

## Discussion

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Periodically, some group of asset prices rises at a rapid pace that is matched neither by general price inflation nor seemingly by the relevant fundamental asset values. This situation rightfully causes great consternation at central banks, as it has dangerous implications for the stability of inflation and full employment and for financial stability. Some asset prices, such as those for housing, may directly affect general price inflation. Accelerating asset prices may also raise consumption through wealth effects and raise investment, say, due to the signal that rising equity prices sends firms. Together these can push output above potential, prompting instability in both employment and inflation. Finally, the accelerating growth in asset prices is sometimes rapidly reversed, posing threats to financial stability, full employment, and stable prices. Possible asset price bubbles give sleepless nights to central bankers.

Takatoshi Ito, in his paper "Optimal Monetary Policy in an Environment of Low Inflation and Rising Asset Prices," has provided an excellent discussion of the vast array of theoretical and empirical issues surrounding asset price bubbles and monetary policy. I agree with most all of the analysis in the paper and with the main conclusions. The main thrust of Ito's advice is to temper the temptation of central bankers to respond aggressively to possible bubbles. As Ito argues, the central bank should be more reticent to react if, i) the central bank is less certain about whether or

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not there is, in fact, a bubble, ii) the central bank is less certain whether or not policy action would be beneficial, and iii) the central bank is more certain that the bubble-related costs would be modest. In my view, this is excellent advice.

My main concern about Professor Ito's interesting paper, and about much of the related literature, is that all the cogent analysis may leave the impression that economists understand a great deal about bubbles – enough to contemplate "optimal" policy in response to bubbles. In my view, our understanding of bubbles is still quite primitive, and this has important implications for how policymakers should respond. In these comments, I attempt to distill from Prof. Ito's paper and the rest of the literature what solid results the economics profession can offer regarding the policy response to bubbles. The result, I hope, is a sharper understanding of the excellent advice offered by Professor Ito.

### A heuristic framework for thinking about bubbles

Consider the following case. Asset prices are rising rapidly but general price inflation appears well contained. In the normal case, there is little suspicion that the rising asset prices differ significantly from fundamental values. Conventional wisdom in this case is that asset prices may play a prominent role in monetary policy analysis. Asset prices are central to the transmission of monetary policy and summarize vital information about the economy. For the purposes of my discussion, the most important fact, however, is that the role of asset prices is entirely captured in conventional analysis of optimal policy.

Now consider what I'll call the bubbly case. Asset prices are rising rapidly; general price inflation appears well contained; in addition, some asset prices seem to exceed fundamental values by a growing amount. This is the case I will focus on in this discussion. Should the central bank respond differently in the bubbly case than it does in the normal case? Of course, the only difference in the cases is that, in the bubbly

case, the central bank suspects that asset prices exceed fundamental values. Does this suspicion warrant some special policy response?<sup>1)</sup>

Everyone agrees that a government facing the bubbly case should take special care to get its regulatory house in order. Much research has and should be devoted to exactly what this means, but I will set aside these regulatory issues. Further, I am considering the case in which the financial system, but for the potential bubble, is generally sound. Some of my reasoning might require substantial modification if we were to apply it, say, to an economy with very fragile or illiquid capital markets.

Thus, I will focus exclusively on the question of what solid lessons economics offers about how to manipulate the policy interest rate in the face of potential bubbles. To answer this question, we must be a bit clearer about the nature of bubbles.

One element in everyone's account of bubbles is that the asset price is above its fundamental value by a growing amount. In a model with fully rational agents, this situation can be shown to be impossible except under a narrow range of assumptions.<sup>2)</sup> Many economists, central bankers and others, however, think that bubbles in reality may involve elements not captured in the fully rational setting. Unfortunately, there is no generally accepted or uncontroversial account of bubbles outside the fully rational case. What exists is a set of *ad hoc* treatments. While the state of our understanding is incomplete and unsatisfactory, though, we can draw out a few key ideas.

I will highlight a baseline bubbly case with a few components. First, holders of bubbly assets do not expect to lose money relative to competing investments--that is,

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1) It is worth noting that there has been some controversy or confusion over what we might mean by "special" action. For example, Cecchetti, Genberg, and Wadhvani (2002) were initially interpreted as arguing for *special* action, but most recent writers seem to lump them in the *no special action* category. The later writers see them mainly as arguing that we need to take account of the effect of asset prices (fundamental or otherwise) on conventional goals in a manner that is not naive, but is not a radical departure from behavior in absence of bubbles. Several recent papers make this interpretational point, e.g., Disyatat, 2005.

