Asset prices and monetary policy:
should central banks adopt asset-based reserve requirements?

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Abstract

Over the last ten years or so, a number of economists have addressed the question of a central bank's behaviour in order for the latter bank to limit fluctuations in asset prices, which have a bearing on real activities as well as on the economy as a whole. Despite the abundant literature, no consensus exists as yet on the attitude a central bank should adopt to control this phenomenon with a view to enhance macroeconomic stabilisation. One of the reasons of disagreement lies on the complexity of the issue at hand, and on the role that expectations play in determining asset prices as well as their dynamics over time.

This paper aims at investigating the influences of the financial sector on real activities. It considers the whole spectrum of theoretical approaches to the policy instruments that a central bank ought to implement in order to reach its goals. Our analysis shows the destabilising effects that financial cycles have on business activity. To limit the negative effects of asset price volatility, and in light of their inflationary character, we argue in favour of a central bank's direct intervention on the financial sphere. In this respect, this paper discusses two proposals, considering the pros and cons of each of them. The first proposal consists in adopting a pre-emptive and restrictive monetary policy with respect to financial market dynamics. It has the merit of being easy to put into practice, and of contributing to limit the optimism of agents on financial markets. Nevertheless, this policy entails a major drawback, notably, its negative effects on the economy as a whole, and in particular on production and employment. As such, it has to be rejected on the ground of the real costs it elicits. A second proposal, which consists in introducing asset-based reserve requirements for all financial intermediaries, averts this critique. In spite of its theoretical advantages, however, this proposal elicits some main problems when one tries to put it into practice, particularly because of its strong requirement of administrative and jurisdictional control.

Keywords: asset prices, central banks, financial bubbles, monetary policy

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Introduction

The current consensus in macroeconomic analysis is based on the assertion according to which a country's monetary policy affects its rate of inflation only, that is, has no effects on production and employment levels. In this case, the primary objective targeted by monetary authorities is stability of the internal value of the national currency, a necessary condition for the stability of the general price level. As a result, the targeting of a very low and stable rate of inflation became the major concern of central banks around the world.

In light of the importance of this monetary policy goal and its stakes, we may ask whether the objective of price level stability aimed at by monetary authorities takes into account all relevant variables. In particular, in this paper we want to ascertain in which measure asset prices and their fluctuations over time are included into the objectives of central banks. The behaviour of monetary authorities with respect to asset prices has a huge importance in an environment within which the consequences of misalignments in asset prices on economic activity have been recognised by many economists. A particular attention to fluctuations in asset prices can be justified by the definition of inflation, as well as by the harmful effects that large fluctuations in asset prices engender on real, financial, and monetary magnitudes.

The first section of this paper presents a survey of recent economic theory on the reaction of central banks with regard to fluctuations in asset prices, and on the advantages and limits of each intervention that economists have suggested so far. In this respect, one ought not to forget that the difficulties with which monetary authorities are confronted can be important. This can be explained by the interactions, objective as well as subjective, that exist between different markets, and by the difficulties of evaluating the financial situation. In this regard, the second section of this paper provides a critical assessment of two alternative proposals that have been put to the fore in order to control asset price misalignments without slowing down economic growth, hence engendering costs and sacrifices for the whole population in terms of output and employment. The conclusion of this paper is that no consensus exists as yet on the attitude central banks should adopt with regard to the evolution of asset prices.

1. What stakes represent asset prices?

The theoretical postulates enunciated by Milton Friedman since the mid-1970s have been dominating monetary policy making over the last thirty years. Since 1990, most central banks have been made independent institutions of the government, and their main objective consists now in targeting a low and stable rate of inflation. Indeed, advanced economies had never reached such low inflation rates for about fifty years before the 1990s.

The struggle against inflation seems to have met with considerable success. However, some questions arise as to which kind of "inflation" monetary authorities are fighting really. As a matter of fact, inflation is a decline in the domestic purchasing power of money, which can be measured by the relationship between the money stock and the volume of real goods and services produced within the country considered. Now, generally speaking, "inflation" is seized using the Consumer Price Index (CPI). According to this approach, every economic

agent spends her or his income on purchasing real goods and services. This means that the purchase of real estate and/or financial assets is not considered in the measurement of the inflation rate that central banks consider for the conduct of their monetary policy. However, the total money stock in an economy, which is connected to the total value of bank credits as "bank loans create deposits," allows economic agents to buy real goods and services, but also real estate and financial assets. Further, if the level of those credits that banks provide over any given period of time exceeds the level of production over this period, the result of "excess credit" will be an additional sum of bank deposits, which induces an increase in the prices of real goods and services, and allows the creation of a property or financial bubble.

As a matter of fact, after the collapse of the Bretton Woods regime (1944–73), international capital markets and financial activities have been liberalised. As a result of these changes in the regulatory framework of the financial system, households have become more and more exposed in financial activities and since the 1980s there have been important fluctuations in asset prices.[1] Financial markets have become more unstable, because of the increase in all forms of speculative behaviour, largely facilitated by the abolition of capital flows control and the decrease of transaction costs. More important, financial instability, characterised by a series of creation and explosion of bubbles, has inevitable consequences on real activities, as it influences the latter through different transmission channels. The harmful character of financial instability on real magnitudes has been shown by the number of financial crises that hit the global economy since the end of the 1980s. These crises had harmful effects not only on financial markets, but also on credit and product markets (Rochon and Rossi 2006).

