# The Building Society Mortgage Market in Ireland

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# THE BUILDING SOCIETY MORTGAGE MARKET IN IRELAND*

by

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## I. *Introduction*

This paper sets out an econometric model of the Irish building society mortgage market. It arises out of work being carried out on the housing market in Ireland. There have been a number of international studies which have tried to model housing and mortgage markets (see Muth, 1960; Whitehead, 1974; Hadjimatheou, 1976; Artis, Kiernan and Whitney, 1975; Smith, 1969; Arcelus and Metzler, 1973 and Swan, 1973). For Ireland, Nolan (1979) attempted to model the housing market while Hewitt and Thom (1979) estimated a quarterly model of Irish building society behaviour over the period 1970-77.

Table 1 gives some indication of the importance of the building societies as financial institutions. By March 1980 their total liabilities stood

TABLE 1: Total Liabilities Within the State as at:

| | *Dec. 1971* | | *March 1980* | |
|---|---|---|---|---|
| | £m | % of total | £m | % of total |
| Associated Banks | 947.1 | 70 | 3904.7 | 54 |
| Non-associated Banks | 293.7 | 22 | 2323.3 | 32 |
| Building Societies | 111.0 | 8 | 1002.9 | 14 |
| TOTAL | 1351.8 | | 7230.9 | |
| | *1979* | | | |
| Building Societies: | £m | | | |
| TOTAL RECEIPTS | 432 | | | |
| Net Inflow including interest | 242 | | | |
| Total loans advanced | 200 | | | |
| (— all house-lending agencies | 292) | | | |
| Associated Banks: | | | | |
| Increase in deposit accounts | 423 | | | |
| Non-associated Banks: | | | | |
| Increase in deposit accounts | 396 | | | |

Sources: Central Bank, Quarterly Bulletin, Spring 1980.
Quarterly Bulletin of Housing Statistics.

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at over £1,000m, which is about one-quarter of the liabilities of the Associated Banks. Taking the liabilities of all the banks — associated and non-associated — and those of the building societies, it can be seen that the building societies have increased their share from 8% at end 1971 to 14% at end March 1980. In 1979, which was admittedly an exceptional year due to Ireland's participation in EMS, the net inflow into the building societies amounted to £242m compared with £423m for the associated banks and £396m for the non-associated banks. Of total mortgage funds advanced in 1979, of £292m the building societies accounted for 69% or £200m which emphasises the dominant role played by the societies in the supply of mortgage finance. The Associated Banks advanced £36m, Local Authorities £44m and Assurance companies £6m.

Section II of this paper sets out the model to be estimated while Section III details the results for each equation and for the model as a whole. In Section IV the conclusion and policy implications of the analysis are set out.

## II: *A Model of the Building Society Mortgage Market*

The approach adopted here is similar to that of O'Herlihy and Spencer (1972) for the U.K. mortgage market. They attempt to provide "a set of structural equations which describe the determination of the major financial flows involved in the building societies balance sheets and the two key interest rates over which they have control — the rate of interest offered on shares and deposits, and the mortgage rate" (p. 40). The hypothesis followed is that the public adjusts the allocation of the current income and savings in accordance with relative interest rates, subject to some delay in reaction. The gross flows of receipts and withdrawals were found to be income-elastic, affected by changes in the standard rate of income tax, and sensitive to changes in bank rate and the share and deposit rate. The real flow of mortgages was found to be income-elastic, although consumers appeared to react slowly to changes in real incomes. The mortgage rate was insignificant but mortgage rationing was very important. Hewitt and Thom (1979) estimated a model of building society behaviour in Ireland for the period 1970 IV - 1977 II using a stock adjustment approach. Equations were estimated for the building society share rate, mortgage rate, stock of shares and deposits, mortgage approvals and gross advances.

The structure of the model to be estimated is set out below.

1. $BSR = f_1(X_i, u_1)$
2. $BSW = f_2(X_j, u_2)$
3. $NI = BSR - BSW$ identity
4. $BSM = f_3(X_k, u_3)$

BSR = building society receipts

BSW = building society withdrawals

NI = net inflow into the building societies

BSM = supply of building society mortgage finance

$X_i, X_j, X_k$ = vectors of independent variables.

$U_{1,2,3}$ = random disturbances, assumed to satisfy the usual ordinary least squares assumptions.

All the equations with the exception of equation 3 are stochastic. The equations to be estimated only include flows into and out of the building societies, so that mortgage finance from the other private lending agencies — the associated banks and assurance companies — are not explicitly taken into account in the model. This can be justified on the basis that housing finance only represents a relatively small proportion of the business of the latter two agencies and that the volume of funds chanelled into mortgage finance by these agencies tends to be the result of government prompting and bureaucratic decision rather than of market forces. Also, the model does not estimate the demand for building society mortgage finance. It is assumed that the market for mortgage funds is not in equilibrium which implies that the standard equality cannot be made use of:—

$$BS^d = BS^s = BS^{as}$$

where $BS^d$ = demand for building society mortgages

$BS^s$ = supply of building society mortgages

$BS^{as}$ = actual building society advances.

It is further assumed that there has been excess demand at the prevailing mortgage interest rates over the period of estimation so that $BS^{as} = BS^s$ and therefore the supply curve can be identified. Given the various rationing rules used by the building societies to allocate mortgage finance, it would seem that the latter assumption is reasonable.

The above approach examines the individual financial flows of the building societies. It may be criticised in that it does not specify an objective function to be maximised by the building societies. However, Stafford (1978, p. 80) quotes a study by Clayton et al (1975) where it is argued that application of standard theory of the firm as a profit-maximiser by standard mean variance portfolio theory is an inappropriate method for the analysis of British building society behavoiur. Instead, a flow of funds approach is more suitable in order that building society behaviour, in their demand for certain assets, mortgages, government securities and cash, can be considered separately and the motivations disentangled.

## III: *Estimation Results*[1]

1. *Building Society Receipts (BSR):* Building society receipts are defined as the gross inflow of shares and deposits, including interest credited to accounts per quarter.

1. In all the equations nominal variables have been deflated by the consumer price index. See Appendix 1 for data sources.

