a systems approach. On a priori grounds we might expect the financial behaviour of the personal sector (see, for example, Akerlof and Milbourne, 1980) to differ from that of the company sector say, (see Sprenkle, 1969) and disaggregation may provide additional insights into problems that arise in some aggregate asset demand functions (eg Hall et al 1988, gilt edged stock Spencer 1981). In addition, disaggregation by asset (within the personal sector) requires the consideration of a much wider set of relative yields than is usual in aggregate studies (Cuthbertson 1985). A quantitative measure of the substitutability between assets may help to explain why asset shares in different sectors often move in markedly different ways (eg the behaviour of the velocity of money in the early 1980's for persons and companies). If substitutability between liquid assets is low then this may favour the use of Divisia indices when modelling broad money aggregates (Barnett 1984).

The interest rate and exchange rate implications of financing the PSBR by open market sales of government debt clearly depends in part on the personal sector's demand function for gilt edged stock. However, if holdings of gilt edged stock are determined simultaneously with holdings of other capital uncertain assets then a systems approach is likely to yield more behavioural information than single equation studies.

Financial innovation has proceeded very rapidly in the 1980s, and this has undoubtedly impinged on personal sector financial decisions. Concern has been expressed over the rising debt-income ratios of the personal sector and the 'credit boom' is seen as a leading indicator for inflation. Gross liquidity of the personal sector has also risen rapidly over the last few years and this is reflected in the rapid growth in the monetary aggregates. The causes of such dramatic changes in assets and liability holdings have policy implications. If the rapid rise in gross liquid assets or liabilities reflects a desired increase in demand due to 'financial innovation' or other determining variables then the inflationary consequences may be minimal. On the other hand if actual asset holdings are above desired long-run holding and the reverse applies to liabilities then one might expect increased inflationary pressures, not least in the housing market. Thus, if a stable set of demand functions for personal sector assets and liabilities can be found then this important policy question may be resolved, at least in part.

When embedded in a complete financial model, asset demand and supply functions may be 'solved' to yield market clearing 'prices' which in turn may influence the behaviour of real variables and hence income-expenditure flows. The personal sector asset demand equations presented in this paper may be viewed as a first step in this model building process.

II MODELLING STRATEGY

The basic theoretical approach used in modelling asset demands is based on the Almost Ideal Demand System (AIDS) of Deaton and Muellbauer (1980), and is described in detail in a companion paper (Barr and Cuthbertson 1988). The long-run AIDS asset share equations are:

$$s_{it} = \alpha_i + \sum_j \gamma_{ij} \ln p^{\tau}_{jt} + \beta_i [\ln(W/Z)_t - \ln P^{*\tau}_t] + \delta' x_t \qquad (1)$$

$s_i = a_{it}/W_t$ = share of asset i in the portfolio of k assets

$\ln p^{\tau}_{it} = \ln[(1+r_{it})(1-g_z)]^{-1}$ = real 'price'

W_t = wealth held in k assets

Z_t = aggregate price index

$\ln P^{*\tau}_t = \sum_{i=1}^{k} \bar{s}_i \ln p^{\tau}_{it}$ = aggregate composite 'price' index

($\bar{s}_i$ are the mean shares).

r_{it} = expected (proportionate) nominal return on asset i between t and t+1, including any capital gains.

g_z = expected (proportionate) rate of goods price inflation between t and t+1.

x = set of additional variables that influence asset shares.

The constraints suggested by the AIDS model are

$$\Sigma\alpha_i = 1, \quad \Sigma_i \gamma_{ij} = \Sigma\beta_i = \Sigma\delta_i = 0 \qquad \text{('adding up')} \tag{2a}$$

$$\gamma_{ij} = \gamma_{ji} \qquad \text{(symmetry)} \tag{2b}$$

$$\Sigma_j \gamma_{ij} = 0 \qquad \text{(homogeneity)} \tag{2c}$$

Equation (1) may be compactly expressed

$$s^*_t = \Pi X_t = A \ln p^T + K.RW + Jx + D \tag{3}$$

s_t = kx1 vector of asset shares

X_t = mx1 vector of determining variables.

Π = kxm matrix of long-run parameters. [$\Pi = A:K:J:D$]

RW = real wealth = $\ln(W/Z) - \ln p^{*T}$.

x = additional explanatory variables.

D = vector of constant terms

We apply the Granger-Engle (Engle and Granger 1987) two-step procedure in estimating the system. After checking the order of integration of the variables in the long-run equation (3), (Dickey and Fuller 1979) we search for a co-integrating vector that has correctly signed coefficients (eg negative γ_{ii}) of plausible magnitude (Hendry 1986, Granger 1986). If $\hat{\Pi}$ is a co-integrating matrix (which may also satisfy the theoretical restrictions in (2)) then the k residuals from this system that is, ($s_i - \hat{s}^*_i$), i=1,2,k are I(0) variables. Any k-1 of these are independent (Anderson and Blundell 1983). These k-1 residuals are used in an interdependent error feedback system of equations:

$$\Delta s_t = B_1(L)\ \Delta s_t + + B_2(L)\ \Delta X_t + B_3(s-\hat{s}^*)_{t-1} \tag{4}$$

$B_i(L)$ are conformable matrices in the polynomial lag operator whose columns sum to zero to satisfy the 'adding up' constraints. A general to specific search (Hendry et al 1984) can then be undertaken on $B_i(L)$, i=1,2,3, while the long-run co-integrating vectors are held fixed. 3SLS estimation is used because of potential endogeneity and the need to use the errors in variables method, EVM, to model expectations terms (eg expected returns on capital uncertain assets). It is hoped that any residual serial correlation is minimised by the use of a fairly general system lag structure since corrections for serial correlation in systems with expectations variables (eg Berndt and Savin 1975, Cumby et al 1983) is problematic with current software. With no serial correlation the estimates are consistent and asymptotically efficient (although see Pesaran 1987 for potential problems with this approach). In the presence of serial correlation the 3SLS estimator of the parameters remains consistent. The EVM applied to one period ahead expectations introduces a serially correlated error process of order one and hence valid instruments must be dated t-1 or earlier. In general the instruments used include (two) lagged values of all 'prices', wealth, inflation, consumers' expenditure and, in addition, for capital uncertain assets, the exchange rate ($/£) and the appropriate foreign interest rate.

Data

The basic data used are taken from the flow of funds table in Financial Statistics with adjustments made for classification changes. Benchmark stocks are obtained from a variety of published sources and stock figures are constructed for the personal, company, overseas and public sectors with a detailed breakdown for the financial sector (into banks, various non-bank financial intermediaries and LAPFs). The constructed stock figures use consistent revaluation indices across sectors and the accounting identities continue to hold for all the stock data. (We hope to report on the method of construction of this large data base in the near future.) Thus the personal sector data used in this study is derived from a full stock-flow consistent set of accounts. The data are seasonally unadjusted but seasonal dummies are not reported. The rates of return used, are discussed below, together with detailed definitions of the asset classifications.

Financial innovation and the emergence of new financial assets and liabilities creates problems in terms of data classification. It is therefore worth mentioning some of these factors that have impinged on the personal sector. Throughout the second half of the 1970's loans from the banking system became progressively easier to obtain and were marketed with vigour while rationing of building society mortgages attenuated. After 1982 there was increasing provision and marketing of high interest chequing accounts, reflected in the rapid rise in the proportion of interest bearing M1, in total M1 (see Hall et al 1988). For capital uncertain assets, the ending of exchange controls acted as a catalyst for investors increasing their information on overseas assets either directly by investment in overseas securities or via unit trusts, which received a considerable marketing effort. In a model that is already complex we cannot hope to capture these learning and marketing effects in a sophisticated manner and we have had to deal with them in a piecemeal fashion as described below.

In order to render the model tractable we have assumed weak separability between capital certain liquid assets and liabilites and capital uncertain assets. It is beyond the scope of this paper to undertake non-parametric tests of separability such as those described in Swofford and Whitney (1986). Weak tests of separability namely, adding additional 'price' variables other than those pertaining to the sub-set of weakly separable assets indicated that our a priori choices concerning separability are acceptable.

In order that the reader is not overwhelmed by a plethora of coefficient estimates we have concentrated on presenting our preferred set of equations and we examine their economic properties in some detail. Our aim here is to demonstrate that the models broadly fit the data set, satisfy certain theoretical restrictions and yield plausible parameter estimates. In short, that the equations could be used as part of a working financial model with sensible simulation properties.

III EMPIRICAL RESULTS

(3.1) Liquid Assets

The asset categories modelled are

NC = notes and coin
SD = sight deposits
TD = time deposits
BS = building society deposits
NS = national savings investment account

Data on the sight-time deposit split is only available post 1975 and the full estimation period (after lags) is therefore 1977(4) to 1986(4). Experimentation with other categories of national savings proved problematic (see Hood 1987) as did the minor category local authority temporary debt (see Weale 1986) and these are excluded from the analysis. Interest rates used are the end of quarter rate on 7 day deposit accounts (for TD), the ordinary share rate (for BS) and the standard rate on the NS investment account. All interest rates are net of income tax at the standard rate.

The long-run share equations (3) are reproduced here:

$$s^* = A \ln p^T + K\, RW + Jx + D \qquad (5)$$

The fitted values from OLS on (5) can be interpreted as <u>target long-run shares</u>, because the co-integrating regression provides super consistent estimates of the long-run parameters.

The price index used to deflate nominal wealth and interest rates is the RPI. The additional explanatory variables in x are future real <u>expenditure</u> and a <u>time trend</u> starting in 1983(4). The former measures differential transactions demand and the latter the introduction of new interest bearing chequing accounts and the increasing pace of financial innovation (Barr and Cuthbertson 1988). In future work a stochastic trend or logistic relationship could be used.

The AIDS model implies the following constraints on the long-run coefficients matrices;

(i) the columns of A, K and J sum to zero and the constants sum to one (the adding up constraints).

(ii) the matrix A is symmetric.

Inflation enters the model through its effects on real interest rates, which have a substitution effect on the shares via the matrix A and an 'income' effect via the matrix K. The latter arises because an increase in real rates represents an increase in real (future) wealth, and changes in wealth may alter the portfolio composition. For each asset the real rate is its own nominal rate minus expected inflation. In the case of the non-interest bearing assets in this model (notes and coin, and sight deposits) the real rate is simply the negative of the inflation rate.

Homogeneity implies that the rows of A should sum to zero. In particular, since inflation appears in all of the real rates, changes in inflation have no effect via matrix A. The income effect via K remains, however. All these restrictions are imposed in the long-run cointegrating equations reported.

The short-run error feedback equations, EFE, are:

$$s_t = C \, \Delta \, p_t + B \, \Delta RW_t + F \, \Delta \, x_t + L(s-s^*)_{t-1} \tag{6}$$

C, B, F, L are conformable matrices (vectors) of parameters. L is the matrix of adjustment coefficients which determine the dynamic stability of the system. Levels of all the variables in (5) are found to be I(1) (table 1) and the DF and ADF statistics indicate a co-integrating set of variables (table 2) when homogeneity and symmetry are imposed (in the TD, BS, NS equations).