The relevant literature emphasises four transmission channels through which variations in asset prices affect total demand and inflation. These transmission channels are the financial accelerator, Tobin's *Q*, wealth effects, and the balance-sheet channel. Let us consider them in turn shortly.

The financial accelerator comes into play when we consider the imperfections of the credit market. In an imperfect credit market, the existence of transaction costs and the information asymmetry, both *ex ante* and *ex post*,[2] induce the need of collateral requirements asked for by any financial intermediaries.

The existence of imperfections on the credit market leads to two facts. First, lenders oblige firms to finance a part of their investment projects with their own funds to avoid credit risk. Secondly, that part of the investment project that is financed with loans is characterised by a higher cost than the (opportunity) cost of the self-financing part of the same project.

Stock price volatility, which can be due among other possibilities to a change of monetary policy, has straightforward effects on a firm's net wealth. The amount of credit, which is proportionally related to the net wealth of the firm, varies in the same direction as the latter. When credit is easily granted, firms choose those investment projects for which the levels of risk and return are weak. On the contrary, during a credit restriction period, firms select more risky investment projects in order to obtain higher profits. This increases their default

[1] See Boone et al. (2001, p. 22), Boone and Girouard (2002, pp. 197–204), Pansard et al. (2005, pp. 14–19).
[2] The lender knows neither the future return on investment nor the likelihood of being reimbursed.

risk and their impossibility to obtaining new credits but decreases the amount of investment projects that can be carried out.[3] The consequence is a deterioration of economic activity in the country.

Tobin's Q *ratio* links investment expenditures with the market value of a firm's total assets. According to this approach, it can be profitable for a firm to invest on an additional unit of capital, if the market value of this additional unit of capital is higher than its acquisition cost.

A reduction in interest rates by a central bank makes fixed return bonds less attractive than stocks, for which demand and prices increase simultaneously. The increase in stock prices induces an increase in the market value of the firm and leads the latter firm to invest more (Mishkin, 2001, p. 2). In this way fluctuations in asset prices have direct consequences on a business's investment expenditures. The existence of a persevering bubble has destabilising effects on economic activity, because it gives firms a signal that they can become involved in additional investment expenditures, as they can expect future positive returns from these expenditures. When the bubble bursts, however, firms have an excessive capital stock with respect to its equilibrium level. The surplus of their capital stock then leads firms to reduce their investment expenditures, inducing a slowdown in the growth rate of national income.

The working of *wealth effects* is explained by Franco Modigliani's life cycle model and by Milton Friedman's permanent income hypothesis. According to their views, any increase in prices of real estate and/or of financial assets increases households' wealth, which should encourage households to rise their consumption spending and to reduce their savings ratio. The more a household's capacity to borrow increases, the more this household consumes, owing to an increase in its net wealth serving as a guarantee to the financial institution that grants the loan to it. While stock prices are considered as providing an approximation of the net wealth of firms, it seems that, for households, real estate is the best collateral for obtaining a loan. Consequently, prices in the property market can be useful indicators of future aggregate demand, given that there is a strong correlation between property cycles and business cycles for most OECD countries (Boone et al., 2001, pp. 4–21; Goodhart and Hofmann, 2001, pp. 2–3).

Recent literature puts the emphasis on a fourth channel, which is the *bank's balance-sheet channel*. Being the prevailing actors amongst financial intermediaries, weak banks' balance sheets intensify financial shocks. Indeed, each bank must have a sufficient amount of funds in order to honour its engagements vis-à-vis its creditors. Bank managers may prefer riskier portfolio choices in order to get higher returns, but a higher degree of risk elicits a higher likelihood of bankruptcy. Confronted with this problem of asymmetric information, banks' creditors require higher interest rates. In order to avoid bankruptcy dangers and to diminish systemic risk, the legislator established a threshold of cash flows every bank is required to hold. Banks then prefer increasing their amount of funds in order to give a security signal to their creditors and thereby to obtain loans with a lower interest rate.

[3] See Bernanke et al. (1999) for a more detailed explanation of the financial accelerator mechanism.

Information asymmetry also exists between the bank and investors. Given that banks do not know with certainty the return on assets serving as guarantee, banks impose on their clients higher interest rates than those that would be applied in a situation of perfect information. These interest rates will obviously be higher than the interest rates banks will have to pay to their own creditors (Mésonnier, 2005, pp. 4–10; Naouar, 2006, pp. 4–7).

Hence, when asset prices increase, or when a more expansionary monetary policy induces their increase, the value of banks' assets rise, so that these banks may borrow more funds and grant more credits to any creditworthy non-bank agents. On the contrary, an asset price collapse decreases banks' funds. Refinancing becomes thus more difficult and more costly for them, which leads them to issue loans with higher interest rates. When the reduction in their funds is severe, banks may refuse to lend or supply credits to extreme conditions. This syneresis of bank credit following a change in monetary conditions amplifies the economic downturn. The enlargement of the shock will be as persistent as the initial balance sheets of banks, firms, and households are weak. Further, in this economic context, investors are not willing to invest, and this worsens even more the economic situation (Mishkin, 2001, p. 6; Levieuge, 2005, pp. 319–20; Mésonnier, 2005, pp. 4–10).

