What did the monetarists ever do for us? – speech by Huw Pill

Speech annex

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Annex

A monetary approach to modelling QE can cross-check estimates of QE's impact derived from other frameworks, such as event studies. Forward-looking monetary and portfolio balance models, which relate asset price developments to future QT asset sales that change the relative supply of money and other assets, can help analyse the implications sales to be made in the future, something that event studies – given their focus on the news in announcements of asset sales – by nature cannot do.

A modified version of a model drawn from the Bank's model suite (specifically, the sectoral monetary model of Cloyne et al. (2015)) adopts such a forward-looking approach. The model is estimated as a set of sectoral blocks, which are linked together using standard macroeconomic identities and relationships to get an aggregate impact on GDP and inflation. Each block models the broad money (M4ex) holdings of that sector. One of the sectors considered covers a group of asset managers known as non-intermediate OFCs (which we have labelled NBFIs in the main text), including the insurance companies and pension funds that typically hold a substantial amount of government debt.

The demand for money by this sector is modelled as a portfolio-balance relationship linking asset managers' holdings of money to the value of their overall portfolio of assets and the expected holding period return on money compared to other risky assets such as equities and bonds.

$$m_t = w_t + \theta(R_{Dt} - R_{Bt})$$

Where m_t is the (log of) money holdings, w_t is the (log of) total asset holdings, R_D and R_B are the returns on the safe (monetary) and risky (bond) asset and θ is the (semi-)elasticity of substitution between money and bonds (which we can think of as a proxy for the state of market functioning).

Total asset holdings are just the sum of money and the value of risky assets such as bonds and equities:

$$W = M + P_B B$$

The holding period return on the risky asset depends on the coupon or dividend payment and the expected capital gain to be made over the period:

$$R_{Bt} = \frac{C}{P_{Bt}} + \frac{EP_{Bt+1} - P_{Bt}}{P_{Bt}}$$

where C is the coupon on the bond or dividend on the equity.

Given an expected schedule of asset purchases or sales from this sector, this then delivers a relationship for risky asset prices which is a discounted function of future NBFI money holdings, with the discount factor dependent on the substitutability between money and other risky assets.

$$\hat{p}_{bt} = \frac{\hat{m}_t}{s_b + \theta(1 + c)} + \frac{\theta E\hat{p}_{bt+1}}{s_b + \theta(1 + c)}$$

where s_b is the initial steady-state portfolio share of risky assets and c the initial coupon rate or dividend yield. It is useful to consider the case where s_b and $(1 + c)$ are close to 1, this approximates to:

$$\hat{p}_{Bt} \approx \frac{\hat{m}_t}{1 + \theta} + \frac{\theta E\hat{p}_{Bt+1}}{(1 + \theta)}$$

where lower case letters refer to logged values and a ^ refers to log-deviations from the initial steady state. Solving this recursively forward gives

$$\hat{p}_{Et} \approx \frac{\hat{m}_t}{1 + \theta} + \frac{\theta \hat{m}_{t+1}}{(1 + \theta)^2} + \cdots .. \left(\frac{\theta}{1 + \theta}\right)^N E\hat{p}_{Et+N}$$

As can be seen if asset prices are expected to increase N periods in the future, and assuming the money supply does not change up to that point, then today's asset prices will only rise by a fraction of that amount given by $\left(\frac{\theta}{1+\theta}\right)^N$ with the fraction getting smaller as N gets larger.

The approximate solution to asset prices here is analogous to the solution of goods prices in the model of money demand and inflation first introduced by Cagan (1956) and applied in a rational expectations setting by Sargent and Wallace (1973). In that model, the price level is a discounted function of current and expected future money supplies. The only difference here is that we are applying it to asset prices rather than goods prices and to the demand for money by asset managers (NBFIs) rather than the aggregate demand for money.[1] Note, in the exact solution to the NBFI model, the impact of a QT sale on asset prices also depends on the substitutability between money and risky assets, whereas goods prices are exactly proportional to an immediate permanent increase in the money supply under Cagan's transactions demand for money. So the analogy is not perfect. Once asset prices are determined in the NBFI sectoral block, they then affect other sectors and, in turn, output and inflation through the various channels discussed in Cloyne et al. (2015).

[1] In Cagan's model of aggregate money demand, real balances depend negatively on the expected rate of goods inflation.