The <u>long-run</u> substitution coefficients Table 2 have the signs that one would expect ie negative on the diagonal and positive off it. The innovation 'trend' variable has its major effect on sight and time deposits and shows a movement away from the latter. This almost certainly reflects the increasing <u>number</u> of sight deposits paying interest as agents learn of the existence of such accounts. Wealth and expenditure have opposite effects, as indicated by theory, (see Barr and Cuthbertson 1988) with the latter raising the share of the 'transactions' assets (NC, SD) and lowering that of the 'savings' assets (TD, BS, NS). The Slutsky matrix which may be derived from the A matrix has all eigenvalues negative and therefore satisfies the theoretical 'negativity condition'.

The <u>short-run</u> results (table 3) have much the same characteristics. Note that the share of National Savings does not respond immediately to changes in any interest rate. Equivalently the NS interest rate has no impact effect on the other shares. These restrictions are imposed on a priori grounds and in the interest of parsimony but are accepted by the data.

The lag coefficients also have a reasonable structure with negative effects due to own shares in excess of target and positive effects due to excess holdings of other assets. The eigenvalues of the appropriate elements of the L matrix have modulus (0.6, 0.9, 0.8, 0.4) and indicate a dynamically stable system.

Overall these preliminary results are encouraging on economic and statistical grounds and the R^2 (table 3) are satisfactory for share equations. Simulation results from the model are given in the appendix and indicate sensible dynamic paths and plausible long-run and short-run elasticities.

Summary: Liquid Assets

The results for liquid assets are highly informative. Own 'prices' have powerful effects and indicate that aggregate demand functions for narrow money should include a vector of interest rates. The role of inflation in this model indicates that 'inflation effects' in aggregate M1 equations are probably part of a wealth effect. The analysis also indicates that aggregate M1 equations should include wealth and a transactions variable (which can be reparameterised as a wealth - income ratio). The evidence here is therefore broadly consistent with co-integration studies on aggregate money demand functions where wealth plays a key role (Hall et al 1988) and other single equation studies that utilise a wealth variable (Cumming 1981). We are also able to adequately model dynamic adjustment (see appendix) without the long and somewhat arbitrary lags on a single dependent variable as is sometimes found in single equation studies. Instead we utilise the plausible assumption that disequilibria in all asset stocks influence the adjustment of any one asset. This allows the 'adding-up' constraint to be met in a dynamic system. The influence of wealth on the demand for liquid assets demonstrates the potential importance of 'wealth effects' in the transmission mechanism of monetary (and fiscal) policy.

(3.2) Liabilities

The liabilities in the estimated model are:

FC: bank lending in foreign currency by UK banks to the UK non-bank private sector

BL: bank lending in sterling (other than for house purchase)

M: lending for house purchase (by banks, Building Societies and OFI's)

RC: retail credit and other lending by OFIs.

The interest rate on foreign currency lending is a dollar rate adjusted for 'expected' capital gains due to movements in the dollar-sterling exchange rate. The bank's base rate, building society mortgage rate and rate on retail credit are used for BL, M and RC respectively. The sample period is 1975(4) to 1986(4). Prior to 1975 changes in regime, particularly varying forms of rationing in the home loan and bank lending market, plus the effects of the introduction of Competition and Credit Control and round tripping make this earlier period almost impossible to estimate using a systems approach. In addition, we are primarily interested in assessing as far as possible how this market may be operating in the highly competitive 'free market' of the 1980s and data for the earlier period is unlikely to be informative in this respect. Nortwithstanding the above we are forced to model the period of rationing from 1975(4) to 1982(2). Following Wilcox (1985), the rationed mortgage market is assumed to be cleared not by changes in the interest rate but by movements in the loan to value ratio, that is, the ratio is assumed to be part of the demand function and as it changes the demand curve moves to a full market equilibrium position. By formulating the portfolio optimisation problem in this way a solution satisfying the familiar first order conditions for utility maximisation exists and the AIDS model can be applied as before.

To the extent that the loan to value ratio represents the complete influence of rationing, the effect of the mortgage rate on mortgage demand should be identifiable. However, if it fails to do this the estimated coefficient will lie somewhere between that in the demand function and that in the supply function. In the extreme case in which the ratio fails completely, the estimated coefficient will come from the supply function only. Initial estimates resulted in a positive relationship between the mortgage rate and demand which suggested that the loan to value ratio was not capturing the full rationing effect. In the absence of any better proxy variables, the mortgage rate was removed from the model for the rationing period and the reported coefficient, of the correct sign, derives from the non-rationing period only. Thus it is assumed that the slope of the mortgage demand curve is constant across regimes but that it has no effect on the quantity of lending in the rationing period. The coefficients on the loan to value ratio were allowed to change between regimes.

Rationing was assumed to last from the start of the sample in 1975(4) to 1982(2). In addition, a trend was included for this period.

Changes in the composition of expenditure (from housing to consumption goods for example) may cause changes in the liabilities shares. Thus expenditure on goods and on housing investment were included among the explanatory variables initially. The latter was subsequently dropped due to its insignificant but perversely signed coefficients.

Long Run

The additional variables x (see equation 5) in the long-run share equation are, therefore:

(i) real consumers expenditure
(ii) loan-value ratio
(iii) value of housing stock
(iv) time trend

Dickey Fuller tests indicated that all the series used are I(1). Tests for stationarity of the residuals from the co-integrating regressions are favourable (Table 4A) and we accept that the equations in table 4A which include symmetry and homogeneity of 'price' effects, form a set of co-integrating vectors.

The own price effects are of the correct sign and we make the prior assumption that bank lending BL and mortgages M are substitutes and impose a small negative cross-price effect. The expenditure coefficients indicate a strong switch from bank lending to mortgages for transactions purposes and this in part reflects the 'mortgage leak'. The coefficient in the loan-to-value ratio clearly indicates that rationing by this alternative price mechanism (actually a gearing ratio) is effective.

Short Run

The short-run interest rate coefficient matrices both conform to the AIDS priors in terms of signs (symmetry and adding up were imposed) and many of the additional variables have plausible coefficients (Table 4B). However, it is clear that the data does not contain a lot of information; the t-statistics are small in most cases and, as illustrated by the simulations (see appendix), the impact of interest rate changes is very small.

Although the results suggest only small movements in liability demands they are based on a fixed total stock of liabilities. In a full simulation, which would include an equation to determine total borrowing as a function of interest rates, (in addition to the equations determining shares) the interest rate effects may be much larger as total borrowing also responded to interest rate changes. The total borrowing decision is part of the higher level decision at which borrowing, saving and consumption are determined. Thus the results are not surprising when seen in this context.

Summary: Liabilities

The systems approach forces the researcher to consider the potential interdependencies between financial asset decisions. The results confirm that some switching between these liabilities does take place but emphasises that trying to control the broad money supply by influencing rates on bank lending (to persons) is likely to be impractical, requiring huge movements in rates. In addition there is some evidence that rationing via moral suasion had some effect in the past but it would appear to be impractical after the present liberalisation of Building Societies in the financial system.

The estimated model for personal sector liabilities is consistent with the AIDS theory but reveals only a small degree of substitutability between instruments in response to changes in interest rates. Much of the sample period was dominated by rationing of mortgage lending and 'supply side' changes due to financial innovation. Consequently, although an attempt was made to utilise the data from the rationing period, the number of observations over which the pure demand side model was estimated was severely limited. For this reason, and because the personal sector is likely to become more efficient in managing its liabilities in the next few years, it would seem sensible to re-estimate the model, excluding the rationing period, as soon as sufficient data becomes available. Within the systems framework the marginal return from further work is likely to be rather low at the present time. Until then the estimated model should provide a reasonable, and probably realistic, model of this set of liabilities.

(3.3) Capital Uncertain Assets

The capital uncertain assets in the choice set which are assumed to be weakly separable from other financial assets of the personal sector are:

1 Unit trusts (UT)
2 Company securities (CS)
3 Public sector long-term debt (PSL)
4 Overseas securities (OS)

The share of unit trusts shows a rapid growth after 1981(4) from a low base, and rises to 13 percent by the end of 1986. The share of company securities declines rapidly after 1978 from around 75 percent, to 60 percent by 1986, and this is due to large net outflows throughout the whole of this period. Net flows of public sector long-term debt are large and erratic on a quarter by quarter basis, but there is a strong net inflow over the post-1978 period and the share rises from 9 percent in 1973 to around 20 percent by 1986. The share in overseas securities is erratic, but small in the 1960 to 1979 period and rises rapidly after the abolition of exchange controls from 4 percent to around 8 percent. The post-1981 period is likely to be rather difficult to model. An increased marketing effort and more information on unit trusts and the opening up of overseas markets involve 'supply side' (or regime) changes that our 'demand model' is unlikely to pick up.

Long-run Behaviour

There are two main issues that arise in the case of capital uncertain assets: the use of market value wealth and the time horizon chosen for the calculations of expected returns (or 'price' variables).

In the <u>long run</u> it is reasonable to assume that cumulative revaluations and the cumulative flow of funds into capital uncertain assets have an equal effect on asset shares. In short, that agents choose long-run asset shares based on market values.

Consider next the time horizon for the holding period. If we have a heterogeneous group of agents then they may have different holding periods in mind when purchasing capital uncertain assets. Some will be interested in short-term returns, some will hold assets to maturity while others will have an intermediate horizon but with some flexibility in the holding period. It is reasonable to assume that in determining their long-run asset shares some agents will have primarily a hedging motive and will be influenced by longer-term expected movements in asset prices and that these will be based on a backward looking information set spanning a number of years. In other words such agents in determining their long-run expectations filter out any volatile short run changes in price. To keep the problem tractable we therefore assume (average annual) returns over the last three years to be a reasonable measure of 'long-run' expected returns $\ln(p_{jt})$. (This was to some extent determined by co-integration tests on the variables, see below.) $\ln P_t^{*\tau}$ and g_z are defined to be consistent with the time horizon chosen for $\ln(p_{jt})$.

The cost of achieving a given level of utility may depend on the expected level of expenditure. In particular if expenditure by the personal sector is undertaken mainly on domestic goods then we might expect a differential effect of expenditure on domestic relative to foreign asset holdings.

Our 'basic' long-run share equations for capital uncertain assets (where we have separated real prices into nominal prices and the rate of inflation) are:

$$s^*_{it} = \alpha_i + \sum_{j=1}^{k} \gamma_{ij} \ln p_{jt} + \sum_{j=1}^{k} \gamma_{ij} g_z + \beta_i RW_t + \psi_i y_t \qquad (7)$$

where

$s^*_{it} = a^m_{it}/W^m_t$ = market value share of asset i

a^m_{it} = market value of asset i

W^m_t = market value of all capital uncertain assets in the portfolio

$p_{jt} = (1 + r_{jt})^{-1}$ = nominal 'price'

r_{jt} = expected (proportionate) 'long-run' nominal return on asset i including any capital gains

g_z = (proportionate) rate of inflation of the goods price index, Z_t

$RW = \ln(W^m/Z)_t - \ln P^{*r}_t$

y_t = real transactions variable

Equation (1) implies that nominal expected returns (r_{jt}) and expected goods price inflation g_z have an equal impact on long-run asset shares. If long-run homogeneity holds, then returns can be expressed in nominal terms and g_z if entered separately should have a zero coefficient. However, inflation may provide a catch-all proxy variable for omitted variables (eg changing perceptions of risk, variability of purchasing power over goods) due to the second order approximation used in deriving the AIDS model. We therefore include it in the long-run (co-integrating) equation as a separate variable along with the nominal 'prices', $\ln p_{jt}$.

