SHOULD CENTRAL BANKS BURST ASSET PRICE BUBBLES?

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The collapse of Ireland's housing market exemplifies the devastating impact which asset price bubbles can have on the economy. In this essay, Andrew Winterbotham strongly argues that it is insufficient to 'clean up' asset price bubbles after they have occurred. If we are to learn from the events of the past number of years, this essay makes it clear that central banks must incorporate asset prices in their inflation targeting frameworks.

1. Introduction

The link between monetary policy and asset prices[1] and what exact role the central bank should play in this regard has been of perennial interest to economists. The collapse of US house prices and the ensuing financial crisis and global re- cession has served but to only increase the attention this issue has received.

Many believe that monetary policy should be used to directly deal with asset price bubbles. Namely, they advocate that the central bank should raise interest rates to deflate such bubbles. Since periods of explosive growth in asset prices have often preceded financial crises and contractions in economic activity, as Kindleberger (2000) famously attests, some economists argue that by defusing asset price booms, monetary policy can limit the adverse impact of financial instability on economic activity.

Yet this idea is highly controversial, as many others believe that monetary policy should not be directed towards such ends. Namely, they believe that inflation targeting should achieve both monetary and financial stability. Proponents of this argument believe that, in the absence of inflation in goods and services no, or minimal, restrictive monetary policy action is warranted during the formation and growth of a bubble. Rather, they believe the correct action to be a speedy response to ease policy once the bubble has burst, to reduce the potential loss of output and employment. This has been dubbed the 'lean' versus 'clean' debate.

Which stance is more appropriate? To answer this question, we critically examine

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[1] To be clear, by asset prices we mean the price of something bought to generate income or to sell later on for a profit. Examples are physical assets such as housing, and financial assets such as shares, bonds, foreign exchange and other financial instruments.

both sides of the debate and bring the recent financial crisis to bear on this discussion. First it is necessary to examine the impact of monetary policy on asset prices and the effect of asset prices on the real economy. Conceptual issues surrounding the theoretical basis for the existence of asset price bubbles and the effects of bubbles bursting are then discussed.[2]

In this paper it is argued that the central bank should play a greater role in preempting asset price bubbles, a tenet to which the financial crisis and the ensuing global recession gives greater credence to. Given the impact of financial markets on the real economy, this necessarily has important implications for all market participants; not only central banks and governments, but also investors and households alike.

2. The Impact of Monetary Policy on Asset Prices and the Economy

2.1. Transmission Mechanisms

The interrelations between interest rates and asset prices is no new idea; it has been argued that it can be seen in Locke (1824) an embryonic view of these interrelations (Vickers, 1968).

By affecting risk-free rates[3], the central bank can change a wide array of asset prices, since all of these are related to the risk-free rate, and this, in return, has an impact on the real economy. For instance, we may recall the basic dividend discount formula: $P = \sum \frac{D_t}{(1+r_t+\rho)^t}$, where P is the stock price, r is the riskless rate, ρ is the risk premium, and D_t is the dividend in period t. The central bank affects r_t, and a fall in the risk-free rate therefore raises stock prices. Also, by preventing a recession, lower rates might increase profits and therefore expectations of Dt. In addition, the risk premium may fall. As a result, stock prices rise.

Equivalently, we may think of any asset pricing model (e.g. the CCAPM), which

2 We believe these to be both requisite and useful exercises. They are necessary in the sense that they allow us to ascertain whether there even exists a prime facie case for employing monetary policy as a tool to deal with asset price bubbles. They would also be of great interest for policymakers and financial market participants. Having reliable estimates of the reaction of asset prices to the policy instrument is a critical step in formulating effective policy decisions. Furthermore, having accurate estimates of the responsiveness of asset prices to monetary policy should facilitate investors in making prudent investment and risk management decisions.

