BANK OF ENGLAND

Speech

Asset Prices, Monetary Policy and Financial Stability: A Central Banker's View

Speech given by

Charles Bean, Chief Economist and Member of the Monetary Policy Committee, Bank of England

At the American Economic Association Annual Meeting, San Diego

3 January 2004

Abstract
This paper reviews the argument that monetary policy should react to asset price movements and/or financial imbalances over and above their impact on the inflation outlook. In a simple New Keynesian model, modified to allow for capital and debt accumulation, I then explore some of the ways in which the possibility of a credit crunch in the aftermath of an asset boom can affect the design an optimal monetary policy.
JEL Classification: E52, E58, E44
Key Words: Asset prices, monetary policy, financial stability.

The views expressed are those of the author and do not reflect those of either the Bank of England or the Monetary Policy Committee.

1 Asset Price Bubbles and Monetary Policy

What role should asset prices play in the setting of monetary policy? Prompted by the experience of the 1980s Japanese asset price bubble and the 1990s US stock market bubble, that question is hotly debated in central banking and academic circles. Under one view, exemplified by Alan Greenspan (2002) and Ben Bernanke and Mark Gertler (1999, 2001), monetary policy should remain focused on achieving the macroeconomic goals of low inflation and stable growth and should seek to do no more than deal with the fall-out from the eventual unwinding of an asset price bubble. An alternative perspective is that such an unwinding may lead to financial instability and that it is better to take pre-emptive action against the bubble during the upswing; see, for instance, Andrew Crockett (2003), Claudio Borio and Philip Lowe (2002), Stephen Cecchetti, Hans Genberg, John Lipsky and Sushil Wadhwani (2000) and Michael Bordo and Olivier Jeanne (2002).

At the outset, it is worth stressing that the issue is not really about asset price bubbles per se. If the only macroeconomic consequence of booms and busts in asset prices were via conventional wealth effects on aggregate demand, then they would constitute little more than a nuisance to monetary policy makers. Since the lags from changes in wealth to consumer spending seem to be at least as long as those from interest rates, policy makers would be able to offset the impact of asset price swings without much difficulty.

Rather, as stressed by Borio and Lowe and by Bordo and Jeanne, asset price bubbles tend to be associated with a broader set of symptoms, typically including high investment and a build-up of debt. The development of a bubble may initially be prompted by a beneficial supply shock, but subsequently excessive optimism about future returns drives up asset values, prompting increased borrowing to finance further capital accumulation. Moreover, appreciating asset values raise the value of collateral facilitating the accumulation of debt. During the upswing, balance sheets may look healthy as the appreciation in asset values offsets the build-up of debt. But when the bubble bursts the consequence will be a sharp deterioration in net worth and the possibility of financial distress. That is particularly likely if financial intermediaries respond to the deterioration in balance sheets by tightening credit conditions. Offsetting the macroeconomic consequences of such a credit crunch is more problematic than offsetting conventional wealth effects as a monetary relaxation is likely to have a smaller and less predictable impact.

The discussion is sometimes portrayed as being about whether the traditional central bank objectives of low inflation and stable growth need to be augmented with a separate objective relating to asset prices or financial stability. And a number of the analytical contributions, including some of those cited above, approach the issue by asking whether the incorporation of asset prices into a Taylor-style reaction function in which the interest rate responds to the leads to (sometimes expected) inflation and the output gap leads to better macroeconomic performance judged according to the usual criteria. But though these studies contain important lessons, they do not imply that an additional asset price/financial stability objective is required. Asset price bubbles are of concern precisely because of the financial instability and contraction in output that may result when they burst. Consequently a central bank seeking to stabilize inflation and output over a sufficiently long time horizon, should necessarily aim to incorporate the possible adverse long-term consequences of an asset price bubble in its deliberations. Changes in the formal mandates of central banks such as the Federal Reserve and the Bank of England[1] are therefore not required; for further discussion, see Charles Bean (2003).

But though the principle that a central bank should take on board the long-term implications for output and inflation of asset price boom-busts is persuasive, there are a number of serious practical difficulties in implementation. First, the policymaker must judge whether an asset price increase is warranted by the fundamentals or whether it is instead based on misplaced expectations and furthermore poses a threat to future financial and macroeconomic stability. A mechanical response that treats all asset price movements alike, whatever their cause, is unlikely to be appropriate; see Marvin Goodfriend (2002). Given that asset price boom-busts are apt to occur when there has also been an improvement in fundamentals, that is not likely to be a straightforward task, at least in the early stages of the upswing.

[1] The Bank of England is formally required to pursue an inflation rate for the CPI of 2% at all times and, subject to that, to support the Government's objective of high and stable growth and employment.