In the post-1979 period there were a number of changes emanating from government policy and financial innovation (broadly defined). Exchange controls were abolished in 1979 and the extension of share ownership due to privatisation schemes made more individuals aware of this form of investment. Financial deregulation encouraged increased competition and marketing of unit trusts both domestic and foreign. The personal sector therefore had to gradually learn about these 'new' investment outlets for their savings. We capture these 'supply side' and learning effects by a time trend, TM, beginning in 1981(4).

Short-run Behaviour

To obtain an equation for the demand for capital uncertain assets in the short run we have to consider the impact of revaluations of wealth. In the short run suppose we assume a linear relationship between the change in <u>market value</u> asset Δa^m_{it} holdings and market value wealth ΔW^m_t:

$$\Delta a^m_{it} = \alpha_i + \delta_i \Delta W^m_t \qquad (8)$$

Equation (8) is unduly restrictive because it assumes an equal short-run response to valuation changes and changes in nominal wealth. Releasing these restrictions for asset i:

$$(\Delta a^{n}_{it} + REV_{it}) = \delta_{ii} REV_{it} + \sum_{\substack{j=1 \\ i \neq j}}^{k} \delta_{ij} (REV_{jt}) + \theta_i F^{T}_{t} \quad (9)$$

where

Δa^{n}_{it} = change in nominal holdings of asset i

REV_{it} = revaluations of asset i

F^{T}_{t} = total nominal flow into all capital uncertain assets

$$\Delta a^{m}_{i} = \Delta a^{n}_{it} + REV_{i} \quad (10)$$

$$\Delta W^{m}_{t} = \sum_{i=1}^{k} REV_{it} + \sum_{i=1}^{k} F_{it} = \sum_{i=1}^{k} REV_{it} + F^{T}_{t} \quad (11)$$

$$F^{T}_{t} = \sum_{i}^{k} \Delta a^{n}_{it} \quad (12)$$

Although it is possible to estimate (9) and impose the adding up restrictions across the k-asset equations, this results in collinear variables and a loss of degrees of freedom. Hence we impose the restriction that revaluations for asset i, all accrue to asset i within the quarter:

$$\delta_{ii} = 1, \quad \delta_{ij} = 0 \quad i \neq j \quad (13)$$

We turn now to the short-run price variables. In the short run we assume some agents to undertake speculative transactions in capital uncertain assets (or a proportion of the portfolio is used for speculation).

Short-term speculators (eg securities dealers) are assumed to alter asset demands in response to one period expected returns (including capital gains), rs_{it}, between t and t+1. Hence the short-run 'flow demand' for capital uncertain asset i, (scaled by W^{m}_{t-1}) is

$$(\Delta a^{n}_{it} / W^{m}_{t-1}) = h_i + \sum_{j} c_{ij} \ln (ps)^{r}_{jt} + \theta_i (F^{T}_{i} / W^{m}_{t-1}) \quad (14)$$

where the short-run 'real price' is defined as

$$\ln (ps)^{r}_{jt} = \ln (ps)_{jt} - g^{s}_{z} \quad (15)$$

$$(ps)_{jt} = (1 + rs_{jt})^{-1} \quad (16)$$

$g^{s}_{z} = \ln (Z_{t+1}/Z_{t})$ = one quarter ahead inflation rate of goods prices

rs_{jt} = quarterly running yield plus one quarter ahead expected capital gains.

The link between long-run and short-run behaviour is then provided by the following error-feedback equation EFE:

$$(\Delta a^{n}_{it}/W^{m}_{t-1}) = h_{i} + \sum_{j} c_{ij} \ln(ps)^{r}_{jt} + \theta_{i}(F^{T}_{it}/W^{m}_{t-1}) + \sum_{j} l_{ij}(s_{j} - s^{*}_{j})_{t-1} \quad (17)$$

where (k-1) asset disequilibria are included in (17).

Data

The asset price indices used are the FT investment trust index, the FT Actuaries all share index (for CS), the FT Actuaries 'all stocks' index for British Government Securities (post-1969) and the price of 2 1/2 percent consols (pre-1969), for PSL. For overseas securities the return is based on the US all-share price index and the change in the £/$ exchange rate. The running yield on each asset is added to the capital gain/loss. The transactions variable used is total real consumers' expenditure.

The estimation period is 1968(3)-1986(4) using 3SLS in the second stage regressions.

Order of Integration of the Variables

It can be seen from table (5) that the market value asset shares, s_i, real market value wealth RW, inflation g_z, expenditure, y, and long-run nominal prices $\ln(p_{it})$ are all I(1) variables. The one step ahead ex-post short-run real prices $\ln(ps)_{it}$ are I(0) as are the nominal asset flows $(\Delta a^{n}_{it}/W^{m}_{t-1})$ and the total nominal flow $F^{T}_{t}|W^{m}_{t-1}$. It is possible for the variables in the long-run share equation (7) to form a co-integrating vector. Using data up to 1981(4) these variables form a co-integrating set with correctly signed 'own prices' and reasonable coefficients on real wealth, real expenditure and inflation. However, when the data period is extended to 1986(4), the equation for unit trusts is not co-integrated and the own price effect is incorrectly signed in the equation for PSL. Introducting a time trend beginning in 1981(4) to capture 'learning' and supply side effects yields a co-integrating vector of variables.

Model I: Long Run Symmetry Not Imposed

The preferred long-run co-integrating regressions when symmetry of the long-run price matrix (γ_{ij}) is not imposed are given in table 6. The Dickey-Fuller (DF) test indicates stationarity in the residuals of all the share equations.

All the long-run own prices have the correct sign. The expenditure variable is quantitatively small in the CS and PSL equations and is therefore excluded. At higher levels of expenditure there is a switch out of overseas securities and into unit trusts. Higher inflation induces a switch out of public sector debt (PSL) and into company securities (CS). This could represent a breakdown of the homogeneity restriction ($\Sigma\ \gamma_{ij} = 0$) but is more likely to represent a switch into financial assets which are backed by real assets (ie CS) when inflation is highly variable.

The time trend indicates that post-1981 the main switch is out of company securities and into unit trusts (although there are small switches into public sector debt and overseas securities). This does not appear to be totally implausible given our extraneous information on supply side changes and the abolition of exchange control, although clearly we are not really 'explaining' these effects.

After some simplification the preferred EFE (which does not incorporate long-run or short-run symmetry of 'price' effects) is shown in table 7. The one step ahead expected capital gain on unit trusts does not influence any asset flow and the flow into unit trusts is unaffected by any short-term capital gains terms. Unit trusts do not appear to be a vehicle for short-term speculation: speculation takes place in company securities, public sector debt and overseas securities. Given that transactions and penalty costs of switching UT is relatively high, this is an acceptable result. The expected return on overseas securities is positive in the unconstrained regression but is constrained to be 2 standard deviations below this in table 7. The cross price effects in the company securities and public sector debt equations are statistically significant (although short run symmetry does not hold) but those in the overseas securities equation are statistically insignificant.

The θ_i coefficients indicate that a very high proportion of new net inflows accrue to public sector debt (0.78). With OLS estimation this is reduced to 0.6, with 0.3 being held in company securities. There have been net outflows from CS over most of the estimation period, particularly post-1978 and therefore the figure of 0.78 may not be too unreasonable.

The error feedback terms (l_{ij} matrix) are not well determined but the 'own disequilibria' for unit trusts, company securities and public sector debt are all negative. The l_{ij} matrix has all eigenvalues less than unity and therefore the system is stable.

Model II: Long Run Symmetry Imposed (Table 8)

When symmetry is imposed on the long run γ_{ij} matrix in the co-integrating regressions incorporating real wealth, real expenditure, inflation and a time trend post 1981, the residuals are stationary (all Dickey-Fuller test statistics are negative and $|t|>5$, with critical value 4.0). However, the own price effect for public sector debt is positive. Constraining the latter to equal -0.33 (somewhat smaller than its value in the non-symmetry co-integrating regressions) produces a Dickey-Fuller statistic DF = -2.5 and ADF = -2.8 for this equation. However the correlogram dies away quite quickly and we assume this is indicative of stationary residuals for PSL equation.

All assets are long-run substitutes except for the response of company securities to a change in the return on overseas assets which indicates 'weak' short-run complementarity.

Short-run EFE (Table 9)

With long-run symmetry imposed via the error correction terms, the IV estimates of the preferred short-run EFE (Table 9) are similar to those of Model I (ie where long-run symmetry is not imposed). The 'own price', capital gains terms for company securities and public sector debt are correctly signed and statistically well determined, as are the cross price effects in these two equations.

Economic Interpretation of Results

In table 10 we present a summary of the main economic implications of the model. The long-run wealth elasticities vary between 0.6 and 1.2. The wealth series includes revaluations and this accounts for the relatively high coefficient of 1.2 on company securities: it reflects the effect of positive revaluations (particularly the 1980 to 1986 period) on the value the stock of assets held in company securities (which are 60 percent of the total in 1986). In future work it may be worthwhile trying to split this effect between cumulative nominal flows and cumulative revaluations. The potential importance of the latter distinction is reflected in the size of the short-run allocation of net inflows (F^T). Here 0.73 of the net inflow of wealth (ie excluding revaluations) accrues to public sector debt and only 0.05 to company securities.

The expenditure elasticities of +0.8 for unit trusts and -1.4 for overseas securities appear plausible as do the inflation elasticities which indicate a switch into company securities and out of public sector debt. The own yield elasticities indicate that unit trusts and overseas securities are more responsive to a change in long-run capital gains than are company securities and public sector debt. The high elasticities for UT and OS account, in part, for the rapid rise in the share of these assets in the 1980s.

The response of CS, PSL and OS to one period ahead expected capital gains is quantitatively important. Taking a one standard deviation change in the expected gain, the effect on the net inflow (Δa_1^n) is about 0.25-0.5 of the mean absolute flows ($/\Delta a_1^n/$) into these assets. Thus the generally highly volatile short-run movements between capital uncertain assets appears to be explained in large part by speculative behaviour. Furthermore, in general, the off-diagonal elements of the short-run c_{ij} price matrix are smaller in absolute value than the 'own rate effects', and in the main imply substitutability (particularly between PSL and CS). These results are intuitively plausible.

Summary: Capital Uncertain Assets

It is well known that empirical modelling of capital uncertain assets is an extremely difficult task. Although the models discussed here are preliminary and are the result of a 'global search', most of which is not reported here, nevertheless, they provide some interesting economic and statistical results. In particular in the short run it is important to separate wealth arising from capital gains and that arising from new net inflows into this set of assets. In addition agents may be viewed as having a long-run hedging demand which is responsive to changes in long run (ie 3 year) expected returns while an element of the portfolio is used for short-term speculation.