This succinct analysis of the four transmission channels listed above shows the influence of asset prices volatility on consumption and investment spending. The last channel addresses an area of particular importance, because it underlines the destabilising role of variations in asset prices on real magnitudes. It also highlights the amplifying character of any financial shocks that may occur within an economic system. This channel constitutes one of the most important factors in the occurrence of economic and financial crises. Further, we may note that financial markets evolve in a pro-cyclical way, exercising booster effects in periods of either expansion or economic downturn.

Consequently, high asset price volatility gives rise to a high degree of uncertainty about the future evolution of financial and real economic activities. Both firms and households are concerned in this respect. Another important consequence of high asset price volatility is the increase in the likelihood of financial institutions' bankruptcy, particularly for private banks. Financial instability may lead to macroeconomic instability, owing to the fact that it provokes a confidence crisis over the long run. This crisis will hit all economic agents independently of their involvement in financial markets. As a result, the harmful effects on real magnitudes will be important. These effects will be the more damaging as households think that the financial situation may be interpreted as being a quite good indicator of future economic performance (Durré, 2001, pp. 2–12).

2. Monetary policy and asset prices

Two factual observations lead us to consider whether monetary authorities have to react to fluctuations in asset prices in the same way as they react to CPI inflation. First, the impact of fluctuations in asset prices on output and on future conditions of aggregate demand has

been recognised by a number of economists and central bankers.[4] Secondly, variations in aggregate demand could induce upward pressures on the price level. Further, asset prices seem to be leading indicators of inflation: "[t]he logic of this point of view lies in the fact that the value of an asset is measured in a forward-looking way, and thus, as a result, asset prices integrate expectations relating to economic growth and future inflationary pressures" (Trichet, 2002, p. 40, our translation).

If we agree with the proposal of a direct reaction of the central bank to fluctuations in asset prices, it is important to recognise the large number of difficulties with which the monetary authority is confronted. The first difficulty in this respect is to assess how the central bank has to react to asset price variation. Is it necessary to establish a price index integrating the prices of financial assets? Is it necessary to include asset prices into a Taylor rule, targeting in this case not only the CPI inflation rate, but also financial stability? If we agree with this inclusion, should the central bank's reaction be symmetric or asymmetric? What should the reaction coefficient to fluctuations in asset prices be? Further, one needs also to determine the reference value from which all deviations of asset prices will require an intervention of monetary authorities. How should one adapt the reaction of the monetary authorities to the nature of the shocks that cause fluctuation in asset prices? There are several questions that one has to consider simultaneously and to which it is necessary to give the most appropriate answer. Let us expand on them in the remainder of this section.

The creation of a price index including asset prices

Considering the argument that asset prices are leading indicators of the future evolution of the prices of goods and services, and given that asset price fluctuations can induce a loss in the purchasing power of money, we can imagine the construction of a new price index in order to measure the inflation rate targeted by the central bank. Two problems arise in this respect. The first problem is to determine the weight that should be given to asset prices in the new index. The second problem, which emerges from the fact that any increase in asset prices is not necessarily inflationary, stems from the theoretical as well as practical difficulties in assessing the moment from which a monetary authority's intervention (to control excessive fluctuations in asset prices) could be justified. Some authors, for instance Shiratsuka (1999, pp. 107–23) and Filardo (2001, p. 15), put the emphasis on the harmful impact of a large variation of policy interest rates needed to control asset price fluctuations. Large interest rate volatility can have more harmful effects on economic activity than its beneficial effects on inflation and financial stability. Hence a change in policy interest rates is problematic.

The reaction of monetary authorities with respect to the nature of shocks

As the idea of constructing a new price index incorporating the prices of financial assets and real estate has been rapidly abandoned, some authors, such as Goodhart and Hofmann (2001, pp. 10–15), suggest introducing asset prices in a monetary authority's loss function.

[4] See in this respect Bernanke et al. (1999, pp. 1341–75), Cecchetti et al. (2000, p. 2), Filardo (2001, p. 2), Goodhart (2001, pp. 346–52), Goodhart and Hofmann (2001, pp. 4–9), Bordo and Jeanne (2002b, pp. 5–7), Ahearne et al. (2005, pp. 8–10).

These authors, however, refuse the principle that a central bank should react automatically to asset price fluctuations. In their view, monetary authorities should analyse the reasons of these variations, in order to know whether these fluctuations stem from supply or demand factors.