*Independent variables: Income:* It is hypothesised that personal disposable income will be positively related to BSR. Unfortunately, no quarterly series on personal disposable income exists. Earnings in transportable goods industries is the proxy variable used to measure income. This is deficient in that it only covers one sector of the economy. Since incomes amongst wage and salary earners generally move in line, this may not be too serious. However, it cannot take into account movements in the incomes of farmers and other self-employed groups. There is also the question of whether to use some measure of permanent income, which is usually measured by taking a weighted average of current and past incomes with the most recent periods receiving the greatest weights. One would expect that building society receipts are influenced by actual income rather than permanent income. In fact, if there was a big increase in transitory income, it would probably be more likely to go into savings of the liquid sort, such as building societies, rather than spending. The proxy income variable which we are using is probably a better proxy for permanent income than it is for current income. This is because earnings rises in transportable goods industries are normally permanent.

*Rate of change of income (ΔTGI):* This is defined as the percentage increase in transportable goods earnings in the current quarter from the preceding quarter. An increase in ΔTGI may be viewed as transitory in nature and may be put into savings. Therefore, a positive relationship between BSR and ΔTGI is postulated.

*Interest Rates:* The competitors of the Building Societies for funds are the associated banks, post office savings schemes, etc. The interest rate ($i_B$) paid by the Associated Banks on deposits (< £5,000) is used as a proxy to measure the relative attractiveness of other institutions for funds. It is the differential between bank deposit rates and building society rates ($i_S$) which will determine the relative flow of funds amongst these institutions. Since interest from building society savings accounts is not taxable at the standard rate, the variable used is the differential between the building society share rate, grossed up by the standard rate of income tax, and the associated banks deposit interest rate. Since the first £70 of bank interest is exempt from income tax it may be argued that this is not entirely correct. However, using the tax adjusted interest differential only changes the magnitude of the interest variable and would not affect the overall conclusions.

*Rate of change of consumer prices (ΔCPI):* This is defined as the quarterly percentage increase in the consumer price index. It may be viewed as a proxy variable for the expected rate of inflation. This may be justified by assuming that inflationary expectations can be explained by the adaptive expectations model. This assumes that expectations concerning the dependent variable (ΔCPI) are revised in proportion to the error associated with the previous level of expectations. In practice, this involves estimating coefficients of current and past values of the dependent variable but, by assuming zero coefficients for previous values, one gives the current value a coefficient of one. Therefore, under this assumption, inclusion of $\Delta$CPI can be considered as a proxy variable for the expected rate of inflation. The response of savings behaviour to higher inflation is uncertain since it may lead to increased saving from a precautionary motive, while it could also lead to reduced saving due to anticipatory purchases. A positive relationship between $\Delta$CPI and BSR may be more likely, since a large proportion of savers with the building societies save with a view to house purchase so that a higher expected rate of inflation would imply the necessity to accumulate more savings for future house purchasing.

*Lagged dependent variable ($BSR_{-1}$):* O'Herlihy and Spencer (1972) argued that a change in the independent variables will not result in a complete immediate adjustment of the flow of receipts. To accommodate this, use can be made of the hypothesis that a constant proportion of the gap between the completely adjusted flow and the actual flow will be made good in each quarter, following a change in one of the determining variables. Therefore, a geometric lag distribution is being imposed on the model under the so-called partial adjustment hypothesis. The desired level of R at time t, say $R_t^*$ is given by a linear function plus a disturbance $\epsilon_{t1}$ i.e.

$$R_t^* = a + b_i X_{i(t)} + \epsilon_{t1} \quad (1)$$ where $b_i X_{i(t)}$

represents the coefficients and determining variables respectively i = 1-n. The relationship between the actual and desired level of R may be specified as follows:

$R_t - R_{t-1} = \lambda (R_t^* - R_{t-1}) + \epsilon_{t2}$ (2) where $0 < \lambda \leqslant 1$ and $\epsilon_{t2}$ is a random disturbance. The coefficient $\lambda$ is called the "adjustment coefficient" since it indicates the rate of adjustment of R to $R^*$.

Solving for $R_t^*$ we obtain

$$R_t^* = \frac{1}{\lambda} R_t + \frac{\lambda - 1}{\lambda} R_{t-1} - \frac{1}{\lambda} \epsilon_{t2} \quad (3)$$

and substituting (3) into (1) gives

$$R_t = a\lambda + b_i \lambda X_{i(t)} + (1 - \lambda) R_{t-1} + U_t \quad (4)$$

where $U_t = \lambda \epsilon_{t1} + \epsilon_{t2}$ and $U_t$ is a normally distributed random variable with mean zero and variable $\sigma^2$. The specification of the partial adjustment model does not lead to any further restrictions on $U_t$ and if it is further assumed that $E(U_t U_s) = 0$ for all $t \neq s$ then ordinary least squares leads to consistent and asymptotically efficient estimates of the parameters of (4).[1]

Here we are making use of the partial adjustment model under which current values of the independent variables determine the "desired" value of the dependent variable, but only some (fixed) fraction of the desired

1. An alternative rationalisation for using a geometric distributed lag model is the adaptive expectations model. This would result in the same transformed equation (equation (4) above) but the error term would be different and its properties under this model would lead to Maximum Likelihood Estimates and not Best Linear Unbiased Estimates. (See Kmenta, 1971, pp. 473-495.)

adjustment is accomplished within any particular time period (see Griliches, 1967).

It may be questioned whether the partial adjustment model is applicable to the mortgage market. Essentially, what is assumed here is that over the course of a quarter the various flows analysed will not adjust fully to changes in the respective determining variables. This would seem reasonable since adjustments to changes in interest rates and income levels are unlikely to occur immediately. There have not been any behavioural studies on the causes and nature of the lags assumed for the variables analysed here, nor is there any evidence on whether in fact such lags extend beyond a quarter. However, the area of mortgage finance, and housing more generally, is characterised by relatively long time lags so that use of a distributed lag model is probably appropriate.

Table 2 sets out the results with building society receipts (in £000's) as the dependent variable. In all cases, nominal variables are deflated by the consumer price index with base 1968 IV = 100. Seasonal dummies are included since non-seasonally adjusted data were used but only the dummy for the third quarter ($S_3$) had a coefficient which was significant.

Equation 2 shows that 53% (1-0.47) of the adjustment to a change in each of the independent variables takes place in the first quarter; in the ensuing quarters, the gap between the final level and the current level will continue to be closed by the same proportion, implying that after one year about 98% of the gap will be closed. Therefore, the adjustment process takes place relatively quickly. The long-run elasticity of each coefficient can be calculated by dividing the estimated coefficient by the adjustment coefficient (0.53 in this case). All the independent variables are of the expected sign. Equation 2 would seem to provide a reasonable estimation of the factors explaining building society receipts. The Durbin-Watson statistic is shown but it has been pointed out (Nerlowe and Wallis, 1966) that the test is not valid when the lagged value of the dependent variable is included in the equation.