2) The literature on details of when rational bubbles are possible continues to grow. Important contributions include Tirole, 1982, 1985 and Santos and Woodford, 1997.

they are not knowingly making foolish investments. Since the price of the bubble asset is above its fundamental value, this can only happen if the asset price is expected to be further above the fundamental in the future. Thus, bubbles involve a sort of Ponzi-scheme-type behavior.<sup>3)</sup> Further, holders recognize that bubbles can pop, which involves substantial capital losses. The expected return on bubble assets must compensate holders for this risk. Finally, if the return on competing assets rises, the expected return on the bubble asset must as well. Based on these few components, we can draw out some important observations.

### Some positive results

**Observation 1: Existence and identification. Many, but certainly not all, economists and other analysts agree that asset price bubbles have occurred. Some, but many fewer, would agree that in certain cases bubbles were reliably identified before they ended.**

Potential bubbles are identified when we become convinced that an asset price is very different from its fundamental value; the main difficulty in identification is reliably measuring fundamentals. Especially in the case of real assets, neither theory nor evidence suggests that we can estimate fundamental value with any precision. Thus, only when prices greatly exceed reasonable estimates of fundamental values can we gain confidence that a bubble may be present.

Despite these problems, many of us believe that bubble-like behavior has been observed; famous candidates for bubbly phenomena include the tulip mania, the case

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3) This characterization, in part, is meant to distinguish bubble behavior from sunspot behavior in which conventional fundamentals do not determine a unique path for asset prices. This lack of uniqueness leaves room for asset prices to fluctuate in a manner unrelated to conventional fundamentals.

of certain Japanese asset prices in the early 1990s, and the technology stock boom in the U.S. and elsewhere in the late 1990s.<sup>4)</sup> Our confidence that these may have been bubble episodes has been considerably bolstered by hindsight. The most persuasive evidence that a bubble was in fact present comes not when prices rise above our real-time estimates of fundamentals, but later when asset prices have fallen back and we have refined our estimates of fundamentals using data from before, during, and after the bubble.

For policymaking, real-time identification may be important. Here things get much murkier. In every case in which there seems, *ex post*, to have been a bubble, one can probably find reputable economists who warned in real time of the bubble. Indeed, at most times one can find a reputable economist who says that the stock market is significantly over- (and under-) valued. In my view, though, there are very few cases in which a clear consensus regarding a bubble existed in real time, and these required that the asset price be far from reasonable estimates of fundamentals.

Thus, claim 1 is conservative. While many believe that asset price bubbles have occurred, reliable real-time identification, if possible at all, is fraught with difficulty and certainly requires that the bubble be very large.

**Observation 2: In the face of a bubble, the rationale for a government intervention in the economy is clear; the rationale for a central bank response is fairly clear.**

The modern analysis of optimal government policy in the economic arena begins with identifying an economic distortion or market failure. Optimal policy then attempts to offset the effects of the distortion. In the most familiar monetary policy case, sticky prices and/or wages represent a distortion reflected in fluctuations in employment and inflation relative to the efficient levels. Optimal monetary policy can reduce the costs of these distortions by smoothing these inefficient fluctuations.

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4) The difficulty identifying bubbles is underlined by the fact that even the famous tulip mania is not uniformly accepted as a bubble (e.g., Garber, 1990).

If asset prices differ from fundamental values, prices in the economy do not reflect underlying relative values, and decisions based on the distorted prices will tend to be inefficient. The concrete manifestations of this generic reasoning are that bubbles may lead to inefficiently high investment (and a "capital overhang") and excess consumption. Thus, we have a distortion and the rationale for government action in the economic realm is present. Recent speeches by policymakers such as Governor Kohn (2006) of the Fed and others have made this point; Bill Dupor (2004) illustrates the point more formally.

As with any distortion, we should ask what government body should respond. I think that a strong case can be made for at least some of the responsibility falling to the central bank. Asset price bubbles are inherently tied up with the monetary sector of the economy. Central banks are in a unique position to be well informed about asset price bubbles since monitoring both asset prices and the fundamental state of the economy are core aspects of monetary policymaking. Further, asset price bubbles are dynamic, cyclical phenomena in the economy, and we commonly argue that central banks are better placed to deal with such phenomena than are other arms of the government. Finally, many central banks have responsibilities with regard to financial stability.

