ARTICLES

ASSET PRICE BUBBLES AND MONETARY POLICY

At times, asset prices seem to rise beyond levels that are considered consistent with an appropriate valuation of the underlying asset. Such developments may indicate the existence of a "bubble" in the asset market, i.e. a rapid and sustained increase in prices that is bound to revert – possibly in a disruptive manner – at some time in the future. History has shown that boom-bust cycles in asset prices can harm the entire economy. Whenever the building-up of a bubble is associated with excess credit and liquidity creation – which is very often the case – asset price crashes can become the cause of deflationary trends, as observed in some economies in the past.

The primary objective of the ECB is the maintenance of price stability. While the ECB does not target asset prices, it monitors asset price dynamics closely because of the potentially very high costs for price stability and for the economy as a whole that are associated with strong appreciations and subsequent rapid reversals in asset prices.

1 INTRODUCTION

There are several reasons for asset price fluctuations. For example, sustained increases often simply reflect the adjustment of prices to a rise in their fundamental value. The latter could be defined as the present value of the "true" earning capacity of that asset or the "true" value of the services that the holder of that asset will receive from using it over time.

However, a surge in the valuation of assets can also be caused by no`-fundamental forces. As a number of historical examples tend to suggest, a record of high stock returns or capital gains on residential property trading might at times induce an increasing number of investors to enter the market in the belief that business profits and the price of stocks, or the price of houses, will continue to rise.[1] Growing numbers of traders can bid up prices for a while. The visible capital gains that this process generates initially tend to validate expectations that stocks, or real estate, can be re-sold at systematically higher prices. However, as more and more market participants are motivated by the short-run profits they expect to make from trading in the asset, rather than by its use or earning capacity over a longer horizon, market prices start drifting further and further away from their long-run fundamental determinants.

Asset price trends become fragile and sensitive to news when they are driven by non-fundamental factors. As returns start to fall short of the levels experienced in the past, market sentiment might turn around and a generalised sell-off might ensue.

The formation of bubbles blurs the information content of asset prices. In normal times, asset prices are very important information variables. Asset prices are inherently forward-looking variables, in the sense that they are determined mainly by the expectations of market participants about the future evolution of their underlying pay-offs.[2] However, as noted above, when a bubble forms, expectations of the productive potential of the underlying asset might come to reflect excessively optimistic beliefs.

The formation of bubbles can distort the allocation of resources in the economy and harm macroeconomic stability for a prolonged period of time. Given its implications for macroeconomic stability, an asset price collapse – when expectations of excessive returns are sharply corrected – can mark the beginning of periods of economic contraction. The liquidation of imprudent positions in the market can be disorderly. In conditions of heavy losses, in particular on property prices, and heightened uncertainty, there is a risk that

1 See, among others, C. Kindleberger (1978), "Manias, panics and crashes", Basic Books, New York.

2 See the article entitled "Extracting information from financial asset prices" in the November 2004 issue of the Monthly Bulletin.

asset price deflation will translate into consumer price deflation. In conjunction with faltering demand, depressed sentiment and excessive risks in bank balance sheets, falling prices of goods and services can pose a particular challenge for a stability-oriented central bank.

This article deals with the issue of asset price bubbles and monetary policy. It focuses on positive bubbles. The formation of negative bubbles is also possible, but they often result from a process reversing a previous unsustainable build-up in prices. Therefore, the arguments put forward in this article are also applicable, to a large extent, to negative bubbles. The article focuses on the markets for stocks and houses in particular, because the value of an increasingly large proportion of an economy's wealth is determined in those markets. It first touches upon the identification problem facing central banks whenever prices of stocks and houses appreciate rapidly and on why such rapid appreciations can put macroeconomic stability at risk. It then outlines the options that monetary policy possesses in such circumstances and how the ECB, in particular, takes account of abnormal developments in asset prices in the context of its monetary policy strategy.

2 THE IDENTIFICATION ISSUE

A look into the determinants of the price of an asset reveals that detecting the bubble component of observed price dynamics is difficult. The price of an asset that is to be held for a given length of time is determined by four main factors: first, the expected stream of returns that the asset might yield (e.g. dividends, rents, etc.); second, the expected stream of returns that an alternative investment, say a government bond, would produce; third, the price at which the owner of the asset expects to re-sell it in the future; and, fourth, the perceived (relative) risk associated with holding that particular asset and the liquidity services it possibly provides to the holders.

One major difficulty in identifying a suspected bubble lies in the fact that all the determinants of the price of an asset depend on private individuals' subjective expectations of uncertain magnitudes. It is therefore very difficult to disentangle the purely psychological component of the price from the objective valuation of the asset. In particular, it is hard for any analyst to presume that his judgement regarding the "correct" valuation of an asset is superior to that emerging from the decisions of large numbers of sophisticated market participants operating in a competitive environment. Consequently, there may well be different views about the appropriate valuation of stock and house prices.

The difficulty of making a judgement is compounded by the fact that bubbles often manifest themselves as overreactions to fundamental news. Positive fundamental news can trigger the bubble in the first place and generate widely-shared optimistic expectations that the bubble, for a while, tends to confirm. Indeed, academic literature on bubbles reflects this dilemma. One extreme theoretical view – identified as the "efficient market hypothesis" – claims that a profit-oriented rational person who is aware of the existence of the bubble would attempt to sell the inflated asset short. In this context, the bubble would immediately be arbitraged away and could thus not be observed in the real world. On the empirical side, existing econometric research is at best inconclusive in its attempt to detect the existence of asset price bubbles in history.[3]

However, while strong systematic evidence in favour of the "irrationality" hypothesis is hard to put forward, even a casual look at some historical episodes offers some remarkable evidence. For example, Chart B in Box 1 provides a comparison between the price/earnings ratios prevailing in the US stock market

3 For a recent survey of empirical attempts to detect bubbles, see, for example, R. Gürkaynak (2005), "Econometric Tests of Asset Price Bubbles: Taking Stock", Finance and Economics Discussion Series No 2005-04, Federal Reserve Board.

