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Discussion Papers

No 38

Stockbuilding and Liquidity:
some empirical evidence for
the manufacturing sector

by

T S Callen
S G B Henry

June 1989

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1 Introduction

In this paper we analyse the behaviour of stockbuilding and the relationship between stockbuilding and liquidity in the UK manufacturing sector using co-integration methods.

Both stocks and liquidity can play a buffer role in the company's decisions while variables that are more costly to change (eg employment, investment) adjust more slowly to their long-run levels. It is this feature of stocks and liquidity which is the main concern here. The buffering role of stocks is well known: if there are quadratic adjustment costs in output, it is optimal for a firm to let stocks absorb a proportion of any change in demand and then stock levels gradually adjust to the new equilibrium. Liquid assets may also play a buffering role because holdings of liquid assets and/or bank borrowing are less costly to change than other items in the accounts. The implication behind such an interpretation is that disequilibrium in liquidity from its long-run target level may affect other company sector variables. Recognition of this feature led to the company sector adjustment system developed in the Treasury where disequilibrium financial effects were included in real company sector equations. The benefits of using co-integration for such a model is then obvious, the residual generated in the estimation of the co-integrating vector for liquidity can be interpreted as the deviation of liquidity from its long-run desired level. Ireland and Wren-Lewis (1988) for example, find that disequilibrium effects in liquidity when measured this way are significant when entered into a stocks equation (as well as other company sector equations), indicating that stocks and liquidity are inter-related: one method of improving liquidity in the short-term is to decrease stock holdings.

The work presented here uses co-integration techniques to investigate both stocks and liquidity. The results suggest that there is an important relationship between companies' holdings of stocks (of finished goods), liquid assets and liquid liabilities (in the form of bank borrowing). However, our findings do not confirm that this relationship is consistent with disequilibrium effects. Instead it appears that portfolio type considerations are important in the firms' decision to hold stocks and liquid assets and, as with any allocative decision, the respective holdings depend on relative rates of return and as well as scale variables.

The empirical work incorporates two approaches to capture financial effects in stockbuilding equations. The first emphasises the actual level of real gross liquid assets and real bank borrowing in the stocks equation. The second (and preferred) approach uses the determinants of the allocation between liquidity and stocks in the stocks equation. The main result in this latter approach was that a borrowing rate and a lending rate proved to be significant (with opposite signs), with the obvious interpretation that the difference in rates or the 'cost of liquidity' determines both holdings of gross liquid assets and the level of bank borrowing. As the interest rate spread declines, the cost of holding liquidity decreases and both the holding of liquid assets and the level of bank borrowing should increase. Thus stockholding is in part dependent upon the relative cost of stockholding (which we describe later) and of holding liquidity. The interpretation of the alternative which uses liquidity levels directly is not so clear. Probably the most convincing is that liquidity is acting as a proxy variable. If stock and liquidity levels have a common sub-set of regressors which we cannot identify or cannot measure accurately, the actual level of liquidity may proxy the effect that these variables have on stocks. These regressors are most likely to be the costs and benefits of holding stocks and liquidity. While we use a cost of stockholding term (derived by Kelly and Owen (1984)) which includes both costs and benefits of stockholding, and a cost of liquidity term, it is possible that these terms do not accurately reflect true costs and benefits. An alternative interpretation is that the use of liquidity variables in expenditure equations are capturing 'rationing' effects. This appears to be the interpretation behind the widespread use of net liquidity effects, ie they indicate a borrowing constraint upon the firm, so that when the constraint is relaxed borrowing increases and companies expenditure, including that on stocks, will expand.