Second, once a bubble is large enough to be reliably identified, the presence of lags in the transmission mechanism of monetary policy complicates the calibration of the appropriate policy. Raising official interest rates will be counterproductive if the bubble subsequently bursts, so that the economy is subject to the twin deflationary impulses of the asset price collapse and the effect of the policy tightening. Indeed in the unlikely event that the policymaker knew that an asset price collapse was imminent, then monetary relaxation, rather than tightening, would be called for. David Gruen, Michael Plumb and Andrew Stone (2003) show that once one takes account of such lags, then the informational requirements necessary to make effective an activist policy are extreme. At best there is likely to be only a very narrow window of opportunity during which such action is desirable.

Third, a modest increase in interest rates may do little to restrain an asset price boom. But an increase large enough to materially affect the evolution of asset prices is likely to have a significant adverse impact on economic activity. So the policy maker would need to believe that the short-term costs from such a strategy are outweighed by the uncertain longer term gains. Moreover, if the key concern is the associated build-up of debt, then higher interest rates could exacerbate the problem if the associated increase in debt service outweighs the depressing effect on new borrowing. In any case, expectations of future returns are likely to be a key driver of asset prices, investment and borrowing, suggesting that expectations of future policy actions may be just as significant as current policy.

2 Optimal Monetary Policy with Asset Booms and Busts

The remainder of this paper illustrates some of these issues - in particular the role played by expectations of future policy actions – in the context of a simple New Keynesian macroeconomic, modified to allow for debt-financed capital accumulation and the possibility of credit crunches. Asset prices do not figure explicitly, but can be thought of as moving in sympathy with investment and borrowing.

Besides the central bank, there are two types of agents in the economy: households and firms. Households supply labour, consume and save. Firms are monopolistic competitors, and nominal prices are fixed with a fraction of prices being re-set each period as in the standard New Keynesian Phillips curve. Capital lasts a single period, has to be installed a period in advance, and is financed by borrowing from households. Debt lasts a single period and is denominated in real terms.

Credit crunches occur with a fixed probability, ρ. When they do occur their effect is to lower the level of supply in the economy. One rationalisation could be that a credit crunch leads to bankruptcies and the associated reorganisation of the firm's assets absorbs resources. Another could be that firms need access to working capital within the period in order to pay their workers, buy inputs, etc.; if firms cannot get access to the required working capital then supply will be curtailed. In effect a credit crunch is a negative shock to total factor productivity, though it reflects events in financial markets rather than a change in the technical capabilities of the economy.

Moreover, if a credit crunch occurs, it is assumed to be more severe the higher is the *overall* debt outstanding. It is this feature that provides the incentive for the central bank to moderate a current debt-financed investment boom. Since an individual firm's borrowing decision has negligible impact on overall debt, firms ignore the impact of their borrowing on the severity of any future credit crunch. Of course, the first-best policy would be to seek policies that tackle this market failure directly, such as prudential capital requirements, but it is nevertheless of interest to ask how the presence of such a market failure impinges on the design of the optimal monetary policy.

The production function is (variables are in logarithms and inessential constants are normalised to zero throughout):

(1) $y_t = a_t + \alpha k_t + (1-\alpha)n_t,$

where y_t is output, a_t is total factor productivity, k_t is the capital stock at the start of the period and n_t is employment. Total factor productivity is given by the process:

(2) $a_t = e_t - [\gamma + \omega(d_t - E_{t-1}y_t)]\varepsilon_t,$

where e_t is a serially uncorrelated shock to the technology, d_t is debt outstanding and ε_t takes the value unity if a credit crunch occurs and zero otherwise[2].

The demand for capital, conditional on the expected future level of output, is then:

$$(3) \qquad k_{t+1} = E_t y_{t+1} - E_t a_{t+1} + (1-\alpha)(E_t w_{t+1} - E_t p_{t+1} - r_t + v_t)$$

$$= E_t n_{t+1} + E_t w_{t+1} - E_t p_{t+1} - r_t + v_t,$$

where w_t is the nominal wage, p_t is the price level, r_t is the real rate of return on debt and v_t is a serially uncorrelated shock to "animal spirits".

Price changes are staggered as in the standard New Keynesian pricing equation:

$$(4) \qquad \pi_t = \beta E_t \pi_{t+1} + \delta m_t + u_t,$$

where m_t (= $w_t - p_t + n_t - y_t$) is marginal cost, u_t is an uncorrelated shock to the mark-up and β is the discount factor.

Households' savings are assumed to be a constant fraction of income, and labor supply is an increasing function of the real wage alone:

$$(5) \qquad w_t - p_t = \phi n_t.$$

The model can be developed along standard lines with an inter-temporal optimality equation for consumption and a corresponding intra-temporal optimality condition for labor supply, but that complicates the dynamics without changing the basic insights.