This point has been elaborated upon by Durré (2001, pp. 12–24). The author notably argues that monetary authorities do not have to react in the same way to any variations in asset prices. Rather, they have to determine the kind of shock that has induced these variations in asset prices, and to assess whether the dynamics of financial magnitudes is destabilising or stabilising. A fortiori, the monetary authorities' reaction has not to be the same when they have a traditional objective (that is to say price stability) and when they also target financial stability. In the latter case, a central bank's reaction function takes the form of a Taylor rule augmented by asset prices. The central bank's loss function is then as follows:

$$\pounds = E_t\,((y_t - y^* - \varepsilon_t^s)^2 + \chi(\pi_t - \pi^*)^2 + \gamma(l_t - l^*)^2)$$

where y represents output, π the current rate of inflation, l asset prices, ε_t^s different types of shocks that hit the economy, and E_t is the expected loss at time t. The objectives pursued by the central bank are: minimisation of the output gap, minimisation of the gap between the current (π) and the targeted inflation rates (π_1^*), and finally stabilisation of asset prices with regard to their target (l^*). This means that monetary policy focuses only on the deviations of asset prices with respect to their fundamental values, on the assumption that the central bank is always able to know these values.

Let us investigate the behaviour of the central bank with regard to each type of shocks.

In case of positive demand-side shocks, aggregate demand increases, eliciting some upward pressures on the price level. The central bank intervenes by raising the nominal interest rate in order to minimise the gap between the measured inflation rate and its target level. The increase in nominal interest rates leads to a reduction in asset prices, which, in turn, induces a reduction in aggregate demand through wealth effects. On the other hand, this rise in the interest rate makes capital cost more expensive and depresses investment spending. In this case, the reaction of a central bank to positive demand-side shocks should be weaker when the central bank targets financial stability than when it targets price stability only, owing to the stabilising role of asset prices. Further, the stronger the sensibility of aggregate demand to variations in asset prices is (thus when wealth effects are important), the less should the central bank vary its policy interest rates.

In case of supply-side shocks, monetary authorities must detect the nature of these shocks. During a technological shock, the central bank should not intervene. A technological shock contributes to an increase in production capacities. Asset prices are expected to rise, owing to a permanent increase of future dividends. On the one hand, aggregate demand increases because of a raise in asset prices via a wealth effect. On the other hand, the potential level of production increases owing to technological progress. When the central bank targets its traditional objective, it can react to the supply shock by lowering interest rates with the aim of stimulating aggregate demand. Nevertheless, in an inflation targeting model with wealth

effects, the central bank does not have to intervene systematically in case of technological shocks. Indeed, aggregate demand can be at the level of aggregate supply, as a result of the positive impact of the increase in asset prices on aggregate demand. The degree of a central bank's intervention in this case should depend on the sensibility of aggregate demand to fluctuations in asset prices. In case of a technological shock, the higher the wealth effects, the less the central bank should intervene. According to Durré's calculations (2001), the central bank's intervention is not needed if the elasticity of aggregate demand with regard to asset prices is up to 0.7. This example highlights the re-equilibrating role of asset prices.

When the central bank is confronted with a supply-side shock, nevertheless, and when the elasticity of aggregate demand with regard to asset prices is weak, the central bank has to arbitrate between stabilisation of economic activity and stabilisation of asset prices. In this case, the central bank is confronted with two contradictory objectives: it must either accept a higher inflation rate in order to minimise fluctuations in asset prices, or on the contrary it has to abandon its financial stability objective in order to attain price stability. This choice will finally depend on the central bank's preferences and, consequently, on the coefficients that the central bank assigns to each monetary policy objective (Levieuge, 2005, p. 323).

If we consider a positive financial shock, an increase in risk premium induces a fall of asset prices according to the dividend discount model. A reduction in asset prices influences negatively aggregate demand. If the level of production remains unchanged, any downward pressures in aggregate demand could affect negatively the prices of real goods and services. In order to avoid the decline of the price level, the central bank reacts by reducing its own policy interest rates, which can lead to an increase in aggregate demand. The stronger the sensibility of aggregate demand to variations in asset prices is, the stronger will be the modification of the central bank's policy interest rate in case of a financial shock. Indeed, monetary authorities should minimise economic activity fluctuations, as well as asset price variations. The central bank's reaction will be stronger when it targets financial stability than when it targets price stability. This can be explained by the fact that a financial shock (as well as a technological shock) influences asset prices directly. With a financial stability objective, monetary authorities have to react to the reduction in asset prices on one side and to the reduction in aggregate demand on the other side. The monetary authorities' reaction to fluctuations in asset prices would not be always the same: they have to react strongly to financial shocks, but they have to be much more rigorous in case of supply-side shocks, allowing asset prices to play their stabilising role.

The integration of asset prices in the central bank's reaction function

Bernanke et al. (1999, pp. 1341–93)[5] are amongst the first economists who have recognised the impact of fluctuations in asset prices on the real sector and who have been interested in the relevance of the introduction of asset prices in a central bank's reaction function when two main transmission channels are working, namely, the wealth effects and the financial accelerator.

[5] See also Bernanke and Gertler (1999, pp. 22–42).

While considering a closed economy, the authors integrate the possibility of an exogenous shock, which means that their model accepts the hypothesis of a speculative bubble creation. The bubble appears unexpectedly (as it is exogenous), and develops in a way that makes it double every period and bursts at the end of five periods. When the bubble bursts, asset prices return to their fundamental values. "This assumption of exogeneity has important implications for monetary policy. First of all, it underlines that the creation, the existence and the burst of asset bubbles, as well as the way the bubble reacts to a change in monetary policy, include some unpredictability by the fact that disequilibrium factors are not specified in the model. As a result, it is difficult for monetary authorities to know how to react to a misalignment of asset prices: is it necessary to tighten monetary policy and to react countercyclically or, on the contrary, is it necessary to ease monetary policy in order to weaken the shock's impact that the bubble will provoke?" (Selody and Wilkins, 2004, p. 6, our translation).

