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The Brave New World of Central Banking: The Policy Challenges Posed by Asset Price Booms and Busts

Stephen G. Cecchetti *

Abstract

At the dawn of the 21st century, property and equity ownership are spread more broadly across the population than they once were. One consequence of this is that asset price booms and crashes now have a direct impact on general welfare. The fact that bubbles distort nearly all economic decisions gives policymakers a stronger interest in asset price stability. In this essay I examine the theoretical and empirical case for the existence of equity and property bubbles, and then summarize the economic distortions that they create. The evidence suggests increasing our attention on property prices. I go on to discuss the possible policy responses, including examining the consequences of changing the way in which housing is included in standard aggregate price measures.

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Keywords: Central bank policy, equity price bubbles, housing price bubbles.

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Nontechnical Summary

In this article I discuss the role of central bankers with respect to equity and property price bubbles. I argue that monetary policymakers have no choice but to face the risks posed by asset price bubbles head on. While equity markets are small in most countries, and so stock-price bubbles are not of any significance in most of the world, bubbles in housing markets have the potential to wreak havoc in developed and emerging market countries alike. And significant deviations of exchange rates from fundamentals create problems as well.

I discuss theoretical contributions regarding the existence of bubbles. I also provide empirical evidence that supports the existence of booms followed by crashes. Moreover, I assert that asset price bubbles distort nearly all economic decisions of any importance. Wealth effects cause consumption to expand rapidly and then collapse. Increases in equity prices make it easier for firms to finance new projects, causing investment to boom and then bust. The collateral used to back loans is overvalued, so when prices collapse it impairs the balance sheets of financial intermediaries that did the lending. The booms tend to raise fiscal revenue, encouraging tax cuts and expenditure increases that are politically difficult to reverse when the crash inevitably comes.

Bubbles clearly compromise the stabilization objectives of central banks. They create volatility in consumption, investment, fiscal policy, financial intermediaries' solvency, and more. In most cases, asset price misalignments influence aggregate demand, driving inflation and output up during the boom and down during the bust. It seems obvious that monetary policymakers – even those whose primary objective is price stability – have no choice but to care.

Finally, I identify and discuss five suggested responses to asset price bubbles:

1. Take them into account only insofar as they influence forecasts of future inflation.
2. Act only after the bubble bursts, reacting to the fallout of the bubble.
3. Lean against the bubble, raising interest rates in an attempt to keep it from enlarging.
4. Include housing prices directly in the price index that the central bank targets.
5. Look for regulatory solutions both to keep the bubble from developing and to reduce the impact of a crash should one occur.

1. Introduction

In the days when equity and property ownership was concentrated among the very wealthy, fluctuations in asset values posed few problems for the economy as a whole. Booms and crashes occurred, but the burden was borne largely by rich owners of equity and property. For public policy aimed at improving the general welfare, these gyrations in asset prices were relatively unimportant.[1] But at the dawn of the 21st century, things are different. In developed countries, both property and equity ownership are spread more broadly across the population than they once were, so the impact of price bubbles is on general welfare. As a result, policymakers have a stronger interest in asset price stability. What should they do about it? When faced with sharp movements in equity and property prices that are almost surely unsustainable, how should central bankers react?

It is surprising that so many monetary policymakers are hesitant to address the potential risks to their stabilization objectives that are created by asset bubbles. The evidence is not in dispute. Bubbles – by which I mean booms followed by crashes – both increase the volatility of growth and inflation, and threaten the stability of the financial system. The 2003 IMF *World Economic Outlook* estimates that the average equity price bust lasts for 2½ years and is associated with a 4 percent GDP loss that affects both consumption and investment. While less frequent and somewhat less severe, property (or housing) busts are twice as long and are associated with output losses that are twice as large – more on this shortly.[2]

Asset price bubbles distort nearly all economic decisions of any importance. Wealth effects cause consumption to expand rapidly and then collapse. Increases in equity prices make it easier for firms to finance new projects, causing investment to boom and then bust. The collateral used to back loans is overvalued, so when prices collapse it impairs the balance sheets of financial intermediaries that did the lending. The booms tend to raise fiscal revenue, encouraging tax cuts and expenditure increases that are politically difficult to reverse when the crash inevitably comes.

It is the job of central bankers to eliminate the sort of economic distress asset price bubbles cause. Although the rhetoric has been changing slowly, especially in the case of the responses to the Australian and British housing market booms, most central bankers remain extremely reluctant to act directly to manage these risks.

As the IMF evidence makes clear, any discussion of bubbles must distinguish between equity and property prices. This is true for several reasons. First, the efficient markets hypothesis is more likely to apply to equity than to property. Arbitrage in stocks, which requires the ability to short sell, is at least possible. In housing and property, it is not. Second, even in the few countries with sizeable equity markets, ownership continues to be highly concentrated among the wealthy – people whose consumption decisions are well insulated from the vicissitudes of the stock market. By contrast, home ownership is spread much further along the income and wealth distribution.

[1] The view that the Great Depression was precipitated by the stock market crash of 1929 has not borne the test of time. Instead, the consensus today is that proximate cause was flawed monetary policy, combined with the way in which the interwar gold standard operated. See, for example, Bernanke (2002) and Cecchetti (1998).

[2] See the excellent essays in Chapter II of IMF (2003) for a summary of the evidence.

Finally, in many countries housing purchases are highly leveraged, leaving the balance sheets of both households and financial intermediaries exposed to large price declines. This final point suggests that the macroeconomic impact of a boom and crash cycle in property prices might be larger in countries that have more credit outstanding.[3]

Financial innovation reduces the costs and improves the efficiency of risk shifting. Risk goes to those best able to bear it, and the result is smoother consumption. At least, that's what will normally be the case. The difficulty is that with the ability sell risk comes the ability to buy it, so individuals who wish to concentrate risk can do so. And this concentration of risk, especially inside leveraged financial institutions, can have externalities. It has the potential to create financial fragility. The result is that during normal times things will be smoother, but when things go badly, they go very badly.

Asset price booms and busts clearly compromise monetary policymakers' stabilization objectives. Not only do they raise the volatility of inflation and output, but they have the potential to increase the risk of very bad events occurring. As the risk managers of the economic and financial system, policymakers are forced to care about bubbles.