IV CONCLUSIONS

We shall be brief and confine our remarks mainly to the methodology employed. The 'general to specific' methodology advocated by Hendry (1979, 1983) has powerful arguments in its favour if one is to avoid specification errors due to mis-specified dynamics. However, in the context of a systems approach where the economic restrictions apply to the long-run parameters, 'testing down' is extremely difficult (because of the large number of 'simplification paths') and the final parsimonious equation may be undesirable on economic grounds (eg coefficients that are 'implausible' with respect to size or sign) or on statistical grounds (eg the variables may not form a co-integrating vector (see Hall et al 1988, Hall 1986)).

The Granger-Engle two-step approach allows one to establish a co-integrating vector with plausible long-run parameters at 'stage one'. The specification search over the short-run dynamic coefficients in 'stage two' does not alter these long-run equilibrium parameters. Hence considerable simplification is achieved throughout the search procedure, which is of great importance in a system of equations with many parameters. The approach is flexible in that one can easily make marginal adjustments to the long-run or short-run parameters around the basic parsimonious model. Although not without its difficulties, the method appears to be more flexible than either a straightforward 'general to specific' approach or in using the Bewley (1979) transform to establish the long-run directly.

We have applied the Granger-Engle two-step procedure to systems of share equations for personal sector liquid and capital uncertain assets and to holdings of liabilities, assuming weak separability. We found the method to be useful in establishing plausible equations which conform to theoretical priors and which capture the main features of the data. The applied economist faced with modelling an ever changing environment must strike a balance between theoretical rigour and explaining the data set. To veer too sharply in either direction is likely to produce either implausible theory models (see for example Courakis 1988) or uninterpretable statistical descriptions of the data (see Cuthbertson and Taylor 1988). We hope we have acted judiciously in this respect when modelling the asset choices of the personal sector.

Table 1

LIQUID ASSETS: ORDER OF INTEGRATION OF VARIABLES[1]

	I(0) DF	I(0) ADF	I(1) DF	I(1) ADF
S_1 (NC)	0.5	-0.8	-5.5	-2.8
S_2 (SD)	-0.8	-1.2	-5.2	-1.5
S_3 (TD)	+0.1	-0.4	-3.5	-1.9
S_4 (BS)	-0.3	+0.2	-4.0	-1.9
S_5 (NS)	-2.0	-0.4	-5.4	-4.0
g_z	-3.0	-2.2	-10.8	-4.7
$\ln p_3$	-2.0	-2.2	-7.2	-4.1
$\ln p_4$	-1.7	-1.7	-6.8	-4.6
$\ln p_5$	-1.4	-1.6	-9.5	-4.1
RW	+3.0	+1.3	-6.8	-2.0
y[2]	-1.6	+0.4	-7.6	-1.7

(1) The critical values for the DF and ADF statistics for stationary variables are about 2.8. A negative test statistic with absolute greater than 2.8 indicates a stationary series.

(2) y is real aggregate consumption, the 'transactions variable'.

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Table 2

LIQUID ASSETS: LONG-RUN CO-INTEGRATION REGRESSIONS(1)(2)

'Price' Matrix (A)

Share:		NIB[3] NC + SD	TD	BS	NS
1	NC	-0.6	0.4	0.2	0.0
2	SD	-1.8	1.0	0.8	0.0
3	TD	1.4	-2.5	0.8	0.3
4	BS	1.0	0.8	-2.2	0.4
5	NS	0.0	0.3	0.4	-0.7

Share:		Wealth	Expenditure	Trend(*100)		DF[4]	a[4]	ADF[4]
1	NC	-0.2	0.14	0.1	-0.4	-2.8	-0.4	-2.5
2	SD	-0.4	0.29	0.7	-0.5	-3.3	-0.7	-3.7
3	TD	0.2	-0.37	-0.6	-0.3	-2.2	-0.3	-1.9
4	BS	0.3	-0.01	-0.1	-0.3	-2.5	-0.3	-2.3
5	NS	0.1	-0.05	-0.1	-0.5	-3.4	-0.7	-4.2

---

(1) The t statistics from this regression are invalid and are not reported.

(2) Adding up, symmetry and homogeneity constraints are imposed in both the long and short run equations.

(3) NC, SD both have a real rate equal to minus the rate of inflation. Consequently, the separate effects of inflation on the NC and SD rates cannot be identified. However, the sum of those effects can be estimated and is reported in the non-interest bearing, 'NIB' column. The symmetry constraint is imposed on the lower 3x3 (a_{ij}) elements for TD, BS, NS, and on the appropriate row and column sums for NC and SD.

(4) DF is the Dickey-Fuller test and, ADF the augmented Dickey Fuller test for stationarity in the residuals. The critical values at 5 per cent significance level are about -4. 'a' is the coefficient in the equation $\Delta e_t = a e_{t-1} + \Sigma_i (b_i e_{t-i})$

where e_t are the residuals from the long-run share equations.

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Table 3

LIQUID ASSETS: SHORT-RUN EFE COEFFICIENTS[1]

'Price' Matrix (C)

	(NIB) NC + SD	TD	BS	NS[2]
NC	-0.5 (1.3)	0.0	0.5 (1.5)	0.0
SD	-0.5 (1.8)	0.5 (1.8)	0.0	0.0
TD	0.5 (1.2)	-0.7 (1.2)	0.2 (0.4)	0.0
BS	0.5 (1.5)	0.2 (0.4)	-0.7 (1.5)	0.0
NS[2]	0.0	0.0	0.0	0.0

	B Wealth	F_1 Expenditure	F_2 Trend (*100)
NC	-0.1 (1.0)	0.1 (0.7)	-0.1 (0.2)
SD	-0.2 (2.0)	0.2 (2.2)	0.5 (3.6)
TD	0.0 (0.002)	-0.1 (1.0)	-0.5 (2.7)
BS	0.2 (2.1)	-0.1 (1.0)	0.2 (1.3)
NS	0.1 (2.4)	-0.1 (1.6)	-0.1 (1.6)

(1) Asymptotic t-statistics in parentheses.
(2) Column and row coefficients constrained to zero.

Table 3

LIQUID ASSETS (contd.)

ADJUSTMENT MATRIX L

Coefficients on lagged disequilibrium terms(1)

	(1) NC	(2) SD	(3) TD	(4) BS	(5) NS
NC	-	0.1 (0.5)	0.1 (1.1)	0.2 (1.7)	0.3 (0.6)
SD	-	-0.4 (2.6)	0.0	0.0	0.0
TD	-	0.3 (1.1)	-0.1 (1.3)	0.0	0.3 (0.7)
BS	-	0.0	0.0	-0.2 (1.7)	0.0
NS	-	0.0	0.0 (0.8)	0.0	-0.6 (3.7)

Goodness of fit: Error Feedback Equations

Equation	R^2
1 NC	0.3
2 SD	0.6
3 TD	0.5
4 BS	0.4
5 NS	0.3

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Table 4A

LIABILITIES: CO-INTEGRATION REGRESSIONS[1]

'PRICE' MATRIX (A)

	Rate on			
Shares:	FC	BL	M	RC
1 FC	0.002	-0.002	0*	0*
2 BL	-0.002	0.071	-0.002	-0.067
3 M	0*	-0.002	0.014	-0.012
4 RC	0*	-0.067	-0.012	0.079

	K (Real Wealth RW)	J1 (Expenditure)	J2 (loan-value ratio)	J3 (trend)
1 FC	0.014	-0.002	0.0	-0.0
2 BL	-0.001	-0.02	-0.0	0.003
3 M	-0.006	0.017	0.001	-0.003
4 RC	-0.007	0.005	-0.001	-0.0

	a[2]	DF[2]
1 FC	-0.3	-2.2
2 BL	-0.4	-3.2
3 M	-0.3	-3.1
4 RC	-0.7	-4.6

(1) A "*" indicates coefficient values imposed

(2) The Dickey Fuller test (DF) on the residuals of the cointegrating regression et utilises, $\Delta et = aet-1 + vt$ and "DF" is the t statistic on a.

1533L

Table 4B

LIABILITIES: SHORT-RUN EFE COEFFICIENTS[1]

MATRIX C (Prices)

	FC	BL	M	RC
FC	0.005 (1.7)	-0.005 (1.7)	0*	0*
BL	-0.005 (1.7)	0.012 (0.1)	-0.006 (0.2)	-0.001 (0.01)
M	0*	-0.006 (0.2)	0.006 (0.2)	0*
RC	0*	-0.001 (0.01)	0*	0.001 (0.01)

OTHER VARIABLES

	B (Real wealth)	F1 (exp)	F2(2) (loan to value)		F3 (trend)
FC	0.006 (1.1)	-0.0 (0.3)	0.0001: (0.5)	0.0004 :(1.5)	0.0 (0.03)
BL	-0.003 (0.2)	-0.002 (0.5)	-0.0003: (0.7)	0.000 :(0.1)	0.003 (6.3)
M	-0.003 (0.2)	0.002 (0.5)	0.0006: (1.6)	-0.000 :(0.1)	-0.003 (5.5)
RC	-0.0 (0.1)	0.0 (0.1)	-0.0004: (3.5)	-0.0004 :(1.5)	-0.0 (1.4)

(1) A "*" indicates an imposed coefficient, t-statistics are in parentheses.

(2) Coefficients on the loan-to-value ratio in the first column are for the rationing period, and in the second column are for the non-rationing period.

Table 4B (contd.)

LIABILITIES

ADJUSTMENT MATRIX L

Coefficients on lagged disequilibrium terms.

	FC	BL	M	RC
1 FC	-	0.23 (1.8)	0.21 (1.8)	0.23 (1.0)
2 BL	-	0.18 (0.6)	0.26 (1.0)	0
3 M	-	-0.32 (1.0)	-0.44 (1.6)	0.28 (0.9)
4 RC	-	-0.09 (0.9)	-0.03 (0.3)	-0.51 (2.7)

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Table 5

CAPITAL UNCERTAIN ASSETS: ORDER OF INTEGRATION OF VARIABLES(1)

	I(0)	I(1)
	DF	DF
$\ln(p_1)$	-2.6	- 9.1
$\ln(p_2)$	-2.4	- 7.6
$\ln(p_3)$	-2.1	-11.1
$\ln(p_4)$	-1.5	- 5.3
s1	-	- 6.7
s2	-	- 8.2
s3	-	- 7.9
s4	-	- 8.3
q_z	-2.9	- 4.2
RW	2.1	- 6.4
y(2)	0.3	-13.5
FT/W_{-1}	-7.6	-
$\ln(ps)_1$	-7.9	-
$\ln(ps)_2$	-6.8	-
$\ln(ps)_3$	-9.4	-
$\ln(ps)_4$	-6.2	-
a_1/W_{-1}	-	- 2.5
a_2/W_{-1}	-	- 6.8
a_3/W_{-1}	-	- 9.2
a_4/W_{-1}	-	- 6.5

(1) For the Dickey-Fuller test the critical value at 5 percent significance level is around 2.8. The ADF statistic gave similar qualitative results and is not reported.

(2) y is aggregate consumers' expenditure.