Bernanke and Gertler (1999, pp. 17–51) try to answer this question. They are interested in determining whether a central bank must adopt accommodating or aggressive behaviour with respect to expected inflation, and whether it is necessary for a central bank to react to asset price fluctuations. An accommodating rule consists in varying nominal interest rates in the same direction and with the same extent as the expected variation in the future rate of inflation, in order to keep real interest rates unchanged. This rule respects the now famous relation put to the fore by Irving Fisher. It has the advantage of not influencing economic activity. By contrast, this rule is aggressive when the central bank has a strong aversion to inflation. In this case, nominal interest rates will have to react strongly to any inflationary expectations. This means that real interest rates will be affected, and that monetary policy will have an impact on real economic activity.

These two monetary rules can be applied to the following relation (we simplify):

$$i_t = \alpha i_{t-1} + \beta E_t \pi_{t+1} + \delta Y_t + \gamma (S - S^*)_t$$

where i_t is the nominal interest rate decided by the central bank in period t, $E_t\pi_{t+1}$ represents the period t expectations of the inflationary gap, which will be created in t+1, Y_t represents output gap in period t, and $(S - S^*)_t$ represents the difference in period t between the stock-market value of assets (S) (that is, their market price) and their fundamental value (S^*).

The authors assume then that the central bank will not react to the output gap ($\delta = 0$). The inclusion of asset prices among the central bank's objectives is represented by the value of γ. If $\gamma \neq 0$, the central bank reacts to asset price fluctuations. If $\gamma = 0$, the central bank does not react to asset prices. When the monetary authorities apply an accommodating rule, the value of β is 1.01. If they apply an aggressive rule, the value of β is 2.0.

Bernanke and Gertel (1999) carried out four simulations: accommodating rule with a price stability objective ($i_t = 1.01\ E_t\pi_{t+1}$), aggressive rule with an objective of price stability ($i_t = 2.0\ E_t\pi_{t+1}$), accommodating rule with objectives of price and financial stability ($i_t = 1.01\ E_t\pi_{t+1} + 0.01\ (S - S^*)_t$) and an aggressive rule with objectives of price and financial stability ($i_t = 2.0\ E_t\pi_{t+1} + 0.01\ (S - S^*)_t$). Notice that the reaction coefficient of monetary authorities

to asset prices variation is very weak. Consequently, we might think that financial stability is not an objective in itself for the monetary authorities. Nevertheless, as this coefficient is positive and different from zero, it has the merit of integrating households' behaviour as one of the concerns of the central bank.

The authors' results of their econometric tests conclude for the choice of an aggressive rule with the only monetary policy goal of price stability of real goods and services. This result can be explained as follows: knowing that the central banker is very averse to inflation, and that s/he is going to increase policy interest rates each time when s/he expects an increase in the inflation rate, economic agents will integrate this behaviour into their consumption behaviour. Indeed, if economic agents expect a period of economic contraction, they will rapidly respond by reducing their consumption and investment spending. The expectation of a future decrease in stock-market prices (because of the increase in policy interest rates) means that households' net wealth will decrease, which will imply a drop of consumption spending (if we consider the life cycle model with a consumption smoothing objective).

Abiding by a rigorous rule with the additional objective of financial stability does not bring very different results from what we have already discussed. For that reason, according to Bernanke and Gertler (1999), the introduction of asset prices in the central bank's reaction function is neither necessary nor desirable: central banks do not need to detect the nature of the shock that hits financial markets and do not have to be confronted with an arbitration of objectives in the case of demand side shocks.

The implementation of an accommodating rule (β = 1.01), which allows keeping the real interest rate constant, leads to perverse as well as unsatisfactory results in any case. The application of an accommodating rule when the central bank targets the sole goal of price stability is not optimal. Indeed, the creation of a speculative bubble stimulates aggregate demand through the financial accelerator channel and the wealth effects. Consumption and investment increase, as do output and the inflation rate. When the bubble bursts, a firm's net wealth decreases while the external financing premium increases, which leads to a fast loss of output. On the other hand, the application of an accommodating rule, if the central bank wishes to reach both price and financial stability, leads to perverse results. The reason is that "the expectation by the public that rates will rise in the wake of the bubble pushes down the fundamental component of stock prices, even though overall stock prices (inclusive of the bubble component) rise. Somewhat counterintuitively, the rise in rates and the decline in fundamental values actually more than offset the stimulative effects of the bubble, leading output and inflation to decline – an example of the possible 'collateral' damage to the economy that may occur when the central bank responds to stock prices. However, the general point here is that a monetary policy regime that focuses on asset prices rather than macroeconomic fundamentals may well be actively destabilizing. The problem is that the central bank is targeting the wrong indicator" (Bernanke and Gertler, 1999, p. 28).