It is important to note that asset prices fit naturally into any modern central bank's policy framework. Including them is completely consistent with inflation targeting as it is commonly practiced. As Bank of England Governor Mervyn King (2004) has put it, "any (coherent) monetary policy can be written as an inflation target plus a response to supply shocks." That is, any functional monetary policy framework must be based on an implicit or explicit inflation target combined with a rate at which policymakers intend to bring inflation back to this target following shocks that move output and inflation in opposite directions. The more concerned a central bank is about deviations from potential output, the less rapidly it will strive to return to the inflation target.[4]

The remainder of this essay examines asset price bubbles and their policy implications. Sections 2 and 3 describe the theory and evidence behind the consensus that there are bubbles. Section 4 discusses the economic impact of bubbles. This is followed in Section 5 by an examination of the difference between housing and equity bubbles. Section 6 presents an evaluation of the policy options that have been suggested, and Section 7 concludes.

2. Do Bubbles Exist? Some Theory

On 3 June 2005 an American postage stamp printed in 1918, with a face value of 24 US cents, sold at auction for $577,500 – nearly three times its November 1988 sale price of $192,500. This was obviously no ordinary stamp. It was one of the finest of the 80 to 90 surviving examples of a misprinted airmail stamp – the image of a biplane in the middle of the stamp is upside down. After the red border had been printed on one printing press, a single sheet of 100 stamps had

[3] For a somewhat more detailed discussion of the issues and the debate see Cecchetti (2003).

[4] See Svensson (1999).

inadvertently been rotated 180 degrees before being sent through a second press to print the image of a blue biplane in the center. Since the US Postal Service has never cancelled any of its stamps, we know that the stamp will still be honored at its face value – 24 cents. In the language of financial economics, an asset with a fundamental value of 24 cents sold for $577,500. Why would someone be willing to pay this much for something with so little fundamental value? Especially since any prudent person would surely put the stamp into a temperature and humidity controlled bank vault immediately.[5]

While it is possible that preferences for having this specific stamp in one's vault (out of sight) have shifted enough to justify a 16.5% compound annual return between the sales in 1998 and 2005, this seems extremely unlikely. What is more plausible is that the stamp's buyer believes that in a few years someone else will pay more. As LeRoy (2004) forcefully argues, there is a strong presumption in *favor* of bubbles.

The criticism of the bubble view is based on the efficient markets logic that markets incorporate all available information and this automatically eliminates bubbles. But there are many circumstances under which the argument fails. The dynamic stories that we tell to explain market efficiency are based on arbitrage. And when arbitrage fails, so does market efficiency. In fact, even if everyone knows that there is a bubble, there is a broad set of realistic circumstances under which arbitrageurs will not eliminate it.

In a recent paper, Jeremy Stein (2004) constructs just such a model. He starts with the logical premise that individual investors cannot identify good from bad money managers. In order to signal that they are good and overcome the information asymmetry, managers must allow redemptions from the fund being managed – that is, the fund has to be open-ended rather than closed-end. And an open-ended fund is exposed to withdrawal if it underperforms its benchmark, since investors will monitor short-run performance, taking their money out of a fund that underperforms because that is evidence that the manager may be bad.

To understand the importance of this line of reasoning, consider a bubble in the aggregate equity market that is certain to burst. Specifically, imagine that the bubble grows at 5% each quarter, and has a 5% probability of bursting each quarter. The existence of the bubble is common knowledge among the well-informed fund managers, but their naïve investors aren't sure about it. Will the manager of an open-ended fund take a short position to profit from the bubble? The answer is almost surely no. With the bubble growing each quarter, a manager that is long will have a 5% return every quarter until the bubble bursts. Alternatively, if the manager sells the market short, the fund will lose 5% every quarter until the bubble bursts.[6] Since the fund is open-ended and investors worry about manager quality, they will withdraw their money from the fund that sells short. In equilibrium, no one sells short, everyone goes long, the benchmark against which performance is judged is the bubble return, and arbitrage doesn't drive prices to fundamentals

[5] This argument is based on LeRoy (2004).

[6] Even if a manager has the fortitude to take the short position, it can be difficult to maintain. Since the market is moving against the position, the manager will have to constantly post additional margin to maintain it. And since the lender of the stock can always recall share without notice, there is always the possibility of being closed out before the bubble bursts.

even though everyone knows the bubble is there.[7] In the end, no one has the combination of a long time horizon and deep pockets to eliminate the bubble.

3. Do Bubbles Exist? Some Evidence

So much for theory; what about evidence? Thanks to Robert Shiller (2005) we have over 100 years of data for American equity and housing prices. Starting with the level of prices, we see that during the late 1990s real equity prices rose to more than double their historical levels. And for housing prices, the Shiller data show that in 2005, US house prices (deflated by the CPI) were 67% above their 1950–1995 average. Since the standard deviation of real house prices during that 45 year period was a mere 5 percentage points, the 2000–2005 move is 13 standard deviations in size!

While the raw price data are interesting, it is useful to look at price-earnings ratios. If prices are rising because earnings growth has increased, there would be justification for the run-ups that we see. (We also know, at least for the case of equity, that a high price-earnings ratio forecasts a low future return.) Figure 1 plots both the contemporaneous price-earnings ratio and the ratio of current prices to the average of the past 10 years' earnings (see Shiller 2005 for a discussion of the rationale for the averaging). During the tech bubble of the 1990s, a number of observers repeatedly pointed to the fact that price-earnings ratios had reached unprecedented levels. Multiples that are normally around 30, by the fall of 1997 had nearly reached 50 and were on their way to 60. There were only a few explanations for this that are based on economic fundamentals: Either dividend growth could have risen significantly or the equity risk premium could have fallen. There is no evidence of the former, and the latter is completely inconsistent with survey evidence, which shows that investors purchasing stocks did so in anticipation of future price appreciation.[8] Not only that, but rough calculations suggest that any price earnings ratio in excess of 30 implied a *negative* equity risk premium!