Durbin (1970) has suggested an alternative test 'h'

$$h = 1 - \tfrac{1}{2}d \frac{n}{1 - rV(b_1)}$$

where d = the D-W statistic

n = no. of observations

$V(b_1)$ = the estimated variance of $b_1$ which is the coefficient of the lagged dependent variable. The null hypothesis is that there is no autocorrelation against the alternative hypothesis of positive autocorrelation. 'h' is a standard normal deviate so that the 'h'-value of 0.8 in the equation indicates non-rejection of the null hypothesis. However, when the value of the D-W statistic is near 2 this test always results in non-rejection of the null hypothesis. However, calculation of Geary's tau statistic indicated the absence of serial correlation in the residuals. The correlation matrix (not shown) for equation 2 indicated that multicollinearity is not a problem.

TABLE 2: Dep. Var. Building Society Receipts. (£000's) deflated by the Consumer Price Index (1968 = 100)

Mean = 143.3
Standard Deviation = 43.7 No. of Observations = 33 Time period 1970 III - 1978 III

1. $BSR/CPI = -100.1 + \underset{(2.9)}{549.7}\ TGI/CPI + \underset{(2.0)}{}\ \underset{(3.6)}{11.4}\ (i_{BST} - i_{AB}) + \underset{(1.3)}{1.4}\ \Delta TGI + \underset{(4.3)}{0.61}\ BSR_{-1}/CPI_{-1} + \underset{(2.7)}{15.4}\ S_3$

$\bar{R}^2 = 0.89$ standard error = 14.3 F-value = 54.5
D-W = 1.97 first-order autocorrelation = -0.06

2. $BSR/CPI = -115.3 + \underset{(3.5)}{}\ \underset{(3.3)}{784.9}\ TGI/CPI + \underset{(3.5)}{9.9}\ (i_{BST} - i_{AB}) + \underset{(2.3)}{12.3}\ S_3 + \underset{(1.9)}{20.3}\ BD + \underset{(3.7)}{0.47}\ BSR_{-1}/CPI_{-1}$

$\bar{R}^2 = 0.90$ standard error = 13.8 F-value = 58.7 'h' = 0.8
D-W = 1.82 first-order autocorrelation = -0.01

3. Log $BSR/CPI = 4.59 + \underset{(3.5)}{}\ \underset{(3.1)}{1.21}\ Log\ (TGI/CPI) + \underset{(2.5)}{0.19}\ Log\ (i_{BST} - i_{AB}) + \underset{(2.9)}{0.42}\ Log\ (BSR/CPI)_{-1} + \underset{(1.9)}{0.09}\ S_3 + \underset{(1.3)}{0.12}\ BD$

$\bar{R}^2 = 0.85$ standard error = 0.122 F-value = 37.01
D-W = 1.61 first-order autocorrelation = 0.089

The correlation coefficient between the lagged dependent variable and TGI/CPI is 0.89, but the correlation between the remaining independent variables are quite low. The standard error of the equation is 9.6% of the mean.

To get some idea of the magnitude of the coefficients, unit changes are expressed as a percentage of the mean of the dependent variable over the estimation period. An increase in TGI/CPI of 1% of the mean value (0.0028) leads to an increase in BSR/CPI of 1.54 which is 1.1% of its mean value. The long-run elasticity is 2.0%. A one percentage point increase in the interest rate differential (grossed up by the standard rate of tax) leads to a rise of 9.9 in BSR/CPI which is 6.9% of the mean and the long-run elasticity is 13.0%. These results may be compared with those of O'Herlihy and Spencer (1972) for the U.K. They found that an increase in personal disposable income equivalent to 1% of the mean value would give rise to an increase in receipts of 1.2% in the short-run and 3% in the long-run. O'Herlihy and Spencer included the building society share rate, the banks deposit interest rate and the tax rate as separate independent variables. They found that a 1 percentage point increase in the building society share rate would lead to a 17% increase in receipts in the short-run and a 50% increase in the long-run. The long-run elasticities estimated here would seem to be implausible. They imply that, as income increases, the share of total savings attracted by the building societies will increase rapidly. In the extreme, this would imply that eventually building societies would have 100% of the market. This suggests that a non-linear model would be more appropriate and/or the adjustment mechanism is incorrect. Therefore, the long-run elasticities estimated here should be treated with greater than normal caution.

The effects of the bank dispute in the third and fourth quarters of 1976 are taken into account by the inclusion of a dummy variable (BD) which shows that receipts in these two quarters were 14% higher than would have been the case if there was no bank dispute.

Equation 3 presents the results of transforming the variables to their natural logs. One advantage of this is that the elasticities can be read directly from the coefficients. It also implies a multiplicative specification rather than an additive one.

The rate of change of TGI earnings was included but it had a low t-value, implying that little confidence can be placed in its estimated value (equation 2). However, the coefficient is positive and indicates that a rise of 1% in TGI leads to a 1.0% rise in BSR/CPI with a long-run elasticity of 1.8%. The rate of change in consumer prices (CPI) was also not significant. Since real incomes have been increasing over the period under review, the positive relationship between BSR and TGI/CPI could be due in part to the fact that both are increasing over time. A time trend was included in the equation but the t-value was 0.1.

The equation explaining BSR shows clearly that real income and interest rate differentials are the major determinants of the flow of money into building society share and deposit accounts. This is an important result, since it provides clear empirical evidence that savers (particularly small savers) do adjust their portfolios in response to changes in interest rates.

2. *Building Society Withdrawals (BSW):* The flow of building society withdrawals of shares and deposits including interest per quarter is the dependent variable used.

*Independent variables: Income:* The relationship between income and withdrawals depends on the assumption made with regard to people's behaviour when their income changes. An increase in income could result in a fall in withdrawals, implying that investors live off their current income rather than run down their assets. Conversely, in times of a fall in income, withdrawals may increase as people try to maintain their real standard of living. However, there is evidence that when income falls (or the rate of income increase declines) the savings ratio increases as people engage in precautionary savings. This implies the opposite relationship between income and withdrawals to that suggested above. Since income has been increasing over almost the entire period under review, a time trend may be included.

*Rate of change of income ($\Delta TGI$):* Again, the direction of the relationship between this and BSW is difficult to predict. On balance it is probably the case that a rise in the rate of increase in income would lead to a fall in withdrawals.

*Stock of building society shares and deposits (BSD):* A positive relationship is postulated between this and BSW since the larger the stock the larger will be the level of withdrawals, other things being equal.

*Lagged dependent variable ($BSW_{-1}$):* This is included under the same constant lag adjustment hypothesis described for building society receipts.