3 The central bank ultimately has control over short–run nominal rates. Say it wants to reduce interest rates. The central bank would buys bonds from banks with printed money. Banks now have increased reserves, and so they are willing to lend to each at a lower interest rate (called the federal funds or inter-bank lending rate). Banks will then pass on this interest rate reduction to consumers. This is believed to only be effective in the short–run, as in the short–run we assume price stickiness on account of both nominal and real rigidities. These are New–Keynesian micro–founded rationalizations for price stickiness.

predicts $r_i = r_f + \rho$, where r_i is the expected return on a stock and ρ is the model's predicted risk premium. Thus a fall in the risk-free rate, r, causes a fall in the stock's return, r_i. However, the price of the stock rises, as returns and prices are inversely related. In reality, prices will have risen in expectation beforehand though, if the move was expected. Conversely, a fall in interest rates will result in an increase in bond prices, due to the inverse relation between the yield of a bond and its price.

Does the theory hold up in the empirical evidence? It would certainly seem so. For instance, Fama and French (1989) find that the term spread and dividend yield are predictors of future asset returns. Similarly, Thorbecke (1997) finds that monetary policy expansions increase contemporaneous stock returns using a multi–factor model. A more recent strand of research uses vector autoregressions in order to overcome the endogeneity problem (interest rates have an impact on asset prices, yet asset prices can also have an effect on interest rates) in estimating the effect of monetary policy on asset prices. For example, Rigobon et al. (2004) find that an increase in short-term interest rates results in a decline in stock prices. They find a statistically significant, albeit small effect; for example they find that an unanticipated 25-basis point increase in the short- term interest rate results in a mere 1.7% decline in the S&P 500 index.

These asset price changes then have an impact on the real economy. For example, asset prices can have so-called 'wealth' effects, in that an increase in their value may cause individuals to consume more, causing aggregate consump- tion to increase. To see this, consider the following result derived from basic intertemporal analysis:

$$C_1 = C_2 = \frac{A + Y_1 + Y_2}{2} \tag{1}$$

Where A represents Assets, C_t represents consumption in period t and Y_t income in period t.

From (1) above, we can see that an increase in the value of the consumer's assets (this could be the value of their home or stock portfolio say), results in an increase in spending i.e. consumption, therefore having an effect on the real economy and in the last decade, changes in asset prices have indeed had large impacts on consumption.[4] Similarly, higher stock/house prices raise the value of one's portfolio and lifetime wealth. By the permanent income hypothesis, this raises consumption a small bit every period.

Thus, we know that there is at least a prima facie case for asset prices af- fecting

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[4] For ease of exposition, this analysis is somewhat oversimplified in that we are assuming the interest rate to be equal to zero. Furthermore, we are assuming β, the discount factor, to be equal to 1. In other words, the individual, contrary to standard finance theory, values the present and the future equally. However, the results are the same when we relax these some- what unrealistic assumptions. Alternatively, one may view C_2 and Y_2 as present discounted values.

the economy, but can the wealth effect be observed? Poterba (2000) for example argues that the rising stock market most definitely contributed to ris- ing consumer spending in the 1990s. However, the evidence suggests that these wealth effects are smaller than we expect, perhaps due to consumption smooth- ing implied by the permanent income hy- pothesis. For instance, his estimates suggest that a $1 increase in share values raise con- sumption in the next quar- ter by a mere 2 cents, while an analogous increase in non-stock market wealth raises next-quarter consumption by 1.4 cents. In addition, Christina Romer (1990) argues that consumption declines as a result of increased uncertainty in the financial markets. She also argues that there was a significant negative relationship between stock market variability and the production of consumer durables in the prewar era. This reflects the fact that the worst economic down- turns are almost always proceeded by a collapse in asset price bubbles.

Changes in asset prices have lots of other indirect effects. For example, higher stock prices lower the cost of capital since they make it cheaper for a firm to raise equity. Namely, by issuing shares, the firm now makes more revenue. In turn, this increases in- vestment; this is essentially the well known Tobins Q theory in action. For the same reason, a rise in house prices stimulates housing production. The transmission mechanisms that have the largest impact on the real economy however are the balance sheet and lending effects, to which we now turn.