Box 1

APPROACHES TO ASSESSING STOCK PRICE VALUATIONS

This box describes the fundamental determinants of stock prices along the lines of a framework which is often used to value stocks, the so-called dividend discount model.

This modelling framework applies a present value approach to stock prices. The current stock price, P_t, is the discounted sum of all expected future dividends, D_{t+i}:

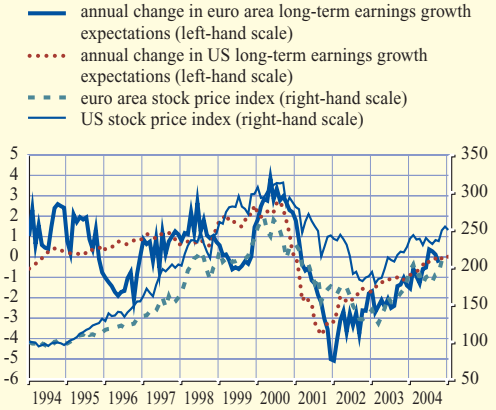
$$P_t = \sum_{i=1}^{\infty} \left(\frac{E_t\{D_{t+i}\}}{(1+r)^i} \right)$$

with E_t indicating rational expectations based on information available in period t and r the discount rate, which is assumed, for ease of exposition, to be constant. Key fundamental stock price determinants are thus the expected dividend growth and the discount rate. The discount rate is typically broken down into a measure of opportunity costs, which are the returns expected on investing in risk-free assets and a corresponding equity-specific risk premium. As all these fundamental components of stock prices are not directly observable, the valuation of stocks in practice is surrounded by a large degree of uncertainty.

Some proxy for the variables entering the dividend discount model could be gained from a variety of sources. Expected earnings growth, as reported by stock market analysts, is often used as a proxy for expected dividend growth, on the assumption of a constant dividend pay-out ratio. Chart A plots the annual revisions made to long-term earnings growth expectations and stock prices for the euro area and the United States over the last decade. It illustrates that earnings expectations indeed seem to play an important role for stock price developments. The chart also

Chart A Revisions to long-term earnings growth expectations and stock price indices in the euro area and the United States

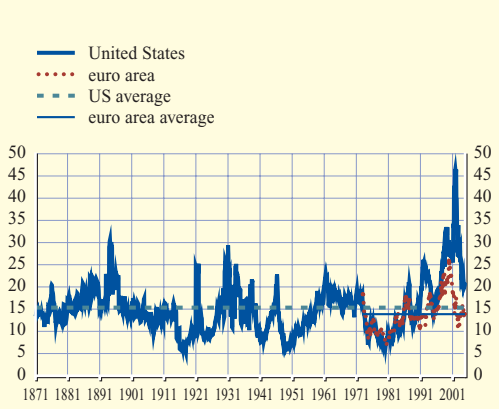
(monthly data; stock price index: January 1994 = 100; revisions in percentage points)



Sources: I/B/E/S Global Aggregates on Datastream.
Note: The stock price index for the euro area is the MSCI EMU aggregate, and that for the United States is the Standard & Poor's 500 index aggregate.

Chart B Stock market price/earnings ratio in the euro area and the United States

(monthly data; euro area: 1973-2004; United States: 1871-2004)



Sources: Thomson Financial Datastream (euro area) and Global Financial Data (United States).
Notes: For the euro area, the ratio between the EMU Datastream market index and Datastream earnings is used, and for the United States the ratio between the Standard & Poor's 500 index and reported earnings is used.

indicates that, between 1998 and 2000 (a period which has often been labelled as the "dot-com bubble"), the strong rise in stock prices apparently reflected continuing upward revisions to long-term earnings growth expectations. At the time the stock markets peaked in 2000, long-term earnings expectations had reached very high values (annual upward revisions of between 2 and 4 percentage points with an underlying expected long-term earnings growth of around 17%). This could have raised some concern regarding the sustainability of such steep increases in profits.

Turning to the discount rate, the equity risk premium component remains an elusive value to pin down with any degree of certainty. It reflects both investors' risk preferences and the perceived risk properties of the return on equity vis-à-vis that on other assets. An implied discount rate can be derived from the dividend discount model, assuming certain values for the expected stream of dividends, e.g. current dividend payments and expected (long-term) earnings growth.[1] In a second step, a measure of the implied equity risk premium could be derived by subtracting a measure of the risk-free interest rate from the discount rate. Significant differences between this implied equity risk premium and its longer-term average might signal mispricing in the stock market, at least with regard to the discount rate. However, as the equity risk premium could be affected by many factors, such an exercise remains highly uncertain.

The dividend discount model can, under certain assumptions, also be used to derive popular stock market valuation indicators, such as the price-earnings ratio and the dividend yield.[2] The prevailing values of these stock market valuation indicators are typically compared with their historical averages to assess the fair value of a stock market.[3] The idea is that these valuation indicators should, over time, eventually revert to some long-run equilibrium level, as determined by the long-run growth potential of dividends and the long-run level of the discount rate.

Chart B plots the price-earnings ratios and their historical averages for the euro area and the United States. The price-earnings ratios in the euro area and the United States were well above their historical averages in the years around the turn of the century. This could have raised at least some suspicion about the existence of a bubble.