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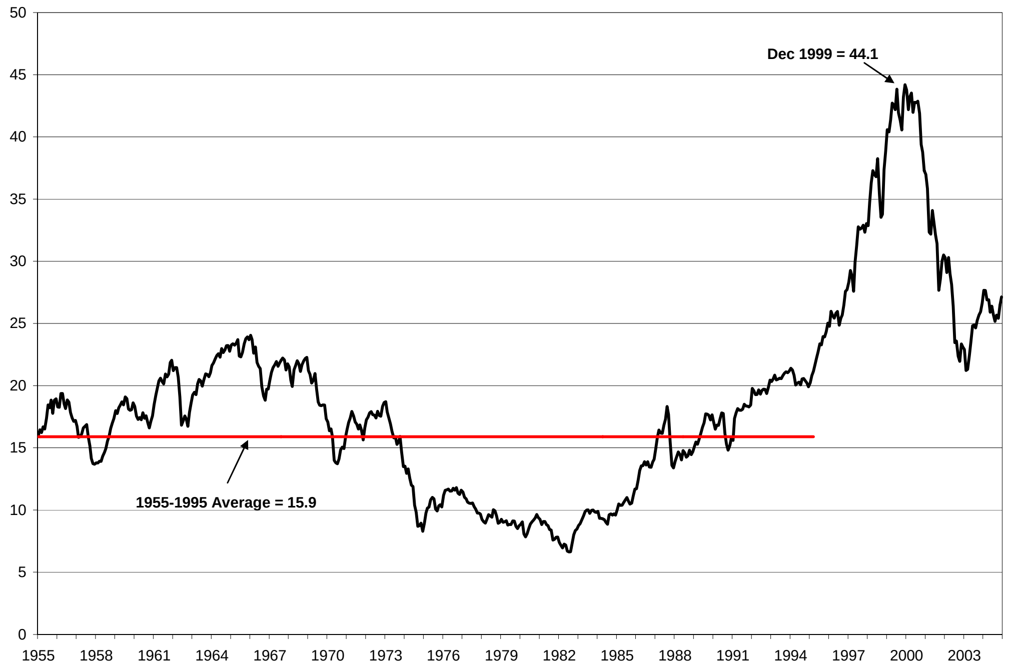
[7] It is reasonable to ask why hedge funds can't profit from this. Hedge fund managers have significant access to leverage and few restrictions on their investment strategy, and appear to severely restrict withdrawals. While all this may be true, the fact is that the vast majority of hedge funds look for trades that converge rapidly. And performance is evaluated at least quarterly. Unfortunately, there is no survey of hedge fund withdrawal policies, but anecdotal evidence suggests that they are structured essentially as open-ended funds. Large investors can negotiate with the manager to allow for frequent withdrawals in the event of underperformance. While we don't know as much about this as we would like, casual observation suggests that the hedge funds are out there taking short positions that would have to be in place for several years before they pay off.

[8] See Cecchetti et. al (2000), chapter 3, for a discussion.

Figure 1: S&P Composite Real Price-Earnings Ratio

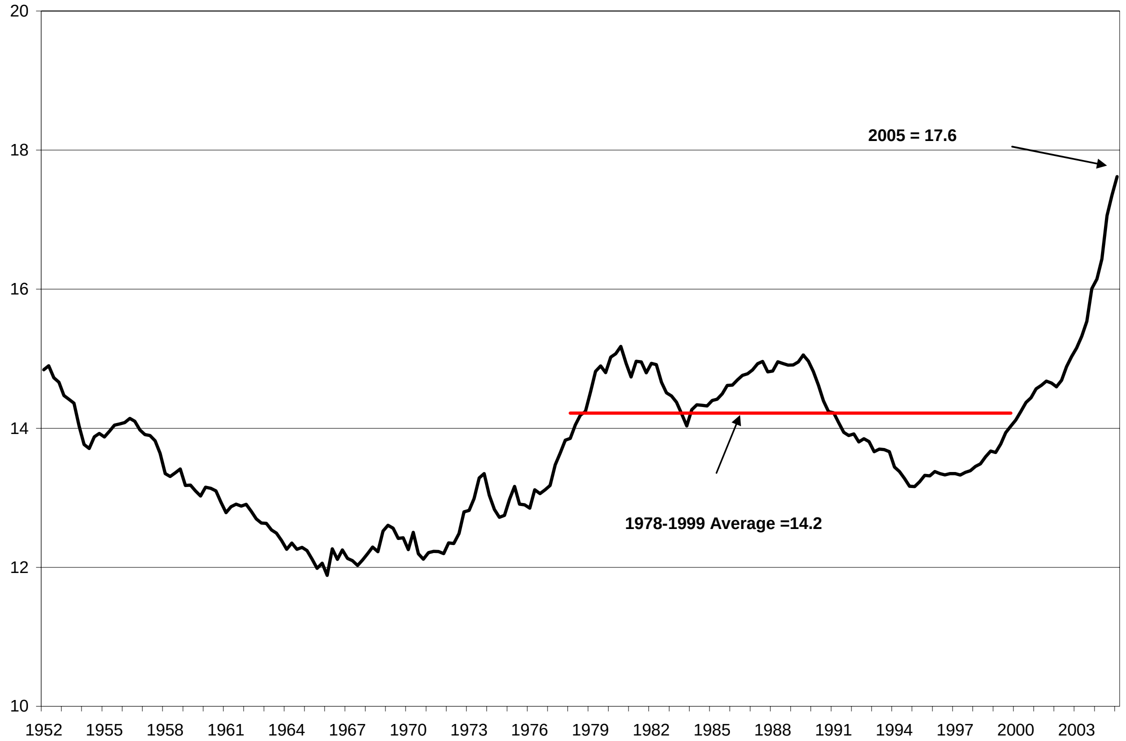


Source: Data are from http://www.econ.yale.edu/~shiller/data.htm. Prices divided by the 10-year lagged moving average of earnings, not adjusted for share buybacks.

Turning to housing, the equivalent to the equity price-earnings ratio is the ratio of the market value of the housing stock to its service flow. For the US, the data on the aggregate value of residential real estate is constructed by the Federal Reserve Board and reported quarterly in the Flow of Funds (the Z.1 release), and the consumption of housing services is computed by the Bureau of Economic Analysis in the process of constructing the National Income and Product Accounts.[9] The ratio is reported in Figure 2.

[9] The housing wealth data from the flow of funds is constructed by applying a perpetual inventory method to net residential investment and applying the Office of Federal Housing Enterprise Oversight (OFHEO) matched-resale price index. The housing service data in the National Income and Product Accounts is based on a survey of rental units whose characteristics are matched to those of the owner-occupied residential housing stock.

Figure 2: The Ratio of the Value of the US Housing Stock to the Rental Service Flow



Source: The ratio of the flow of funds estimate of the value of residential real estate, Table B100 line 4 plus Table B103 line 4, to the National Income and Product Accounts estimate of the total housing services in personal consumption expenditure, Table 2.3.5 line 14.