2.1.1. Balance Sheet Effects

Most firms depend on banks rather than stock issuance for financing. As a result, they are dependent on bank's willingness to lend. When interest rates fall, firm's profits typically rise (due to greater aggregate demand). Also, if firms are on adjustable loans, their debt payments fall, again raising profits. These increases in cash flow improve their balance sheets, so they can offer more collateral to banks, raising bank's willingness to lend. Also, greater collateral reduces the risk of moral hazard (i.e. the fear firms might use funds recklessly and default) since firms now lose more under default. Again, this increases the bank's willingness to lend. The idea that banks make more loans in good economic times— leading to further good times—is what is called a "financial accelerator", which is built into the standard models which we shall examine later.

Woodford however, in his recent Jackson hole speech argued that there is (fairly) perfect substitutability between assets, which would mean that Fed pur- chases of assets cannot easily change their relative prices. In contrast to Wood- ford, the Fed's stated view is that Quantitative Easing (QE) can still change asset prices through portfolio balance sheet effects.

2.1.2. The Lending Channel

This is somewhat different from the interest rate channel, since it represents a response

on the supply side, as opposed to the demand side. With cheaper access to reserves in a monetary expansion, banks will be able and willing to lend more, which in turn leads to more investment. Banks will now lend more if they have more capital/reserves themselves. Conversely, if banks suffer losses from default, they will lend less. Small firms rarely issue equity and so are heavily reliant on bank lending and, consequently, are especially affected by banking problems.

A collapse of banks disrupts these transmission mechanisms and will thus reduce overall lending in the economy. This is exactly what occurred after the collapse of US house prices in 2007, leading to what the media calls the "credit crunch". Accordingly, Rajan et al. (2011) argue that central banks can reduce financial fragility by raising rates in normal times to offset their propensity to reduce rates in adverse times.

3. Bubbles

3.1. A Cursory Definition

Stiglitz (1990) provides a useful definition of bubbles, along with an explanation of how they occur. If the expectations of investors change in such a way that they believe they will be able to sell an asset for a higher price in the future than they had been expecting, then the current price of the asset will rise. Many formal definitions of what a bubble is exist, but the basic intuition is relatively straightforward: if the reason that the price is high today is only because investors believe that the selling price will be high tomorrow–when "fundamental" factors do not seem to justify such a price–then a bubble exists. In this sense "crowd psychology" may influence asset prices (Blanchard and Watson, 1983). Conversely, under the assumptions of rational expectations and behavior, asset prices will fully reflect their fundamentals. However, Blanchard and Watson (1982), among others have, in theory, identified situations where bubbles can still occur under these assumptions.

Kindleberger (2000, p.54) asserts that "speculative manias gather speed through expansion of money and credit or perhaps, in some cases, get started because of an initial expansion of money and credit". It would appear that the boom and subsequent collapse of equity prices in 1929 in the US, equity prices in Japan in the 1990s and housing prices in the US in 2007 were all fuelled by this dramatic increase in credit. Taking the last example, it has been argued that low interest rates raised house prices by making mortgages cheaper and thereby increasing demand.

3.2. Definitional Problems: Bubbles and Fundamental Value

Firstly, there is disagreement over the very existence of bubbles. Those who subscribe to the Efficient Markets Hypothesis (henceforth EMH) necessarily believe that bubbles cannot occur. An informal and perhaps oversimplified definition of the EMH is that it asserts that asset prices fully reflect all known information and hence fully represent the "funda-

mental" value of said asset. In other words, the value of the asset has to be just equal to the discounted value of the stream of returns it generates (Stiglitz, 1990).

