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Cash Flow as an Investment Determinant: A Note on Coen's Speed of Adjustment Model

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Abstract: Investment models incorporating liquidity as an investment determinant and experimenting on the two possible roles that liquidity can play in an investment process – that of a direct capital stock determinant and that of a speed of adjustment determinant – should have to make a parallel search of the significance of the liquidity regressor under both assumptions, if a specific role is to be attributed to liquidity. Coen's leading model on the speed of adjustment is shown not to provide that distinction. JEL classification: E22, E62.

Key words: Coen's speed of adjustment model, cash flow

INTRODUCTION

Despite the neoclassical propositions that financial factors or the method of financing is of no consequence in deciding investment expenditures, it is accepted today that a well specified investment function should have to include financial variables, given the known imperfections in capital markets and the uncertain environment in which firms have to live. Internal liquidity or a cash flow variable is usually entered as the financial regressor[1,2].

The usual practice in the literature is to study the effects of liquidity mainly on aggregate investment, and this is usually done through simple (non tax-adjusted) flexible accelerator models. Only very few studies, including a major one by Coen[3] have tried to indicate a separate role for liquidity through affecting the weights of the adjustment function. Despite the later attempts, even simple acceleration theorists have not yet provided firm evidence for the liquidity role, possibly because most of these studies treat as the capital stock determinant the absolute level of funds. A greater consensus seems to exist on the second role of liquidity as a speed of adjustment determinant, but even Coen's results are questioned at present as to their completeness.

THE MODEL REEXAMINED

Coen showed that the ratio of cash flow to the difference between desired and actual stocks of capital is a highly significant determinant of the speed of adjustment in the presence of a well-specified desired capital stock incorporating the long run opportunity cost of capital. Some further considerations though could have substantiated Coen's model. In particular he could carry out an additional research on the form of lags of his liquidity variable that could enter his investment function, not only as a speed of adjustment determinant but also as an aggregate investment determinant. More specifically he had to incorporate liquidity as an aggregate investment determinant and identify any liquidity lag under which this term could prove significant. Then a comparison of the significance of the best lag structure under both assumptions (about the effect of liquidity) could have shown the specific role that the cash flow variable played in his investment function. One can prove, using Coen's formulations for the derivation of his model, that if, for example, liquidity entered as one of the desired capital stock (K^*) determinants the derived investment model would include liquidity in the same lagged form as Coen's liquidity term in his investment expression. This is demonstrated as follows. The expression of the optimal stock under the above assumption would be

$$K_t^* = f\,\{s_t, (c/w)_t, F_t\} \quad (1)$$

Where, s is the realized level of sales
c is the user cost
w is the wage rate, and F is liquidity

Considering the K_t^* function as linear, one can take

$$K_t^* = \beta_0 + \sum_{i=0}^{n-1} \gamma_{t-i}\,\{\beta_1 s_{t-i} + \beta_2 (c/w)_{t-i} + \beta_3 F_{t-i}\} \quad (2)$$

where, γ's are different weights for each variable given by the expectation lag distribution. Using (2) one can formulate the difference $K_t^* - (1-\delta)K_{t-1}^*$. More specifically,

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$$K^*_{t-1} = \beta_0 + \sum_{i=0}^{n-1} \gamma_{t-i} \{\beta_1 s_{t-1-i} + \beta_2 (c/w)_{t-1-i} + \beta_3 F_{t-1-i}\}$$

and

$$\delta K^*_{t-1} = \delta\beta_0 + \sum_{i=0}^{n-1} \gamma_{t-i} \{\delta\beta_1 s_{t-1-i} + \delta\beta_2 (c/w)_{t-1-i} + \delta\beta_3 F_{t-1-i}\}$$