The results from 2000 to 2005 are striking. The Federal Reserve Board estimates that, over that 5-year period, the value of the (nominal) housing stock has risen 66%, or an incredible $9 trillion. (Over this period, US GDP rose from roughly $9.5 trillion to $12 trillion.) Meanwhile mortgage debt rose from $5 trillion to $8 trillion. From 2000 to 2004, nominal personal consumption expenditure rose $1.7 trillion, or 25%. Putting these together, we see that in 2005 the value of housing wealth (both owner occupied and rental) was more than 17½ times the estimates of the value of housing services – one-quarter above the 14.2 average of the previous 20 years.[10]

There are two ways that the housing/rent ratio can return to more normal levels: Either housing prices can fall, or rents can rise. If the adjustment were to occur completely through rents, they would have to rise by roughly one-third. This would have a significant impact on headline (and core) inflation. To get a sense of how big the inflation adjustment would be, note that shelter accounts for one-third of the headline US Consumer Price Index (CPI). If sale prices of homes

[10] McCarthy and Peach (2004) argue that recent increases in the prices of US housing can be attributed in large part to changes in quality. They note that the ratio of the OFHEO home price index (on which the flow of funds data are based) to a constant quality index has risen over 20% from 2000 to 2004. That is, the quality of the existing housing stock has been rising at a 5% annual rate. Since housing services are 15% of personal consumption expenditure, which is 70% of GDP, this would translate into a 0.5% annual increase in real growth through this period. This seems unlikely.

were flat for five years, then shelter would have to rise at a steady 5.7% annual rate, or more than twice the current (2005) rate of 2.5%. As a result the headline CPI would rise by a full percentage point for 5 years! And since shelter is an even bigger component of the CPI excluding food and energy, the impact on traditional core inflation would be even larger.[11] Given how unlikely it is that policymakers would tolerate this, the only remaining possibility is that the adjustment will occur through a collapse of housing prices – that is, the bubble will burst. We will return to the policy implications of this line of reasoning later.

While less extensive than the US data, quarterly equity and housing price information exists for a number of countries. A casual look at the data on equity in 19 countries and housing in 17 countries reveals the following: During an equity bubble, real prices double over a period of 3½ years and return to the original level 4 years later. The full cycle is 7 to 8 years long. And a typical housing bubble involves a 50 percent real price increase over 3 years, followed by a 25% decline over the following 3 years. The full cycle is approximately 6 years long and at the end of the crash, housing prices are roughly 10% higher than where they started.

The conclusion from all of this is that bubbles are relatively common. Measuring them is surely difficult but not impossible. When a constellation of factors converge, we can often be fairly certain that there is a bubble.

4. The Economic Distortions Created by Bubbles

Bubbles exist. They exist in theory and they exist in fact. Both equity and housing prices can go through protracted periods where they deviate significantly from any reasonable notion of fundamental value – first booming and then crashing. But why do we care? If a bubble just involved some rich people becoming richer and then less rich, we probably wouldn't care much. But asset price bubbles create a multitude of distortions in the economy that affect nearly everyone. They have an undesirable impact on consumption, investment, the path of fiscal policy, and the balance sheets of commercial banks.[12] It is worth examining each of these in turn, if only briefly.

Consumption

It seems obvious that changes in the value of equity and housing have direct implications for household balance sheets. Booms in either equity or property prices drive up the wealth of individuals. The natural response to an increase in wealth is to raise consumption. If you are rich, you can buy a fancy car, purchase a bigger and flatter television, go on nicer vacations, eat in expensive restaurants, and the like. And the data show that this is exactly what happens.

[11] Because housing is only 15% of personal consumption expenditure (PCE), the impact on the PCE price index would be much smaller.

[12] This list could be much longer, including pension fund management and insurance companies.

A useful rule of thumb is that a $1 increase in US wealth generates between 2 and 5 cents of additional consumption by American households.[13] That is, the marginal propensity to consume for wealth is in the range of 0.02 to 0.05.

As Norman, Sebastia-Barriel, and Weeken (2002) note, the marginal propensity to consume is of somewhat less interest than the elasticity of consumption with respect to wealth.[14] They emphasize that we care more about the impact of a 10% increase in the value of wealth than we do about the number of cents or pence that consumption rises per dollar or pound of additional wealth. This is especially true of equity wealth, since the sizes of equity markets vary so widely across countries. Bertaut (2002) reports that, at the end of 2001, total equity market capitalization equaled 153% of GDP in the UK, but only 59% of GDP in Germany. To understand the importance of this, consider the impact of a 10% increase in equity prices on consumption in each country, assuming that the marginal propensity to consume is the same. The estimated impact in the UK would be roughly three times as large as that in Germany.[15]

This highlights the importance of thinking about housing and equity separately. There are two reasons for this. First, equity prices are substantially more volatile than housing prices, so a change in the former is much less likely to be permanent than a change in the latter. Reasonably, households respond more aggressively to changes in wealth that they perceive to be permanent.[16] Second, as mentioned earlier, equity ownership tends to be concentrated among the wealthy – people who are much less likely to adjust their consumption levels. Housing ownership, by contrast, is distributed more broadly. And while the quality of housing and the concentration of ownership varies across countries, the differences are far less dramatic.

Turning to the evidence, using data from 14 developed countries Case, Quigley, and Shiller (2005) estimate that a one percent increase in housing wealth raises consumption by between 0.11 and 0.17 percent. By contrast, they find that the stock-market wealth elasticity of consumption is substantially smaller, only 0.02.

Investment

Equity bubbles distort investment decisions. In his excellent book *Dot.con* John Cassidy (2002) recounts a series of stories about the issuance of stock in companies with little or no commercial viability and subsequent inefficient use of the funds.[17] Prices are supposed to provide signals for the allocation of resources in the economy. Higher priced items are more valuable and so attract

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[13] See, for example, Norman, Sebastia-Barriel and Weeken (2002).

[14] The elasticity of consumption with respect to wealth is equal to the marginal propensity to consume out of wealth times the ratio of wealth to consumption.

[15] Careful econometric estimates show an even larger disparity. Bertaut (2002) reports that a 10% increase in the stock market creates a 0.5 to 1.0% increase in consumption in the long run in the US and UK, but only 0.07 in Germany, where the equity is less than 60% of GDP.