According to the logic of neoclassical finance that undergirds the EMH, the mispricings of a bubble cannot occur for the following three reasons: (i) investors invest and trade in the capital markets in a rational manner; (ii) any irrational trades are random and cancel each other out; and (iii) arbitrage corrects any remaining irrational trading not cancelled out (Gerding, 2007). Behavioral finance however repudiates all of these assertions.[5]

Second, the consensus view on what we may consider examples of bubbles has been critiqued. Garber (1990) argues that the Dutch tulipmania (1634-37), the Mississippi Bubble (1719-20), and the closely-connected South Sea Bubble (1720) should not be considered as bubbles, in that they can be explained by fundamental forces.[6]

Third, bubbles are notoriously difficult to identify, both ex ante and ex poste. This is due to the fact that it is almost impossible to quantify what we mean by "fundamentals". The problem of determining the fundamental value of an asset has three parts: first, the problem of estimating the returns received over time (the rent on the land, the dividends on the stock); second, the problem of estimating the terminal value the asset will have at the end of the period; and third, the problem of deciding upon the discount rates to be used for translating future returns into current values (Stiglitz, 1990). Furthermore, fundamental values may be inherently flawed on account of them being based on historical data, as past data may not be an appropriate indicator of current and future prospects.[7] This could not be summarised better than by Alan Greenspan when he says "there is a fundamental problem with market intervention to prick a bubble. It presumes

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5 The EMH was once one of the few hypotheses in the field of economics that enjoyed almost universal acceptance. However, in recent decades, there has been an emerging literature questioning its validity. The main argument that undermines the EMH is that there is no such thing as perfect arbitrage, as proved by Grossman and Stiglitz (1980). Similarly, Shleifer (2003) argues that as long as individuals are risk averse, a bubble may persist for a very long period of time, even if arbitragers recognize the existence of the bubble and believe that it will eventually disappear. Said author also proves that arbitrage is not in fact riskless, which dramatically reduces the effect of arbitrage in eliminating price anomalies. For a useful and lucid review of the behavioral finance literature that undermines the EMH, the reader is referred to Chapter 1 of Shleifer (2003).

6 For an example of the consensus view in the literature, see and Krugman (1986). For an interesting narrative of the Dutch tulipmania and a convincing repudiation of this critique, see Goldgar (2007) and Mackay (2003[1841]). The repudiation of this critique is based on the fact that the price rise of Dutch tulips fully match all the criteria for bubbles set out by Kindleberger (2000). Furthermore, Garber fails to provide any rational explanation for the twenty-fold increase in tulip-bulb prices during January of 1637, followed by an even larger decline in prices in February of that same year (Malkiel, 2010).

7 For a formal, mathematical exposition of the inherent difficulties, see Cogley (1999).

that you know more than the market."[8] This perceived difficulty in identifying bubbles is one of the main arguments against central bank intervention to address them. However, it is worth noting that several authors, e.g. Roubibi (2006), have argued that bubbles can in fact be identified *before* they burst.

3.3. Overemphasis on Bubbles

One cannot look past the fact that all of the major downturns have been asso- ciated with booms and subsequent collapses in asset prices. The fact is, asset price swings do occur and asset prices have become far more volatile since the great moderation, and, whether they represent a bubble or not, it is essential to mitigate the effect this will have on the real economy. Borio et al., among others, provide evidence of this increased volatility. They document the emergence of major boom-bust cycles in the prices of equity and real estate in a number of industrialized countries during the 1980s. Notable examples include the United States, Japan, the United Kingdom, the Netherlands, Sweden, and Finland. All of these led to detractions in economic activity, consistent with the assertions made above.

The title necessarily assumes that we believe asset price bubbles to exist however. Perhaps the essay title is a bit provocative then. A somewhat less dramatic title maybe something which addresses the role of the central bank in ensuring financial stability. A distinction between booms and bubbles is therefore necessary. In reference to the Dutch tulipmania, Dash (2001) writes:

> "Similar booms–by which economists mean exceptionally rapid rises in prices–and bubbles (booms in which a commodity's price quite outstrips what it is actually worth to anyone other than a speculator) have occurred all over the world throughout the last four hundred years."

This view of bubbles asserts that bubbles simply represent price rises which are irrational. Even if the Central Bank cannot determine if a price rise repre- sents a bubble, there always remains the probability that a collapse may occur. Given the adverse impacts on the economy of such a "tail event" occurring, accordingly, the Central Bank should take the necessary steps to prevent said event from occurring. This refers to the "lean against the wind" argument for dealing with bubbles or asset price booms, which we advocate.