Nevertheless, this approach is subject to many caveats. A price-earnings ratio not in line with its historical averages is not necessarily a sign that stock prices are exceeding their fundamental values. It might reflect structural changes in the fundamental determinants of stock prices. Furthermore, the price-earnings ratio depends on the stock price index considered and, more importantly, the measure of earnings used.

In summary, the fundamental stock price determinants, i.e. dividend (or corporate earnings) growth and the discount rate, which includes an equity-specific risk premium, are not directly observable, making it hard to identify the fundamental value of stock prices. This notwithstanding, a cross-check of various approaches to assessing stock price valuations may help to assess such prices, always keeping the corresponding uncertainty in mind.

1 See also the article entitled "Extracting information from financial asset prices" in the November 2004 issue of the Monthly Bulletin.
2 See also the annex to the article entitled "The stock market and monetary policy" in the February 2002 issue of the Monthly Bulletin.
3 Another prominent method to evaluate the stock market is to compare the earnings yields, i.e., the inverted price-earnings ratio, with the nominal long-term interest rate. For a critical assessment of this stock market valuation indicator, see C. Asness (2003), "Fight the Fed model: the relationship between future returns and stock and bond market yields", Journal of Portfolio Management, Vol. 30 (1), pp. 11-24.

over an extended period and in the euro area stock market since 1973, with their respective long-term averages. The box highlights the extreme changes in recent valuations in connection with the build-up of international equity prices in the late 1990s, at a time when the introduction of new information and telecommunication technologies, coupled with concrete signs of gains in productivity, had led many market participants to believe in the advent of a "new economy". Chart A in Box 2 depicts the house price-to-rent ratio in the Japanese real estate market since 1970. The peak that this indicator reached in the early 1990s is, again, apparent. In all cases, valuation indicators were clearly out of line with respect to their long-term averages. When the exaggerated beliefs driving market valuations turned out to be wrong, prices fell significantly.

Box 2

APPROACHES TO ASSESSING HOUSE PRICE VALUATIONS

This box describes two common approaches used to assess whether house prices are in line with their equilibrium determinants or not.

The *asset pricing approach* uses the similarities that exist between a housing investment and an equity investment. When someone buys a house (or an equity), he/she will receive a flow of rent payments (or dividend payments) and will make a gain/loss when selling the house (or the equity). As a consequence, the price of a house should not be very different from the discounted flow of all its future rents. In this model, the ratio of the price (P_t) to the rent (R_t) is positively correlated to the growth rate of rents (g) and negatively correlated to the discount rate, which is the sum of a risk-free rate (i) and a housing risk premium (HRP). This relationship can be represented as follows:

$$\frac{P_t}{R_t} = \frac{(1+g)}{i_t + HRP_t - g}$$

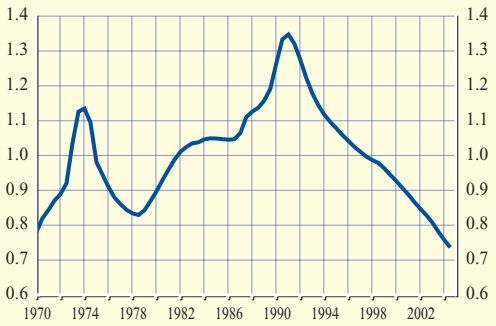
While the risk-free rate can be proxied by a long-term government bond yield, it is difficult to evaluate both the housing risk premium and the future growth rate of rents. Thus, practitioners tend to use the price-to-rent ratio directly as an indicator of valuation. For example, a price-to-rent ratio significantly above its historical average might be seen as a sign of an overvaluation of house prices.

This approach is subject to several caveats. First, housing markets differ in liquidity, for example because of the presence of substantial transaction costs and borrowing constraints. Such differences may explain lasting differences between house prices and rents. Indeed, the model presupposes that homeowners can quickly change rents in order to accommodate changes in house prices, but the presence of national regulations often prevents them from doing so. Second, it cannot be excluded that a misalignment of prices, when observed, is due to the violation of one of the hypotheses made in the model, in particular the hypothesis of a constant growth of rental income, of an unchanged housing risk premium, or of an unchanged discount factor.

Despite the caveats mentioned above, house price-to-rent ratios are often useful housing valuation indicators. As an illustration, Chart A below shows the house price-to-rent ratio in Japan since the early 1970s. The housing market bubble at the end of the 1980s and the beginning of the 1990s is highly visible, as this ratio almost doubled between the trough of the late 1970s and the peak of the early 1990s.

Chart A Ratio of house prices to rents in Japan

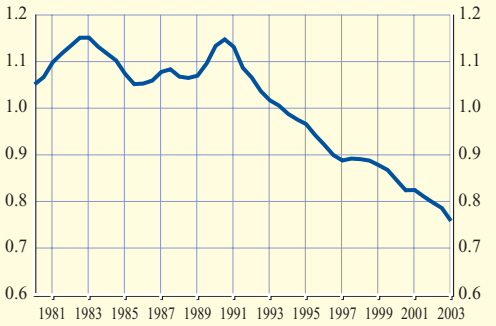
(average between 1970 and 2004 = 1)



Source: Statistics Bureau and Japan Real Estate Economic Research Institute.
Note: For house prices, a series of urban land prices is used.

Chart B Ratio of house prices to households' disposable income in Japan

(average between 1970 and 2003 = 1)



Source: Japan Real Estate Economic Research Institute and national accounts.

A second commonly used method for house price valuation involves the estimation of a more *structural economic model*. This comprises demand and supply equations for the housing market. The supply of housing is normally determined by the profitability of housing production, with construction firms seeking to maximise profits from house building. However, supply is relatively inert in the short term, suggesting that demand is the main force driving house prices at this horizon. In addition, given that some factors of production (e.g. land) are fixed, supply might also be relatively slow to adjust, even in the long run.