Given the constant savings rate assumption, an IS schedule can then be obtained from (3) using the equality of marginal cost and the labor share:

[2] Making the severity of the credit crunch depend on the debt-to-expected-output ratio facilitates the

(6) $y_t = E_t y_{t+1} + E_t m_{t+1} - r_t + v_t$.

Aside from the presence of marginal cost, this is similar to the standard New Keynesian IS schedule, though its interpretation is somewhat different with the terms on the right-hand side being the determinants of investment rather than consumption.

From (2) and (5), marginal cost is

(7) $m_t = (\alpha+\phi)y_t/(1-\alpha) - (1+\phi)(a_t + \alpha k_t)/(1-\alpha)$.

The flexible price level of output, y^o_t, is then obtained by setting $m_t = 0$:

(8) $y^o_t = \nu(a_t + \alpha k_t)$,

where $\nu \equiv (1+\phi)/(\alpha+\phi)$. The model may then be condensed into a New Keynesian Phillips curve:

(9) $\pi_t = \beta E_t \pi_{t+1} + \kappa x_t + u_t$,

where $x_t \equiv y_t - y^o_t$ and $\kappa \equiv \delta(\alpha+\phi)/(1-\alpha)$, and an IS schedule:

(10) $x_t = \eta E_t x_{t+1} + r^o_t - r_t + v_t$,

where $r^o_t \equiv E_t y^o_{t+1} - y^o_t$ is the natural real rate of interest and $\eta \equiv (1+\phi)/(1-\alpha)$ (= $\kappa\nu/\delta$).

The policymaker's loss, L_t, is of the usual quadratic form, except that the objective for output is assumed to be minimize volatility around the natural rate that would obtain in the absence of a credit crunch, y^*_t:

(11) $L_t = E_t[\sum_{k=0}^{k=\infty} \beta^k(\pi_{t+k}^2 + \lambda x^*_{t+k}{}^2)]$,

---

analysis while losing nothing of substance.

where $x^*_t \equiv y_t - y^*_t$ and $y^*_t = \nu(e_t + \alpha k_t)$. Using the fact that $d_t = k_t + r_{t-1}$, the two output gap concepts are related by:

(12) $$x^*_t = x_t - \nu[\gamma + \omega(k_t + r_{t-1} - E_{t-1}y_t)]\varepsilon_t = x_t - [\nu(\gamma + \omega v_{t-1}) + \omega\eta E_{t-1}x_t]\varepsilon_t.$$

The quantity in square brackets represents the output cost of a credit crunch, with terms reflecting the fact that debt carried into the period will be high if "animal spirits" had been buoyant in the preceding period or if output had been expected to be high.

Note that the impact of the credit crunch is *not* directly affected by the interest rate in the preceding period. A higher rate of interest reduces capital formation and debt accumulation, but that is exactly nullified by the higher interest payments on the debt. The total amount to be repaid is thus left unchanged. That means the effect of monetary policy on the severity of any future credit crunch operates purely through its impact on the expected future level of activity.

Consider first the optimal policy when the central bank cannot pre-commit. In that case it treats private sector expectations as unaffected by its current policy choice. Using standard methods, the associated optimality condition is, for all t:

(13) $$\pi_t = -(\lambda/\kappa)x^*_t.$$

In the absence of a credit crunch today, policy is thus unaffected by the possibility of a future credit crunch. If, on the other hand, there is a credit crunch today, policy is set looser than it would otherwise be. So the optimal policy is in effect to ignore the asset boom, but to mitigate the fallout when it busts. Furthermore the expectation of a looser monetary policy in the event of a future credit crunch raises expected inflation. Consequently there is an upward bias to inflation. There are echoes here of the analysis by Marcus Miller, Paul Weller and Lei Zhang (2002) of the "Greenspan put".

The reason the possibility of future credit crunches does not affect policy in the upswing directly is simple: a current policy tightening has no effect of the future debt-income ratio, because the reduction in borrowing is exactly counterbalanced by higher interest payments. The only way the future debt-income ratio can be affected is by lowering expectations of *future* activity, but that is impossible when the policy maker cannot pre-commit.

Now suppose the central bank can pre-commit. Employing the approach of Lars Svensson and Michael Woodford (2003), the "timelessly optimal" plan can be shown to satisfy the conditions, for all t and all k > 0:

(14) $E_t\pi_{t+k} = -[\lambda(1-\rho\omega\eta)/\kappa](E_t x^*_{t+k} - E_t x^*_{t+k-1})$.

Assuming that $\rho\omega\eta < 1$, the possibility of a credit crunch is thus similar in effect to reducing the weight on output in the central bank's objective function.