3.4. Some Models

We henceforth assume that bubbles do indeed exist. However, as previously explained, their not existing does not a fortiori imply the irrelevance of mone- tary policy in dealing with asset price swings. In this section we present some stylized models of asset price

8 Quoted in the New York Times, November 15, 1998.

bubbles found in the literature.

Batini et al. (2000) examine the effects of a bubble in the foreign exchange market, defined as an exogenous process that temporarily shifts the exchange rate away from the value implied by fundamentals. The bubble process is anal- ogous to Bernanke and Gertler's (1999) specification of an asset price bubble, which remains the seminal paper in this area to which, in order to provide an accurate comparison, all responses follow the same modelling process. Examples of such papers are that by Cecchetti et al. (2000), Filardo (2000) and Goodhart et al. (2002). In the Bernanke–Gertler papers, the asset price subject to a bubble is a stock price, whereas Batini et al. examine a bubble in the exchange rate. An example of what is believed to have been an exchange rate bubble is the appreciation of the US dollar from 1980 to 1985, which, it has been argued, was excessive relative to underlying fundamentals (Evans, 1986).

Batini et al. (2000) denote the bubble as zt, which is modelled as follows:

(2)
$$z_t = \rho_z Z_{t-1} + e_{zt}, \rho_z$$

$$\text{where } e_{zt} = 0, t = 0, \ldots, t_{BUB-1};$$
$$e_{zt} = 0.01, t = t_{BUB};$$
$$e_{zt} = 0, t_{BUB} < t < t_{BUB+n};$$
$$e_{zt} - (\rho_z^n e_{zt}, t_{BUB+n});$$
$$e_{zt} = 0, t > t_{BUB+n}.$$

Specification (2) implies that when there is a bubble, the state vector contains an explosive time series process and includes a heteroskedastic process (the e_{zt} sequence). The length of the bubble is specified in the same manner as Bernanke and Gertler (1999), in that the termination point of the bubble is stochastic.

The central bank can attempt to offset the effect of the bubble or prevent it from occurring, by moving R_t (the interest rate) to affect the exchange rate, which is driven by both fundamentals and the bubble. Whether such offsetting action–in the form of a response of monetary policy to movements in this case the exchange rate, but it could also represent stock or bond prices say is desirable, is what we wish to determine.

While this specification of the bubble process is in line with Bernanke and Gertler (1999), it does not produce a "rational bubble" in the sense of Blan- chard and Watson (1982), of which there has been several variations in the literature e.g. Santos et al., (1997). In Blanchard and Watson's framework, a bubble emerges endogenously from the dynamics of rational expectations models; as previously alluded to, the effect of the interest rate on asset prices means that an asset price bubble is sometimes treated as an endogenous as opposed to an exogenous variable. Their rational bubble is intimately related to the existence of multiple model solutions. However, the authors, upon conducting various econometric tests find only circumstantial evidence at best for this type of model's validity.

4. Optimal Monetary Policy

4.1. Taylor Rule

The Taylor rule is a metric used by central banks in order to gain an idea of what the appropriate interest rate should be, given the prevailing economic conditions. It ensures the central bank minimizes its loss function, which is increasing in the deviation of both inflation from target and output from potential. According to the Taylor Rule, the target for the nominal interest rate is:

(3) $$i^* = 2.5 + \pi + .5(\pi - \pi^*) + .5(y - y^*)$$

For example, if inflation exceeds target the central bank will try to contract the economy and lower the real rate below the natural rate and induce a recession. Crucially, $\frac{\partial i^*}{\partial \pi} = 1.5$. So if inflation rises by 1 percent, the central bank will raise rates by 1.5. This way, it will raise real rates, $r^* = i - \pi$, by 0.5 in response to inflation. This idea of raising real rates when inflation rises is called the Taylor Principle: the increase in the nominal rate must be sufficiently high that it raises the real rate. In practice, most banks stress that inflation is their prime mandate and do not like to be perceived as targeting output, as this may may generate inflationary expectations on account of the dynamic inconsistency problem. Neither do they explicitly target asset prices. Finally, to ensure sta- bility in financial markets–and in particular bond prices–banks typically engage in interest rate smoothing. Of course, the central bank faces a constraint, $i \geq 0$, that is sometimes binding (i.e. a liquidity trap).