Although the set of explanatory variables included in a housing demand equation could vary substantially, households' disposable income and mortgage interest rates are generally included, while housing demand may also be influenced by demographic trends. Alternatively, measures of affordability are often used to gauge the state and likely future evolution of housing demand. A simple measure of affordability is the ratio of house prices to households' disposable income. Changes in mortgage rates can also be taken into account so as to calculate interest-adjusted affordability. When affordability or interest-adjusted affordability declines, this might indicate that the house price dynamics are diverging from what developments in income and mortgage rates would suggest. In such circumstances, this could be a signal of an overvaluation of house prices.

Caution is also warranted in using the structural model approach. First, the set of explanatory variables is often limited and might not take all relevant information into account. Second, as with all econometric approaches, this method is based on average behaviour and might be misleading in the presence of structural changes in the demand or supply of housing.

Despite the caveats mentioned above, affordability ratios are useful housing valuation indicators. As an illustration, Chart B shows the ratio of house prices to households' disposable income for Japan since the early 1980s. The housing market bubble of the early 1990s is also visible, although less clearly than in the case of the price-to-rent ratio.

Overall, the caveats with respect to each method always need to be taken into account. At the very least, they suggest that housing values should be assessed by different approaches and by cross-checking different information from various indicators.

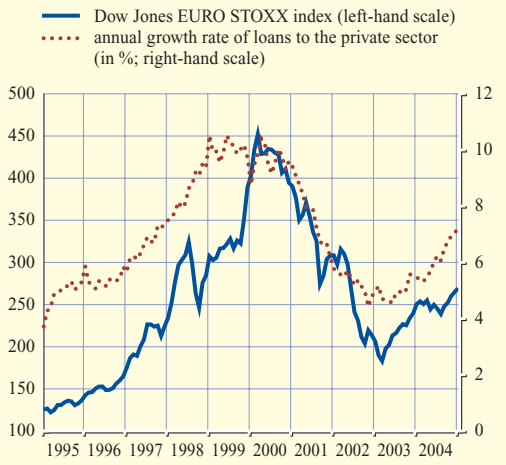
In summary, while mere numbers on asset price escalations are often an insufficient indicator of the existence of non-fundamental forces at play, concomitant and mutually reinforcing signs of "excesses" may sound an alarm bell.

Furthermore, aggregate indicators of monetary and financial imbalances can provide evidence to help assess the sustainability of an asset price boom. Among these latter indicators, intense empirical research has singled out a number of monetary and financial variables that seem to have a clear correlation with asset price inflation, particularly during asset price bubbles that end up in financial distress. For example, the volume of aggregate credit demonstrates a fairly systematic leading relationship with episodes of asset price turbulence. Chart 1 provides evidence of the link between the annual growth of loans to the private sector and an index of stock valuation in the euro area since the mid-1990s. This positive correlation can emerge for a number of reasons. In particular, both sets of variables may react in the same way to monetary policy or cyclical shocks to the economy. For example, strong money and credit growth may be indicative of a loose monetary policy, which may fuel price developments in asset markets. In addition, it is quite likely that the correlation reflects a two-way causation. On the one hand, an increase in credit will support investment in financial and non-financial assets. On the other hand, an increase in the value of assets translates into greater creditworthiness, since these assets can be used as collateral for loans.[4]

A number of studies confirm this relation from a historical perspective.[5] They suggest that measures of the deviation of aggregate credit from their past trend, in conjunction with indicators of asset price overvaluation (e.g. deviation from historical trends) can improve the predictability of financial crises that follow the burst of the bubble.

The close association between potentially disruptive asset price booms and excess credit and liquidity creation is particularly important for central banks because it could signal too expansionary a monetary policy stance at times in which no other indicators would send unambiguous signals in that direction. Indeed, certain historical episodes suggest that major asset price escalations can be encouraged by lax monetary conditions which are not immediately reflected in an increase in consumer price inflation. There are various possible explanations for this evidence. First, enhanced capital formation and expected strong productivity advancements during the formation of a bubble could contribute to cutting production costs and thus encourage moderation in firms' pricing decisions. Second, if the improved domestic prospects which accompany the formation of the bubble attract foreign investors, the exchange rate might appreciate and favour conditions of subdued domestic price increases.

Chart 1 Credit growth and stock prices in the euro area



Source: ECB.

4 See the Box entitled "The link between asset prices and monetary development" in the September 2004 issue of the ECB's Monthly Bulletin, and the references cited therein.

5 See, for example, C. Borio and P. Lowe (2004), "Securing sustainable price stability: should credit come back from the wilderness?", BIS Working Papers No 157. See also the references cited in Box 3 of this article.

In these conditions, inflation forecasts could become an inaccurate indicator of the imbalances building up in the economy. More generally, it is very hard to construct forecasts incorporating a likely future path for the bubble, because it is difficult to characterise the probability distribution assigned to alternative scenarios concerning the possible future evolution of a bubble process.[6] This problem is compounded by the fact that macro-econometric frameworks are generally not well designed to adequately capture the mutual interrelations between financial and real variables, as these often run through intricate confidence and information asymmetry channels which are inherently difficult to model. Thus, macroeconomic projections are unlikely to be able to trace out with an acceptable degree of precision the effects of the balance sheet problems that are likely to accompany the bubble process and, in particular, its resolution.