2 Modelling Stocks and Liquidity

There is some ambiguity in the treatment of liquidity and its possible influence upon stockbuilding (or indeed on items of company expenditures). One influential approach is contained in work done at the Treasury (see Lewis (1981), Wren Lewis (1984) and Meen (1988)), where variations in the level of net liquidity from its desired value affect company expenditures via the so-called company sector adjustment system. The original work by Lewis (op cit) is in terms of gross liquidity (net liquidity plus bank advances), though bank advances are netted off to obtain the net magnitudes which are used in the stockbuilding and investment equations of the Treasury model (Melliss (1986)). The theoretical justification for the use of liquidity as a determinant of company expenditures is unclear. What is evident is that the original motivation behind the introduction of the company sector adjustment system in the Treasury model is that net liquid assets tended to rise or fall indefinitely following an exogenous shock. Consequently ad hoc liquidity adjustments were made to real expenditure equations to prevent the occurrence of 'liquidity crises' in simulations. Two issues may be distinguished here. The first is the theoretical justification for liquidity (or more generally company income) effects on real expenditure. The other is the empirical role disequilibrium financial effects have upon real decisions. In the Treasury system the deviation of net liquidity from its desired value has effects on real expenditures. These effects are imposed in the Treasury model, though recently Ireland and Wren-Lewis (1988) working within the spirit of the Treasury approach have estimated disequilibrium liquidity effects which have a significant influence upon company sector expenditure decisions. As Meen (1988) points out, however, the general problem encountered in simulating the Treasury model was that changes in liquid assets mirror changes in investment and stockbuilding given the identity linking profitability and net liquid assets. Hence very slow responses in investment and stockbuilding following a shock imply very long lasting changes in liquidity. Meen's work therefore investigates the existence of long-run equilibrium relationships in real expenditure equations as a means of constraining the growth in liquidity. Our approach will be rather different, and will be emphasising the determinants of the behaviour of liquidity and expenditure. But, like the Meen and the Ireland and Wren-Lewis work, the present paper will be concerned with empirical evidence; especially evidence about long-run behaviour. We will be very restricted however, by considering the decisions about stocks only, and we will ignore expenditure on investment and employment. The reason for this enforced limitation is one of tractability only. We will also be investigating the empirical evidence for disequilibrium effects of liquidity upon stockbuilding, which treats the firms demand for liquidity as a buffer stock variable.

The simplest form of model assumes the firm solves the dynamic minimisation problem;

$$\Sigma\ \delta^t (a/2\ (S_t - S^*)^2 - b/2\ (\Delta S_t)^2 + c/2\ (\Delta S_t - \Delta S_{t-1})^2) \qquad (1)$$

The first order condition for this optimisation are that stocks follow the dynamic decision rule.

$$B(L)\ S_t = a\ S^*_t \qquad (2)$$

Where B(L) is a polynomial is the lag operator L.

A solution for equation (2) depending upon forward convolutions of the target S* may be obtained by factorising B(L) into backward and forward looking terms, using familiar solution procedures (see eg Callen, Hall and Henry (1989) for further details). For our case this gives the equation.

$$S_t = \lambda_1\ S_{t-1} + \lambda_2\ S_{t-2} + a\ \Sigma\ \gamma_i\ S^*_{t+i} \qquad (3)$$

where λ_1 and λ_2 are the roots of the characteristic equation of (2) and the forward weights γ_i are non-linear functions of these.

Equation (3) is a closed form, forward looking, equation. However, the stockbuilding equations we report will not be estimated in this form and so will not invoke rational expectations formation for example. Instead the forward looking equations will be reparameterised into an ECM form. The principle involved is most readily seen for the first order case for the S_t, ie

$$S_t = \mu_1 S_{t-1} + \mu_2 E \sum_5 \mu_3^S S^*_{t+S} \tag{4}$$

Assuming that the target variable S^* has a simple AR(1) form,

$$S^*_t = a S^*_{t-1} + \epsilon_t \tag{5}$$

(higher order autoregressions may be needed, but these would only complicate the algebra without affecting the principles involved), then (4) may be reparameterised as

$$\Delta S_t = \mu_3 \Delta S^*_t + \mu_4 S^*_{t-1} - \mu_1 S_{t-1} \tag{6}$$

where $\mu_4 = (\mu_2/(1-\mu_3) - \mu_3)$. This equation is evidently of the ECM form. To estimate it we use the two-stage estimation procedure proposed by Engle and Granger (1987).