It has been argued that the fed's policy of low interest rates in the years leading up to the housing bubble actually caused it. With regard to the Taylor rule, it has been argued, by Taylor (2007) among others, that the interest rate was lower than that prescribed by his rule. If housing prices were included in the rule, it would have been higher, perhaps dampening the rise in said prices. This view has been countered by Bernanke (2010) however. He claims that, on account of the inherent lags in monetary policy, a better rule would employ lags in the variables. If one uses this measure instead, then interest rates were actually in line with that prescribed by the Taylor rule. Bernanke, quite rightly, also states that one cannot and should not base monetary policy solely on simple stylized rules. In reality, interactions in the financial system make it far more complex.

4.1.1. Should Asset Prices be Included in the Taylor Rule?

A key question is whether monetary policy makers should respond explicitly to deviations of asset prices from their steady-state or fundamental levels as part of their pursuit of inflation and output gap stability. There have been a number of empirical studies examining this question, with mixed results. Concretely, they examine whether asset prices have a statistically significant impact on inflation. From a theoretical point of view there seems to be a strong case also to consider property and share prices as determinants of aggregate demand, on account of the effect which asset prices have on the real economy. This would

imply a direct reaction of monetary policy to movements in these asset prices. As alluded to in the introduction, this issue has proven to be highly controversial however.

With regard to the type of models we have previously discussed, Goodhart et al. (2002), Cecchetti et al. (2000) and Batini et al. (2000) argue in favour of a direct response of monetary policy to asset price movements which are not in line with perceived fundamentals, on account of finding a significant effect on inflation, and find that using this to guide monetary policy decisions should lead to an improvement in macroeconomic performance and welfare. In contrast, others such as Filardo (2000) and Bernanke and Gertler (1999) posit that this will have undesirable effects on the economy. Namely, they posit that deliberate attempts to puncture asset prices will be destabilizing. However, the latter's models did not directly examine optimal monetary policy in the presence of asset price bubbles.

4.2. Pre vs. Post Crisis Stances

The successful performance of the US economy during the Great Moderation period of 1984 to 2006 and the financial stability this brought about (notwith- standing the two stock market crashes in 1987 and 2001), appeared to have offered both the economics profession and policymakers in particular the assur- ance that asset bubbles, once burst, could be effectively 'cleaned up' with little or no real adverse economic impact. But, this perception changed following the recent global financial crisis.

Prior to the global financial crisis, the Federal Reserve under both Chairman Alan Greenspan and Chairman Ben Bernanke followed an asymmetric policy ap- proach to asset price bubble management. This strategy was based on several factors: ex ante difficulties in identifying bubbles; concerns about the effec- tiveness of monetary policy to manage asset bubbles; and the expectation that losses to the macroeconomy from bursting bubbles could be limited with quick, aggressive responses. This is what is meant by the 'clean' side of the debate. However, even before the crisis, there was a cry for a different policy approach (see section 4.1.1).

Following the financial crisis, Fed officials and academic economists alike have encouraged a vigorous reconsideration of the role of public policy towards asset price bubbles. For example, since the financial crisis, Bernanke might have become slightly more sympathetic to using monetary policy to deal with asset bubbles, as in a 2011 speech he noted; "The possibility that monetary policy could be used directly to support financial stability goals, at least on the margin, should not be ruled out" (Bernanke, 2011).