In this respect, lengthening the projection horizon to include possibly the whole bubble period is certainly useful from a conceptual point of view. But at the same time this recommendation is hardly viable, because the difficulty in assigning probabilities to different bubble evolution processes increases with the length of the scenario. Thus, any standard inflation forecast has to be complemented with a broader perspective on macroeconomic developments. As stated above, credit and monetary indicators are key components of this broader macroeconomic perspective.

3 BUBBLES AND MACROECONOMIC INSTABILITY

Asset price bubbles are a concern for stability-oriented central banks for a number of reasons. As pointed out above, bubbles can distort economic and financial decisions. Because of various frictions, assets are not only used as stores of value, but can also be mobilised as collateral for borrowing. Thus, whenever the market price of firms' or households' stock of capital rises above levels consistent with future revenue streams, this can alter the cost of capital, as firms might find it easier to raise funds in the capital market. At the same time, as households are typically encouraged to spend out of their capital gains when asset prices advance, durable and sizeable bubbles can boost consumer expenditure.

The sudden reversal of a bubble, however, alters the economic conditions that formed the basis for consumption and investment plans. The balance sheets of firms and households deteriorate. Many firms might find themselves unable to pay back their loans, leading to deterioration of bank balance sheets. Furthermore, a sharp correction of the price for capital can lead to the realisation that the amount of investment undertaken when asset prices were soaring was probably disproportionate. The resulting overhang of excess capacity in structures and equipment can deter economic agents from making further investments and contribute to low levels of utilisation of the existing stock for a protracted period of time. Both phenomena can slow down economic recovery.

Consumers could also be induced to curtail their consumption plans, as the fall in asset prices will reduce the value of their wealth. Those with excessive mortgage debt on over-valued property might find the share of income committed for the payment of interest and principal too high to sustain. In this respect, empirical evidence tends to suggest that a deflating bubble in the housing market is more costly than an equally-sized crash in the stock market, as housing equity is more widespread and more intensely used as collateral for securing credit. Box 3 offers a taxonomy of the main stylised facts related to boom-bust cycles with the potential for a disorderly correction.

Borrowers' difficulties in servicing debt and the depreciation of direct asset holdings can

6 See D. Gruen, M. Plumb and A. Stone (2003), "How Should Monetary Policy Respond to Asset-Price Bubbles?", Reserve Bank of Australia Research Discussion Paper, 03-11.

Box 3

SOME STYLISED FACTS ON BOOM-BUST CYCLES IN ASSET PRICES

Recently a number of studies have been analysing historical boom-bust cycles in asset prices in order to detect regularities with regard to the costliness of booms, and to assess the potential for identifying dangerous booms at an early stage.[1]

A recent IMF survey[2] analyses periods of bust in housing and equity markets and reaches the following conclusions:

- Housing price busts appear less frequently than equity price busts. Housing price peak to trough periods on average last longer than equity price busts (four years versus two and a half years). Price declines during housing (equity) price busts are in the order of around 30% (45%) on average. 40% (25%) of housing (equity) price booms are followed by busts.
- The output losses associated with asset price busts are substantial. The loss incurred during a typical housing (equity) price bust amounts to 8% (4%) of GDP.
- Bank-based financial systems incur larger losses than market-based financial systems during housing price busts, while the opposite is true for equity price busts. All major banking crises in industrial countries during the post-war period coincided with housing price busts.

An ECB Working Paper[3] focuses on aggregate asset price *boom* periods. By distinguishing between high and low cost booms[4] it derives the following facts:

- High cost booms typically last around a year longer than low cost booms (four versus three years), lead to a build-up of larger real and financial imbalances and are accompanied by stronger real estate price booms and higher inflation towards the end of the booms.
- During the early stages of booms, real money growth and real credit growth are larger for high cost booms.
- Towards the end of high cost booms the stance of monetary policy is typically looser than during low cost booms.[5]

1 See ECB Workshop entitled "Asset Prices and Monetary Policy" at www.ecb.int/events/conferences/html/assetmp.en.html
2 T. Helbling and M. Terrones (2003), "When Bubbles Burst", World Economic Outlook, IMF, April 2003, Chapter II. The authors base their results on a sample of 14 (for housing prices) or 19 (for equity prices) industrialised countries between 1959 and 2002. Busts are defined as bottom quartile peak to trough real price decreases.
3 C. Detken and F. Smets (2004), "Asset Price Booms and Monetary Policy", ECB Working Paper 364. The authors use aggregate asset price indices (source: BIS), covering private residential and commercial housing prices as well as share prices for 18 industrialised countries for the period from 1970 to 2002. Booms are defined as periods in which real aggregate asset prices exceed a recursive, sluggishly adjusting (stochastic) trend by more than 10%.
4 High cost booms are defined as a drop of more than 3 percentage points in average three-year post-boom real GDP growth relative to average boom-year real GDP growth.
5 This result is confirmed, in the case of the US Great Depression, by L. Christiano, R. Motto and M. Rostagno (2003), "The Great Depression and the Friedman-Schwartz hypothesis", Journal of Money, Credit and Banking 35(6), Part 2, pp. 1119-1197.

cause serious balance sheet problems for financial intermediaries. In an attempt to repair their balance sheets, banks might become reluctant to expose themselves to further risks, thus reinforcing the negative impact of an asset price deflation on the business cycle.

In extreme cases, such as the Great Depression of the past century, a combination of the above-mentioned factors created a situation in which it became very difficult to re-establish confidence and revive spending. The financial crisis that ensued from the bursting bubble took

years to correct. The problem has often been aggravated by the impossibility for a central bank to reduce the nominal market interest rate to levels below zero.