Table 6

CAPITAL UNCERTAIN ASSETS CO-INTEGRATING REGRESSIONS: SYMMETRY NOT IMPOSED (1)

		γ_{ij} (nominal prices)				β_i (wealth)	y (expenditure)	q_z (inflation)	TM x 10^2	DF (2)
		1	2	3	4					
1	UT	-0.11	+0.05	-0.01	+0.06	-0.01	0.05	0*	+0.3	-5.2
2	CS	+0.57	-0.46	+0.13	+0.18	+0.10	0*	+1.76	-0.5	-5.2
3	PSL	-0.82	+0.58	-0.53	-0.03	-0.10	0*	-1.76	0.1	-5.6
4	OS	0.36	-0.17	+0.41	-0.21	0.01	-0.05	0*	0.1	-5.5

(1) A star '*' indicates an imposed coefficient.
(2) Critical value for DF at 5 percent significance level is about -4.0.

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Table 7
CAPITAL UNCERTAIN ASSETS SHORT-RUN EFE: (LONG-RUN SYMMETRY NOT IMPOSED) (1)

	Cij (short-run prices) 1	2	3	4	Θ_i (nominal wealth)
1 UT	0*	0*	0*	0*	+0.07 (0.3)
2 CS	0*	-0.021 (2.2)	+0.047 (3.8)	+0.041 (3.9)	+0.04 (0.2)
3 PSL	0*	+0.017 (1.8)	-0.054 (4.4)	-0.036 (3.4)	+0.78 (5.2)
4 OS	0*	+0.004 (0.6)	+0.007 (0.9)	-0.005*	+0.11 (1.1)

	Lij (adjustment) 1	2	3	h_i (constant)	R^2 (2)	LB(8) (3)
1 UT	-0.06 (0.4)	+0.01 (0.8)	+0.03 (0.3)	0.001 (1.0)	0.25	52.0
2 CS	-0.06 (0.4)	-0.02 (0.4)	0*	-0.007 (7.4)	0.30	12.4
3 PSL	0*	-0.14 (1.2)	-0.16 (1.5)	+0.006 (6.1)	0.62	11.0
4 OS	0*	0.15 (2.5)	0.13 (2.3)	-0.000 (0.3)	0.10	7.4

---

(1) A star '*' indicates an imposed coefficient.
(2) Explained sum of squares over total sum of squares.
(3) LB(8) = Ljung-Box statistic for residual serial correlation (critical value at 5 percent significance level is 15.5).

Table 8
CAPITAL UNCERTAIN ASSETS CO-INTEGRATING REGRESSIONS SYMMETRY IMPOSED(1)

	C_{ij} (prices) 1	2	3	4	β_i (wealth)	y (expenditure)	q_z (inflation)	TM x 10^2	DF(2)	ADF(2)
1 UT	-1.38	+0.75	+0.29	+0.34	-0.02 (2.0)	0.089 (4.5)	-	0.18	-4.7	-3.5
2 CS		-0.67	-	-0.08	+0.10 (1.6)		+1.7 (6.0)	-0.60	-4.5	-3.2
3 PSL			-0.33*	+0.04	-0.10 (8.5)		-1.7 (3.2)	0.30	-2.5	-2.8
4 OS				-0.30	+0.02 (3.5)	-0.089 (4.5)		0.12	-4.8	-3.2

(1) TM = post-1981(4) time trend. A star '*' indicates an imposed coefficient.
(2) Critical value at 5 percent significance level for the DF and ADF statistics is about -4.0.

Table 9
CAPITAL UNCERTAIN ASSETS SHORT RUN EFE: (LONG-RUN SYMMETRY IMPOSED) (1)

		C_{ij} (prices) 1	2	3	4	θ_i (wealth)
1	UT	0*	0*	0*	0*	0.07 (0.3)
2	CS	0*	-0.028 (2.7)	+0.037 (2.6)	+0.05 (3.7)	0.05 (0.3)
3	PSL	0*	+0.026 (2.7)	-0.054 (3.8)	-0.04 (2.9)	0.73 (5.4)
4	OS	0*	+0.002 (0.0)	+0.017 (1.8)	-0.01*	0.15 (2.1)

		L_{ij} (adjustment) 1	2	3	h_i (constant)
1	UT	-0.05 (0.5)	-0.04 (0.3)	-0.03 (0.3)	+0.001 (1.1)
2	CS	-0.07 (0.9)	-0.00 (0.0)	-0.06 (0.8)	-0.007 (8.1)
3	PSL	0*	-0.09 (1.3)	-0.05 (1.5)	+0.006 (6.3)
4	OS	+0.12 (2.4)	+0.13 (2.3)	+0.14 (3.3)	+0.000 (0.0)

(R^2) (2)	LB(8) (3)
0.23	45.0
0.30	16.7
0.61	17.7
0.16	3.0

(1) A star "*" indicates an imposed coefficient.
(2) Explained sum of squares over total sum of squares.
(3) Ljung-Box statistic for residual serial correlation. Critical value at 5 percent significant level is 15.5.

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Table 10
CAPITAL UNCERTAIN ASSETS ECONOMIC PROPERTIES (LONG-RUN SYMMETRY IMPOSED)

1 Long-run elasticities

	Wealth	Expenditure	Own "yield"(1)	Inflation
1 UT	0.8	+0.8	2.5	-
2 CS	1.2	-	0.2	+0.6
3 PSL	0.6	-	0.3	-1.7
4 OS	1.0	-1.4	1.2	-

2 Short-run effect on asset flows

	Net inflow (F^T)	$\|\Delta a_i^n\|$ (2)	$\|\Delta a_i^n\|$
1 UT	0.06	-	
2 CS	0.05	260	1,000
3 PSL	0.73	325	1,000
4 OS	0.15	70	400

(1) These are semi-elasticities with respect to the expected yield, r_{it} rather than the expected AIDS prices $\ln p_{it}$.
(2) The effect on Δa_i^n is calculated for a unit standard deviation change in the short-run capital gain and may be compared with the final column which indicates the mean absolute value of changes in the flow.

APPENDIX: SIMULATIONS

1 Liquid Assets

The model was simulated by fixing all of the exogenous variables at their 1986 Q4 values and allowing the system to run to convergence. The resulting profiles formed the base runs. The effects of changes in the Building Society deposit rate and in wealth were then simulated by raising the former by 1/2% and the latter by £1 bn (about 1/2%) in 1988 Q1.

Base Run

Only two of the assets (notes and coin and National Savings) failed to adjust monotonically in the base run. The behaviour of NC may reflect its role as a transactions variable facilitating movements between other assets. National Savings depends only on its own lagged disequilibrium and so would normally be expected to adjust monotonically. However, since the disequilibrium terms sum to zero for the system as a whole, the behaviour of the NC disequilibrium must have some influence on that for NS. Thus unless the cycle in NC is offset by movements in the other three disequilibria it must lead to an equivalent cyclical pattern in NS. Hence correcting the NC cycle would probably remove the cycle in NS.

Sight deposits adjust more quickly than the other assets with about half of the deviation from target eradicated in two quarters. Of the monotonic adjusters, TD is the slowest, covering about a third of its disequilibrium in the first year.

Building Society Rates +1/2%

The simulation results are seen most easily in charts 6 and 7. Notes and coin fall immediately by around £150 m and decline further over the subsequent year by £25 m. From that point they recover to show a net reduction of about £90 m. National Savings increase on impact because the only effect here is due to the increased level of wealth associated with a rise in the BS deposit rate. Subsequently this increase is quickly offset and within a year the new equilibrium effect is reached at around minus £90 m. Sight deposits move quite slowly initially but reach their long-run decline of £250 m within two years. Time deposits fall by around £50 m on impact and by £100 m in the long run. However, the adjustment is non-monotonic and time deposit increase temporarily after the initial fall. Finally, building society deposits adjust smoothly throughout from an increase on impact of £2200 m to a rise of £600 m in the long run.

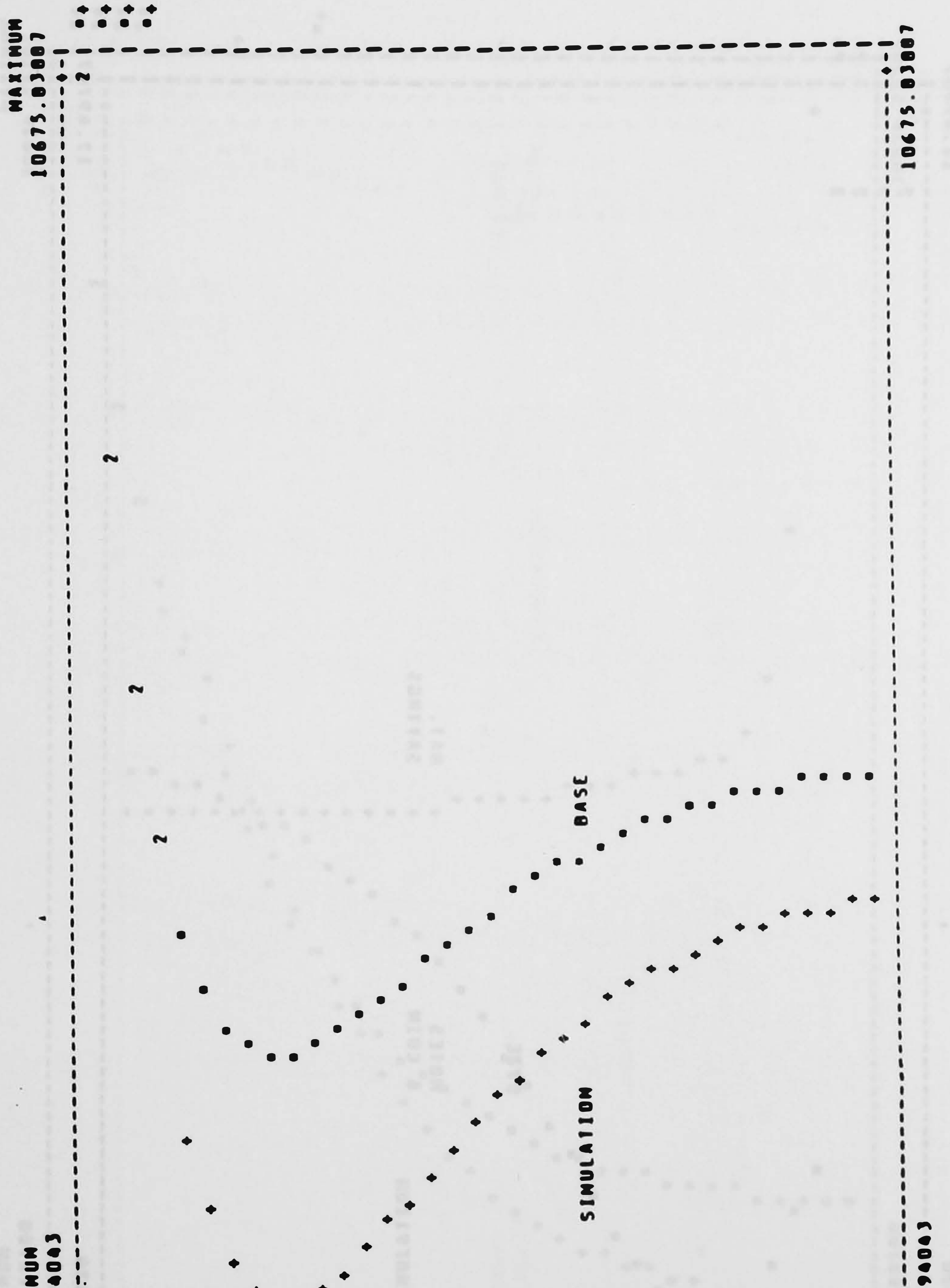
Total Liquid Assets +£1 bn

The behaviour of three of the assets, time deposits, building society deposits and National Savings is reasonably straightforward. BS deposits absorb about 0.8 bn initially and this increases to 0.9 bn in the long run. Time deposits receive about 0.1 bn initially, rising to 0.2 bn and National Savings receive 0.16 an impact with no subsequent change. Notes and coin and sight deposits however fall in both the short and long runs. This is due to their large negative coefficients in the J_i1 and F_i1 vectors. It is likely that these coefficients are picking up the trend decline in these assets and relating it to the trend growth in liquid wealth. However, the fall in the shares may be due to other trended factors that are not included in the equations. Consequently these coefficients probably overstate the negative effect of wealth.