Before proceeding to the empirical results we need first to discuss possible determinants of S^*_t, the target for stocks. In Section 3 we report on co-integration exercises for equations for the level of stocks, gross liquidity and bank lending. The approach we take to the possible determinants of these is fairly catholic. In considering the variables to include in the stocks equation, we experiment with output, the cost of stockholding, liquidity, retained earnings and the representative borrowing and lending rates of interest. The variables used in the liquidity and lending equations are a scale variable (we use GDP), interest rates and the cost of stockholding.

Broadly speaking the analysis underlying the choice is a very simplified one which views both the holding of stocks and liquidity as satisfying a precautionary motive by the firm. On the one hand stocks are held to guard against the risk of stockouts, while liquidity is held to avoid the risk of a liquidity crisis where the firm has to undertake overdraft borrowing probably at penal rates. Both precautionary activities are costly. Holding stocks incurs costs and we proxy this by the Treasury cost of stockholding variable (CS) (although this is actually obtained from an intertemporal optimisation, see Kelly and Owen (1985)). Holding liquidity also incurs a cost at the net internal rate r (= i-p, where i is the borrowing rate and p the lending rate available to companies) (see Kelly (1984)). What we do not explicitly include in the model are risk terms; the conditional variance of sales representing the risk of stockouts, and a probability measure of the likelihood of incurring an overdraft. (Callen, Hall and Henry (1989) give results for the former using GARCH-M estimation.)

The set of variables used in the equations are fairly general, however, and the stock equation allows tests for the inclusion of interest rate effects to be made, as well as the level of net liquidity. The choice between these will figure substantially in the empirical results reported below.

One familiar interpretation of the model is provided by letting the equations for the levels of gross liquidity and borrowing represent B^*, (defining jointly a target or equilibrium for net liquidity). Deviations from this target may be approximated by an error correction stabiliser term, ie by $(B - \hat{B})_{t-1}$ (see eg Ireland and Wren-Lewis (1988)). As compared with equation (6) therefore, this is an extension, with deviations from target stock levels $(S\text{-}S^*)$ and deviations from the target for net liquidity $(B\text{-}B^*)$ both entering the ECM equation. The interpretation which may be placed on this is that the error in net liquidity is a 'financial disequilibrium' effect on stockbuilding. Liquidity is then viewed as playing a buffer stock role, absorbing shocks, but having a spillover effect upon stockbuilding. This is a formalisation of the HMT approach to liquidity adjustment via the company sector adjustment system (Melliss (1986)), and the estimation results are designed to shed further light upon the usefulness of this interpretation.

3 Co-integration Results

Before considering evidence for co-integration the orders of integration of the variables used in later regressions are established. The DF and ADF statistics are shown for the levels and differences in these variables next.

	Level		Difference	
	DF	ADF	DF	ADF
KIFW	-1.7	-1.46	-5.6	-3.5
CS	-1.99	-1.2	-8.4	-4.4
RCBR	-2.23	-2.16	-7.8	-4.7
MPRO	-2.06	-2.09	-8.9	-4.2
UNIU	-0.18	0.77	-12.8	-4.4
GL	0.42	-0.6	-6.8	-3.65
RLEND	-0.35	-1.57	-6.16	-3.61
AMIJ	-2.14	-2.73	-6.99	-4.2
GDP	0.35	0.42	-8.0	-3.87
INF	-1.39	-1.53	-4.68	-4.10

By and large these show that the variables are probably I(1), and so may serve as potential candidates in a co-integration exercise.