4 CENTRAL BANK RESPONSES TO ASSET PRICE BUBBLES

Concerns that a bubble, if left to run its full course, could degenerate into a severe source of harm for the economy might provide some motivation for an active role on the part of monetary policy in the face of suspected misalignments in asset markets. Whether and, if so, to what extent and in which form a central bank ought to intervene in these circumstances are contentious issues. Box 4 presents a review of the recent academic debate surrounding such issues.

Two radical proposals have received some attention, but have failed to gain support. One such proposal is to elevate an asset price index

Box 4

THE ACADEMIC DEBATE OVER MONETARY POLICY AND ASSET PRICE TARGETING

The most radical proposal with regard to the importance of asset prices in the conduct of monetary policy is to include asset prices directly in the price index defining price stability. This argument was originally put forward by Alchian and Klein (1973), who reasoned that from a welfare perspective a central bank should be concerned with stable prices for both current and future consumer goods by focusing on a "cost-of-life" index. Asset prices were supposed to proxy for the prices of future consumption, which are, in fact, unobservable. Recently there has been an argument in favour of including at least housing prices on account of their favourable forecasting properties for future consumer price inflation.[1] Furthermore, the point has been made that only a "cost-of-life" index would be unbiased in times of changing preferences between current and future consumption.[2]

Academic literature on the subject clearly identifies several conceptual and implementation-based problems with regard to including asset prices in the policy-relevant price index.

1. Asset prices are likely to be a bad proxy for future goods prices for at least two reasons. First, the relevant asset price index should theoretically cover all assets, including human capital and the value of consumer durables. Second, asset prices can move in directions unrelated to expectations about future inflation. In order to measure asset price inflation and react appropriately, the central bank would need to be able to determine the fundamental value of assets.[3]

1 See A. Alchian and B. Klein (1973), "On a Correct Measure of Inflation", Journal of Money, Credit and Banking, 5(1), pp. 173-191. On arguments in favour of including a house price index in the index targeted by a central bank, see C. Goodhart (2001), "What Weight Should Be Given to Asset Prices in the Measurement of Inflation?", The Economic Journal, 111, pp. 335-356 and C. Goodhart and B. Hofmann (2000), "Do Asset Prices Help to Predict Consumer Price Inflation?", The Manchester School Supplement, 68, pp. 122-140.

2 See M. Bryan, S. Cecchetti and R. O'Sullivan (2003), "A Stochastic Index of the Cost of Life", in: W. Hunter, G. Kaufmann and M. Pomerleano (eds.), *Asset price bubbles*, MIT Press, Cambridge.

3 See A. Filardo (2000), "Monetary Policy and Asset Prices", Economic Review, Federal Reserve Bank of Kansas City, third quarter. See also E. Diewert (2002), "Harmonized Indexes of Consumer Prices: Their Conceptual Foundations", Swiss Journal of Economics and Statistics, 138 (4), pp. 547-637 and F. Smets (1997), "Financial Asset Prices and Monetary Policy: Theory and Evidence", CEPR Discussion paper, 1751.

2. Targeting asset prices by including them in the relevant price index, and thus establishing a more or less mechanical policy response, creates moral hazard problems with regard to investors' behaviour towards risk. Risk taking would increase in anticipation of the asset price stabilising attempts of monetary policy.[4]
3. "Inflation indeterminacy" could arise as a result of a circularity between asset price determination and a monetary policy stance with forward-looking behaviour. If central banks conduct policy in response to asset price developments and asset prices themselves are at least partly the result of private agents' expectations of the future monetary policy stance, then – under certain conditions – inflation expectations can become self-fulfilling. The inflation rate will become "indeterminate" and could potentially be very volatile.[5]
4. If the central bank is successful and credible in pursuing the objective of consumer price stability then this will also stabilise expectations of future inflation rates. It is then not clear what can be gained by explicitly targeting a (necessarily deficient) proxy for future consumer prices.[6] Indead, this may be seen as a case whereby the central bank double-counts consumer price pressures in its information set.
5. The weight given to current consumption goods prices and asset prices would have to be determined. Based on traditional expenditure shares, the weight of asset prices could easily exceed 90%, which would lead to an extremely volatile monetary policy. Other methods relate the shares to the forecasting ability of future consumption prices. Results for the weights differ substantially, depending on the method chosen.[7]
6. Monetary policy cannot control the fundamental factors which affect asset prices in the long run. Attempts to steer asset prices on a mechanical basis could easily turn out to be futile.

4 C. Goodhart and H. Huang (1999), "A Model of the Lender of Last Resort", IMF Working Paper, 99/39.
5 B. Bernanke and M. Woodford (1997), "Inflation Forecasts and Monetary Policy", Journal of Money, Credit and Banking, 29(4), pp. 663-684.
6 See B. Bernanke and M. Gertler (2001), "Should Central Banks Respond to Movements in Asset Prices?", American Economic Review, 91, pp. 253-257. See also S. Cecchetti, H. Genberg and S. Wadhwani (2003), "Asset Prices in a Flexible Inflation Targeting Framework", in: W. Hunter, G. Kaufmann and M. Pomerleano (eds.), *Asset price bubbles*, MIT Press, Cambridge.
7 See, for example, Bryan, Cechetti, O'Sullivan (2003), op. cit.

to a target variable by including asset prices in the price index on the basis of which a central bank defines price stability. While the theoretical foundations that underpin this argument are, as Box 4 suggests, questionable, there are also many practical obstacles to its implementation which would disqualify this approach as a viable option for monetary policy.