*Rate of change in consumer prices (ΔCPI):* If this is regarded as a proxy for the expected rate of inflation, then an increase in ΔCPI may lead to a reduction in withdrawals as individuals slow down the rate at which they reduce their savings to cope with the expected higher prices. On the other hand, individuals may bring forward planned purchases and so increase withdrawals in anticipation of the higher prices.

Table 3 sets out the results with building society withdrawals as the dependent variable. It should be noted that interest paid out is included as a withdrawal. Nominal variables are deflated by the CPI. Since the dependent variable and some of the independent variables are all increasing over time a trend variable, TIME, was included as an independent variable to take account of this. In contrast to the building society receipts equation, it is positive and significant.

Equation 2 seems to provide a reasonable explanation of withdrawals from building societies. The D-W statistic does, however, indicate that there is some serial correlation present. Also, the correlation matrix indicated that multicollinearity is a problem in the equation. As would be expected, the trend variable is highly correlated with TGI/CPI (r = 0.98) and with BSD/CPI (r = 0.98) and of course these are also highly correlated with one another (r = 0.96). The $\bar{R}^2$ of equation 3 is a little lower than the $\bar{R}^2$ for the equation estimating building society receipts. The standard error expressed as a percentage of the mean of BSW/CPI is 12.7%.

Looking at the individual coefficients, a one percentage point rise in ΔCPI leads to a fall in BSW equal to 5.5% its mean. Therefore, an increase in the expected rate of inflation leads to a fall in withdrawals. A rise in TGI/CPI of 1% its mean value leads to a fall in BSW equivalent to 2.9% its mean value. Care needs to be taken in interpreting the coefficient of this variable since it is highly correlated with time and with the stock of building society shares and deposits. The interest rate differential is highly significant and a one percentage point increase leads to a fall in withdrawals equal to 11.0% its mean. This result, together with that for building society receipts, indicates that interest rate differentials do play an important role in determining where savings are placed. An increase in the stock of building society shares and deposits of 1% the mean leads to a rise in withdrawals equal to 1.1% the mean. However, the high correlation coefficient between deposits and real income means that the individual coefficients and standard errors will not be very reliable. The coefficient of $(BSD/CPI)_{-1}$ indicates that there is a tendency for 8.3% of the stock of shares and deposits to be withdrawn each quarter. These may be compared with those of O'Herlihy and Spencer for the U.K. They found that 8% of the stock of shares and deposits is withdrawn each quarter; a percentage point rise in the rate of interest offered on shares and deposits led to a decline of 8.5% in withdrawals; a rise in real disposable incomes of 1% would lead to a fall of 1½% in withdrawals.

The estimation results for building society withdrawals show that, as was the case for receipts, real income and the interest rate differential between the building societies and the associated banks are important determinants of building society withdrawals. Withdrawals are, additionally, affected by the stock of shares and deposits lagged one quarter and the rate of change in consumer prices (ΔCPI). The coefficient of ΔCPI in the receipts equation is positive, which is consistent with the negative sign in the withdrawals equation, but has a very low t-value (equation not shown). However, the results are suggestive of a tendency for savings to increase when there is an acceleration in the rate of inflation.

Equation 3 takes account of the effects of the bank dispute in the third and fourth quarters of 1976 by including a dummy variable (BD) for these two quarters. The coefficient indicates that withdrawals were 16.5% higher than 'normal' during these two quarters. With regard to receipts, it was found that they were 14% higher than 'normal' during the same two quarters. This would indicate that people were using the building societies as an alternative to certain banking services during the period of the dispute. However, BD in the withdrawals equation is not significant at the 5% significance level. Equation 4 presents the results of using a logarithmic specification. The rate of change of income (ΔTGI) was included and had a negative coefficient but the t-value was as low as 0.2, implying that ΔTGI has no effect on building society withdrawals (equation not shown).

3. *Stock Adjustment Approach:* An alternative to estimating separate receipts and withdrawals equations is to estimate net inflows into the building societies using a stock adjustment approach.

$$S_t - S_{t-1} = p\,(S^*_t - S_{t-1})$$

taking first differences

$$\Delta S_t = p\,\Delta S^*_t + (1 - p)\,\Delta S_{t-1}$$

it is assumed that

$$\Delta S^*_t = f(X_i)$$

so that $\Delta S_t = pf\,(X_i) + (1 - p)\,\Delta S_{t-1}$

where $X_i$ = explanatory variables $i = 1 - n$

$S_t$ = stock of shares and deposits

$S^*_t$ = desired stock of shares and deposits

$p$ = adjustment coefficient

Strictly speaking, this should be considered as a 'stock-flow' approach since the dependent variable consists of the *change* in the stock of shares and deposits rather than the actual stock. For the U.K. building society mortgage market, O'Herlihy and Spencer (1972) and Hadjimatheou (1976) estimated an equation similar to that set out above. It has been argued above that estimating receipts and withdrawals separately, and using the results to estimate net inflow, is a better approach to directly estimating net inflow. However, estimation of the 'stock-flow' equation should be useful in providing evidence as to which approach is better.

TABLE 3: Dep. Var. Building Society Withdrawals deflated by the CPI (base 1968 iv = 100)

mean = 87.81 no. of observations = 33 time period: 1970 III - 1978 III
standard deviation = 31.27

Equation Number

1. $$BSW/CPI = 219.6 - 5.05\ \Delta CPI - 1222.6\ TGI/CPI - 9.7\ (i_{BST} - i_{AB}) + 5.5\ TIME + 0.19\ BSW(-1)/CPI(-1)$$
(2.5) (3.4) (2.0) (3.0) (3.5) (1.2)

$\bar{R}^2 = 0.85$ standard error = 13.2 F-value = 30.4
D-W = 1.93 first-order autocorrelation = -0.02

2. $$BSW/CPI = 219.2 - 4.96\ \Delta CPI - 1336.3\ TGI/CPI - 9.9\ (i_{BST} - i_{AB}) + 0.08\ BSD_{-1}/CPI_{-1} + 3.3\ TIME$$
(2.8) (3.8) (2.6) (3.6) (2.7) (2.0)

$\bar{R}^2 = 0.85$ standard error = 11.4 F-value = 37.2
D-W = 1.65 first-order autocorrelation = 0.14 time period 1970 IV - 1978 III

3. $$BSW/CPI = 174.4 - 4.6\ \Delta CPI - 1053.8\ TGI/CPI - 9.1\ (i_{BST} - i_{AB}) + 98.4\ BSD_{-1}/CPI_{-1} + 2.1\ TIME + 14.5\ BD$$
(2.2) (3.6) (2.0) (3.3) (3.1) (1.2) (1.6)