[16] Kishor (2005) estimates that while 98% of the change in housing wealth is permanent, only 55% of the change in financial wealth is. This suggests that the housing wealth effect should be roughly twice the stock-market wealth effect.

[17] Cassidy's appendix contains an eye-opening list of all the IPOs during the late 1990s, complete with the initial offer price of the shares, the maximum price, and the price when the book was published – often zero!

more resources. The price of a firm’s equity is supposed to give us information about future profitability. High prices mean better prospects down the road.

In theory, the system will allocate capital to its most socially productive uses. But the theory only works when prices correctly reflect fundamental values. That is, when markets are efficient (as discussed earlier). Bubbles destroy all of that, distorting the information content of the price system.

During the internet bubble in the late 1990s, American investment was grossly distorted. High technology firms were able to raise funds easily, while traditional companies had a difficult time. When the crash came, equipment and buildings were abandoned, and people lost their jobs. In retrospect the equipment should never have been purchased; the buildings should not have been built; and the people should have kept their previous jobs. And when it was all over, the investment boom turned into an investment bust.

The impact was striking. From 1993 to 2000 nonresidential fixed investment contributed an average of more than one percentage point per year to growth. In 2001, business investment brought growth down by one-half of one percentage point. The swing was huge – much larger than in the 1990 recession – and the proximate cause was the stock market bubble.

In thinking about the impact of the internet bubble on the path of aggregate US investment, we should also take care to note its impact on measured productivity growth rates and resulting estimates of potential GDP growth. Equity prices did not explode across the board in the late 1990s. The bubble’s effects were concentrated on high-technology companies. These were companies that invested heavily in computer hardware and software – a part of the economy with extremely high productivity growth. These investments were not socially productive, and the resources should have gone elsewhere. As an accounting matter, more investment in high productivity growth sectors raises current GDP growth, estimates of potential GDP, and measured aggregate productivity growth. All of this makes it harder for monetary policymakers to gauge the appropriate level for interest rates.

Fiscal Policy

Political environments differ around the world, but there is one constant: It is always easier to cut taxes than to raise them. This fact, when combined with the dynamics of a bubble, can be very damaging. Since asset price booms increase both income and consumption, they tend to raise tax revenues. Flush with resources, politicians increase spending and cut taxes. But when the bubbles burst, revenues fall, creating fiscal deficits that are very difficult to correct.

In the US case, a particularly dramatic example is the increase in reported taxable capital gains. Comparisons are made difficult by changes in tax law, but during 1999 and 2000 the capital gains reported by individuals for the purpose of personal income tax were roughly twice what they were in both 1996 and 2001. The difference between 2000 and 2001 resulted in a revenue decline on the order of $60 billion, which is roughly 4 percent of US Federal Government revenue at that time. At this writing, the necessary American fiscal consolidation has not yet occurred.

Commercial Banks

Banking is critical to the operation of modern economies. Without financial intermediaries to channel funds from savers to investors the entire economic system would collapse. And we know from hard experience that a healthy banking system is not only indispensable, but also fragile.

Asset price bubbles can bring out financial system fragility. This is true even when banks are precluded from owning equity directly, as they are in many countries. The problem is that assets often serve as collateral for loans. Housing is the classic example. When housing markets boom, banks lend. When housing markets crash, borrowers default and banks are left with collateral that is worth less than the outstanding principal of the loan.

In the emerging market countries, exchange rate misalignments can result in similar problems. This is either because of the currency mismatch on the balance sheet of the intermediaries themselves (something that I hope we have learned how to avoid), or because of the currency mismatch between the revenues and expenses of the banking system's debtors.

In recent years, financial regulators have worked very hard to set up rules and oversight mechanisms that ensure bank solvency. And in the aftermath of the internet bubble, US commercial banks faired quite well. After building up significant capital during the 1990s, financial intermediaries barely felt the collapse of the stock market. The same may not be true if there is a housing crash.

Again focusing on the US, since there is data and I know the case the best, we can look at recent experience. From 2000 to 2005, the level of mortgage debt in the US increased by just over $4 trillion – a 66% rise. Of this, $1.5 trillion, or nearly 40%, has landed on the balance sheets of commercial banks. So, by early 2005, mortgage loans plus marketable securities backed by mortgages accounted for 43.7% of total bank assets – a dramatic increase from the 37.5% at the beginning of 2000.[18] While the risk inherent in this balance structure may be hedged, it could also create a large problem should house prices crash.

And there's more!

The list of distortions created by bubbles doesn't end with those to consumption, investment, fiscal policy, and bank balance sheets. Another, more subtle, difficulty comes from the fact that higher investment during the boom can drive up observed real growth, raising the apparent productive capacity of the economy. The problem is that some portion of the investment during the boom should not have been undertaken. That is, if prices had been correct these projects would not have had positive internal rates of return. When prices fell, many of these investments were abandoned – we all recall the pictures of warehouses piled high with discarded computer equipment. This makes potential GDP look higher than it actually is. For policymakers this creates the risk of trying to stabilize growth at too high a level. For the rest of us it means overly optimistic expectations about growth of income and consumption.

[18] Data are all from the Flow of Funds, tables L10 (line 22) and L109 (lines 1, 7, and 13).

In summary, bubbles clearly compromise the stabilization objectives of central banks. They create volatility in consumption, investment, fiscal policy, financial intermediaries' solvency, and more. In most cases, asset price misalignments influence aggregate demand, driving inflation and output up during the boom and down during the bust. It seems obvious that monetary policymakers – even those whose primary objective is price stability – have no choice but to care.[19]

5. The Difference Between Equity and Housing Bubbles

It is worth returning to consumption wealth effects at least briefly. As I emphasized earlier, the reaction to changes in the value of equity is typically much smaller than the consumption reaction to an equivalent percentage change in the value of housing. This is as it should be. When stock prices rise, it usually signals improved future profitability. Faster growth means higher incomes and more resources to devote to current (and future) consumption. Equity markets may be fickle, often giving one day and taking back the next, but sustained movements really do signal changes in future growth.

Contrast this with housing. We all have to live somewhere. When home prices rise it does not signal any increase in the quantity of economy-wide output. While someone with a bigger house could sell it and move into a smaller one, there must be someone else on the other side of the trade. That is, for each person trading down and taking wealth out of their house, someone is trading up and putting wealth in. And renters planning to purchase should save more. All of this should cancel out, so that in the aggregate there is no change!