Bernanke and Gertler (1999) assume that the central bank can identify (the existence of) a bubble. This means that it can differentiate what in an asset price relates to its fundamental value and what results from non-fundamental elements. This hypothesis is strong because it

assumes that central banks are more informed than the market, and that they have a higher degree of rationality than other agents (Bordo and Jeanne, 2002b, p. 3). Nevertheless, it is worth specifying that even if central banks have a high rationality and perfect information, the definition of a bubble, its creation, its magnitude, and its length imply large subjective assessments. There are no means to assess, in a completely objective way, the fundamental value of the price of a financial asset or a real estate.

Bordo and Jeanne (2002b, pp. 8–12) provide in this respect an additional argument, which seems to reinforce the conclusions of Bernanke and Gertler (1999). According to Bordo and Jeanne (2002b), not all financial bubbles are going to burst. Their results show that the likelihood of a bubble to burst on the stock market is only about 16.7 percent. By contrast, the same likelihood goes up to 55 percent for bubbles concerning real estate. Further, some bubbles do not elicit harmful repercussions for economic activity when they burst. In other words, this is tantamount to saying that the detection of a bubble is not a sufficient reason to justify the intervention of monetary authorities.

Cecchetti et al. (2000, pp. 22–36)[6] contradict the results of Bernanke and Gertler (1999). They consider the same central bank's reaction function used by Bernanke and Gertler (1999) and assign a coefficient to the output gap, which is positive and equal to 1 (contrary to the choice of Bernanke and Gertler (1999), who assigned a zero-reaction coefficient to the output gap). Cecchetti et al. (2000, pp. 22–36) try to work out a loss function for each monetary policy rule (namely, a monetary policy rule that aims only at price stability, and a monetary policy rule that aims at price as well as financial stability), their objective being to choose the monetary policy rule that minimises the relevant loss function. According to their results, the optimal rule must consider asset prices. Cecchetti et al. (2000) suggest a systematic reaction of central banks to asset price fluctuations that do not correspond to fundamental values, contrary to the scepticism of Bernanke and Gertler (1999). Cecchetti et al. (2000) add that the central bank must be capable of estimating precisely asset price misalignments and of reacting differently according to the shock that has engendered these misalignments. The reaction of monetary authorities must be preventive, in order to restrict the scale of the bubble's consequences.

The difficulty in effectively disclosing the presence of a bubble raised the anxiety of many economists.[7] The faster the reaction of central banks to stock market fluctuations is, the higher the likelihood for a central bank to implement the wrong policy. A wrong reaction of the central bank would be largely destabilising in that case (Levieuge, 2005, p. 324), and would carry heavy consequences in terms of wealth losses for the whole economic system. This would induce a loss of credibility for the central bank as well as for its policy.

Consequently, a number of authors disagree with Cecchetti et al. (2000) on the ground that the detection of a bubble is not easy, especially because determining the fundamental value of assets depends on subjective criteria (Selody and Wilkins, 2004, p. 10). More important, the use of the instrument currently held by central banks has uncertain effects: the influence of a variation in the nominal short-term interest rate on stock-exchange prices is not always

[6] See also Cecchetti et al. (2002, pp. 3–9).
[7] See Trichet (2002, p. 39).

univocal. How financial markets interpret this reaction by monetary authorities is essential. This means that a central bank does not have an absolute control over asset prices, which adds a further difficulty to the issues discussed above.

To avoid the problem of a wrong assessment of asset price deviations from their own fundamental values, and to prevent a hasty intervention of monetary authorities, Cecchetti et al. (2002) suggest a reaction of the central bank, via the manipulation of the short-term nominal rates of interest, only in case of large misalignments of asset prices with regard to their long-run fundamental value. This would make sure that these manipulations will have important repercussions on real magnitudes. In their opinion, small deviations do not seem to have destabilising effects. Further, large deviations, such as those observed in Japan in 1989 and in the United States in 2000, are not difficult to discern according to the authors' opinion.

According to the discussion above, we might conclude that the less a central bank is able of estimating accurately the repercussions of asset price fluctuations on real magnitudes and the more it is required to react rapidly by modifying interest rates, the less is it necessary to include financial stability among the central bank's objectives, owing to the fact that the likelihood for a central bank to make the wrong decision is rather high. The introduction of a target regarding financial assets and real estate in the Taylor rule induces an immense difficulty for monetary authorities, owing to the repercussions of a modification of interest rates on the whole economy.

Must central banks react asymmetrically?

Taking into account the difficulties that central banks have to address when intervening preventively to minimise a bubble's impact, we may consider whether an asymmetrical but systematical reaction of central banks would be justifiable. Such behaviour of monetary authorities has been qualified as "benign neglect" in economic literature. Central banks will thus play the role of lenders of last resort. In this regard, central banks reduce interest rates after the collapse of stock-exchange prices in order to limit the losses of households and to avoid an economic recession. The argument that justifies this form of behaviour centres on the claim that any injection of liquidity that is necessary in case of financial instability will be of very short term. As a result, this behaviour has no influence on the macroeconomic objectives of monetary policy, which concern the medium and long run.

The argument that financial stability can be attained after a financial recession and without thereby affecting inflation and output owing to the "benign neglect" behaviour of monetary authorities is correct, but only when households and financial intermediaries expect a future economic crisis and a slowing down of economic activity. If so, then stock-exchange prices will not increase much during the upward phase of the cycle. Hence, during the downward phase of the financial cycle, the fall of stock-exchange prices will not be very tough, and its impact on economic activity will not be very harmful (Bordo and Jeanne, 2002b, p. 4).