Then

$$K^*_t - (1-\delta) K^*_{t-1} = \sum_{i=0}^{n-1} \gamma_{t-i} \{\beta_1 (s_{t-i} - s_{t-1-i}) +$$

$$+ \beta_2 ((c/w)_{t-i} - (c/w)_{t-1-i}) + \beta_3 (F_{t-i} - F_{t-1-i})\} +$$

$$+ \delta\beta_0 + \sum_{i=0}^{n-1} \gamma_{t-i}\{ \delta\beta_1 s_{t-1-i} + \delta\beta_2 (c/w)_{t-1-i} + \delta\beta_3 F_{t-1-i}\} =$$

$$= \delta\beta_0 + \sum_{i=0}^{n-1} \gamma_{t-i} (\delta\beta_1 s_{t-1-i}) + \Sigma \gamma_{t-i} (\beta_1 s_{t-i}) -$$

$$- \Sigma\gamma_{t-i} (\beta_1 s_{t-1-i}) + \Sigma\gamma_{t-i} \{\delta\beta_2 (c/w)_{t-1-i}\} + \Sigma \gamma_{t-i} \{\beta_2 (c/w)_{t-i}\} -$$

$$- \Sigma\gamma_{t-i} \{\beta_2 (c/w)_{t-1-i}\} + \Sigma\gamma_{t-i} (\delta\beta_3 F_{t-1-i}) + \Sigma \gamma_{t-i} (\beta_3 F_{t-i}) -$$

$$- \Sigma\gamma_{t-i} (\beta_3 F_{t-1-i}) = \delta\beta_0 + \Sigma \gamma_{t-i} (\beta_1 s_{t-i}) - (1-\delta) \Sigma \gamma_{t-i} (\beta_1 s_{t-1-i}) +$$

$$+ \Sigma\gamma_{t-i} \{\beta_2 (c/w)_{t-i}\} - (1-\delta) \Sigma \gamma_{t-i} \{\beta_2 (c/w)_{t-1-i}\} +$$

$$+ \Sigma\gamma_{t-i} (\beta_3 F_{t-i}) - (1-\delta) \Sigma\gamma_{t-i} (\beta_3 F_{t-1-i}) =$$

$$= \delta\beta_0 + \Sigma \gamma_{t-i} \{\beta_1 [s_{t-i} - (1-\delta) s_{t-1-i}] + \beta_2 [(c/w)_{t-i} - (1-\delta) (c/w)_{t-1-i}] + \beta_3 [F_{t-i} - (1-\delta) F_{t-1-i}]\}$$

If

$$\mu (S) s_t = \sum_{i=0}^{n-1} \gamma_{t-i} [s_{t-i} - (1-\delta) s_{t-1-i}]$$

$$\mu (S) (c/w)_t = \sum_{i=0}^{n-1} \gamma_{t-i} [(c/w)_{t-i} - (1-\delta) (c/w)_{t-1-i}]$$

$$\mu (S) F_t = \sum_{i=0}^{n-1} \gamma_{t-i} [F_{t-i} - (1-\delta) F_{t-1-i}]$$

then

$$K^*_t - (1-\delta) K^*_{t-1} = \delta\beta_0 + \beta_1 \mu (S) s_t + \beta_2 \mu(S) (c/w)_t + \beta_3 \mu(S) F_t .$$

The original gross investment function in its transformed type

$$I_t = b[K^*_t - (1-\delta) K^*_{t-1}] + (1-b) I_{t-1}$$

becomes

$$I_t = b\delta\beta_0 + b\beta_1 \mu(S) s_t + b\beta_2 \mu(S)(c/w)_t + b\beta_3 \mu(S) F_t + (1-b) I_{t-1} \quad (3)$$

But (3) is similar with Coen's investment function

$$I_t = b_0 \delta d_0 + b_0 d_1 \mu(S) s_t + b_0 d_2 \mu(S) (c/w)_t + (1-b_0) (1-\delta) I_{t-1} + b_1 \{F_{t-1} - (1-\delta) F_{t-2}\} \quad (4)$$

[3]

since all three variables s_t, $(c/w)_t$ and F_t enter in both equations with the same lagged form. This suggests that Coen's model cannot actually distinguish whether cash flow is a desired stock determinant or a speed of adjustment determinant.

CONCLUSION

The liquidity regressor introduced in a properly specified investment function can indicate two separate phenomena: that either cash flow is a direct capital stock determinant or that is may affect the speed of adjustment between desired and actual capital stock. In the first case the cash flow variable is entered in an additive form, while in the second case cash flow is incorporated in the investment function as a determinant of the adjustment coefficient. It is examined in the second case how quickly a firm can adjust towards its desired level of capital stock and liquidity is directly employed in the adjustment cost mechanism. Coen's results on the second possible role of liquidity are indicated to be incomplete. It seems to be necessary that in order to indicate the specific role that liquidity can play in an investment function a parallel search of the significance of the liquidity regressor under both assumptions has to be made.

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