So in Table 1 these variables are used to test for the existence of co-integrating vectors for stocks, gross liquidity and bank borrowing. There are two aspects to these results for stocks (KIFW) which should be emphasised. One is that the equation may be thought of as a levels equation between stocks and its long-run determinants in a single equation framework. The first equation is an example of this. The remaining equations however, introduce another aspect, namely that the determinants of long run stock behaviour depend upon the long run determinants of liquidity. Table 1A gives the results for variables in natural units, and in 1B a parallel set of results are provided for log versions.

Table 1A: Stocks and Liquidity Equations (1970 Q1-1987 Q4)

Stocks (KIFW)

Const	MPRO	CS	GL	UNIU	RLEND	RCBR	AMIJ	INF	R^2	DF	ADF
20444	-0.04	-1.2		0.31					0.54	-2.5	-2.4
21558	0.002	-0.8	-0.22	0.51	0.08				0.57	-3.9	-2.6
18891	0.01	-0.6	-	0.10	-	0.89	-0.70	2.2	0.73	-3.1	-3.0
18910	0.02	-0.6	-	0.08	-	0.98	-0.76	-	0.73	-3.3	-3.2

Liquidity (GL)

Const	CS	GDP	RCBR	AMIJ	UNIU	R^2	DF	ADF
16635	0.59	-	-2.1	1.8	1.97	0.77	-3.6	-2.2
-62772	0.09	1.9	-2.7	2.2	-0.79	0.9	-3.9	-2.2

Lending (RLEND)

Const	CS	GDP	RCBR	AMIJ	INF	R^2	DF	ADF
-26565	1.8	1.27	-1.9	1.4		0.73	-3.13	-2.45
-36953	1.1	1.4	-3.4	3.1	1.5	0.70	-3.9	-1.9

Table 1B: Stocks and Liquidity Equations in Logs (1970 Q1-1987 Q4)

Log of Stocks (LKIFW)

Const	LMPRO	CS	LGL	LUNIU	LRLEND	RCBR	AMIJ	R^2	DF	ADF
9.6	0.012	-0.003		0.02		0.04	-0.03	0.76	-3.2	-3.34
9.57	0.12	-0.062	-0.16	0.07	0.025	0.02	-0.018	0.84	-4.5	-5.0

Log Liquidity (LGL)

Const	CS	RCBR	AMIJ	LUNIU	LGDP	R^2	DF	ADF
-23.9	-0.002	-0.118	0.10	-0.024	3.17	0.88	-3.2	-2.2

Log Lending (LRLEND)

Const	CS	RCBR	AMIJ	LGDP	INF	R^2	DF	ADF
-14.9	0.002	-0.08	0.07	1.92	3.7	0.69	-3.8	-1.9

The results for Table 1A are discussed first. The first result for stocks shows that it is not possible to get a co-integrating equation based only upon scale variables (MPRO and UNIU) and the cost of stockholding. However, the second example shows that a reasonably satisfactory equation may be based on output in manufacturing (MPRO), the cost of stockholding (CS), gross liquidity (GL), retained earnings (UNIU) and bank advances (RLEND). The ADF statistic marginally fails, though this appears to be due to problems induced by the extra differencing used in the ADF test. The DF appears to have serially uncorrelated error, suggesting the ADF may be inappropriately weighted against acceptance. But the behavioural interpretation of this equation is, to say the least, unclear. One possible interpretation is that net liquidity (GL - RLEND) is the appropriate variable, with the interpretation that decreases in net liquidity (as bank borrowing increases) are usually associated with higher than usual interest charges, as banks charge higher rates to overborrowed customers. But according to this view net liquidity should have a positive sign as it proxies (inversely) this borrowing cost. Evidently, the sign implied by the second equation for KIFW in Table 1 is a negative one. Furthermore the sizes of the two components of net liquidity are not equal in absolute magnitude, reflecting the finding that net liquidity is not in fact I(1). Consequently we have opted for the last two equations as being more acceptable in terms of their underlying behaviour. The fourth equation is perhaps preferable, as its Dickey-Fuller test statistics are both marginally better than the third equation. The third equation uses the inflation rate, thus implying, in an unrestricted way, that relative real interest rates influence stock levels.