A systematic and asymmetric intervention of the central bank, however, may destabilise the investors' forms of behaviour, and may give rise to moral hazard. Indeed, knowing that the

central bank adopts an accommodating monetary policy stance systematically after every collapse of stock-exchange prices, investors will get involved in riskier investment projects in order for them to earn higher profits. If so, one might then criticise monetary authorities for having contributed to the emergence of speculative bubbles (Illing, 2001, p. 1; Trichet, 2002, pp. 39–40).

On the other hand, if the central bank does not intervene because of its incorrect estimation of the emergence of the bubble, it can give a misleading signal to the market and may thus contribute to sustaining the bubble: households think that economic and financial activity is healthy, while in fact it is not, and they will therefore choose riskier investment projects. In short, the lack of clear-sightedness by central banks aggravates moral hazard problems.

Towards an alternative solution

So far, we pointed out that asset price fluctuations affect simultaneously the financial, the macroeconomic, and the monetary stability of a country. Monetary policy is directly linked to these evolutions and must assure a certain degree of asset price stability. An increase in the nominal short-term interest rate during the upward phase of the business cycle may elicit a slowdown of the euphoria of financial intermediaries. Certainly, putting this policy into practice does not lead necessarily to an optimal result, because of the essential role of expectations in the financial sector. Over the long run, however, such policy allows the transmission of a clear message to the public, if it is defined and applied in an appropriate way. In this way, this policy could moderate the optimism of financial intermediaries. Nevertheless, such a reaction gives rise to many difficulties: detecting the emergence of a bubble, estimating its repercussions, and discovering the shock that provoked it, are *sine qua non* conditions for a central bank to carry out such a policy successfully. The doubt on the channels by which monetary policy will unfold its effects persists. In spite of this, monetary policy will have inevitably many repercussions on asset prices with a relatively short delay. All the same, by manipulating short-term interest rates, monetary policy could represent a big disadvantage when imbalances appear on a very specific market. The increase in interest rates could have favourable consequences on the prices of the assets considered (for example on real estate during a property bubble), but it has the disadvantage of influencing negatively the prices of other assets – whose prices did not increase before the central bank's policy intervention – as well as the whole economy.

To alleviate all these difficulties, the proposal of Palley (2000, 2004) seems relevant. The author suggests an asset-based reserve requirement (ABRR) system for all types of assets (real estate as well as financial assets) that are on the balance sheet of any kind of financial intermediaries such as banks, pension funds, and insurance companies. The aim of Palley's proposal is to move from a system of reserve requirements based on liabilities (applied only to banks) to a system of reserve requirements based on assets (applied to all financial intermediaries).[8] Financial intermediaries hold assets in exchange of the loans they granted or as a result of their assets purchases. The policy objective of an ABRR system is notably to allow monetary authorities to require an amount of reserves on each type of asset held by any kind of financial intermediaries and on each category of credit granted by commercial

[8] See Palley (2004, pp. 47–54) for a more detailed explanation of the system he proposes.

banks. The relevant reserve ratio can vary according to several criteria such as the level of the risk supported by the asset, the demand for the asset, and so on. If the reserve ratio for a specific category of assets increases, the latter assets become relatively less profitable in comparison with other categories of assets. As a consequence, financial intermediaries will diminish the holding of those assets whose marginal rate of return has decreased, and will replace them with other assets, which become comparatively more profitable (Palley, 2000, p. 7).

Let us illustrate this approach with two examples. Assume that the European Central Bank (ECB) detected the existence of a property bubble in Paris. In this case, the ECB will ask the *Banque de France* to require from its local commercial banks to keep in their deposit at the national central bank a higher amount of non-interest-bearing reserves, according to the amount of mortgage loans they will grant in Paris. If so, then local commercial banks need to keep more reserves at the *Banque de France* in order for them to grant credit on the local property market. For this reason, they will increase the interest rate on mortgages, reducing the demand of real estate in Paris and slowing down the increase in prices on these markets. Imbalances on the Parisian real-estate markets would be cushioned without the intervention of the ECB. To give another example, suppose that, in a country, investors (speculators) are encouraged to demand short-term speculative loans. If the national central bank increases the reserve ratio on short-term loans, the borrowing cost of this kind of loans will rise. This will slow down or even avoid speculative investment.

An ABRR system enables a central bank to find a solution for many difficulties discussed earlier on. This system allows notably guaranteeing greater financial stability, owing to the reduction of the risks associated with the characteristics of the assets considered. Greater financial stability leads then to greater macroeconomic stability, as both consumption and investment spending will be thwarted. Further, monetary stability will result from the fact that the central bank is no more obliged to manipulate the short-term interest rate in order to control asset price fluctuations. In this way, a central bank can struggle against regional imbalances without upsetting the whole economy. The central bank would use its interest rate instruments to guarantee price stability (of real goods and services), and would benefit from another tool to guarantee financial stability. If so, then monetary policy efficiency will increase for two reasons. First, with the additional instrument, monetary authorities could influence bank credit supply. Secondly, the central bank could have a greater influence on the interbank market, owing to the extension of the demand for bank reserves. Further, the ABRR system is absolutely coherent with current monetary control, which occurs through open-market operations (Palley, 2000, pp. 7–9; Palley, 2004, pp. 45–7).