While Bernanke's views against using monetary policy in this regard have softened, he still affirms that (macroprudential) regulation, supervision and monitoring would remain "the first line of defense" against the threat of financial instability (Bernanke, 2011). He also noted that; "The evolving consensus…is that monetary policy is too blunt a tool to be routinely used to address possible financial imbalances" (Bernanke, 2011).

The major paradigm shift since the financial crisis is the recognition that different types of bubbles can be harder to 'clean up' after, and can have differing effects on economic activity. For example, it was relatively straightforward for the Fed to minimise the effects of the 'dot-com' bubble bursting in the early 2000s, while the effect of the housing bubble bursting in 2007 has had far more perverse effects on economic activity. It is now accepted that "credit" bubbles, which form in the way Kindleberger describes above, are far more dangerous and are far more difficult to 'clean up'. This is the exact type of bubble that burst in 2007. Bank's lack of willingness to lend, as described above in section two, has dramatically reduced the effectiveness of monetary policy. For example, the money multiplier is now almost at zero, meaning that injecting reserves into the bank's balance sheets will not have any effect in creating credit in the real economy. Furthermore, the so-called zero lower bound, where the nominal interest rate is at or near zero, is far more problematical than initially believed. Not only are banks not willing to lend, but consumers are unwilling to spend. As shrewdly pointed out by Sir Dudley North in his well known 1691 work '*Discourses Upon Trade*', it is not the supply of money per se that governs the level of economic activity, but the disposition to spend of those who hold it (Vickers, 1968). Perhaps we should look back to history for lessons in this regard.

5. Concluding Remarks

Professor Woodford in his recent Jackson hole paper stressed the importance of the Fed's communication policy, arguing it was even more important than QE. Going forward, perhaps a viable step for the Fed to take would be to incorporate asset prices into their communication policy. The advantage of this is that it would not involve any explicit action to target asset prices. The expectations such a communications policy would create would be sufficient to generate expectations of future low asset prices, if people believed the Fed may target them.

What is crucial to recognise and what should be evident throughout the pa- per is the trade-off between different policy actions. On account of the inherent "bluntness" of monetary policy, bursting the bubble may lead to undesirable levels of inflation and unemployment. While the downside to not bursting the bubble before it gets out of control is a financial crisis. Whatever action is deemed most desirable depends on the value judgement made by the policy- maker and involves calculating the effects on welfare of both actions. Alas, this remains a highly subjective task and is notoriously difficult to quantify. Nev- ertheless, we would tentatively argue that the welfare effect of the fed "leaning against" or deflating the housing bubble would have been far more desirable than the manner in which they are now "cleaning up".

In summary, it is clear that the current inflation targeting framework is insufficient for both preventing asset price bubbles and in 'cleaning up' after they burst. Because of the devastating effects of a bubble bursting and recent academic and financial innovations

that have made it easier for us to identify asset price bubbles, we advocate that the central bank prevent such bubbles from occurring in the first instance, rather than directly bursting or 'cleaning up' after they burst. This can be achieved through incorporating asset prices within the inflation targeting framework, which, as previously alluded to, should result in an improvement in macroeconomic performance i.e. a reduction in output and inflation volatility.

What we find most worrying is policymakers' (i.e. the FED and particularly the ECB) refusal to deviate in any way from the clearly inadequate current inflation targeting framework. What is concerning is that the lax attitude to- wards asset price volatility, as evidenced by Beranke and Gertler's comment in a 2006 paper just before the financial crisis that "…as of this writing, whether the U.S. stock market boom will be sustained or will end in tears is anybody's guess", still remains. Had the FED been willing to incorporate asset prices, namely stock and house prices, into the inflation targeting framework by including them in the Taylor rule say, then this boom which did indeed 'end in tears' would not have been so pronounced in the first place. Furthermore, the apparent sweeping under the carpet of the asset price collapse by policymakers and the tendency to forget about such bubbles, along with the demonstrably fallacious belief which appears to be still held by some of those in power that such dramatic asset price collapses represent so-called 'black swan' events is extraordinarily dangerous, and unfortunately may well mean that we may find ourselves in a similar situation in the not too distant future.

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