Put another way, people own their homes to hedge the risk arising from potential changes in the price of purchasing housing services. They want to ensure that they can continue to live in the same size home. A rise in property prices means people are consuming more housing, not that they are wealthier.

This logic is clear. Even so, when researchers look at individuals they see a large effect.[20] Since individuals view housing wealth increases as more likely to be permanent than increases in stock-market wealth, consumption reacts by roughly twice as much. The best guess is that for the American economy as a whole, the $9 trillion increase in residential-real-estate wealth from 2000 to 2005 translated into an increase of $200 billion in consumption – enough to push GDP up 1½% per year.

[19] To keep things manageable, I have said nothing about exchange rate misalignments. This is not because I believe them to be unimportant. In fact, it is easy to see how non-fundamental movements in exchange rates will distort the allocation of investment and consumption. If a country's currency is overvalued, for example, import-competing industries will be decimated as domestic consumers shift to foreign produced goods. When things return to normal, the industrial structure will have to go through a costly adjustment.

[20] Campbell and Cocco (2005) note a distributional impact. Housing wealth changes have a much bigger impact on the old than on the young. Somewhat paradoxically – at least from a macroeconomic perspective – they find virtually no effect on young renters. The renters experience both an income and substitution effect, which cancel out. The problem is that if the young are planning to purchase less housing, why did the price rise in the first place?

Is the increase in consumption justified? Well, it depends. If the consumption and housing price increases are both a consequence of higher estimated long-run growth, then the answer is yes. That is, if everyone now expects higher future incomes, then they will demand more housing along with more of everything else, and there is no bubble. So, if the house price boom is accompanied by an increase in the rate of growth of potential output, then it is not a bubble. An equity price boom would have to accompany this as well. And, importantly, this would likely imply an increase in the long-run real interest rate, too. So, if housing, equity, and bonds all boom at the same time, we probably need not be concerned.

In the absence of evidence that the economy's growth trend has risen, a housing price boom should not drive up consumption. The fact that it does creates a problem for policymakers. The transitory consumption increase represents reduced saving that must be made up with lower consumption in the future. And the problem is that it is created by the increase in house prices; one that might properly be characterized as inflation.

6. Policy Options

What is to be done about all of this? When confronted with evidence that housing prices are far from fundamentals, what can monetary policymakers do? Given the damage that bubbles do, the idea that central bankers should completely ignore them seems absurd on its face. But what should they do?

In recent years, a broad set of academics and policymakers have addressed this question. There are now so many papers that examine the connection between asset prices and monetary policy that it would be foolhardy for me to try to summarize them all. Instead, I will identify five suggested responses:

1. Take them into account only insofar as they influence forecasts of future inflation.
2. Act only after the bubble bursts, reacting to the fallout of the bubble.
3. Lean against the bubble, raising interest rates in an attempt to keep it from enlarging.
4. Include housing prices directly in the price index that the central bank targets.
5. Look for regulatory solutions both to keep the bubble from developing and to reduce the impact of a crash should one occur.

Before examining each of these, I would like to be absolutely as clear as possible about one thing. My previous coauthors and I agree that policymakers should not *target* asset prices per se, and we have said so repeatedly. Let me quote from Cecchetti, Genberg, and Wadhwani (2002):

> "It is important to emphasize that … we are recommending that while [central banks] might **react** to asset price misalignments, they must **not** target them." [Emphasis is in original].

The debate is explicitly *not* about central bank objectives. It is about how to go about achieving whatever combination of price and output stability policymakers are aiming to deliver. The proposal that interest rates respond to bubbles is completely consistent with inflation targeting or any other policy framework based on standard stabilization objectives.

1. React only if the bubble changes inflation forecasts

Turning to the list of five possibilities, Bernanke and Gertler (1999, 2001) are the original and most influential proponents of the first strategy. They note that directly reacting to asset price booms carries with it the risk of destabilizing both real output and inflation. Cecchetti, Genberg, Lipsky, and Wadhwani (2000) and Cecchetti, Genberg, and Wadhwani (2002) take issue with this conclusion, noting that Bernanke and Gertler study only very simply monetary policy rules that exclude the possibility of interest rate responses to output gaps. Once the universe of possible policy rules is expanded, reacting to asset price bubbles will usually be stabilizing.

The intuition for this conclusion is straightforward. The simplest way to think about monetary policy is that, to achieve their stabilization objectives, central bankers adjust their interest rate instrument in response to shocks. Shocks are things like changes in consumer or business sentiment, movements in international commodity prices, and the like. In this framework, bubbles are just another type of shock to which interest rate policy should react. And, as an empirical matter, Cecchetti et. al (2000) suggest that reacting to bubbles over and above their impact on forecasts of future inflation yields more stable inflation and real growth.

2. Clean up after the bubble bursts

Alan Greenspan (2002) has articulated the view that there is really nothing to be done ex ante, so the only policy prescription is to clean up the mess ex post. Chairman Greenspan's argument has two parts. First, he argues that only after it bursts can a policymaker be sufficiently certain that a bubble was present. And second, "that no low-risk, low-cost, incremental monetary tightening exists that can reliably deflate a bubble." (Greenspan 2002, p. 5). The only remaining option is to respond once the dust settles.

There are three responses to the view that central bankers can't identify bubbles while they are developing. First, earlier in this essay I argued that bubbles can exist in theory and that we can detect them in practice. Substantial movements in the ratio of housing price sales to rental values (or alternatively, market prices to replacement costs) are a signal of a bubble that central bankers would do well to heed.[21] And, as Borio and Lowe (2002) point out, asset price bubbles tend to be accompanied by other financial imbalances including buildups in debt and a high level of money growth.[22] Second, just because something is hard to measure is no reason to ignore it. Cecchetti, Genberg, and Wadhwani (2002) argue that it is surely no more difficult to measure asset price misalignments than it is to estimate potential GDP, and that there are surely times when there are obvious bubbles. Uncertainty should lead to caution, not paralysis.

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[21] As Bean (2003) emphasizes, mechanical responses to changes in asset prices alone – even those that are accompanied by proportional changes in rents, earnings or the like – would be a mistake.

[22] During a panel discussion at a conference in 2002, ECB Executive Board Member Otmar Issing justified the use of the reference value for money growth in part as one early indicator that a bubble may be developing.