All this, I think, gives the central bank a clear warrant for action. But the statement that there is a rationale does not imply that the government should, in fact, act. What is required, in addition, is that there are constructive steps the government can take.

**Observation 3: So long as central banks can raise short-term real interest rate, they can probably end any asset price bubble.**

We sometimes hear of "pricking" asset price bubbles, which sounds surgical and almost dainty. Result 2 is not dainty; it makes no mention of how high the real interest rate might have to be or what collateral damage might follow from raising rates to the required level. The real interest rate is better thought of as a hammer than a needle: if central banks hit the economy hard enough with this hammer, they can probably

smash all asset values, including bubbly ones. [love it]

There is bit of an analogy to the case of speculative attacks on a currency peg. As Obstfeld and Rogoff (1995) argued, there is an interest rate high enough to successfully defend any currency peg. As we know, speculative attacks sometimes cause pegs to collapse, however, as governments are unwilling to maintain the interest rate required.

Since we have no general models covering the broad sense of bubbles in this discussion, observation 3 is not a theorem, it is merely a plausible claim. The logic is that, by pushing up the rate of return on alternative assets, the central bank pushes up the rate at which the bubble must grow, and that ultimately it will reach an unsustainable pace.

A summary of positive observations goes like this: if a bubble gets very large, the central bank may come to recognize that a bubble is present; the central bank has a rationale for action in this case; and it has a hammer it could use to smash all asset values, including bubbly ones. I started out saying that bubbles give central bankers sleepless nights. These positive results should not help them rest easy. [fab]

### Less positive results

Since bubbles cannot be identified until they are large, we might hope that there is some sort of interest rate policy that does not require identifying bubbles. Perhaps some clever way of manipulating the interest rate based on observable variables, including asset prices, could lessen the likelihood of bubbles.

Consider a central bank that is running fully optimal interest rate policy for its economy ignoring the possibility of bubbles---welfare is maximized conditional on no bubbles existing. Can the central bank lower the probability of bubbles and thereby improve welfare by deviating from the interest rate policy that is otherwise optimal? For example, could the central bank beneficially respond to asset price

movements more than is implied by the optimal no-bubble behavior?

**Observation 4: Reducing the frequency of bubbles. No well-established body of theoretical or empirical work suggests that modest variations on otherwise optimal interest rate policy behavior can reduce the probability of bubbles emerging.**

There is a tradeoff here: by deviating from what is otherwise optimal, the central bank incurs welfare costs in every non-bubble period. These costs must be weighed against any benefits from reducing the probability of bubbles. While economics gives us some standard tools for evaluating the everyday costs of deviating from what is otherwise optimal, we do not have any clear idea of the probability of bubbles emerging or of the typical costs associated with bubbles. In particular, we have no generally accepted theory or reasoning about what makes bubbles more or less likely to emerge when they are in fact possible. There are historical summaries of boom and bust periods in asset price movements (e.g., Bordo and Jeanne, 2002; Borio and Lowe, 2002), but we are very far from estimates of the probability of bubbles emerging or of the marginal effect on this probability of changes in the interest rate rule of the central bank. Thus, I think there is no sound basis believing that we should deviate from what is otherwise optimal on an ongoing basis in order to reduce the probability of bubbles. [cool]

If the central bankers do not know how to reduce the probability of bubbles starting, it is natural to hope for a policy that will smooth out the boom and bust of bubbles when they occur. For example, there seems to be a strong intuition on the part of many that raising the interest rate in the face of a bubble must be the right thing to do. This may be correct. In my view, however, this intuition rests on very little reliable reasoning. The final three observations inspect the underpinnings of this intuition. First, we might think that somehow by raising the interest rate we can smooth out what would otherwise be very abrupt bubble dynamics.

**Observation 5: Smoothing bubble dynamics. No generally accepted reasoning or evidence supports the view that interest rate policy can be used to smoothly return asset prices to fundamental values.**

The process of smooth deflation involves a long sequence of capital losses for the holders of bubble assets. In the fully rational case, this is simply impossible: facing the prospect of a sequence of capital losses, no one wants to hold the asset and the price completes essentially the entire fall in one step.