$\bar{R}^2 = 0.86$ standard error = 11.1 F-value = 33.3
D-W = 1.91 first-order autocorrelation = -0.003 time period 1970 IV - 1978 III

4. $$LOG\ (BSW/CPI) = -327.1 - 3.5\ LOG\ (\Delta CPI) - 3.5\ LOG\ (TGI/CPI) - 0.22\ LOG(i_{BST} - i_{AB}) + 2.1\ LOG\ (BSD_{-1}/CPI_{-1}) - 0.5\ LOG\ (TIME)$$
(1.8) (1.8) (0.6) (2.2) (4.2) (1.2)

$\bar{R}^2 = 0.81$ standard error = 0.15 F-value = 27.5
D-W = 1.47 first-order autocorrelation = o.22 time period = 1970 IV - 1978 III

Table 4 sets out the results of using this approach where the net inflow (including interest) into the building societies is the dependent variable. Equation 1 shows that the adjustment coefficient is quite close to unity, implying that virtually all of the adjustment to a change in one of the explanatory variables takes place in the quarter in which the change takes place. Therefore, the difference between the short-run and long-run elasticities is not significant. Equation 2 has a higher $\bar{R}^2$ so we will look at the coefficients of that equation in detail. Real income, lagged one quarter, is positively associated with net inflow. A rise in TGI/CPI of 1% its mean leads to a rise in net inflow of 2.0% in both the short-run and the long-run, which is an implausibly high elasticity. The coefficient of the interest rate differential implies that a one percentage point rise in the differential between the building societies and associated banks leads to a rise in net inflow which is 29% its mean value. This seems high, especially in view of the results when receipts and withdrawals were estimated separately. However, the coefficient on the net inflow equation should be bigger than the individual coefficients on the receipts and withdrawals equation. The rate of change in earnings (ΔTGI) was found to be positively associated with net inflow. A one percentage point rise in ΔTGI leads to a rise in net inflow of 4.6% its mean. If we consider ΔTGI as a proxy for expectations about future income flows, then it implies that a rise in expected incomes leads to a rise in savings into the building societies. Seasonal dummy variables were included in the model and it was found that net inflow in the first quarter was 19% lower than in the other three quarters. The coefficient of BD indicates that net inflow was 19% higher than 'normal' during the bank dispute in the third and fourth quarters of 1976, but it has a low t-value.

The equation estimating net inflow has a lower $\bar{R}^2$ compared with either the withdrawals or the receipts equations. The standard error as a percentage of the mean of the dependent variable is 21.6% which is relatively high. The Durbin-Watson statistic is quite satisfactory at 1.98, indicating that auto-correlation is not a problem. The correlation matrix for the variables included in equation 2 showed multicollinearity not to be a serious problem. Excluding the seasonal dummy, the highest correlation coefficient for the independent variables was that between ΔTGI and $(i_{BST} - i_{AB})$ with a correlation coefficient of —0.36 which is fairly low.

The major determinants of building society net inflow are real income and the interest rate differential on deposits between the building societies and the associated banks. The significance of the rate of change of income (ΔTGI) is interesting since it was found to be non-significant in the receipts and withdrawals equations. However, the coefficient of ΔTGI in both equations was of the 'right' sign and the coefficients are consistent with those found with net inflow as the dependent variable. The finding that an increase in the rate of change of income leads to an increase in savings could be interpreted as showing that people view the increase as transitory in nature and put it into savings rather than consumption.

It does seem that the approach set out in section II is better than the 'stock-flow' approach in that estimating separate receipts and withdrawals equations gives more information. The finding is consistent with that of O'Herlihy and Spencer (1972) for the U.K., who found that estimating separate equations gave better results, and, in addition, they argued that looking at the gross flows was theoretically more satisfactory since the structure of each equation is likely to be different.

TABLE 4: Dep. Variable: Net Inflow into Building Societies (including interest) deflated by CPI

mean = 70.17
standard deviation = 30.71 observations = 33 time period 1970 III - 1978 III

1. $$NETINF/CPI = -128.9 + 520.7\ TGI/CPI + 20.0\ (i_{BST} - i_{AB}) + 3.9\ \Delta TGI + 0.12\ NIBSI_{-1}/CPI_{-1}$$
(3.9) (2.7) (4.7) (2.8) (0.8)

$\bar{R}^2 = 0.62$ standard error = 18.9 F-value = 14.1
D-W = 2.83 first order autocorrelation = -0.28

2. $$NETINF/CPI = -157.6 + 730.0\ (TGI/CPI)_{-1} + 20.4\ (i_{BST} - i_{AB}) + 3.2\ \Delta TGI - 13.3\ S_1 + 13.3\ BD$$
(5.9) (5.8) (6.1) (2.7) (1.9) (1.2)

$\bar{R}^2 = 0.77$ standard error = 15.0 F-value = 21.3
D-W = 1.98 first-order autocorrelation = -0.04 time period 1970 IV - 1978 III.

4. *Supply of Building Society Mortgage Finance ($M_S$):* This is measured by the value of loan approvals (£000's) over the course of a quarter deflated

by the consumer price index.[3] Loans approved rather than loans paid were considered to be a more appropriate measure of the supply of mortgage finance (see appendix one for details).

*Independent Variables, Net Inflow (NI):* A major determinant of building society advances will be their net inflow. New inflow lagged one or two quarters may give a better fit than net inflow in the current quarter.

*Mortgage Interest and Principal Repayments (REPIN):* Repayments of principal was estimated by the formula:—

$REP = GA_t - (M_t - M_{t-1})$ where GA = value of loans paid per quarter
M = mortgage stock.

Interest payments were estimated by applying the average mortgage interest rate for the quarter to the mortgage stock at the beginning of the quarter. Annual data are published for these flows but there are no quarterly figures available. Mortgage repayments and interest payments are an important source of funds to the building societies. In 1977, interest on mortgages amounted to £52.6m. while repayments of principal came to £16.2m.[4] This compares with an increase in the stock of shares and deposits of £118.2m. in the same year. It is expected that there will be a positive relationship between mortgage interest and principal repayments and mortgage supply.

*Mortgage Rate of Interest and Rate of Interest of Exchequer Bills (MORTR-EXBR):* It may be hypothesised that there will be a positive relationship between the mortgage interest rate and mortgage approvals. However, the rate of return on alternative assets will also be an important determinant of the rate of mortgage advances. It was decided to use the rate of return on Exchequer Bills as a proxy to measure the competitiveness of alternative assets to mortgages. To avoid the problem of multicollinearity, the differential between the mortgage rate and the exchequer bills interest rate was used as the explanatory variable.