The interest rate effects suggest that as borrowing rates rise stockbuilding increases, whereas as lending rates rise stockbuilding falls. In other words this is suggestive of a substitution effect; as the cost of acquiring liquidity, measured by the net internal rate

(RCBR - AMIJ) rises, then liquidity will tend to fall and stocks rise.

Turning to the liquidity equations, these also show parameter estimates consistent with the substitution effect. Hence as the cost of stockholding rises, liquidity increases, but it falls when the net internal rate rises. Overall however, the equations appear not to meet co-integration criteria as the ADF are below the acceptable value. Unlike the case for the KIFW equations, those for GL show the residual correlogram for these equations has slowly dampened AR(2) behaviour.

Finally the lending equation shows a similar form of behaviour to the GL equations, though here the equations are somewhat more successful in meeting co-integration criteria than the liquidity equations were. (Their residual correlograms appear damped for example, again indicating that the ADF statistics may be misleading.)

Not surprisingly, the logarithm versions of the equations produce the same overall conclusion though the co-integration properties of the log of stocks (LKIFW) equations are somewhat better than those in Table 1A. Since the overall findings are so similar to the earlier results they are not discussed any further.

In the next section we will describe the results of estimating dynamic stocks equations by the Granger-Engle two stage procedure, using the residuals from the levels equations in Table 1 as stabiliser terms in the dynamic equations.

4 Dynamic Models

In estimating ECM equations we adopt two related approaches. In the first, the ECM is

$$\Delta S_t = \theta(L)\ \Delta S_{t-1} + \Psi(L)\ \Delta Z_t + a(S - S^*)_{t-1} + b\ (B - B^*)_{t-1} \tag{7}$$

where the set of variables Z determine S^* and B^*, and so these enter as differences in the dynamic equation. To estimate the stabiliser terms in this equation, we use residuals from the levels equation in Table 1. This first approach to modelling stockbuilding takes the second equation from the levels equations for KIFW in Table 1A, and also uses the preferred equations for GL and RLEND for the $(B - B^*)$ terms (the second equation from the Table for each is used). The second approach is simply to take the residuals from the third equation for KIFW in Table 1A, excluding liquidity and borrowing effects altogether.

Applying the first approach - treating the stocks, liquidity and lending equations as independent long-run equations - gave the result

$$\underset{}{IIFW} = \underset{(1.2)}{37.4} + \underset{(3.2)}{0.39}\, IIFW_{-1} \underset{(2.8)}{-0.07}\, \Delta GL$$

$$+ \underset{(4.55)}{0.44}\, \Delta MPRO - \underset{(1.7)}{0.07}\, RES(-1) - \underset{(1.02)}{0.02}\, RESL(-1)$$

$$+ \underset{(1.5)}{0.01}\, RESR(-1)$$

$R^2 = 0.48$, LM(1) = 3.4, LM(8) = 11.5, RESET(4) = 12.5, BJ(2) = 0.6, $X^2(8) = 7.9$

In this equation RES = $(S-\hat{S})$, RESL = $(GL-\hat{GL})$ and RESR = $(RLEND-\widehat{RLEND})$.

We need not spend too long in discussing this variant since it is based in part upon the second stocks equation in Table 1 which we think is a-priori implausible. Overall, the equation fits fairly well, but, as well as the problems already noted, the signs of the financial disequilibrium effects are evidently a problem as they are the opposite to the usual effects attributed to financial disequilibria. Thus according to our equation when gross liquidity exceeds its equilibrium value, stocks fall, but when bank borrowing exceeds its equilibrium, the implication is that stocks rise. The opposite seems more plausible: if borrowing is above desired, the firm is likely to destock in order to cut down on borrowing committments.