And third, it is hard to accept the Greenspan view that central bankers have no sound policy options when faced with bubbles. Recent experience in Australia suggests that higher interest rates, combined with explanations that focus on the view that housing price increases are unsustainable, can do the job. After increasing at a rate of 10% per year for six straight years, in early 2004 prices simply stopped rising and have been stable for the past 18+ months. Such an experience certainly suggests that we should be more optimistic than Chairman Greenspan's comments suggest.

3. Use interest rate policy to lean against the bubble

Since 2000, Cecchetti et. al have argued in favor of a policy of leaning against asset price bubbles similar to the one adopted by the Reserve Bank of Australia in 2003. This position has been supported by a growing body of theoretical literature supporting the idea that asset prices have a place in monetary policy rules. For example, Dupor (2002) builds a model with sticky prices in which firms overinvest in physical capital when there is an equity bubble. The model is a complex one in which nominal rigidities create problems with allocations within the economy on a specific date, while bubbles distort saving and investment decisions over time. When faced with these two problems, but only a single interest-rate instrument, Dupor shows that optimal monetary policy requires reacting to both distortions. When faced with a bubble, the best action is to raise interest rates, reducing the marginal product of capital, thereby depressing equity prices. That is, the optimal policy is to lean against the bubble.[23]

Moving from theory to evidence, Cecchetti (2003) presents results suggesting that the Federal Reserve did raise interest rates modestly in reaction to the stock price boom of the late 1990s. As suggested earlier, asset price misalignments or bubbles can be thought of as just another form of destabilizing shock to which policymakers need to react. Equity or property (or exchange rate) movements shift aggregate demand, driving the output gap and inflation up or down together. In principle, monetary policy can neutralize these shocks, since it too can move the output gap and inflation in the same direction.

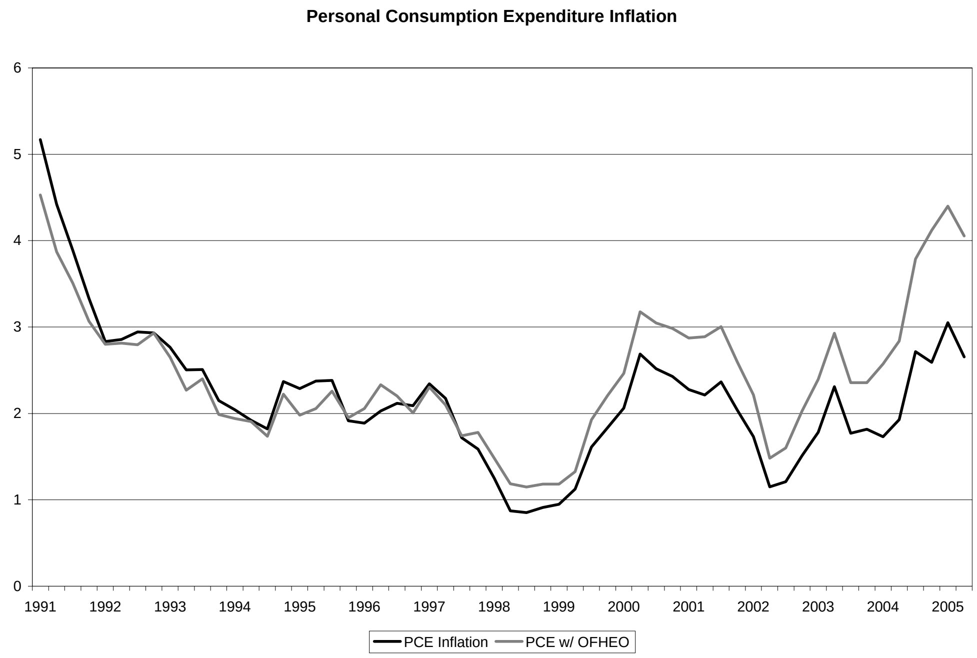
Gruen, Plumb, and Stone (2003) make a very powerful argument that leaning against a bubble is simply impractical. The difficulty arises from the fact that interest rates influence economic activity with a lag, but affect the bubble immediately. Because of the first of these, as output falls following the bursting of a bubble, policymakers would like to have interest rates low for some period *before* a crash. But lowering interest rates reduces the probability of the bubble bursting, causing it to become larger. Gruen et. al proceed to show that successful stabilization policy requires the central bank to detect the bubble when it is just developing – something that most people agree is nearly impossible. This very convincing line of reasoning leads to the inevitable conclusion that interest rates are probably not the right instrument for the job!

[23] Bean (2003) suggests that this is likely a general result in New Keynesian macroeconomic models. He goes on to show that the possibility of credit crunches, which are analogous to asset price busts, leads to less accommodative policy paths. That is, generally higher interest rates.

4. Include housing prices in the target index

Next on the list of possible responses to bubbles is the inclusion of housing prices directly in the price index targeted by the central bank. (I use the term "target" loosely to mean either an explicit or implicit objective.) Bryan, Cecchetti, and O'Sullivan (2002) suggest that the value of existing homes should have a weight in the price index used to measure aggregate inflation.[24] And in some countries, like Ireland, it appears that the weight should be large.