Another advantage of an ABRR system lies in the fact that it acts as an automatic stabiliser. When asset prices increase, the ABRR system generates an automatic monetary tightening through the accumulation of the amount of reserves that financial institutions have to keep at the central bank. Conversely, in periods of diminishing asset prices, the reduction in the reserve ratio allows the release of the pre-existent deposits, providing financial institutions with liquidity when they need it the most (Palley, 2000, pp. 7–8).

The application of an ABRR system discharges the monetary authority of the heavy task of a preventive detection of the emergence of a bubble. The monetary authority does not need to intervene preventively by increasing short-term interest rates. Of course, the central bank must detect the emergence of a speculative bubble, but the modification of reserve ratios is an instrument much less insidious than the manipulation of short-term interest rates. The drawbacks related to a change in interest rates in order to thwart the impact of a speculative bubble would be avoided. Amongst these disadvantages, let us mention the harmful effects of such a policy on consumption and investment spending, as well as on the reduction of liquidity circulating in the country, so many elements that amplify the recessive situation of an economy. In this respect, let us also mention the uncertainty of the effects of an interest rate increase on asset prices. The inclusion of an ABRR system among the instruments of a central bank allows the central bank to reach its traditional objectives besides the financial stability objective, while keeping a high degree of transparency, reputation, responsibility, and credibility with regard to the public at large.

An ABRR system is very interesting in light of the advantages it induces. Nevertheless, this proposal is based on a large number of assumptions, which one needs to verify in practice. In particular, the variation of reserve ratios must be determined by a precise, simple, clear, and by all agents easily understandable rule. More important, the estimation of asset prices raises a huge problem of measurement, and implies a high degree of subjectivity. Indeed, the parameters that one needs to consider when one tries to assess whether an asset is under or overvalued depend on the type of assets, on the industrial sector considered, and so on. The criteria to consider when one analyses the evolution of the price of a financial asset of the metallurgical sector would have to be different from the criteria for the evolution of the price of a financial asset of the biochemical industry. More important, some firms operate in different sectors at one and the same time. When the price of their shares is considered to be overvalued, an ABRR system penalises the whole firm, instead of taking into account only the sector that triggered an increase in this firm's share prices. In addition, the degree required to modify the reserve ratio in order to obtain the desired effect on a specific asset price is not known in advance. This effect will depend on the elasticity of the asset demand with respect to the interest rate that affects this asset. An additional problem concerns the strategic behaviour of commercial banks. To keep credit demand stable, commercial banks could keep their interest rates stable during an economic expansion, as they expect almost certain returns even if they must reduce their mark-up. In this case, banks would consider more the quantity rather than the quality of their loans. Further, financial intermediaries' behavioural strategies, the degree of rationality, the degree of information, and the degree of aversion to risks are all elements influencing the evolution of asset prices. Central banks would have to focus more on their degree of transparency and on clarity of their monetary policies. They would have to continuously reveal to the public information relating to the asset market situation and to the policies they intend to put into practice in order to achieve their macroeconomic goals. The exact timing of their policy interventions would have to be clearly announced and respected in actual facts, too.

Another difficulty in applying an ABRR system lies in the fact that financial supervision authorities should know, at any time, the composition of the assets side of the financial institutions' balance sheets. For that reason, a degree of transparency higher than today's is

necessary. In fact, at the time of writing, hedge funds represent the most active institutions in speculative market investment, whilst data on their actual operations as well as on their balance sheets are remarkably poor. As a result, the implementation of an ABRR system requires a considerable legal and administrative effort as well as a stronger collaboration between monetary authorities and financial supervision authorities at an international level. The application of an ABRR system should indeed involve all countries and all financial intermediaries, to avoid jurisdictional evasion and strategic forms of behaviour. This stake is immense today.

Conclusion

The rather strong correlation that exists between financial, monetary, and macroeconomic stability justifies the inclusion of financial stability among the objectives of a central bank. This paper has offered a survey of the literature that considers this issue, and has analysed the pros and cons of the proposals formulated in this respect. The complexity of the issue at hand is huge and, for this reason, it is very difficult to draw an optimal solution. Among the proposals discussed in this paper, we appreciate those of Cecchetti et al. (2000) and Palley (2000). The proposal of Cecchetti et al. (2000) can be distinguished for its simplicity of implementation, but is confronted with difficulties relating to the preventive detection of a speculative bubble, the factors that have triggered the bubble, as well as the uncertainties of the repercussions of monetary policy on the financial sphere. The main criticism that leads us to reject this proposal is the undesirable character of a monetary policy that would, in fact, penalise the whole economy in order to minimise specific sector imbalances. In this respect, the proposal of Palley (2000) is better. The application of an ABRR system elicits a number of advantages, at both the macroeconomic and microeconomic levels. However, its implementation requires a deep reorganisation of financial regulation and of the legal framework within which financial activities occur today. It also requires a higher degree of collaboration between monetary authorities and financial supervision authorities.

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