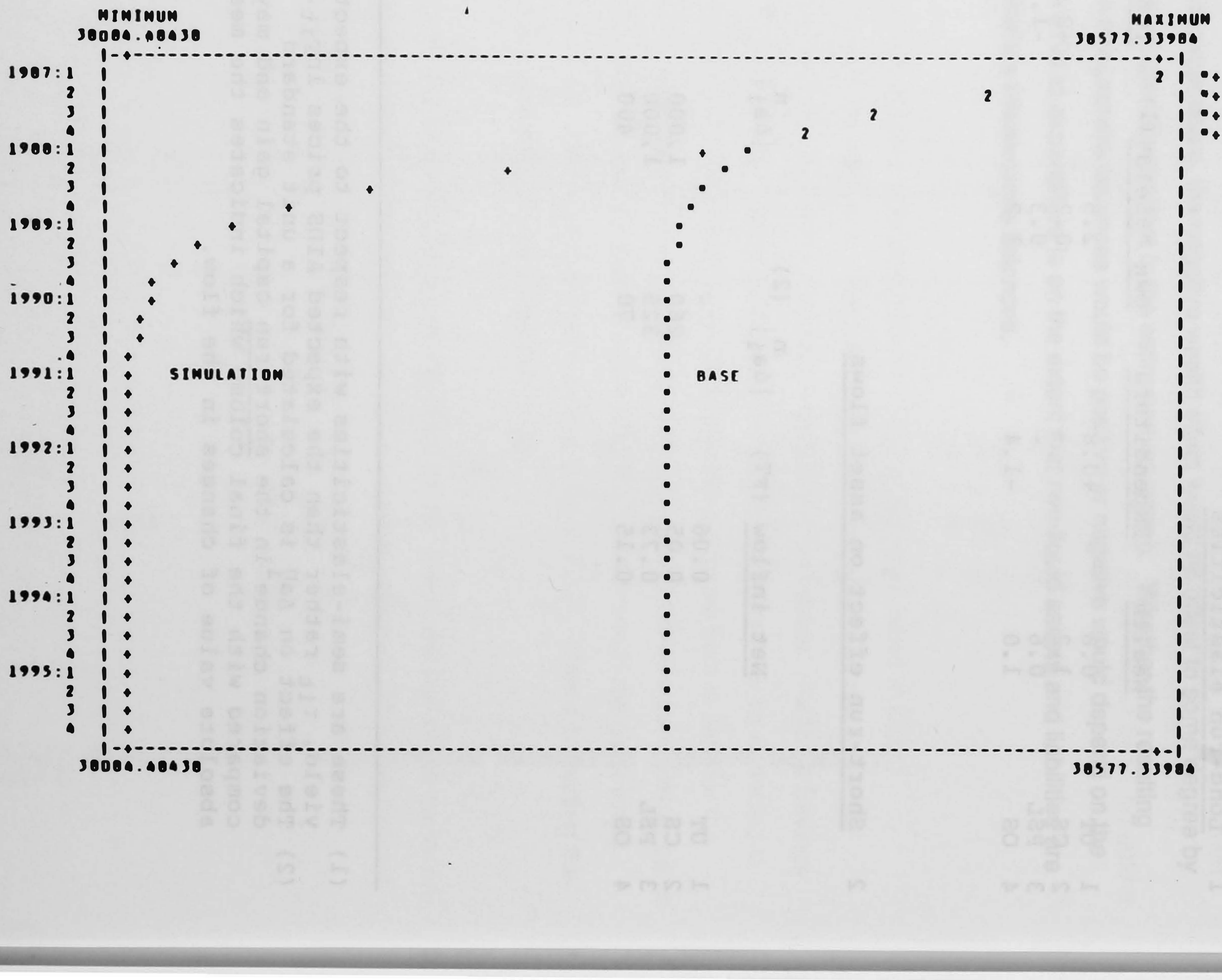
It may be possible to rationalise the empirical results for the wealth effect by considering the circumstances in which liquid wealth might increase. For example, consider an 'exogenous' change in preferences leading to an increased demand for BS deposits and assume that the cause of this change is not captured in the estimated model. One consequence of this could be a shift from a non-liquid asset, in which case W would increase. It is also reasonable to expect some degree of substitution away from some of the assets within W and this could give rise to the decline in NC and SD. This is simply an omitted variable problem ie W is responding to the missing variable and acting partly as a proxy for its substitution effect on the transactions assets.

If the cause of the increase in W is an increased demand for transactions balances due to a rise in expenditure, the negative wealth effect would be offset to some degree by the positive expenditure effect in the estimated equations. Whether the resulting change in transactions balances would be positive or negative would depend on the response of W to expenditure ie on the extent that non-liquid assets and liabilities are used to finance transactions balances.