Setting aside full rationality, we cannot rule out smooth deflation with such a simple argument. In the baseline bubbly case described above, however, we presume that even less-than-fully-rational agents do not expect to lose money on their investments. In this case, a successful interest rate policy of smooth deflation requires that agents do not understand the policy. Even with less-than-fully-rational agents, it is a leap of faith to suppose that central banks can use a straightforward and publicly observable policy of raising the interest rate to systematically surprise asset holders in the manner required for smooth deflation. (A policy that depends for success on repeated surprises should presumably come with some sort of public disinformation campaign by the central bank.)

While the intuition for raising rates to smooth out bubble dynamics seems strong, from a different perspective it is strongly counterintuitive.

**Observation 6: Raising rates. In the baseline bubbly case, raising the policy interest rate either makes bubbles grow faster or pops them.**

In conventional reasoning, raising the policy rate raises the required return on all assets. If, as a consequence, the bubble grows more slowly, we have the very counterintuitive result that by raising the required return on the asset, we lower the actual return.

In the baseline case, so long as those holding the bubble asset recognize that the

rate of return on competing assets has risen, the required return on the bubbly assets rises as well. If the bubble cannot grow faster, agents will not hold it and the bubble pops; otherwise, it grows faster to give holders the new higher required return. There is no evidence or well-accepted theory showing how, by raising the required return on a bubble asset, one can make the bubble grow more slowly. Kohn (2006) points out anecdotal evidence to the contrary. Observations 6, then, essentially suggests that the constructive use of the interest rate is captured by observation 3, popping the bubble.

**Observation 7: Pop now or later? The ad hoc literature on bubbles suggests a timing tradeoff between fundamental growth and ending bubbles.**

In the realistic case, only as a bubble gets large, the central bank may begin to strongly suspect that a bubble exists. Suppose we accept that by raising the policy interest rate, the central bank can make the bubble pop sooner than it would otherwise pop. Is this a good idea?

The literature on ad hoc bubbles illustrates a tradeoff regarding the time of popping.<sup>5)</sup> As we argued above, the bubble involves distortions. Thus, delaying the time of popping extends the period over which the economy incurs these costs. Popping generally also involves costs--these are the costs that keep central bankers awake at night. Thus, by delaying we pay the ongoing bubble costs but put off into the future the one-time popping cost.

There may also an additional wrinkle. The popping costs may be due in part to distortions originating in the financial sector of the economy. In conventional accounts, these distortions will be smaller if balance sheets are stronger in the financial and nonfinancial sectors. Thus, if fundamental values in the economy are growing during the bubble period, delaying the bubble not only pushes back the

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5) A nice article formally illustrating the main point of this section is Gruen, Plumb, and Stone, 2005. Chairman Bernanke of the Fed makes the same point in a speech in 2002.

popping costs, it may also lessen the popping costs by strengthening balance sheets. The ad hoc bubble literature gives plausible examples supporting either popping now or delaying. Weighing which of these is correct in any given case depends on intricacies of the bubble economy that are very poorly understood.

### Conclusion: Bleeding the patient?

I have focused on a narrow question. Some asset prices are accelerating, while general price inflation is well contained: should the central bank respond differently depending based on whether or not it believes the asset price rises to be supported by fundamentals? Should central bankers respond *differently* to asset prices depending on whether or not the price movements are warranted?

Like Prof. Ito, I believe that bubbles present a clear danger to the primary goals of policy, giving clear rationale for a response. Unfortunately, the current state of knowledge of the economics profession about bubbles can offer few positive insights about the proper response. The literature mainly offers us reasons to question the common intuition that raising the interest rate in the face of bubbles is the right thing to do.

I liken the current state of knowledge in this area to that of western medical doctors in the nineteenth and early twentieth centuries when facing a patient with a severe fever. While patients very often recovered nicely from fevers, fevers regularly ended very badly. Thus, a great deal was at stake, and there was clear rationale for action. For many doctors, there was a strong sense that bleeding the patient--though damaging to other patient fundamentals--might help solve the problem. Even if they practiced bleeding, the best doctors were aware that the reasoning supporting bleeding was primitive at best. While all doctors had a strong urge to actively intervene, the best outcomes, given the state of knowledge, came from making the patient as comfortable as possible and preparing to deal with other problems should

they emerge.

Given the state of knowledge, bubbles are likely to continue to give central bankers sleepless nights. I think the best advice is to make the patient as comfortable as possible through generally sound interest rate policy and, through regulatory policy, to prepare for problems that might emerge. Despite the urge to act, we simply do not know whether more aggressive action might be helpful or might amount to bleeding the patient.

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