*Lagged Dependent Variable ($M_{S-1}$):* This is included under the same constant lag adjustment process discussed in the previous equations.

*Building Society Liquidity Ratio:* It could be argued that the liquidity ratio (defined as cash *plus* bank balances *plus* investments as a percentage of total assets) would have an influence on mortgage advances. However, this would only be the case if the building societies had some target liquidity ratio which they wanted to maintain. This does not seem to be the case and the actual liquidity ratio would seem to be simply the outcome of decisions taken with regard to mortgage advances and alternative investments. It is, therefore, better to use net inflow and the interest differential between mortgages and exchequer bills as separate independent variables rather than using the liquidity ratio.

3. It could be argued that some house price index should be used as a deflator. However, the model is concerned with real flows into and out of the building societies so it would seem more appropriate to use the same deflators for all flows.

4. Report of the Registrar of Building Societies for the year ended 31st Dec. 1978.

Table 5 presents the estimation results with value of mortgage loans approved (£000's) by the building societies deflated by the CPI as the dependent variable. Net inflow was lagged one and two quarters and it was found that net inflow lagged one quarter was most appropriate. This is in line with *a priori* reasoning since it is unlikely that the building societies would respond immediately to a change in their net inflow position. However, the results are not unambiguous since in some equations net inflow lagged one quarter was not significant. For instance, when the interest rate differential between the mortgage rate and exchequer bills is lagged one quarter, $NETIN_{-1}$ becomes insignificant (equation not shown). However, when the current interest rate differential is used, $NETIN_{-1}$ has a high t-value and a plausible coefficient (equation 2). Nevertheless, it is more likely that the building societies would adjust the level of their mortgage approvals in response to the current mortgage rate relative to other competing interest rates rather than to past interest rates. In fact, a more appropriate variable would probably be one which attempted to measure expected interest rates. A time trend variable was included but its coefficient and a t-value changed substantially with different specifications.

While equation 1 has a higher $\bar{R}^2$, equation 2 would seem to be a more theoretically satisfying equation while also being more informative from a policy point of view. From a statistical point of view, it is not entirely satisfactory since two of the independent variables are only significant at the 10% significance level. This should be borne in mind when the individual coefficients are being discussed. Equation 2 has an $\bar{R}^2$ of 0.69 which is somewhat low but, as indicated by the F-value, the equation does have substantial explanatory power. A lower $\bar{R}^2$ than in the other equations explaining receipts and withdrawals is only to be expected, given the smaller number of decision-makers involved in mortgage approvals than either receipts or withdrawals.

The standard error expressed as a percentage of the mean of the dependent variable is 20.3% which is relatively high. The Durbin-Watson statistic indicates the absence of autocorrelation but, as pointed out earlier, when the lagged dependent variable is included as an explanatory variable the D-W test is not reliable. The correlation matrix indicated that multicollinearity was not a problem.

Looking at the equation in detail, the coefficient of 0.3 of the lagged dependent variable indicates a relatively fast rate of adjustment: 70% (1-0.3) of the adjustment to a change in one of the independent variables takes place in the first quarter; in the ensuing quarters, the gap between the final level and the current level will continue to be closed by the same proportion, implying that after three quarters 97.3% of the gap will have been closed. The long-run elasticity of each coefficient can be estimated by dividing the estimated coefficient by the adjustment coefficient (0.7 in this case).

The coefficient of $NETIN_{-1}$ indicates that 30% of net inflow in the previous quarter is lent out in the current quarter; in the long-run, 43% of net inflow is lent out. This seems low, given that about 75% of the building societies total assets consist of mortgages. The coefficient of repayments of interest and principal indicates that 52% of REPIN are lent out in mortgage loans in the current quarter. In the long-run the figure is 74.3%, which is closer to what would be expected from the building societies liquidity ratio. In fact, over the estimation period the liquidity ratio of the building societies (defined as cash *plus* balances with the central bank *plus* bank balances *plus* investments as a percentage of total assets) averaged 19.7%, although it has shown a tendency to rise over time. The coefficient of the differential between the mortgage rate and the exchequer bills interest rate suggests that a one percentage point increase in this differential would lead to a rise in mortgage approvals, equivalent to 8.9% the mean in the short-run and a rise of 12.7% in the long-run. From a policy point of view, this is a very important result since it suggests that building societies will reduce the proportion of their funds allocated to mortgage loans if the mortgage rate of interest becomes relatively uncompetitive. MORTR-EXBR also has a very high t-value so that a high degree of confidence can be attached to this result.

TABLE 5: Dep. Var. Loan Approvals of the Building Societies (£000's) deflated by the CPI (base 1968 IV = 100)

mean = 101.5
standard deviation = 37.3 no. of observations = 32 time period 1970 IV - 1978 III

1. $$M_s = \underset{(0.8)}{10.3} + \underset{(2.4)}{0.49}\,NETIN + \underset{(4.4)}{10.6}\,(MORTR - EXBR)_{-1} + \underset{(2.0)}{1.2}\,TIME + \underset{(2.4)}{24.2}S_1 + \underset{(0.9)}{9.1}S_2 - \underset{(0.3)}{3.1}S_3$$

$\bar{R}^2 = 0.72$ standard error = 19.6 F-value = 14.48
D-W = 1.63 first-order autocorrelation = 0.16

2. $$M_s = \underset{(0.8)}{10.6} + \underset{(1.8)}{0.30}\,NETIN_{-1} + \underset{(1.7)}{0.52}\,REPIN + \underset{(4.0)}{9.0}\,(MORTR - EXBR) + \underset{(2.1)}{0.30}\,M_{s-1}$$

$\bar{R}^2 = 0.69$ standard error = 20.65 F-value 18.48
D-W = 1.97 first-order autocorrelation = -0.05

5. *A Model of the Building Society Mortgage Market:* Table 6 presents the model of the building society mortgage market. The estimation period is 1970 IV-1978 III since data on all variables included is only available from 1970 IV. In equations 3 and 2A, estimated net inflow rather than actual net inflow is used in the equation explaining building society loan approvals.[4] In equation 3, net inflow (R — W) is estimated from the identity NETIN = BSR — BSW. From this equation it can be seen that the coefficient on net inflow is much higher than was the case when actual net inflow was used. The coefficient of $(R-W)_{-1}$ implies that 86% of net inflow in the current

4. It should be noted that there is a problem of simultaneous equation bias since some of the right-hand side variables are endogenous. Therefore, OLS may not give efficient estimates. However, using another estimation technique normally results in estimates very similar to those given by OLS.