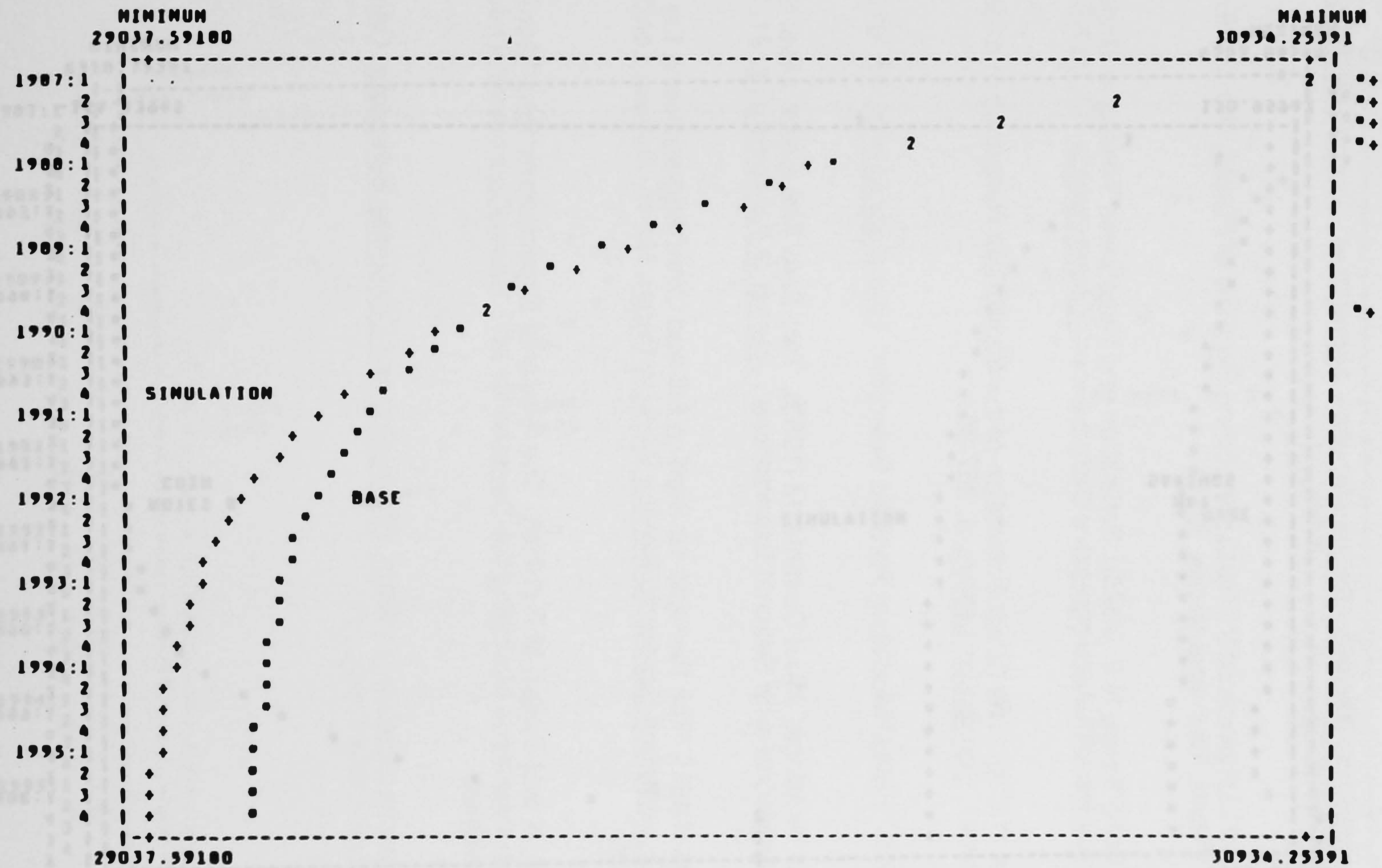
B.S. RATE +1/2 % : NOTES & COIN



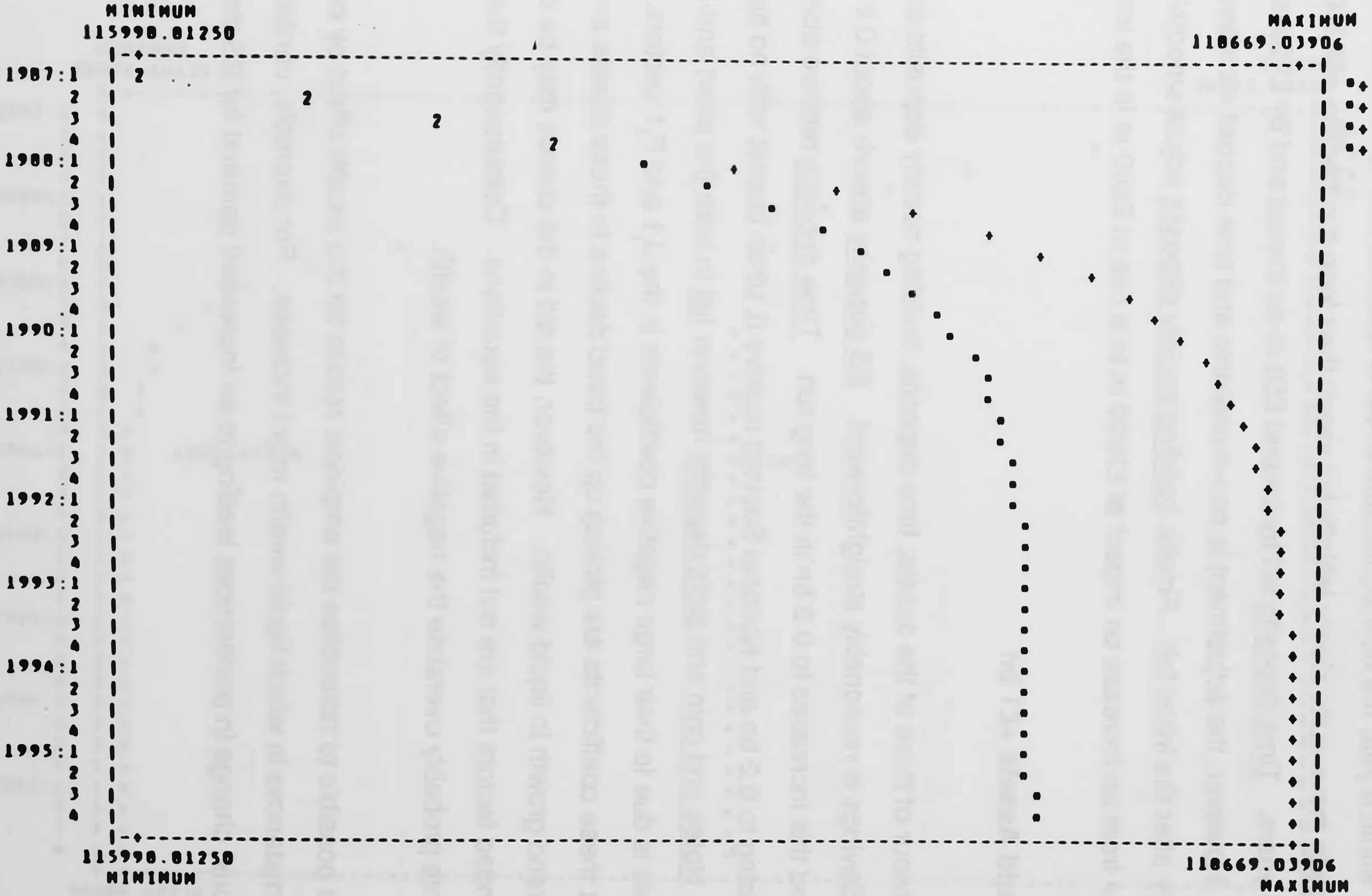
BS. RATE +1/2 % : SIGHT DEPOSITS

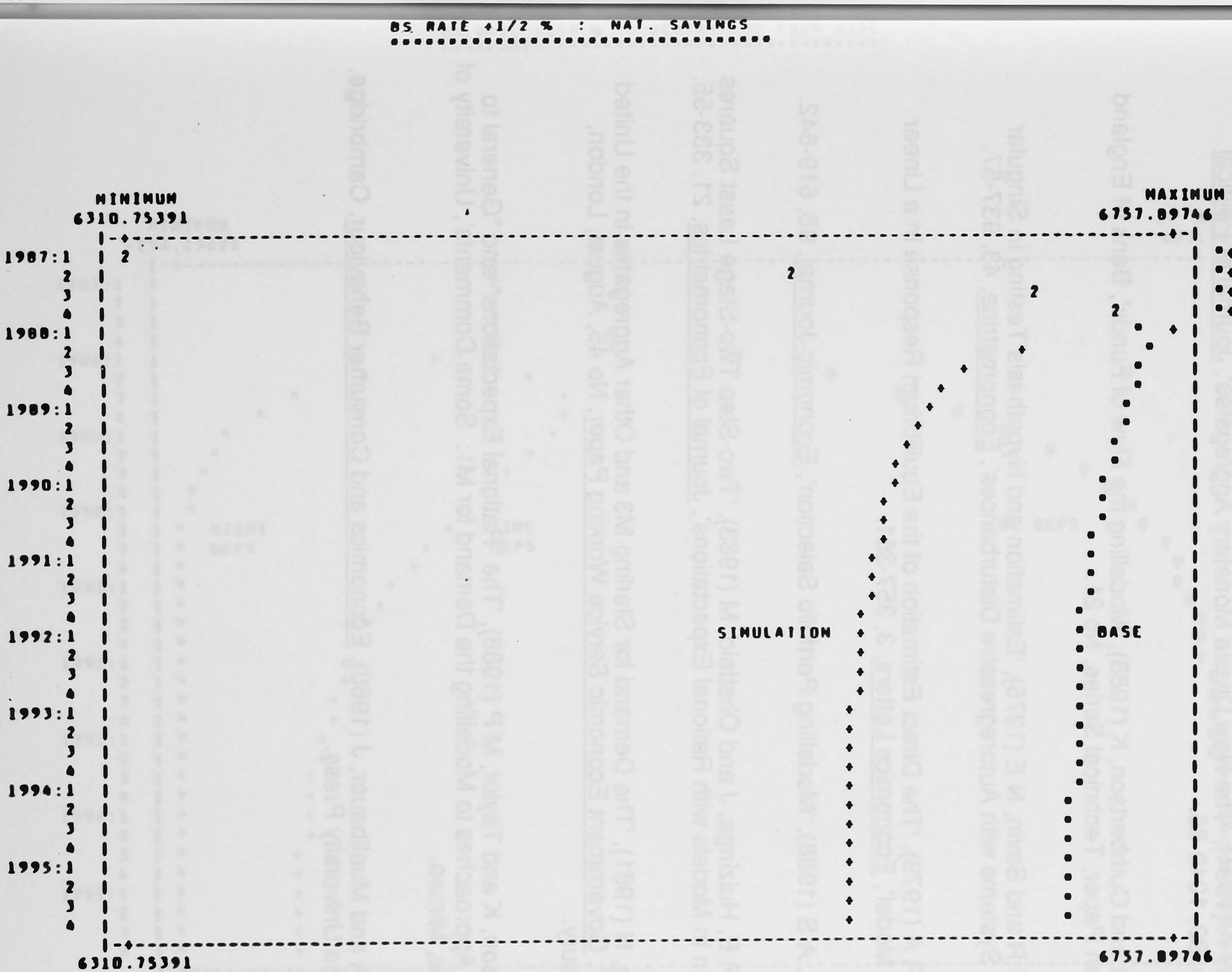


BS. RATE +1/2 % : TIME DEPOSITS

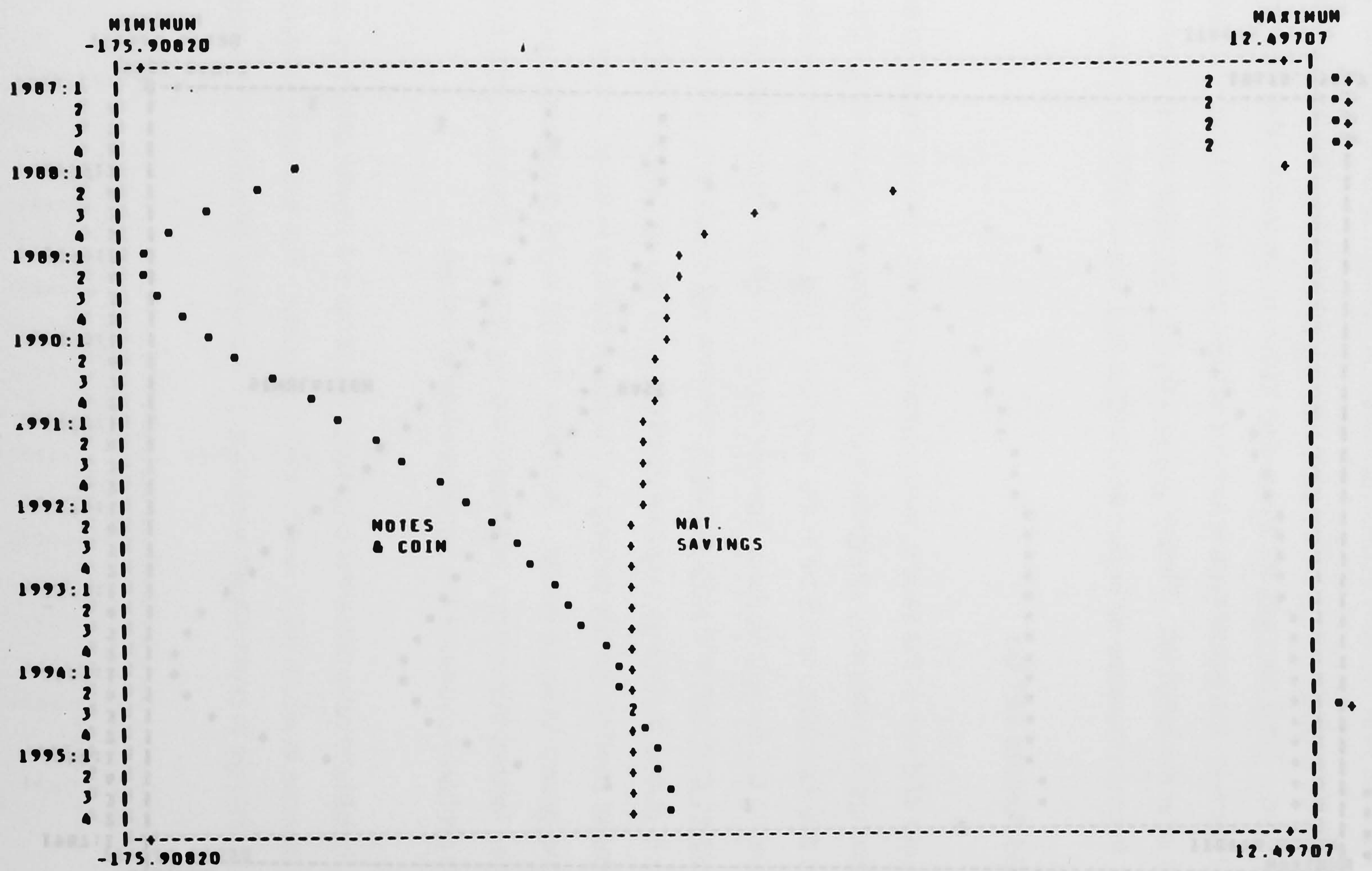


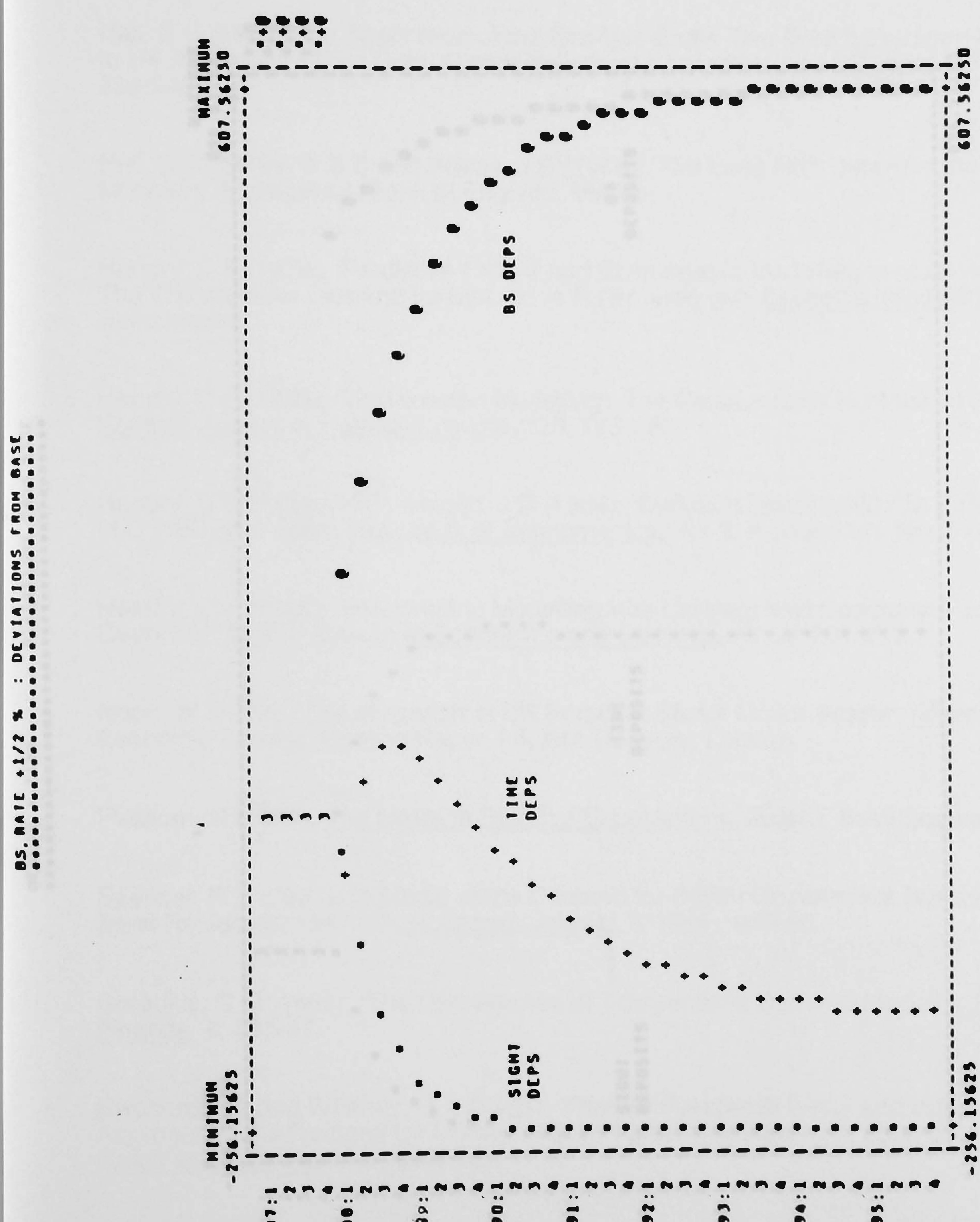
BS RATE +1/2 % : BS DEPOSITS



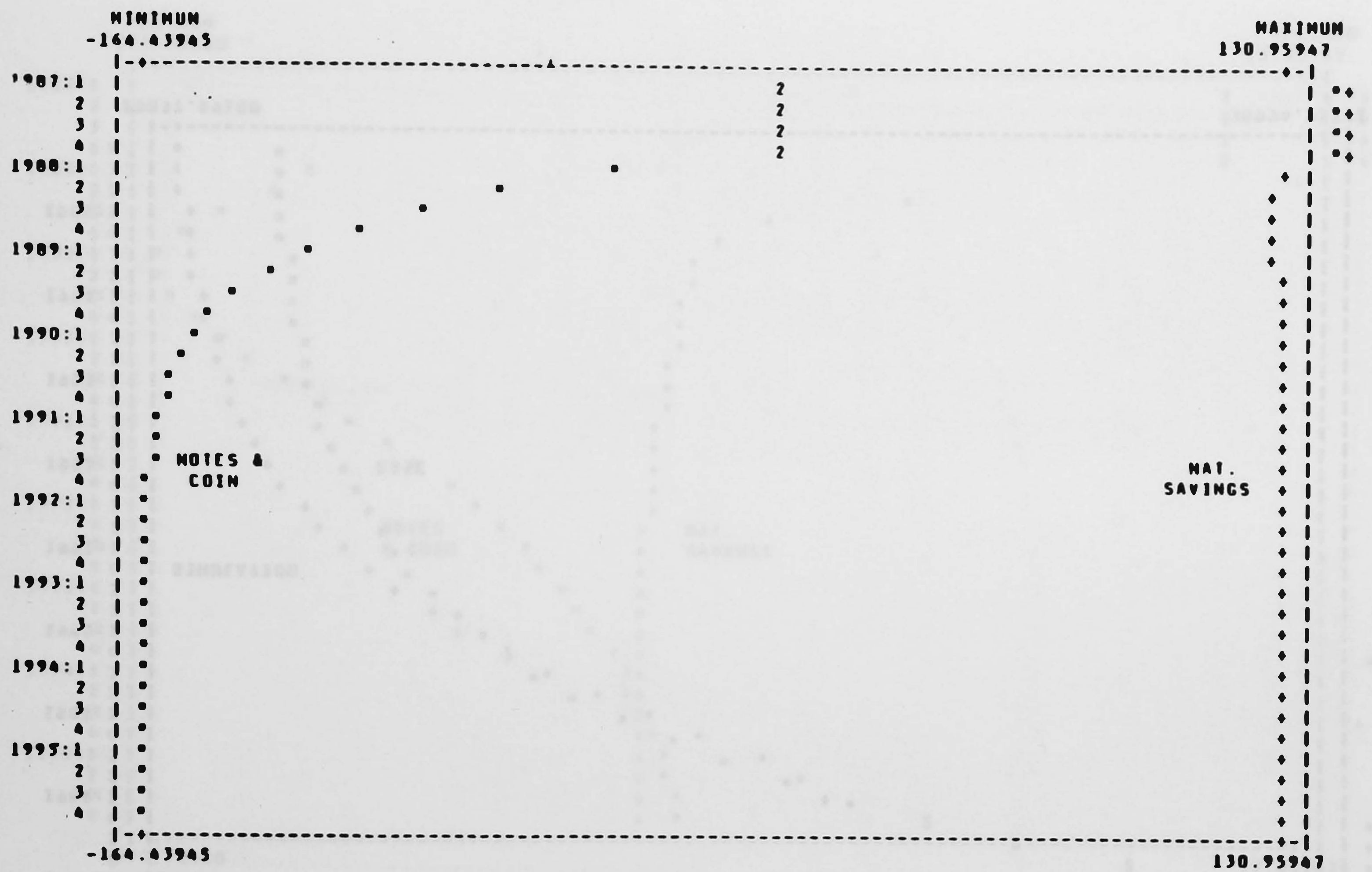

BS RATE +1/2 % : NAT. SAVINGS
MINIMUM
6310.75391
MAXIMUM
6757.89746
SIMULATION
BASE
1987:1
1988:1
1989:1
1990:1
1991:1
1992:1
1993:1
1994:1
1995:1
6310.75391
6757.89746