A second option available to a central bank confronting an abnormal trend in asset prices would be to "prick" the bubble when sufficient evidence had been gathered in support of the suspicion that a bubble might indeed be in progress. In this case a late stage in the maturity of the bubble might be reached before the central bank intervenes with a vigorous tightening of policy in order to counter speculation. The presumption would be that, by substantially increasing the cost of maintaining a speculative position in the market, such corrective action would force liquidation of the most stretched positions. However, experience indicates that the market reaction to such an abrupt change in the prevailing monetary conditions is highly unpredictable. In addition, attempts to prick the bubble may require very large changes in interest rates, which could pose serious risks to the economy. Furthermore, the bubble can prove resilient to even aggressive interest

rate hikes in a first phase. In a second phase, though, even marginal incremental interventions can precipitate a generalised sell-off, which can multiply the contractionary impact of the tightening.[7] For these reasons, a policy of "pricking the bubble" is not a viable option for a stability-oriented central bank.

A third option has received some qualified support in the policy debate. This approach amounts to a cautious policy of "leaning against the wind" of an incipient bubble. The central bank would adopt a somewhat tighter policy stance in the face of an inflating asset market than it would otherwise allow if confronted with a similar macroeconomic outlook under more normal market conditions. In this way a central bank would, already at an earlier stage of market dynamics, err on the side of caution in trying to avoid feeding the bubble with an accommodative policy. It would thus possibly tolerate a certain deviation from its price stability objective in the shorter term in exchange for enhanced prospects of preserving price and economic stability in the future.

A policy of "leaning against the wind" involves relatively limited risks where a rise in the stock market stems from the spread of optimistic expectations about future productivity gains. If such expectations were to prove exaggerated ex post, the decision to pursue a tighter policy at an early stage would indeed be vindicated in retrospect, as a less accommodative stance would have diminished the contribution of monetary policy to an unjustified collective euphoria. More restrictive credit conditions in the early phases of the process would presumably restrain the course of market valuations and thus make the eventual reversal less disruptive for the stability of the economy as a whole. Conversely, were optimistic private expectations to be confirmed ex post, the cost inflicted by a somewhat more restrictive policy stance would be limited by the economy's expanded production possibilities and enhanced growth prospects.

A policy of "leaning against the wind" would appear more attractive the higher the costs that the central bank ascribes to large, fundamentally unjustified swings in the valuation of assets and the more serious the risk that – if left unchecked – market movements would tend to gain momentum as time progresses.

One argument in favour of a policy of "leaning against the wind" is symmetry. Through such a policy, the central bank would dispel expectations that monetary policy would only act in support of the economy in the event of a sharp decline in asset prices, but would abstain whenever prices rise. As investors would no longer feel hedged on the downside, this would counter a systematic under-pricing of risk in the markets. A better assessment of the risks would minimise the incentive for traders to engage in speculative strategies and for banks to build up excessively risky positions, thereby removing the momentum for the bubble to progress further.

The symmetry implicit in a "leaning against the wind" approach would also help in designing policy after the bubble has burst. In that phase, measures to counter deflationary pressures could be implemented without running the risk of encouraging moral hazard practices in the future.

Despite these attractive features, a policy of "leaning against the wind" also entails risks. First, it should be borne in mind that bubbles are often the result of underlying structural imbalances which can be appropriately addressed through other policies. These policies, such as prudential regulation measures, changes to the tax code and a general overhaul of government subsidies and transfers, would often be the optimal

7 Many analysts have attributed the depth and persistence of the Great Depression to an attempt on the part of the Federal Reserve system to "prick" an ongoing stock market bubble. See, for example, E. White (1990), "When the ticker ran late: The stock market boom and crash of 1929", in: E. White (ed., 1990), *Crashes and Panics: The Lessons from History*, Homewood, Ill.: Dow-Jones Irwin, pp. 143-187.

option for correcting structural imbalances lying behind the unsustainable asset appreciation. Secondly, a disorderly market reaction to a policy intervention can never be completely ruled out, even in cases where the policy is implemented gradually over an extended time horizon.

Finally, such an approach might be perceived as dictating a rather mechanistic reaction to asset price developments. However, a prudent policy response to a suspected asset price misalignment is unlikely to take the form of a simple reaction rule expanded by an asset price index.

5 MONEY, ASSET PRICES AND THE ECB'S MONETARY POLICY STRATEGY

The above discussion has illustrated a number of principles of prudent monetary policy in conditions of suspected asset overvaluation. The ECB's monetary policy strategy can be seen as one strategic framework which incorporates these principles.

The ECB's primary objective pursuant to the Treaty is unambiguously centred on the maintenance of price stability. The ECB does not target the price of any asset. Most of the time market forces ensure an efficient allocation of resources through the free determination of relative prices.

The medium-term orientation inscribed in the ECB's concept of monetary policy reflects the need to evaluate the impact of economic shocks – including those driving asset prices – over sufficiently long horizons. A longer time horizon is essential to trace out all the implications of lower-frequency asset price cycles. This policy approach reduces the risk that, by adopting a short-sighted perspective, the central bank might overlook risks to price stability at longer horizons.

The ECB's two-pillar strategy rests on a broad analytical framework which can also help to deal with the problem of identifying the underlying distortions in asset prices and trace out the intricate repercussions of asset price movements for the economy.[8] Under the economic analysis, the ECB monitors asset prices as leading indicators of economic activity and assesses their impact on spending and consumer price formation from a short to medium-term perspective. A better understanding of the state of expectations facilitates an assessment of the outlook for near-term consumer price inflation. At the same time, a key component of economic analysis is the study of the repercussions of movements in the prices of stocks and property for wealth, the cost of capital and the balance sheet positions of various euro area sectors and, through these channels, for consumption and investment. This aspect of economic analysis measures the consumer price pressures likely to emerge from asset-price-induced shifts in the balance between demand and supply over the short to medium term.