TABLE 6: Model of the Building Society Mortgage Market: OLS Estimation time period 1970 IV – 1978 III

| | Equation | $\bar{R}^2$ | F-value | standard error / mean (Y)% | D-W |
|---|---|---|---|---|---|
| 1. | $BSR/CPI = -131.3 + 845.1\ TGI/CPI + 10.5\ (i_{BST} - i_{AB}) + 7.8\ S_3 + 21.1\ BD + 0.48\ \frac{BSR}{CPI-1}$<br>(4.4) (4.0) (4.2) (1.5) (2.2) (4.3) | 0.92 | 74.78 | 8.5% | 1.82 |
| 2. | $BSW/CPI = 174.4 - 1053.8\ TGI/CPI - 9.05(i_{BST} - i_{AB}) + 2.1\ TIME + 14.5\ BD - 4.6\Delta CPI + 98.4\ BSD_{-1}/CPI_{-1}$<br>(2.2) (2.0) (3.3) (1.2) (1.6) (3.6) (3.1) | 0.86 | 33.30 | 12.4% | 1.91 |
| 3. | $M_s = 14.2 + 0.86\ (R-W)_{-1} + 0.34\ REPIN + 8.7\ (MORTR-EXBR) + 0.10\ M_{s-1}$<br>(1.3) (3.9) (1.3) (4.5) (0.8)<br>time period 1971 I – 1978 III | 0.78 | 26.91 | 17.2% | 2.04 |
| 1A | $NETINF = -157.6 + 730.0\ (TGI/CPI)_{-1} + 20.4\ (i_{BST} - i_{AB}) + 3.2\Delta TGI - 13.3\ S_1 + 13.3\ BD$<br>(5.9) (5.8) (6.1) (2.7) (1.9) (1.2) | 0.77 | 21.29 | 21.6% | 1.98 |
| 2A | $M_s = 12.8 + 0.40\ NETINF_{-1} + 0.41\ REPIN + 9.0\ (MORTR-EXBR) + 0.26\ M_{s-1}$<br>(1.0) (1.8) (1.3) (3.9) (1.6)<br>time period 1971 I – 1978 III | 0.68 | 17.17 | 20.5% | 1.98 |
| 3A | $M_s = -114.8 + 5.4\ (MORTR-EXBR) + 18.3\ (i_{BST} - i_{AB}) + 701.7\ TGI/CPI + 37.0\ BD$<br>(3.5) (1.5) (2.5) (4.1) (2.5)<br>time period 1970 IV – 1978 III | 0.71 | 20.5 | 20.3% | 1.36 |

NOTE: The simple correlation coefficient (r) between actual NETIN and predicted receipts <u>minus</u> predicted withdrawals is 0.86; r between actual NETIN and predicted NETIN (from equation 1A) is 0.90

quarter gets lent out in the following quarter. The coefficient of the lagged dependent variable is small with a very low t-value implying that virtually all of the change taking place in the dependent variable occurs within one quarter.

Using net inflow estimated from equation 1A in the supply of mortgage equation leads to an equation quite similar to that when actual net inflow series was used. The coefficient of $NETIN_{-1}$ indicates that 40% of net inflow in the previous quarter is lent out in mortgage loans in the current quarter, while in the long run 54% is lent out. With regard to repayments of principal and interest, 41% is lent out in the short-run and 55.4% in the long-run. These figures are lower than what would be expected from the historical liquidity ratios of the building societies. The coefficient on the interest rate differential between the mortgage rate and the exchequer bills interest rate remains remarkably stable in all the estimated mortgage supply equations. This further highlights the importance of interest rate differentials in the flow of funds to and from the building societies.

While it was argued earlier that estimating gross flows into and out of the building societies was preferable to simply estimating net inflow, it can be seen from Table 6 that for purposes of predicting net inflow, the predicted values from the net inflow equation are better than the net inflow estimated from the difference between predicted receipts and predicted withdrawals. The correlation coefficient between actual net inflow and (R—W) is 0.86 compared with 0.90 for actual net inflow and NETIN (predicted from equation 1A).

From equation 3 it can be seen that net inflow into the building societies is an important explanatory variable of mortgage supply. Equations 1 and 2 show that the interest rate differential—($i_{BST}$-$i_{AB}$)—and real income are the major determinants of receipts and withdrawals. Equation 3 shows that another interest rate differential—(MORTR—EXBR)—is also an important explanatory variable. Therefore, equation 3A gives a reduced form with the independent variables consisting of interest rate differentials and real income. While the t-statistic of (MORTR—EXBR) is not significant, the equation emphasises that relative interest rates do explain a substantial proportion of building society mortgage supply.[5]

The analysis here clearly shows that the flow of funds into the building societies and the mortgage interest rate are the major determinants of the availability of mortgage finance. This finding is in line with the theoretical model used here which implies that mortgage flows are a function of available resources and relative interest rates.

5. The correlation coefficient between the two differential interest rate variables is quite high at r=0.79 while the D–W statistic indicates that serial correlation is a problem.

IV: *Conclusions and Policy Implications*

The aim of this study was to provide an econometric model of the building society mortgage market in Ireland and on the basis of normal econometric criteria the model would seem to be relatively satisfactory. The major finding of this study is that interest rates and real incomes are important determinants of the flow of funds into and out of the building societies. The model estimated here is not a complete model of building society activity to the extent that all interest rates were taken as being exogenous. Also the demand for building society mortgage finance was taken as exogenous under the assumption that there was continuous excess demand over the estimation period. In effect the model here estimates the demand for building society share and deposit accounts and the supply of building society mortgage finance.

The policy implications of this study need to be viewed in the context of existing housing policy. Since the early seventies total annual new house completions have hovered around the 25,000 mark, which is a substantially higher rate of completions than that experienced in any previous period. In spite of the importance of housing investment, a comprehensive public policy on housing has never been formulated. Government policy has not gone much beyond the stated principle of ensuring that every family should be able to afford housing of an 'adequate' standard. There has been no attempt at encouraging the development of a private rented sector which would provide an alternative to purchasing a house. In the recent Government White Paper* it was stated that:— "It will be an important part of Government policy to ensure, as far as practicable, that the supply of housing finance will be adequate to support the national programme needed to accommodate our increasing population. The major funding of private house building will continue to come from building societies while important contributions will be made by the associated banks and assurance companies. The Government will be concerned to ensure that this finance is directed primarily towards increasing the housing stock with suitable regard for environmental and other living conditions rather than improving quality of new houses in a limited range of the market."