BS. RATE +1/2 % : DEVIATIONS FROM BASE

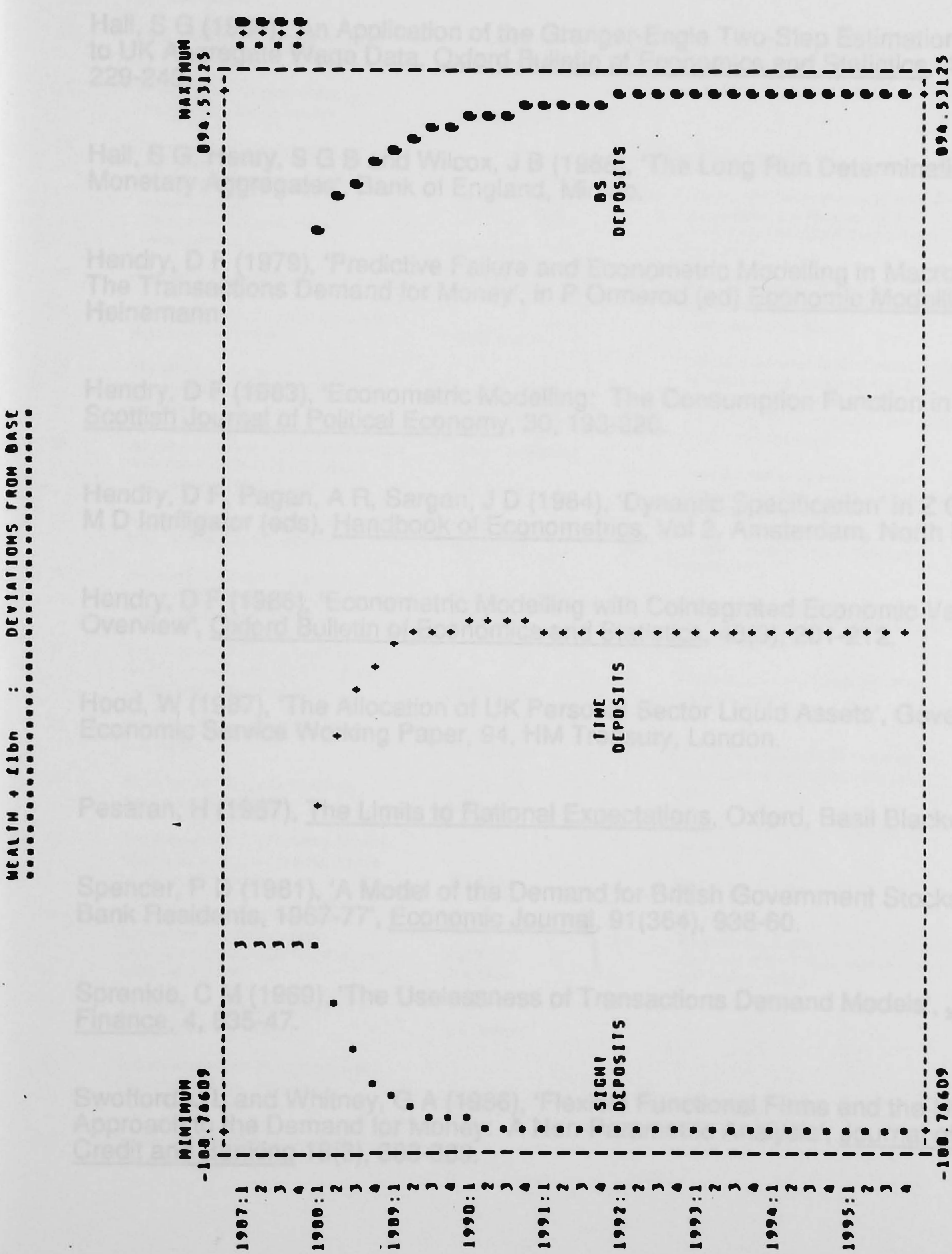



BS RATE +1/2 % : DEVIATIONS FROM BASE
MINIMUM
-256.15625
MAXIMUM
607.56250
BS DEPS
TIME DEPS
SIGHT DEPS
1987:1
1988:1
1989:1
1990:1
1991:1
1992:1
1993:1
1994:1
1995:1
-256.15625
607.56250

WEALTH + £bn : DEVIATIONS FROM BASE



BS RATE +1/2 % : NAT. SAVINGS


WEALTH + £1bn : DEVIATIONS FROM BASE
MAXIMUM
894.53125
MINIMUM
-188.74609
BS DEPOSITS
TIME DEPOSITS
SIGHT DEPOSITS
1987:1
1988:1
1989:1
1990:1
1991:1
1992:1
1993:1
1994:1
1995:1

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