Accordingly we move on to the alternative approach which uses the fourth KIFW equation from Table 1, drops gross liquidity and bank borrowing from the stocks equation, and introduces relative interest rates. The error correction model for this alternative, sets b=0 in equation (7), and lets S* depend upon relative interest rates among other things. Estimating the ECM equation gave the result,

$$
\begin{array}{l}
IIFW = \underset{(0.6)}{-17.3} + \underset{(3.54)}{0.44}\, IIFW(-1) + \underset{(1.44)}{0.16}\, IIFW(-2) + \underset{(2.55)}{0.23}\, \Delta MPRO - \underset{(2.14)}{0.24}\, \Delta CS \\
\quad + \underset{(2.42)}{0.29}\, \Delta CS(-2) + \underset{(2.07)}{145.5}\, \Delta RCBR - \underset{(1.57)}{117.7}\, \Delta RCBR(-1) - \underset{(1.68)}{97.3}\, \Delta AMIJ \\
\quad + \underset{(1.7)}{115.4}\, \Delta AMIJ(-1) + \underset{(2.4)}{0.09}\, \Delta UNIU(-1) + \underset{(2.3)}{0.08}\, \Delta UNIU(-2) - \underset{(1.9)}{0.10}\, RESN(-
\end{array}
$$

$R^2 = 0.58$, LM(1) = 1.5, LM(8) = 6.3, RESET(4) = 8.5, BJ(2) = 0.4, $\chi^2(8) = 10.7$.

In this equation RESN are residuals from the fourth equation for KIFW in Table 1A.

This equation is reasonably favourable to the approach we have outlined in earlier sections. Overall the equation is fairly good, with only the transitory incorrect sign on ΔCS to object to.

The interpretation we may place on this equation is that as relative interest rates and the cost of stockholding change, then stockbuilding will be affected. The effects work through the levels equation which shows that if the net internal rate increases (ie if the borrowing rate RCBR rises and/or the lending rate AMIJ falls) then stocks will increase via a substitution effect. A similar effect operates dynamically, though given the closeness of the absolute size of the estimated coefficients these effects are offset in 1-2 quarters. What is interesting about the contrast between the first and second version of the stockbuilding model is that they offer opposite implications about interest rate effects. The former model enters liquidity directly in the stocks levels equation.

Liquidity in turn is determined by relative interest rates and scale variables. According to the estimated effects of the relative interest rate terms, increases in borrowing rates decrease, while increases in lending rates increase, liquidity and borrowing. So in this model as borrowing rates rise, borrowing will decrease and, providing the borrowing disequilibrium term is correctly signed, stocks should decrease. The estimates we provide show that the estimated signs on the disequilibrium terms are negative for gross liquidity and positive for borrowing, the opposite sign to the usual financial disequilibrium interpretation. Our estimates of the second version of the model then reveal why this statistical result occurs and indeed points to an alternative interpretation. This is more in keeping with the model we described in Section 2 where decisions about the relative size of stocks and liquidity are affected, inter alia, by their relative costs. In this alternative a rise in borrowing rates leads to a substitution away from liquidity towards stocks, and as our results show, it is this alternative which is supported by the econometric evidence.

If the financial disequilibrium terms are added to the stockbuilding equation this tests whether the earlier adverse finding still holds. The result of this is shown next.

$$
\begin{aligned}
IIFW = & \underset{(0.43)}{-11.96} + \underset{(3.56)}{0.42}\, IIFW(-1) + \underset{(0.1)}{0.01}\, IIFW(-2) + \underset{(3.16)}{0.31}\, \Delta MPRO \underset{(0.67)}{-0.07}\, \Delta CS \\
& + \underset{(2.5)}{0.27}\, \Delta CS(-2) + \underset{(2.76)}{0.1}\, \Delta UNIU(-1) + \underset{(2.66)}{0.09}\, \Delta UNIU(-2) + \underset{(2.5)}{115.9}\, \Delta^2\, RCBR \\
& - \underset{(2.6)}{99.2}\, \Delta^2\, AMIJ - \underset{(1.16)}{0.069}\, RESN(-1) - \underset{(1.06)}{0.03}\, RESL(-1) + \underset{(1.8)}{0.02}\, RESR(-1)
\end{aligned}
$$