That there is less incentive to stabilize current output when the economy is overheating may appear counterintuitive. However, recall that though policy cannot affect the future debt stock directly, it *can* affect it via expectations of the *future* output gap. The expectation of a large positive output gap tomorrow boosts capital accumulation today, so raising the future debt stock and the costs associated with a credit crunch.

Now optimal policy in the standard New Keynesian model without credit crunches is history-dependent despite the absence of any backward-looking structural dynamics. That is because the optimal policy exploits the fact that a credible commitment to hold output above potential in the future raises inflation today via the expectations term in the Phillips curve. Given the convexity of the loss function, the optimal response to a temporary supply disturbance thus involves a small, but persistent, output gap, rather than returning inflation to target straightaway through a larger, but more short-lived, one (demand shocks are contemporaneously and fully neutralized).

When there is a possibility of a credit crunch, however, a gradualist response to, say, a beneficial supply shock generates additional expected future costs in the shape of a more severe credit crunch, should one occur. The optimal policy therefore involves a *less* accommodative policy today, i.e. more variation in the current output gap, and less persistence than in the standard model. Moreover, the optimal policy under commitment involves a weaker monetary policy response to the occurrence of a credit crunch than is the case under discretion. That is because the central bank recognizes that a policy of accommodating credit crunches through the loosening of monetary policy has adverse effects on inflation expectations. Consequently there is less monetary response to a credit crunch than under discretion, but average inflation is lower.

The analysis here is obviously highly stylized and purposely omits a number of features that may be of practical significance, including a direct influence of current interest rates onto future debt levels and the non-linearities that could arise in the event of a credit crunch. Nevertheless it highlights the role of expectations and inter-temporal linkages in designing an optimal monetary policy that recognizes the potential for an asset price boom today to increase the threat of future financial instability.

References

Bean, Charles (2003), 'Asset Prices, Financial Imbalances and Monetary Policy: Are Inflation Targets Enough?', in *Asset Prices and Monetary Policy*, (eds. Anthony Richards and Tim Robinson), Reserve Bank of Australia, pp.48-76.

Bernanke, Ben and Mark Gertler (1999), 'Monetary Policy and Asset Volatility' *Federal Reserve Bank of Kansas City Economic Review*, 84(4), pp. 17-52.

Bernanke, Ben and Mark Gertler (2001), 'Should Central Banks Respond to Movements in Asset Prices?' *American Economic Review*, 91(2), pp. 253-257.

Bordo, Michael and Olivier Jeanne (2002), 'Monetary Policy and Asset Prices: Does Benign Neglect Make Sense?', *International Finance*, 5(2), pp.139-164.

Borio, Claudio and Philip Lowe (2002), 'Asset Prices, Financial and Monetary Stability: Exploring the Nexus', Working Paper 114, Bank for International Settlements, Basle.

Cecchetti, Stephen, Hans Genberg, John Lipsky and Sushil Wadhwani (2000), *Asset Prices and Central Bank Policy*, Geneva Reports on the World Economy, 2, International Centre for Monetary and Banking Studies and Centre for Economic Policy Research.

Cecchetti, Stephen, Hans Genberg and Sushil Wadhwani (2002), 'Asset Prices in a Flexible Inflation Targeting Framework', in *Asset Price Bubbles: The Implications for Monetary, Regulatory and International Policies*, (eds. William Hunter, George Kaufman and Michael Pomerleano), MIT Press, pp.427-444.

Crockett, Andrew (2003), 'International Standard Setting in Financial Supervision', Institute of Economic Affairs Lecture, Cass Business School, London, 5 February.

Goodfriend, Marvin (2002), 'Interest Rate Policy Should Not React Directly to Asset Prices', in *Asset Price Bubbles: The Implications for Monetary, Regulatory and International Policies*, (eds. William Hunter, George Kaufman and Michael Pomerleano), MIT Press, pp.427-444.

Greenspan, Alan (2002), 'Opening Remarks', in *Rethinking Stabilization Policy*, Federal Reserve Bank of Kansas City, Kansas.

Gruen, David, Michael Plumb and Andrew Stone (2003), 'How Should Monetary Policy Respond to Asset-Price Bubbles?', in *Asset Prices and Monetary Policy*, (eds. Anthony Richards and Tim Robinson), Reserve Bank of Australia, pp.260-280.

Miller, Marcus, Paul Weller and Lei Zhang (2002), 'Moral Hazard and the US Stock Market: Analysing the Greenspan Put', *Economic Journal*, 112 (3).

Svensson, Lars and Michael Woodford (2003), 'Implementing Optimal Policy through Inflation-Forecast Targeting', in *Inflation Targeting* (eds. Ben Bernanke and Michael Woodford), University of Chicago Press, Chicago.