

## Reply to L. Stracca

The issues (i) and (ii) are addressed on pp. 5 to 10, and they result from the mathematical treatment of the optimal investment decision of firms quoted in the stock market. To begin with, equation (6), which represents optimal investment in terms of Tobin's 'q' with adjustment costs, "comes out" as the first order condition of the maximization of the expected profit equation (4) (the proof is in Appendix A1). Then, we derive mathematically the relationship between the firm's stock market value and optimal investment, which is a direct derivation of the fundamental valuation principle of stock prices. The result is in line with Tobin's theory: 'q' is the ratio of the stock market value to the replacement cost of capital (see eqs. 8 to 12); a higher stock market value raises 'q' and hence induces new investment (according to eq. 6). We have revised the maths, and we have found it is correct. But if there is any mistake we are unaware of, we are ready to correct it.

The reason why stock price bubbles depend on the interest rate, which we find a realistic and significant part of our model, is due to the way in which we model the bubble process (see para. 2.2). The key point is that, unlike usual practice, we let the bubble inflate the expected profits of the firm (see eq. 13, and subsequent explanation), instead of directly the stock price. As Akerlof and Shiller (2010) have noted, the most obscure aspect of bubbles is how they start; admittedly, we can offer little on this. However, we may say that our treatment based on extrapolations of future profits captures some "stylized facts" of bubbles (see our short discussion on p. 9). Therefore, the interest rate matters because it is the discounted value of expectations of ever growing profits that inflates the stock market value of the firm, while an increase in the interest rate operates in the opposite direction. The statistical properties of the bubble process are the same as in our benchmark papers by Bernanke and Gertler (1999, 2001).

The paper by Christiano et al. (2007) is indeed supportive of the view that monetary policy is improved by adding a "financial variable" to the interest-rate rule (namely the growth rate of credit). We have not expanded on it because it hinges on quite a different model structure, which, however, may deserve a more extended comment. Briefly, (i) Christiano et al. do not have an explicit treatment of stock price bubble dynamics, but they introduce an exogenous on-off fake signal of future higher productivity which directly impinges on the investment decision. (ii) The reason why conventional inflation targeting is inefficient goes through sticky wages. With sticky wages, the fake signal should be allowed to produce lower inflation as a means to increase real wages, but inflation targeting suppresses deflation thereby amplifying the undue boom in economic activity. Christiano et al. mention in support the well-known evidence that inflation has been weak in various recent episodes of the stock market booms. We tell a different story, where the origin is in the stock market price bubble, which triggers excess

investment, capital accumulation and excess capacity, which squeezes the gap with aggregate demand and hence suppresses inflation. As a result, inflation targeting alone is inefficient because the inflation rate fails to signal the ongoing boom. Note that in the Christiano et al. model the central bank's wrong decision is reflation, whereas in our model its wrong decision is too little deflation. Our paper is not aimed at an empirical assessment of these different explanations, but we think that our model is more straightforward and fits better the narrative evidence of recent US episodes of asset market booms, when the Fed did not seem concerned with incipient deflation but rather confident that the economy was on a balanced growing path of supply and demand with low and stable inflation.

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