$R^2 = 0.586$, $LM(1) = 4.7$, $LM(8) = 7.7$, $RESET(4) = 13.4$, $BJ(2) = 0.67$, $\chi^2(8) = 15.4$

Although there is some worsening in the overall properties of this equation compared with its immediate predecessor (there is now first order serial correlation, and the forecast test is marginally failed), again the signs on the financial disequilibrium terms are the reverse to that required by the disequilibrium hypothesis.

Finally, the logarithmic version of the preferred model derived from Table 1B is estimated. This used the first equation for LKIFW from Table 1B, ie again that version which drops the liquidity and borrowing variables. Entering the residuals from this equation in a dynamic model for LKIFW gave the results,

$$\begin{aligned} \Delta LKIFW = {} & \underset{(0.83)}{0.001} + \underset{(3.41)}{0.197}\ \Delta LMPRO + \underset{(3.62)}{0.399}\ \Delta LKIFW(-1) - \underset{(2.1)}{0.001}\ \Delta CS \\ & + \underset{(2.9)}{0.008}\ \Delta RCBR - \underset{(2.3)}{0.005}\ \Delta AMIJ - \underset{(2.4)}{0.13}\ RESN(-4) \end{aligned}$$

$R^2 = 0.5$, LM(1) = 1.9, LM(8) = 4.5, RESET(4) = 7.1, BJ(2) = 0.09, $\chi^2(8)=8.09$

This is also a reasonably successful equation on most criteria, being something of an improvement on the levels version for this specification discussed above.

5 Conclusions

The conclusions of this work are that there is some evidence for financial influences as well as stockholding cost effects upon stockbuilding. This is shown most clearly in our first equation for stock levels in Table 1. This equation clearly fails to co-integrate, whereas the remaining equations probably succeed. Hence there seems to be a need to use financial variables as well as the cost of stockholding and output variables to get a reasonable explanation of stock levels. What financial variable it is best to use has occupied the bulk of this note. According to our results, there is a general preference in favour of direct measures, such as interest rates, in the stocks equation rather than proxy measures such as the level of company liquidity. Furthermore in the models we have investigated we do not find evidence of acceptable disequilibrium financial influences. That is to say, although the stockbuilding equations we report have fairly good statistical properties, we invariably find that disequilibrium financial effects are incorrectly signed when entered in these equations.

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Data Definitions

AMIJ	-	3-month inter-bank rate (Financial Statistics, Table 13.15.Code:AMIJ).
CS	-	cost of stockholding (from Kelly and Owen (1985)).
GDP	-	gross domestic product (average estimate) (Economic Trends, Table 3.Code:CAOP).
GL	-	LQAN/PGDP.
IIFW	-	manufacturer's stockbuilding of finished goods and work in progress (Economic Trends, Table 13 Codes:DGAY and DGAN).
INF	-	inflation rate (defined as (PGDP-PGDP(-4))/PGDP(-4).
KIFW	-	stock level: manufacturer's work in progress and finished goods (Economic Trends, Table 13).
MPRO	-	manufacturing production (Economic Trends, Table 16. Code:DVIS).
RCBR	-	clearing banks' base rate (Financial Statistics, Table 13.15. Code:AMIJ).
RLEND	-	LEND/PGDP.
UNIU	-	ICCs undistributed income adjusted for net unremitted profits (calculated from CSO printout reference DB14).
PGDP	-	GDP deflator (Economic Trends, Table 2. Code:DJCM).
LQAN	-	Industrial and Commercial Companies Liquid Assets (Financial Statistics, Table 8.4. Code:AIEL).
LEND	-	Bank advances to Industrial and Commercial Companies (Financial Statistics, Table 8.4. Code:AIEM).

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