In the monetary analysis, the assessment of money and credit plays an important role in shaping the medium to long-term outlook for price developments. This complementary perspective makes it possible to follow the interactions between price formation in the market and credit and liquidity creation in the financial sector. Monetary analysis can contribute to assessing the extent to which generously valued assets can be traced to – and at the same time become a source of – excess creation of liquidity and over-extension of credit. Detecting and understanding this link helps the ECB form an opinion on whether an observed movement in asset prices might already reflect the inflating of an unsustainable bubble. Constructed measures of "excess liquidity" – also defined in terms of the quantity of money that would result from standard money demand models – and "excess credit" formation provide valuable quantitative evidence for the central bank. For example, such evidence may signal a looser monetary policy stance than that derived from the

8 See "The monetary policy of the ECB", ECB, 2004.

economic analysis and the projections of consumer price inflation. This, in addition to more standard measures of asset price overvaluation, would help to corroborate suspicions that a bubble might be forming.

Cross-checking between economic and monetary analysis lengthens the horizon over which the ECB traces out the likely developments in consumer prices. Thanks to the medium to long-term perspective provided by the monetary pillar and to the systematic monitoring of monetary and credit developments conducted within the monetary analysis, the two-pillar strategy does not overlook the potential role of such developments as driving forces for consumer price inflation in the medium to long run. As a consequence, this approach has an important positive side effect. It makes it possible to take account of the risks that might be associated with unsustainable asset price developments. In addition, it may contribute to limiting the emergence of unsustainable developments in asset valuations. Ultimately, this cross-check leads to a better assessment of the correctness of the policy stance. Early indications that a process of surging equity or house prices in the euro area might be interacting with conditions of abundant liquidity would lead to heightened vigilance.

The ECB's mandate to preserve a euro area perspective ensures that economic and monetary analyses are firmly concentrated on phenomena with an area-wide dimension. This does not imply that regional developments – such as sizeable misalignments in the prices of property in a number of regions – should go unnoticed. Indeed these need to be carefully assessed in order to better understand the nature of shocks and their potential for impacting upon the stability of the monetary and financial system of the euro area as a whole. Signs of contagion and spill over effects transmitted by an integrated credit system need to be fully taken into account. All this information is important for taking monetary policy decisions.

6 CONCLUSION

Asset price bubbles pose many challenges to central banks. Historical episodes have shown that they can evolve quickly and that the costs of their bursting can be very high for the economy.

Asset price bubbles are difficult to identify in real time and are thus often only identified ex post. This notwithstanding, it appears that there are a number of tools which can help to identify the emergence of bubbles.

The ECB does not target asset prices. However, it needs to pay close attention to asset price movements with a view to preserving the stability of consumer prices over longer horizons. In this respect, the prominent role of money and credit in the ECB's strategy should help the ECB to assess developments in asset prices and the degree to which they pose a risk for price stability in the more distant future.

COMPARABILITY OF STATISTICS FOR THE EURO AREA, THE UNITED STATES AND JAPAN

The international comparison of key macroeconomic indicators plays an increasingly important role in economic and monetary analysis. The economic situation in the euro area is regularly assessed in comparison with two other large economies: the United States and Japan. However different statistical concepts, data coverage, accounting conventions and compilation practices affect the comparability of statistics. The international harmonisation of statistics has progressed considerably over recent years. While the headline figures for the euro area, the United States and Japan are often not completely comparable, certain adjustments can be performed or alternative statistical indicators compiled which facilitate comparison. However, headline indicators also frequently reflect certain peculiarities of the individual economies and, consequently, full harmonisation of these between the euro area, the United States and Japan might imply a loss of relevant information.

1 INTRODUCTION

The comparison of macroeconomic indicators for the euro area with those for the United States and Japan is an integral part of monetary, economic and structural analyses. Cross-country comparisons provide a measure of the relative economic situation. Moreover, they allow the impact of different institutional features on macroeconomic developments to be analysed.

A rigorous comparative analysis between the euro area, the United States and Japan is greatly facilitated by comparable statistical data. It is therefore essential to explain the differences between the indicators and to provide additional indicators or estimates that allow international comparisons.

In the past decade, international harmonisation has improved considerably in the area of macroeconomic statistics as a result of the further development and implementation of international standards in various statistical fields. Table 1 presents an overview of the main recent methodological developments. These improvements notwithstanding, international comparisons of economic indicators remain complex. Analysis suggests that differences in concepts, data coverage, accounting conventions and compilation practices are the main factors limiting the comparability of statistics. Furthermore, the application of the same statistical measures to market economies with different institutional settings may require careful analysis. For example, the household saving ratio measured in line with national accounts concepts may show rather different results depending on the institutional settings for old age pension schemes.[1]

This article focuses on the statistical comparability of a selected set of key indicators for the euro area, the United States and Japan and will not address comparability issues related to institutional settings. The indicators chosen are among those closely monitored by the ECB in the conduct of monetary policy.[2]

The article is organised as follows. Section 2 gives an overview of the factors impairing comparability as well as a summary assessment of key indicators. Section 3 analyses in more detail the comparability of some of these key economic indicators, namely inflation rates, GDP, unit labour costs, bank credit aggregates, indebtedness indicators and government deficit/surplus. These statistics are of particular interest with regard to their international comparability or lack thereof. Wherever possible, euro area indicators have been compared in detail to both the US and Japanese equivalents. Owing to data constraints, a systematic analysis of the comparability of Japanese statistics is not always possible. Section 4 concludes.

1 See "Comparison of household saving ratios: euro area, United States, Japan", ECB/OECD, 9 June 2004.

2 Monetary aggregates are not covered in this article as the definition and measurement of these aggregates depend on institutional characteristics.