Figure 3: Including House Prices in the Inflation Measure



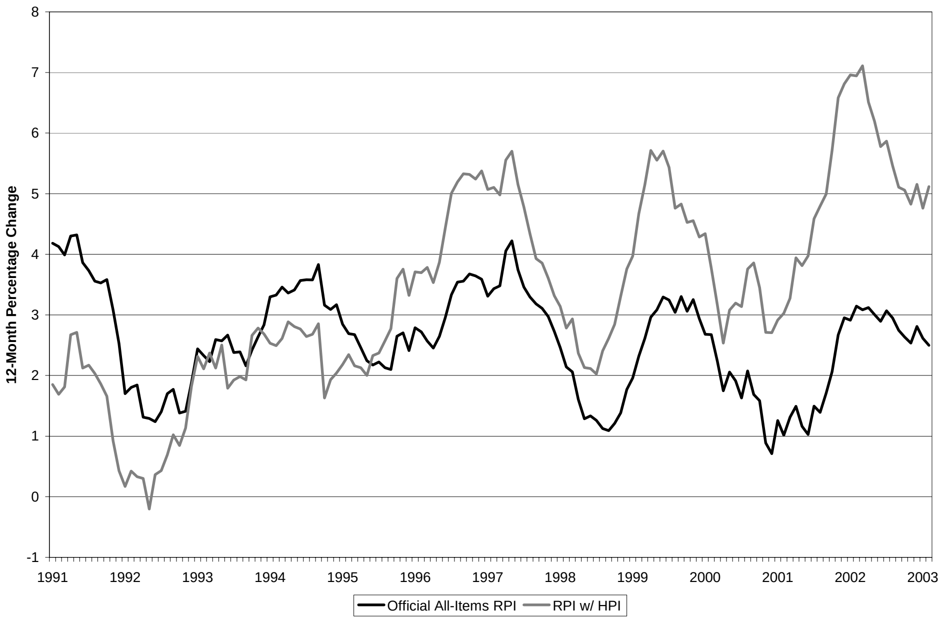
Source: The dark line is the 4-quarter percentage change in the all-items Personal Consumption Expenditure Price Index from the National Income and Product Accounts Table 2.3.4. These data are from www.bea.gov. The gray line replaces the housing component in the PCE price index with the OFHEO matched-resale price index, the "HPI" from www.ofheo.gov. The series, computed by the author, uses weights generated by regressing the quarterly change in the aggregate index on inflation in eight components, and then substituting the OFHEO index for the PCE housing index.

Housing represents a large portion of consumption expenditure – 15 to 20% is standard – so it can't simply be ignored. The response in the US has been to include an estimate of the price of housing services that accrue to owners occupying their own homes from a survey of rental units. This is good as far as it goes, but it fails to account for movements in market prices of homes that are not immediately reflected in the rental market. During periods when home prices are booming, rents tend to be depressed, leading to distortions in the index. A solution to this is to assume that

[24] Bryan, Cecchetti, and O'Sullivan (2002) argue that policymakers should be stabilizing the cost of lifetime consumption, not just per period consumption. This leads to the immediate consideration of assets which are the prices of entire streams of consumption over a lifetime. It then naturally follows that something like housing, which provides a lifetime of housing services, should be included in the price index at its current market price.

the price of housing services is proportional to the cost of the house, and simply substitute current market transactions prices in the index. Such a change has a substantial impact on measured inflation and hence on policy. I would argue that this is appropriate.

Figure 4: The UK Retail Price Index



Source: The dark line is the UK all-items Retail Price Index and the gray line replaces the RPI housing component with the Nationwide UK-wide HPI, monthly seasonally adjusted taken from www.nationwide.co.uk/hpi, as calculated by the author.

To see how big the impact might be, I have taken a US and a UK price index and replaced the housing component with an index of home sale prices.[25] The results are plotted in Figures 3 and 4. Over the five years from 2000 to 2005, recomputed inflation based on the Personal Consumption Expenditure price index has averaged three-quarters of a percentage point higher than the conventional index. For core PCE, excluding food and energy, a similar computation gives a full percentage point difference. And since housing has roughly twice the weight in the US CPI than it has in the PCE (30% vs. 15%), the difference between those two gauges of inflation would be even bigger.

The UK example is even more striking. The recomputed all-items Retail Price Index registers a consistent 2 to 4 percentage points (at an annual rate) of additional inflation since the late 1990s. Obviously, targeting an index that includes the acquisition cost of housing would change things dramatically.

[25] These results are approximations, as they are based on assuming the weight on housing is the average weight over the 1990 to 2005 sample period.

5. Unconventional alternatives

Are there any alternatives to interest rate policies? The answer is surely yes, and it is time to start studying them. To get things started, let me frame the problem as I see it. First, financial development is unambiguously a good thing. It promotes economic development, raising the level of growth. A well-functioning financial system is an essential precondition for high, sustained real growth. It also increases the ability to share risk, providing mechanisms for smoothing consumption and investment in the fact of volatile income and sales. The result is lower volatility of growth as well.

But financial development may be a two-edged sword. By providing households with a mechanism for increasing leverage, especially through mortgage lending, the financial system could be increasing the chances of catastrophe. Ready access to loans allows individuals to bid up the prices of existing homes and has the potential to create frenzies that result in booms followed by crashes – e.g. bubbles. The risk is that when the bubble bursts there will be a large number of defaults. And as we think about housing bubbles, it is important to keep in mind that they tend to be geographically concentrated.

As I have argued, interest rates are likely to be the wrong instrument for addressing the risks housing bubbles create. This means looking toward solutions that focus on the lending that propels the bubble. There are two possibilities. Either try to restrain the lenders through regulatory mechanisms or attempt to restrict the borrowers. The first would involve supervisory adjustments to risk-based capital requirements. This is likely to be both complex and ripe for evasion – banks could simply sell the loans to willing investors.

The alternative is to adjust borrower loan qualification requirements to the environment. For example, the maximum loan-to-value ratio could depend on deviations in rent-to-sale price ratios from their lagged moving average (or on the rate of recent increase). Alternatively, income coverage tests could depend on long-term interest rates rather than short-term interest rates. There are many possibilities, and we need to explore them.

Related to this is the issue of financial market structure. Are primarily bank-based financial systems more prone to difficulties? Should we strive to increase the importance of secondary financial markets? Or, alternatively, move toward narrow banks? The problem with this is that financial innovation cuts both ways. By making it easier to trade risk, it means that risk can go both to those best equipped to bear it and to those willing to accumulate it. The latter can create externalities.

7. Concluding Remarks

Monetary policymakers have no choice but to face the risks posed by asset price bubbles head on. While equity markets are small in most countries, and so stock-price bubbles are not of any significance in most of the world, bubbles in housing markets have the potential to wreak havoc in developed and emerging market countries alike. And significant deviations of exchange rates from fundamentals create problems as well.

Severe boom-bust cycles have the potential to dramatically destabilize both inflation and output in an economy. They affect consumption, investment, fiscal policy, and the health of financial intermediaries. Importantly, the down-side risks that they pose are significant. As the risk managers of the economic and financial system, central bankers are bound to focus on these.

But caring about asset price bubbles is only the first step. Policy is not abstract, it is practical. Reacting to equity, property, or exchange rate misalignments means estimating their numerical size. This is surely difficult, but as I argue in Cecchetti, Genberg, and Wadhwani (2002), it is both essential to forecasting inflation and growth, and unlikely to be more difficult than estimating other critical but elusive quantities such as potential GDP. Policymakers do not usually shy away from important issues just because the solution is difficult. They should not do it here, either.

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