Housing policy is characterised by a variety of housing subsidies and tax allowances whcih have been introduced in an *ad hoc* manner. Given that the building societies are seen as the major suppliers of mortgage finance for private house purchase, the findings of this study should be of relevance to policy-makers.

The supply of mortgage finance was shown to be dependent upon the building societies' net inflows plus their inflows from mortgage interest payments and repayments of principal, plus the interest rate differentials between the mortgage interest rate and the rate of interest on exchequer bills. It is no surprise that mortgage supply depends upon the flow of funds

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*Investment and National Development 1979-83, p. 61. Government Publications, Jan. 1980.

into the societies. However, the finding with regard to the interest rate differential—(MORTR—EXBR)—is important since it suggests that the building societies may be profit maximisers in that a fall in the mortgage rate of interest relative to other interest rates leads to a reduction in the volume of funds allocated to mortgage loans. This is an interesting finding given that the stated sole function of the building societies is to provide finance for home purchase.

The net inflow of the building societies was shown to be primarily determined by the differential between the building society share rate of interest and the associated banks deposit rate of interest and changes in real income. As well as analysing net inflow the gross flows of receipts and withdrawals were analysed separately. The significance of interest rate differentials bears out the importance attached by the societies in maintaining a 'competitive' rate of interest on their share and deposit accounts. It implies that, in the long run, funds flowing into mortgage finance may be increased by improving the relative attractiveness of savings accounts with the building societies. This is consistent with statements from the building societies emphasising the importance of keeping their share and deposit rates in line with other competing deposit institutions, primarily the associated banks. The model shows that an increase in the share rate of interest, relative to the associated banks rate of interest, will lead to a rise in net inflow which will in turn lead to a rise in mortgage approvals after a time lag of one quarter. Also the greater the differential between the mortgage interest rate and exchequer bills interest rate the higher the proportion of funds allocated to mortgages. This latter finding implies that while a rise in the mortgage rate increases the burden on existing mortgage holders, it will tend to increase the flow of funds into building society mortgage loans. If the aim of the policy is to increase the flow of funds into the mortgage market, then increasing the attractiveness of building societies as savings institutions would be the appropriate policy. Of course, this implies increasing the market share of the building societies at the expense of other financial institutions which may or may not be desirable. It could imply that funds for productive purposes would be diverted to house purchase, which could conceivably lead to higher house prices rather than higher output.

The empirical analysis also showed the demand for building society share and deposit accounts to be highly income elastic and to be positively related to the rate of change in income. This finding may be partly due to a tendency for house-ownership demand to increase with rising income levels, which would cause potential house-buyers to initially increase their savings with the building societies.

The primacy shown to belong to interest rates in determining the flow of funds of building societies and the distribution of their assets between mortgages and other investments is probably the most relevant finding of this study for the purposes of policy formulation.

## APPENDIX I: DATA

There are two major sources of information on housing and mortgage markets, viz. Quarterly Bulletin of Housing statistics (Department of the Environment) and the Central Bank Quarterly Bulletin—Statistical Appendix.

*Quarterly Bulletin of Housing Statistics—data obtained*

1. Loan applications, loan approvals and loans paid: These series differ in a number of respects:

   the loan applications series is for loan applications on hand at quarter end and is therefore a stock variable. Loan approvals series refer to loan approvals over a quarter and is a flow variable. Loans paid refer to actual payments over the course of a quarter and are a function of past loan approvals. Loans approved are probably the most appropriate proxy of the supply of mortgage finance since loans approved indicate the volume of mortgage finance to which the agency in question has committed itself to extending and therefore represents the amount of mortgage finance available. Loans paid depend on previous loan approval decisions plus the various time lage involved between approval and actual payment. The loans paid series is therefore subject to a number of influences which tend to distort it as a proxy for mortgage finance available. All the series referred to above exist in terms of number and value.
2. Building Society receipts, withdrawals and net inflows of share and deposit accounts both inclusive and exclusive of interest.

*Central Bank Quarterly Bulletin—Statistical Appendix—data obtained*

1. *Mortgage rate:* average three-monthly rate.
2. *Exchequer Bills interest rate:* average three-monthly rate.
3. *Bank deposit interest rates:* average three-monthly rate and end-quarter rate.
4. *Building society interest rate on share accounts:* average three-monthly and end-quarter rates.
5. *Stock of mortgages held by building societies:* This data is only available from 1970 III. Up to 1974 data on building societies published in the Quarterly Bulletin of Housing Statistics only covered the major societies, whereas the Central Bank data covers all societies. In 1972 and 1974 the Department of the Environment extended their coverage and now cover all societies. However, according to the Department, the extension of coverage had only a negligible effect on their series.
6. *Stock of building societies' shares and deposits (including accrued interest):* Series begins in 1970 III.

*Other Data*

1. CPI — 1968 IV = 100.
2. Earnings per week in Transportable Goods Industries.
3. *Mortgage repayments and interest payments.* One important omission in the data on building societies is the absence of any quarterly series of repayments of principal and interest on mortgage loans. Annual data does exist which gives an indication of the significance of such flows. Interest payments were estimated by multiplying the stock of mortgages at the beginning of the quarter by the average mortgage rate over the quarter. Repayments of principal were estimated as the value of loans paid over the quarter minus the change in the mortgage stock:—

$$REP_t = GA_t - (M_t - M_{t-1})$$ where GA = value of loans paid per quarter

M = mortgage stock

t = time

## APPENDIX II: LIST OF VARIABLE NAMES

BSR = building society receipts (£000's)

BSW = building society withdrawals (£000's)

CPI = consumer price index base 1968 IV = 100

TGI = earnings in transportable goods industries

$i_{BST}$ = interest rate on building society shares and deposits grossed up by the standard rate of tax

$i_{AB}$ = interest rate on deposits (< £5,000) with Associated Banks

BD = dummy variable for bank dispute in 1976 II, III

TIME = time trend variable

BSD = stock of building society shares and deposits (£000's)

ΔCPI = rate of change in consumer price index (percentage)

ΔTGI = rate of change in earnings in transportable goods industries (percentages)

NETINF = net inflow including interest into the building societies (£000's)

$M_s$ = value of building society loan approvals (£000's)

$S_i$ = seasonal dummy variables i = first-third quarters

MORTR = mortgage interest rate on building society loans

EXBR = rate of interest on exchequer bills

REPIN = repayment of principal and interest payments on mortgage loans (£000's)

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